MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A++' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

The list of projects submitted to Government funding agencies in last three years (i.e 2020,2021,2022)

Sr. No.	Title of the Project	Principal Investigator &co- Investigator	Department	Funding Agency	Amount	Date of submission	status	Year
1	Movement for Health:A Movement in Indian Health Science & Technology	PI : Dr Rajani Mullerpatan	MGM School of Physiotherapy	Science and Engineering Research Board, SERB	INR 385000	9th December 2022	Not Accepted	2022
2	Proforma for Submission of a proposal under 'SAHAJ-Infrastructure Programme	PI : Dr Rajani Mullerpatan, Co-I: Dr Mansi Thakur	MGM School of Physiotherapy	Department of Biotechnology,	INR 42964000	25th November 2022	Not Accepted	2022
3	Re-configuration of management of osteoporosis in children and adults: ashift in paradigm from treatment to prevention using a novel biotechnology device 'Swasthya for Asthi-Tavasya	Dr Rajani Mullerpatan(PI),Co-I : Dr Triveni Shetty, Dr Dayanand Jadhav, Dr Sunil Wagh	MGM School of Physiotherapy	Department of Biotechnology (DBT)	INR 2961165	15th September 2022	Accepted for sanction	2022
4	FIST Life Science 2022: Level B	PI : Dr Rajani Mullerpatan, CO-I : Dr Bela Agarwal MGM School of Physiotherapy ,MGM Institute of Health Science, Navi Mumbai	MGM School of Physiotherapy	Department of Science and technology	INR 29978890	10th of August 20222	Not Accepted	2022
5	Prediction and Management of Diabetic Neuropathy in Urban, Rural and Tribal People of Raigad District, Maharashtra: The Foot-MaP Study	PI : Dr Rajani Mullerpatan, Co-I : Professor Ravi. B, Mr Nishant Kathpal, Dr. Maninder Singh Setia	MGM School of Physiotherapy	Deptartment of Health Research (DHR) -Ministry of Health and Family Welfare (MoHFW) - Grant in Aid scheme	INR 15585394	30th July 2022	Not Accepted	2022
6	Integrated Geriatric Training: Targe.ed to address 5 Geriatrics Giants-Immobility, Instability, Incontinence, Impaired cognition and Insomnia	PI:Dr Rajani Mullerpatan	MGM School of Physiotherapy	Deptartment of Health Research (DHR) -Ministry of Health and Family Welfare (MoHFW) HRD	INR 4996607	15th July 2022	Accepted for sanction	2022
7	Empowerment of primary caretakers of children with cerebral palsy using Mobile-based technology DREaM of CP: Detect, REhabilitation and Monitoring of Cerebral Palsy	PI:Dr Rajani Mullerpatan,CO-I Dr Triveni Shetty	MGM School of Physiotherapy	Department of Biotechnology ,BIRAC – PACE Scheme	INR 3490000	30th march 2022	Not Accepted	2022
8	Empowerment of community-dwelling elderly people for maximization of physical function using mobile-based technology: DREaM of E Detection, REhabilitation and Monitoring of Elderly	PI-Dr. Rajani Mullerpatan, Co-I Ms. Poonam Desai	MGM School of Physiotherapy	Department of Biotechnology ,BIRAC PACE Scheme	INR 3520000	30th march 2022	Not Accepted	2022

9	**Health of health care workers - A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic**	**PI-Dr. Rajani Mullerpatan**	**MGM School of Physiotherapy**	**ICMR-Concept Nore**	**NA**	**30th June 2021**	**Rejected**	**2021**
10	**Foster Human Movement Science for excellence in Biomechanics Training, research, services, technology design and validation for application in health, sports and wellness**	**MGM School of Physiotherapy**	**MGM School of Physiotherapy**	**Department of Science and Technology (DST), Govt. Of India- FIST PG College Level 0**	**INR 14596044**	**21nd September 2021**	**Rejected**	**2021**
11	**Squat Intervention Squat Test for Evaluation and Rehabilitation – Novel, non invasive tool to monitor, assess and manage Osteoarthritis of Knee to Improve physical function and social performance**	**PI: Dr. Rajani Mullerpatan CO-I Dr. Bela Agarwal, Dr. Raman P. Yadav, Dr. Preeti Kapoor**	**MGM School of Physiotherapy**	**Pfizer Competitive Grant Program**	**INR 12271169.31**	**23rd September 2021**	**Rejected**	**2021**
12	**Telemonitoring of physical function and distance rehabilitation of community dwelling elderly people)**	**PI- Dr.Poonam Desai, CO-I Dr. Rajani Mullerpatan**	**MGM School of Physiotherapy**	**Department of Science and Technology (DST), Govt. Of India - Women Scientist Scheme – B**	**INR 3042600**	**1st March 2021**	**Accepted ongoing**	**2021**
13	**Surface EMG and Kinematics of muscles of Pelvic floor and Trunk in patients with Dysfunctional Voiding and Obstructed defecation syndrome due to pelvic floor dyssynergia ,in sqautting , sitting and modified commode chair sitting positions.**	**PI: Dr Aparna Hegde Co-I :Dr Rajani Mullerpatan, Dr Bela Agarwal**	**MGM School of Physiotherapy**	**International Uro-Gynecological Association**	**INR 901000**	**15th June 2021**	**Rejected**	**2021**
14	**Development of mobile technology (Detect, Rehabilitate And Monitor DREAM) : empowerment of primary care takers of children with cerebral palsy**	**PI:Dr. Rajani Mullerpatan CO-I Dr. Sailakshmi Ganesan, Dr. Triveni Shetty, Dr. Vijay Bhosale**	**MGM School of Physiotherapy**	**Rajiv Gandhi Science and Technology Commission (RGSTC), Govt. of Maharashtra**	**INR 2254000**	**26th February 2021**	**Accepted ongoing**	**2021**
15	**Adding breathes to life of patients with chronic respiratory disorders**	**PI : Dr. Bela Agarwal ,CO-I (PT) ,Dr. Rajani Mullerpatan**	**MGM School of Physiotherapy**	**ICMR-Ad HOC: 2021**	**INR 994000**	**17th December 2021**	**Rejected**	**2021**
16	**Screening for early Peripheral Vascular Disease and influence of patient-education with self-care using mobile application based guided telerehabilitation**	**PI :Dr. Rajani Mullerpatan P, CO-I : Dr. Bela Agarwal**	**MGM School of Physiotherapy**	**ICMR-Ad HOC: 2021**	**INR 1635000**	**17th December 2021**	**Rejected**	**2021**
17	**Mobile based application for tele-rehabilitation of older adults with primary insomnia**	**PI : Dr. Rajani Mullerpatan, CO-I Dr Bela Agarwal, Dr Shreeja Nair**	**MGM School of Physiotherapy**	**ICMR-Ad HOC: 2021**	**INR 1905000**	**17th December 2021**	**Rejected**	**2021**
18	**Re-configuration of management of osteoporosis in children and adults: a shift in paradigm from treatment to prevention using a novel biotechnology device**	**PI : Dr. Rajani Mullerpatan,**	**MGM School of Physiotherapy**	**TATA Innovation Fellowship(TIF)**	**-**	**11th Novemeber 2021**	**Rejected**	**2021**
19	**Cultivation of Health Sanskar among post-menopausal women for Swasthya and Asthi-tavasya**	**Dr. Rajani Mullerpatan**	**MGM School of Physiotherapy**	**TATA Innovation Fellowship(TIF)**	**INR 2395000**	**15th December 2020**	**Rejected**	**2020**

Criteion III Incharge
MGM School of Physiotherapy,
Navi Mumbai

QAC Co-Oridinator
MGM School Of Physiotherapy
Navi Mumbai

MGM School of Physiotherapy NAVI MUMBAI

Head of Institute
MGM School of Physiotherapy
Navi Mumbai

Professor - Director
MGM School of Physiotherapy
MGMIHS, Navi Mumbai

Movement for Health: A Movement in Indian Health Science & Technology

Reference No. : 282022002445

Saved By : Dr. Rajani Prashant Mullerpatan
Saved Date : 05-Dec-2022

Application for Financial Assistance For Seminar/Symposia

Event Details	Convener Details
Movement for Health: A Movement in Indian Health Science & Technology (Workshop) 10-Feb-2023 to 11-Feb-2023 (2 Days) **Geographical Coverage :** National **Broad Area :** Life Sciences https://mgmsopnm.edu.in/humanMovementSciences.html **MGM Centre of Human Movement Science, MGM School of Physiotherapy, MGM Institute of Health Sciences, Sector 30A, Plot 46, Vashi, Navi Mumbai 400705**	**Dr. Rajani Prashant Mullerpatan** Professor-Director,Physiotherapy chmsmgm@gmail.com **Date of Birth :** 24-May-1972 **Contact No. :** +919920048476 **Nationality :** INDIAN **Mahatma Gandhi Mission Institute of Health Sciences** Deemed University (Private) Sector 1, kamothe, kalamboli, Navi mumbai, Maharashtra-410209

Drapan Portal ID : MH/2017/0180241

Objective :

1. Training young minds in health and engineering to integrate bio and mechanics for need-based innovative applications in healthcare: Human movement science has wide applications in healthcare ranging from identification of risk for injury/movement disorder, prevention of injury/ disorder, treatment of injuries and monitoring function after injuries and design of technology pertinent to movement disorders. Biomechanics is fundamental to human movement science. The science of human movement is steadily growing in India. The last decade has witnessed increased opportunities for Biomechanics research throughout India with the support from GoI. However, the fundamental biomechanics research and clinical biomechanics is happening a few health and engineering institutes. Each institute is working in isolation within a specific mandate of funded projects. Secondly, there are negligible opportunities for interdisciplinary training in biomechanics, because currently training is delivered within the nucleus of health or engineering as a part of curricular activity. Therefore, an urgent need to integrate knowledge and skills in bio with mechanics for a deeper, comprehensive understanding of human movement, motivates us to organize this workshop which will bring young researchers and policy makers in health and engineering disciplines together to impart training in biomechanics and set a road map for building a sustainable evidence-based ecosystem for such ongoing training. 2. Building awareness of human movement science, recent development in biomechanics and its healthcare applications among students, researchers, faculty members and policy makers from health and engineering disciplines and disseminate information: In the western world, human movement science has developed a range of applications in movement pertinent healthcare technology. India is a huge consumer of these products(80%) which are used in routine clinical practice for diagnosis and management. Hence the proposed Workshop aims to build awareness among students,researchers,faculty members and policy-makers from health and engineering disciplines to develop human movement science with an objective of creating affordable robust interdisciplinary solutions within country and build an Atmanirbhar Bharat in movement technology! 3. Capacity building between health and engineering institutes: India faces an urgent need to develop an interdisciplinary taskforce in biomechanics for designing simple, bold health care solutions for movement pertinent disorders. We can address this need through an interdisciplinary sustainable ecosystem for ongoing seamless activities on online and offline platforms. Hence,the event is designed to provide a live platform to concerned faculty members and policy-makers from health and engineering disciplines across India to network for sustainable capacity building in movement science for training,research and technology-design activities. 4. Establishment of Society of Human Movement Science in India: India faces an urgent need for concerted, cohesive inter-disciplinary effort between health and engineering sciences to develop human movement science for affordable, robust, indigenous health care solutions for the management of movement disorders. Currently, there is no active Society of researchers and clinicians working in the area of human movement science with a focus on biomechanical solutions pertinent to health care issues. The Indian Society of Biomechanics,was conceived two decades ago and established in IIT Delhi at the Center of Biomedical Engineering. Webpage of Indian Society of Biomechanics is currently linked on website of IIT-Roorkee with no records of any activity since 1998. Hence,need for a new Society with a broader healthcare focus is identified. MGM Centre of Human Movement Science is committed to develop this science in India,disseminate fundamental knowledge and study applications of movement science in health promotion and management of movement disorders, to address unmet local and global needs of people from across all economic strata of society. Esteemed researchers actively working in the area of biomechanics and policy makers from institutes such as such as IITs , Rajiv Gandhi Science and Technology Commission, TIFAC, DST, IISc, BARC, and MGM Institute of Health Sciences, Navi Mumbai expressed a strong need for creating a vibrant society of biomechanics in India during the Annual Meets of MGM Centre of Human Movement Science(MGMCHMS). 5. Fortify existing facilities at MGM CHMS as a national facility for design and validation of movement pertinent technology: MGM Centre has supported individual innovators and organizations to validate 11 ingeniously designed devices against gold standard to address unmet needs in management of patients with poliomyelitis, lower extremity amputations, diabetes, backache, health promotion, athletic performance and gait . Individual innovators ranged from entrepreneurs to our youngest listed innovator who was a standard X school student. The Workshop aims to interact with policy-makers in health and engineering disciplines to evolve MGMCHMS as a national Centre for validation of technology pertinent to management of movement disorders where innovators and entrepreneurs find a platform to validate their indigenous solutions against gold standard tools. With due support and recognition to develop MGM Centre of Human Movement Science as a national facility will help to organize a standardized seamless ecosystem for rehabilitation technology validation and strengthen initiatives launched by Government of India to ‘Make in India’, ‘Innovate India’ and ‘Start-up India’. 6. Building Industry partnership: The Workshop is designed to voice a dialogue between academia and industry to garner support from relevant industry partners for successful commercial transfer of innovative healthcare solutions in movement technology.

Keywords :

Human Movement Science, Clinical biomechanics, management, Technology design-validation, Sports, Health

Brief information of last three events organised by your department :

In past 7 years, the MGM Centre of Human Movement Science(MGM CHMS) has gained recognition for its work in training healthcare professionals and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering. The MGMCHMS has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi, Guwahati , Bengaluru through total 20 training courses and tours. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1200 students from Bachelors and Masters of Physiotherapy, Bachelors of Prosthetics & Orthotics and Master of Surgery (Orthopedics) benefited from biomechanics training. The last three events organised by MGMCHMS included workshops in 3D gait analysis from 2020-2022 and a conference on Spine disability in 2019. Total 309 participants were trained in gait analysis workshop whereas more than 150 participants attended the conference in January 2019. The participants registered across healthcare and engineering disciplines from various states of country to attend 2 day event delivered by national and international faculty members. The conference was organised in collaboration with World Spine Care, Europe and included key note speakers from Spine Foundation-India, SEARCH- Gadchiroli, Yale University, Cardiff University.

Is this Seminar/Symposia held annualy? :

Yes

Any other relevant matter :

Not Available

Broad Details of Estimated Expenditure :

S.No.	Budget Description	Total Expenditure (INR)	Funding Required from SERB (INR)
1	Domestic Travel (Young and Senior Scientists)	3,35,000	3,35,000
2	Pre-conference printing	50,000	50,000
	Grand Total (INR)	**3,85,000**	**3,85,000**

RTGS Details

Name of Account Holder :	MGM Institute of Health Sciences Research
Email ID :	accountmumbai@mgmuhs.com
Designation :	Registrar
Account Number :	0183104000347532
Bank Name :	IDBI Bank
Branch Name and Address :	IDBI Building, Plot no 39,40,41 Sector-1, CBD Belapur, Navi Mumbai-4006 I 4
IFSC Code :	IBKL0000183
Comments :	Not Available

Theme of Proposed Work :

1. Health
2. Technology Design & Validation

Suitability of the proposed work in the major national initiatives of the Government :

1. Make in India
2. Startup India
3. Innovate India

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Certificate from the Convenor

Event Name: **Movement for Health: Movement in Indian Healthcare**

1. The same proposal for organize conference/ seminar/ workshop/ symposia titled **Movement for Health: A Movement in Indian Health Science and Technology** has not been submitted elsewhere for financial support; if submitted, kindly furnish the details-

2. I agree, I will submit audited statement of Income and Expenditure, Utilization Certificate and brief report within three months after the completion of the event.

3. I agree to display the SERB logo on all materials being used for the event.

4. I declare I have already submitted all financial papers (UC & SE) for previous grant received; if not submitted, kindly provide details-

5. I agree to abide by the terms and conditions of SERB grant.

Name and signature of the Convener:

Dr Rajani Mullerpatan
Date: 8th December 2022
Place: Navi Mumbai

Professor - Director
MGM School of Physiotherapy
MGMIHS, Navi Mumbai

MGM School of Physiotherapy NAVI MUMBAI

Name and signature of the Co-Convenor (if any):

Dr Darshan Shah
Date: 8th December 2022
Place: Navi Mumbai

MGM INSTITUTE OF HEALTH SCIENCES

(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)

This is to certify that:

1. Dr. Rajani Mullerpatan, the Convener of the proposed conference/ seminar/workshop/ symposia titled Movement for Health: A Movement in Indian Health Science and Technology is working in our **Institute will assume the full responsibility for organizing the same.**

2. The Convener is a regular employee of our Institute and working as Professor- Director at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai.

3. The Convener will be governed by the rules and regulations of University/ Institute/ Organization/ College/ Society and will be under administrative control of the University/ Institute/ Organization/ College/ Society for the completion of all the formalities related to the approved event.

4. The grant-in-aid by the SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi will be used to meet the expenses related to the approved event only i.e. TA/DA to Young and Senior Indian Scientists, Pre-conference printing etc.

7. The University/ Institute/ Organization/ College/ Society will provide basic infrastructure and other required facilities to the Convener for implementing the event.

8. The Convener through University/ Institute/ Organization/ College/ Society will submit materials (i.e. audited income expenditure statement, brief report of the event, copy of certificate, abstract book etc.) related to the approved event to SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi after completion.

9. The University/ Institute/ Organization/ College/ Society assumes to undertake the financial and other management responsibilities of the released grant for the event.

Signature of Convener / Organising Secretary

Professor - Director
MGM School of Physiotherapy
MGMIHS, Navi Mumbai

MGM School of Physiotherapy NAVI MUMBAI

Signature with Seal
(Head of the Institution i.e. Registrar / Director / Principal)
(In case of University / Academic Institution)

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Post Box no 06, 3rd Floor MGM Educational Campus, Plot No. 1 & 2, Sector -1, Kamothe, Navi Mumbai – 410 209.
Tel: 022-27432471/27431994, Fax: 022-27431094
Website: www.mgmuhs.com Email: registrar@mgmuhs.com

Other Technical Details
(Financial Assistance to Seminar / Symposia)

Name of the event-

Movement for Health: A Movement in Indian Health Science & Technology

Technical Meeting: Canvas for Human Movement Science & Technology in India
&
Workshop in Clinical Biomechanics

Broad details of estimated expenditure: (In Rupees)

a)	TA/DA for Young Scientists (Indian, n=50)	= 125000.00
b)	TA/DA for Senior Scientists (Indian, n=35)	= 210000.00
c)	Pre-conference printing (Announcements, abstracts, etc.)	= 50000.00
d)	Publication of Proceedings	= 150000.00
e)	Stationary	= 50000.00
f)	Secretarial Assistance	= 25000.00
g)	Local Hospitality	= 100000.00
h)	Misc.	= 50000.00
		Total = 760000.00

2. Financial assistance required from SERB for the proposed event:

a. Domestic Travel for Young and Senior Scientists (Indian Only) = 125000+210000=335000.00

b. Pre-Conference Printing (Announcements, abstracts etc.) = 50,000.00

Total = 3,85,000.00

3. Details of income:

A. Revenue:

a)	Registration fees	= 100000.00 (2000 *50)
b)	Advertisement Charges	= 50000.00
c)	Sponsorships	= 50000.00

B. Contribution by organizing Society/Institute = 175000.00

C. Support from other funding agencies:

	Agency Name	Amount Requested (`)	Amount Committed (`)	Amount Received (`)
a)	-none-			
	Total (C)	**(a+b+c+d)**	**(a+b+c+d)**	**(a+b+c+d)**
Grand Total		**(A+B+C)**	**(A+B+C)**	**(A+B+C)**

4. Details of previous grant received <u>by convener</u> from SERB in past:

S. No.	Sanction order No.	Date	Name of Activity (Seminar / Conference / Workshop etc.)	Amount Sanctioned (`)	UC Furnished to SERB (Y/N) (If Y, attach UC copy)
1.	- None -				

5. Details of previous grant received <u>by organizing Institute / University / College / Society</u> from SERB in past:

S. No.	Sanction order No.	Date	Name of Event (Seminar / Conference / Workshop etc.)	Amount Sanctioned (`)	UC Furnished to SERB (Y/N) (If Y, attach UC copy)
1.	- None -				

6. **Details of participation in the event:**
   - **A. Foreign Delegates (Nos.):** None
   - **B. Indian Delegates (Nos.): 85**
     a) Young Scientists – Participants (<35 years): 50
     b) Senior Scientists- Invitees: 35

7. **List of participants (Confirmed- Young Scientists)**

Sr. no	Name of the Participant	Affiliated Department and Institute (with full address)	Email ID	Contact no.
1	Heli Nitin Savla	MPT, MGMIHS	helis@mgmsopnm.edu.in	9920271667
2	Prerna Yogesh Khosla	MGM School Of Physiotherapy	prernakhosla6263@gmail.com	8369479789
3	Vaidehi Gharpure	MGM School Of Physiotherapy	vaidehi96.gharpure@gmail.com	9096598725
4	Chetna Lingraj Kunti	MGM School Of Physiotherapy	chetnakunti82@gmail.com	9145249749
5	Niyati Dharmendra Desai	MGM School Of Physiotherapy	niyatid@mgmsopnm.edu.in	9821383738
6	Nikita Jagtap	MGM School Of Physiotherapy	jagtapnikita25@gmail.com	8169456183
7	Devika Anant Bhosale	MGM School Of Physiotherapy	bhonsaledevika@gmail.com	9119525766
8	Jaimini Chaudhri	MGM School Of Physiotherapy	jaimini340@gmail.com	9820873477
9	Bhumika Adsul	MGM School Of Physiotherapy	bhumikaadsul98@gmail.com	9987964555
10	Manasi Borse	MGM School Of Physiotherapy	borsemanasi121@gmail.com	7755938882
11	Jahnvi Shah	MGM School Of Physiotherapy	shahjahnvi@mgmsopnm.edu.in	8369929065
12	Dishti Manish Solanki	MGM School Of Physiotherapy	dsolanki@mgmsopnm.edu.in	9833693421
13	Labdhi Shah	MGM School Of Physiotherapy	labdhishah2907@gmail.com	7208797151
14	Shraddha Narsappa Shakapnor	MGM School Of Physiotherapy	shraddhashakapnor30@gmail.com	8452024668
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16	Devi Nagini Pilli	MGM School Of Physiotherapy	devipilli@gmail.com	7550171964
17	Trupti Yashodhara Poojary	MGM School Of Physiotherapy	poojaryt9@gmail.com	9769924324
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22	Laxmi Simanlal Arya	MGM School Of Physiotherapy	laxmiaryabpt2016@gmail.com	8449039289
23	Netra Nandaram Kokane	MGM School Of Physiotherapy	netrakokanek16@gmail.com	7447313574
24	Tanvi Santosh Kadve	MGM School Of Physiotherapy	tanvi6115@gmail.com	7021274657
25	Shubham Tawade	MGM School Of Physiotherapy	shubhamtawade1999@gmail.com	9987548266
26	Pratiksha Pol	MGM School Of Physiotherapy	pratikshapol29@gmail.com	7738425858
27	Shrushti Jhachak	MGM School Of Physiotherapy	shrushtijachak@gmail.com	7507051123
Name to be identified				
	2- M.Sc/ Mtech	IIT Madras		
	2- PhD Scholars	IIT Madras		
	2 Prosthetic &Orthotics	MGMIHS		
	8 MSc / MTech	IIT Bombay		
	2 PhD Scholars	IIT Bombay		
	5 MSc - name to be identified	Pillai COE		
	2- M.Sc -name to be identified	BITS Pillani, Goa		
	1 PhD Scholar	BITS Pillani, Goa		
	M Tech Students	MGM COE, NM		
	MSc/ M Tech Students	SVERI , COE		

****Note:** To avoid any failure for consideration of submitted application, please do not make anychanges in the prescribed format of this document.*

Annexure No. (If any):

Movement for Health: A Movement in Indian Health Science & Technology

Technical Meeting: Canvas for Human Movement Science & Technology in India

2023 Agenda

13.00 - 13.30	Opening remarks	
13.30- 14.00	Lunch	

Scientific Meeting

Chairman: Dr Anil Kakodkar, Chairman, Rajiv Gandhi Science & Technology Commission
Co-chairman: Shri. Kamalkishore N. Kadam, Chancellor, MGM Institute of Health Sciences, Navi Mumbai.
Dr. Shashank D. Dalvi, Hon'ble Vice Chancellor, MGM Institute of Health Sciences, Navi Mumbai

Time	Topic for discussion	Speaker
14.00-14.30	Current work in Human Movement Science	
	Future work : Patient Care, Training, Research & Validation of Technology	Dr. Rajani Mullerpatan
14.35- 15.05	Pathway for translation of movement science research into healthcare improvement	Dr. Rajani Mullerpatan
15.05-16.00	Brainstorm & identify collaborative research initiatives to generate scientific applications of clinical biomechanics in healthcare: Indian and global map	
16.00-16.30	Roadmap to establish National COE in Human Movement Science & National Centre for validation of Movement pertinent Technology. Potential Collaborations with Internal and External Stakeholders	**Invitees** (DST, AYUSH, NIAS Bangalore, SVYASA Bangalore, DHR,DBT, RGSTC) **& Partners** (IISc Bengaluru, IIT-Madras, IIT-Guwahati, IIT-Bombay)
16.30-16.45	Concluding remarks on relevant research initiatives in tune with national priority and roadmap for feasibility	Dr Anil Kakodkar Shri. Kamalkishore N. Kadam Dr. Shashank D. Dalvi
16.45-17.00	Vote of Thanks	Dr. Bela Agarwal

* 17.00 onwards join us for High Tea

Movement for Health: A Movement in Indian Health Science & Technology

Workshop in Clinical Biomechanics

Schedule (16 hours)

Day	Activity	Type of activity	Resource Person
8.30-9.15	Registration, introduction and interaction over Breakfast		
	Day 1: Session 1- Motion Capture and Analysis		
9.15-10.00 am	Introduction to Human Movement Science: Integration of Health & Science.	Theory	Dr Rajani Mullerpatan
10.05-11.35 am	Motion Capture and Analysis: Kinematics eg. Gait	Theory & Practical	Dr Bela Agarwal
11.40-13.00 pm	Motion Capture and Analysis: Kinetics of movement (Forces, Moments & Power) eg. Gait	Theory & Practical	Dr. Triveni Shetty
13.05—13.15 pm	Interdisciplinary Dialogue	Interaction	
1.00 - 2.00	***Lunch***		
	Session 2 – Integration of Bio and Mechanics		
2.00-2.40 pm	Foot geometry and Plantar Pressure	Theory & Practical	Dr. Triveni Shetty
2:40 – 3:15 pm	Motor control and Movement Analysis: Movement Science and Robotics	Theory & Practical	Dr. Darshan Shah
3.20 – 3.45 pm	Virtual Tour/ Visit to BETiC – IIT B	Interactive	Dr. Rupesh Ghyar
3.50-4.15	Virtual Tour to BiOME Centre –IIT B	Interactive	Dr. Darshan Shah
4.30 - 5.00 pm	Interdisciplinary Dialogue & feedback		
	Day 2 : Session 3- Musculoskeletal Modeling & Application		
9.00-9.45 am	Musculoskeletal Modeling-I - Theoretical Approach	Theory	Dr Ganesh Bapat
9.45-10.45	Musculoskeletal Modeling-II- Application in Rehabilitation	Practical	Dr Rupesh Ghyar
10.50-11.30 am	Application Movement Science for guiding prosthetic design	Practical	Dr Sujatha Srinivasan
11.40-12.15 pm	Biomechanics & Technology- continuum from clinical needs- research –industry entrepreneurship	Theory & Interaction	Prof B Ravi- to be confirmed
12.20-12.45 pm	Group discussions-groups Use of movement analysis to guide rehabilitation -roadmaps	Interactive	
12.50-1.30	Lunch		
	Day 2 : Session 4- Musculoskeletal Modeling & Application		
1.30-4.00 pm	Introduction to Opensim & practical application of Opensim		Faculty from MGMCHMS & Industry- Names to be confirmed
4.05-4.30 pm	Interdisciplinary Dialogue & feedback		

List of key-note Speakers / Resource Persons:

S. No.	Name & Designation	Research / Expertise Area	Affiliated Department and Institute (with full address)	Email Id (Official)	Contact No (Office & Mobile)	Status of Availability (Confirmed/Awaited)
1.	Dr. Anil Kakodkar, Chairman		Chairman ,Rajiv Gandhi Science and Technology Commission	ak@anilkakodkar.in		**Awaited**
2.	Dr. Rajesh Gokhale		Secretary, Dept. of Biotechnology, Govt. of India	sec@dbt.nic.in		**Awaited**
3.	Dr. Sanjay Mishra		Scientist `H' , Dept. of Biotechnology, Govt. of India	sanjaykr.mishra[@nic.in		**Awaited**
4.	Dr. Arindham Bhattacharya		Scientist 'E' , Dept of Science & Technology, Govt. of India	a.bhattacharyya@nic.in		**Awaited**
5.	Dr. Arun Sapre		Former Member Secretary and Advisory - Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra			**Awaited**
6.	Dr. Narendra Shah		Secretary, Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra	rgstcmaha@rediffmail.com		**Awaited**
7.	Dr. T.M Srinivasan	Yoga	SVAYSA, Bengaluru	editor@ijoy.org.in		**Awaited**
8.	Dr. Sujatha Srinivasan		R2D2 lab, IIT - Madras, Chennai	sujsree@iitm.ac.in		Confirmed
9	Dr. Darshan Shah		IIT Bombay, Mumbai	d.shah@iitb.ac.in dssiitb@gmail.com		Confirmed
10.	Dr. Bhushan Patwardhan	Yoga	Chairman of the Interdisciplinary AYUSH R&D	bhushan@unipune.ac.in bpatwardhan@gmail.com		**Awaited**
11.	Dr. Sandhya Koushika		Associate Prof, Department of Biological Sciences, Tata Institute of Fundamental Research	spkoushika@tifr.res.in		**Awaited**
12	Dr. Satyanaranyan Bheesette		Scientific Officer(H);Tata Institute of Fundamental Research	bsm@tifr.res.in		**Awaited**
13	Dr. Surendra Jaiswal	Social Studies	Deputy Director, Tata Institute of Social Studies			**Awaited**
14	Dr. Sai Baba M	Yoga	NIAS, Bengaluru, Karnataka	msaibaba@nias.res.in director@nias.res.in		**Awaited**
15	Dr. Kanagraj	Biomechanics	IIT- Guwahati, Guwahati, Assam	kanagaraj@iitg.ac.in		Confirmed
16	Dr. Omkar SN	Biomechanics	Indian Institute of Science, Bengaluru	omkar@iisc.ac.in		**Awaited**
17	Name to Identified		IIT- Gandhinagar			**Awaited**
18	Dr. Rajiv Bahl		Secretary, Dept. of Health Research	secy-dg@icmr.gov.in		**Awaited**
19	Dr. Geeta Laatkar	Engineering	COE, MGM, Panvel			**Awaited**

20	Dr Richa Agrawal	Engineering	COE Pillai , Panvel	ragrawal@mes.ac.in		Confirmed
21	Dr. Sandeepraj Salunke	Engineering	Shri Vithal Education & Research Institute(SVERI), Pandharpur	rrgidde@coe.sveri.ac.in		Confirmed
22	Dr. Vilas Sakpal	Engineering	Vice Chancellor, MGM University, Aurangabad	vc@mgmu.ac.in		**Awaited**
23	T.G Sitharam	Engineering	Chairman, All India Council of Technical Education	director@iitg.ac.in tgs@iitg.ac.in proftgs@gmail.com	+91 361 258 2005	**Awaited**
24	Dr Anil Sahastrabudhe	Engineering	Former Chairman, All India Council of Technical Education	info@imperialsociety.in	+91-1204538457 +91-9971625088	**Awaited**
25	Dr. Manish Agarwal	Orthopedics	Head of Orthopedic Oncosurgery, Hinduja Hospital			**Awaited**
26	Dr. Ashok Johari	Orthopedics	World President, International Society of Orthopedics & Traumatology	drashokjohari@drashokjohari.com		**Awaited**
27	Dr. Arun Bal	Diabetes	Consultant Diabetic Foot Surgeon, S. L. Raheja Hospital	arunbal@vsnl.net	: 91 22 24468033 +919820128656	**Awaited**
28	Dr. Dinshaw Paridiwala	Sports	Head of Sports Centre, Hinduja Hospital, Mumbai	Dinshaw.Pardiwala@relianceada.com. pardiwala@outlook.com dinshaw.pardiwala@kokilabenhospitals.com		**Awaited**
29	Dr Mihir Bapat	Spine	Director & Sr Consultant - Nanavati Max Institute of Spine Surgery			**Awaited**
30	Dr. Shekhar Bhojraj	Spine	Professor in Orthopedics and Chief Neurospinal Unit, KEM Hospital	dr.shekharbhojraj@jointsurgeryhospital. com	91-9860432255 91 – 9325887033	**Awaited**
31	Dr. Raghuprasad Verma	Spine	Fortis Hospital, Vashi, Navi Mumbai		91-9325887033 91 22 3919 9222	**Awaited**
32.	Dr. Abdur Rub	Industry	CEO, Wadhwani Research Center for Bioengineering (WRCB)	ceo.wrcb@iitb.ac.in	+91 (22) 25765500	**Awaited**
33.	Dr. Mukesh Doshi	Industry	Consultant, Prosthetist & Orthotist, Jupiter Hospital, Thane		91 22 6297 5555	**Awaited**
34	Sandeep Makkar	Industry	Managing Director, Johnson & Johnson Medical India (JJMI)	smakkar@its.jnj.com		**Awaited**
35	Sridhar S	Industry	Country Manager, Pfizer			**Awaited**
36	Parvati Dutta	Classical Dance	HOD, Mahagami Dance Institute, MGM Aurangabad	mahagami.outreach@gmail.com	070836 52636	**Awaited**
37	Mayoor Gandhi	Industry	Vissco, Chairman	mayoorg@hotmail.com	919322449857	**Awaited**
38	Mr. Vikas Rastogi		Principal Secretary, Department of Higher and Technical Education,Government of Maharashtra	psec.higheredu@maharashtra.gov.in		**Awaited**

***Note:** To avoid any failure for consideration of submitted application, please do not make any changes in the prescribed format of this document.*

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
MGM SCHOOL OF PHYSIOTHERAPY
Sector-1, Kamothe, Navi Mumbai – 410209

INVITATION

2023 Workshop in Clinical Biomechanics

Movement For Health:
A Movement in Indian Healthcare

Time: 9.00 am-5.00 pm
Location: MGM Centre of Human Movement Science

REGISTER

Link:

Eminent speakers from known universities across India and abroad

Objectives

- Basic methodology of movement analysis
- Principles of biomechanical modeling
- Theories of movement control and loading
- Able to integrate and apply the above to analyze movement problems encountered in patient population

+91-9920633288
mgmchms@mgmsopnm.edu.in
https://mgmsopnm.edu.in/humanMovementSciences.html

7143/2019/HRD-DBT

Department of Biotechnology
Ministry of Science & Technology

SUB: Proforma for Submission of a proposal under 'SAHAJ-Infrastructure Programme

I. General Information

A. Principal Investigator(s) details (Multi-institutional project, please provide details of all the stakeholders)

i. **Name of the Investigator**: Dr. Rajani Mullerpatan
ii. **Date of Birth:** 24th May 1972
iii. **Official Address**

MGM School of Physiotherapy, MGM Institute of Health Sciences, Plot 1, Sector 1, Kamothe, Navi Mumbai 410209
Tel. & Mob. No. :022 7437866/9920048476
Email: rajani.kanade@gmail.com
iv. **Status of Institute: Private**

(In case of private/ NGO(s) copies of registration certificate, Articles and Memorandum of Association and Audited Statement of Accounts of last three years have to be enclosed)

B. Collaborator(s) and /or co-investigator(s) details (In case of any changes during the execution of the project, a formal letter has to forwarded to DBT)

ii.Name of the Co-investigator: Dr.Mansi Thakur
Date of Birth:18 Aug 1979
Official Address: Director, MGM School of Biomedical Sciences, MGM Institute of Health Sciences, Plot 1, Sector 1, Kamothe, Navi Mumbai 410209
Mob.No.+ 91-9769909212
Email: mansibiotech79@gmail.com

II. Technical Information about the Project

A. Overall Objectives:

1. Develop an integrated Science of clinical biomechanics at macro level(ligament,tendon, muscle, tissue) with movement analysis and micro level with zebrafish models and bio-cellular response of tissue to exercise, fatigue and injury.
2. To augment the existing training facilities at MGM Centre of Human Movement Science to a national facility which can offer ongoing online and offline training in clinical biomechanics to healthcare and engineering students, researchers and practitioners to generate an interdisciplinary task force for clinical biomechanics pan India.
3. To upgrade the existing facility to a robust national level of excellence in sports science to provide a DNA print of the body profile of a sports-person at the beginning of a sports career, to identify a human body shape for a specific sport, guide performance enhancement, identify risk of injury, prevent injury and rehabilitate the sports person for return to sport.
4. To fortify MGM Centre of Human Movement Science as a national facility for innovative design of indigenous healthcare solutions and technology for rehabilitation of people with movement disorders resulting from neurological, musculo-skeletal, endocrinological, cardio-pulmonary conditions, injury, trauma and aging. For e.g. cerebral palsy, stroke, parkinson's, osteoarthritis, joint arthroplasty, diabetes, amputation.
5. To evolve MGM Centre of Human Movement Science as a national Centre for validation of technology pertinent to rehabilitation of movement disorders where innovators and entrepreneurs find a platform to validate their indigenous solutions against gold standard tools. With due support and recognition to develop MGM CENTRE OF HUMAN MOVEMENT SCIENCE as a national facility will help to organize a standardized seamless ecosystem for rehabilitation technology validation and strengthen initiatives launched by Government of India to 'Make in India', 'Innovate India' and 'Start-up India'.

7143/2019/HRD-DBT

a. **Proposed Budget** (Please refer to SAHAJ-Infrastructure guidelines)

Kindly also include justification of subhead wise budget requirement.

a. Total cost of the project

	Item		**Proposed Cost Estimate (Rs. in Lakhs)**				
		Equipment Name	**I yr**	**II yr**	**III yr**	**IV yr**	**V yr**
	Non-Recurring (includes Equipment's, Facilities, Platform, Teaching aids etc.)- Quotations must be provided	6 Vicon Valkyrie VK8 Outdoor portable motion analysis	71,00,000.00				
		Isokinetic system	120,00,000.00				
		In-shoe plantar pressure system with a pliance sensor	52,00,000.00				
		Portable color Doppler and Ultrasound scanner	36,00,000.00				
		Total	294,00,000.00				
	Subtotal(I)=		**279,00,000.00**				
	Recurring						
	Manpower (on consolidated salary basis/or as per GoI notifications)	JRF (Engineering Mechanical/ Computer Science/ M Tech)	372000.00	372000.00	372000.00	372000.00	372000.00
		JRF (Physiotherapist)	372000.00	372000.00	372000.00	372000.00	372000.00
		Radiologist (Consultant-4hr/ week)	288000.00	288000.00	288000.00	288000.00	288000.00
	Consumables		1,00,000.00	1,00,000.00	1,00,000.00	1,00,000.00	1,00,000.00
	Contingency		1868000				

	Travel		2,00,000.00	2,00,000.00	2,00,000.00	2,00,000.00	2,00,000.00
	Overhead		37,36000.00				
	Training & Workshop*		3,00,000.00	3,00,000.00	3,00,000.00	3,00,000.00	3,00,000.00
	Maintenance *						
	Total		16,44,000	16,32,000.00	16,32,000.00	16,32,000.00	16,32,000.00
	Subtotal(II) =		137,64,000.00				
	Grand Total (I+II)=		429,64,000.00				

- For equipments – their name and number must be included in the table which will be supported via quotations.
- Please include quotations for outsourcing work, if any
- *Optional

b. Details of equipment proposed

S. No.	Equipment	Budgeted cost (Rs. in Lakhs)			
		Quotation details (Please compulsorily enclose copies of quotation(s))	**Cost in foreign currency (if applicable)**	**Cost in Indian currency (INR)**	**Requested Cost (INR)**
1.	**6 outdoor Vicon 3D motion capture camers**	**Attached**	**75430 sterling pounds**	**74,52,936.00**	**71,00,000.00**
2.	**Isokinetic System**	**Attached**	**-**	**120,57,000.00**	**120,00,000.00**
3.	In-shoe Pedar E3 plantar pressure system with a pliance sensor	**Attached**	**61933 euros**	52,63,219	**52,00,000.00**
4.	**Color doppler and ultrasound**	**Attached**	**-**	**3600000.00**	**36,00,000.00**

Note: For multiple institutes kindly provide the above mentioned tables separately.

b. **Proposed Revenue Model** (Please enclose a list of approved service charges, Also refer to SAHAJ-Infrastructure Guidelines)

Year	Budget Share (Rs. in Lakhs)		
	DBT's Contribution	**Institution/Organization Contribution**	**Revenue proposed to be generated through services**
1	60%	40%	49,80,000.00
2	50%	50%	54,78,000.00
3	40%	60%	6025800.00
4	30%	70%	6628380.00
5	20%	80%	7291218.00

a. **Declaration** - It is certified that

a) The research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out elsewhere on the subject.

b) The same project proposal has not been submitted to any other agency for financial support.

c) The emoluments for the manpower proposed are those admissible to persons of corresponding status employed in the institute/university or as per the Ministry of Science & Technology guidelines.

d) Necessary provision for the scheme/project will be made in the Institute/University/State budgetin anticipation of the sanction of the scheme/project.

e) If the project involves the utilization of genetically engineered organisms, we agree to submit an application through our Institutional Biosafety Committee. We also declare that while conducting experiments, the Biosafety Guidelines of the Department of Biotechnology would be followed in to.

f) If the project involves live trials/experiments/exchange of specimens, etc. we will ensure that ethical clearances would be taken from concerned ethical Committees/Competent authorities and the same would be conveyed to the Department of Biotechnology before implementing the project.

g)It is agreed that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure.

h) We agree to accept the terms and conditions. The same is signed and enclosed.

i) The institute/university agrees that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigator(s) throughout the duration of the project.

j) The Institute assumes to undertake the financial and other management responsibilities of the project.

Signature of Principal Investigator

Signature of Executive Authority of Institute/ University with seal

Date 24 Nov 2022

Pro.Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

Signature of Co-Investigator(s)

Dr. Mansi Thakur

Director, MGM School of Biomedical Sciences,

MGM Institute of Health Sciences, Navi Mumbai

Date:

Director
MGM School of Biomedical Science
Kamothe, Navi Mumbai

Note: An MoA has to be signed by the Institution with Department of Biotechnology for implementation of the project

This is to certify that.

- Requested equipment is/ are not available in the Institute.
- As per the terms and conditions of the grant, grant received in DBT supported R&D project will be kept in the saving bank account and interest earned will be reported in the Utilization Certificates (UC) and Statement of Expenditures (SE).
- There is no pending Utilization Certificate (UC) from our organization for any DBT grant. Also details of all UCs have been uploaded in Public Finance Management System (PFMS) of O/o Controller General of Accounts, Ministry of Finance, Govt. of India and NO UC is pending against the organization as per details of PFMS

Signature of Principal Investigator

Signature of Executive Authority of Institute/ University with seal

Date 24 NOV 2022

Pro.Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

PROJECT HISTORY

Project Title: Re-configuration of management of osteoporosis in children and adults: a shift in
paradigm from treatment to prevention using a novel biotechnology device ‘Swasthya for Asthi-Tavasya’ [BT/PR48544/MED/32/895/2023]

Name of Coordinator: Prof. Rajani Mullerpatan ,Mahatma Gandhi Mission's Medical College

Date of submission: 30/01/2023

PI Details:

(1) **Prof. Rajani Mullerpatan**
Institute: Mahatma Gandhi Mission's Medical College
Address: Sec 1, Kamothe
City: Mumbai
Pin: 410209

Projects Duration: 1Years 6Months

Proposed Cost: Rs. 3641165.00/-

Status: Proposal Under Consideration

TF RECOMMENDATIONS:

MEETING DATE	DECISION TAKEN
30/05/2023 - 30/05/2023	Recommended for fund release

Project Proposal On

"Re-configuration of management of osteoporosis in children and adults: a shift in paradigm from treatment to prevention using a novel biotechnology device 'Swasthya for Asthi-Tavasya'"

Submitted to:

Department of Biotechnology
Ministry of Science and Technology
Government of India
New Delhi, India

Submitted By
Project Coordinator:

Prof. Rajani Mullerpatan
(Mahatma Gandhi Mission's Medical College - Mumbai)

Part 1: General Information

1. **Name of the Institute/University/Organisation submitting the Project Proposal :**

   Mahatma Gandhi Mission's Medical College

2. **State:** Maharashtra

3. **Status of the Institute:** Others

4. **Designation of the Executive Authority of the Institute/University forwarding the application :**

   Director

5. **Project Title :**

   Re-configuration of management of osteoporosis in children and adults: a shift in paradigm from treatment to prevention using a novel biotechnology device 'Swasthya for Asthi-Tavasya'

6. **Category of the Project :** R & D [2]

7. **Specific Area :** Biomedical Engineering (Medical Devices, Diagnostics and Implants)

   Is the Proposal Submitted Under Specific Call for Proposal: Yes

   Call for Proposal Details: Research on key components or resources for Biomedical Technologies

   Category of support : Phase I

8. **Project Duration :** 1 Years and 6 Months

9. **Project Total Cost (Rs):** 3641165.00

10. **Single/Multiple-Institutional:** Single-Institute

11. **If the project is multi-institutional, please furnish the following :**

    Project Coordinator : N/A

    Affiliation : N/A

    Address : N/A

12. **Project Keywords:** Osteporosis, Swasthya for Asthi-Tavasya

13. **Require Regulatory Clearance:** No

    Uploaded Regulatory Clearance Document: **Not uploaded**

14. **Require Ethical Clearance:** Yes

15. Industry Collaboration: No

16. Project Summary (Not to exceed one page. Please use separate sheet).

Osteoporosis is a major public health problem in both developing and developed nations in older age groups and children. In view of the huge health care cost of management of fractures caused by osteoporosis and resultant morbidity and mortality, it is critical to reconfigure the management of osteoporosis by integrating bio-technology in the model of care of osteoporosis. Inclusion of bone health screening in health promotion programs for elderly and children in routine clinical practice will reconfigure the treatment of osteoporosis by shifting the paradigm from the existing model of care which is focused on treatment to a reconfigured model of care where detection and prevention is the focus. The innovation is to develop a novel non- invasive, portable, handheld, easy-to-use device to measure bone density through sound wave propagation which can be added to the primary health care toolkit of Health Care Workers operating in child health and maternal health, elderly care.

Part 2: Particulars of Investigators

Principal Investigator:

1) Name:	Prof. Rajani Mullerpatan
Date of Birth:	24/05/1972
Designation :	PI
Department:	MGM School of Physiotherapy
Institute/University:	Mahatma Gandhi Mission's Medical College
Address:	Sec 1, Kamothe
Pin:	410209
Email:	rajani.kanade@gmail.com
Fax:	0
Phone:	8876768899

Number of Projects being submitted/pursued/carried out by PI(s): 5

Co-Investigator:

1) Name:	Dr. Triveni Shetty
Date of Birth:	11/03/1985
Designation :	Associate Professor
Department:	Physiotherapy
Institute/University:	Mahatma Gandhi Mission's Medical College
Address:	MGM School of Physiotherapy, MGM Educational Campus, Sector 1, Plot no 1 & 2, Kamothe
Pin:	410209
Email:	tshetty@mgmsopnm.edu.in
Fax:	0
Phone:	9920633288 / 02227437866

Number of Projects being submitted/pursued/carried out by Co-PI(s): 1

2) Name: Dr. Dayanand Jadhav

Date of Birth: 05/11/1988

Designation : Assistant Professor

Department: Electronics and Telecommunication Engineering

Institute/University: Mahatma Gandhi Mission's Medical College

Address: MGM Institute of Health Sciences, MGM's College of Engineering and Technology, Sector 1, Plot no 1 & 2, Kamothe

Pin: 410209

Email: dayanandjadhav@mgmuhs.com

Fax: 0

Phone: 7977716922 / 02227437866

Number of Projects being submitted/pursued/carried out by Co-PI(s): 4

Part 4: BUDGET PARTICULARS

A. Non-Recurring (e.g. equipments, accessories, etc.)

Sno.	Equipment Name	Justification	Qty	Unit Cost	Year_I	Total
Mahatma Gandhi Mission's Medical College						
1	Laptop computer	Data analysis/Recording	1	75000	75000	75000
2	Development of device 2 Transducer ,Amplifier, Vibration sensors,Data Acquisition System(Digital to Analog Converter, Oscilloscope),Chassis for Interface Board,Power driver, tablet computer	listed above are the basic equipment required for the development of novel, hand-held device for BMD test	1	605000	605000	605000
Total			2	680000	680000	680000

Uploaded Quotations for Equipments

S No	Institute	Uploaded Quotation
1	Mahatma Gandhi Mission's Medical College	Not uploaded

B. Recurring

B.1 Human Resource Details

Sno.	Resource	No	Justification	Year_I	Year_II	Year_III	Year_IV	Year_V	Total
Mahatma Gandhi Mission's Medical College									
1	Junior Research Fellow	1	Engineering for development of device	372000	372000	0	744000		
2	Junior Research Fellow	1	Physiotherapist-field testing	0	372000	0	372000		
Total				372000	744000	0	1116000		

B.2 Consumables

Sno.	Item	Justification	Qty	Year_I	Year_II	Total

Mahatma Gandhi Mission's Medical College						
1	DEXA scan cost	to validate the new device against gold standard DEXA scan	150	525000		525000
2	DEXA scan cost	While establishing the reference range in different age groups the borderline cases (in range of mild and extreme) would be undergoing DEXA scan to estimate the floor and ceiling effect of the novel device.The budget submitted for LOI for 2874000, however we have estimated the cost of consumables and therefore an increase in budget is noticed	100		350000	350000
Total				525000	350000	875000

B.3 Travels

Sno.	Description	Justification	Year_I	Year_II	Year_V	Total
Mahatma Gandhi Mission's Medical College						
1	Travel	disseminate the information to attend workshop and conferences		300000		300000
2	Travel	travel to test the device for validity and reliability to near by villages, pada, urban hospitals	150000			150000
Total			150000	300000	450000	

B.4 Contingency

Sno.	Description	Justification	Year_I	Year_II	Total
Mahatma Gandhi Mission's Medical College					
1	Contingency	Overheads and maintenance of equipment, repair, and any unforeseen expenses will be covered	104033	104032	208065
Total			104033	104032	208065

B.5 Overhead

Sno.	Description	Justification	Year_I	Year_II	Total

Mahatma Gandhi Mission's Medical College					
1	MGM Institute of Health Sciences overhead	The Institute will allow use of existing instruments, manpower, facility, electricity, water facility for participants	208067	104033	312100
Total			208067	104033	312100

B.6 Recurring Others

Account Holder Details

Account Holder Name	Postal Address	Phone No	Email Id
Mahatma Gandhi Mission's Medical College			
MGM Institute of Health Sciences Research	MGM Educational Campus, Sector 1, Kamothe, Navi Mumbai 410209	0227437838	accountmumbai@mgmuhs.com

Bank Details

Account No.	Type	Bank Name	Branch Name	IFC Code	MICR Code	Phone No.
Mahatma Gandhi Mission's Medical College						
0183104000347532	Saving	IDBI BANK	Belapur	IBKL0000183	400259023	0227576763

Part 6: DECLARATION/CERTIFICATION

It is certified that

1. The research work proposed in the scheme/project entitled **"Re-configuration of management of osteoporosis in children and adults: a shift in paradigm from treatment to prevention using a novel biotechnology device 'Swasthya for Asthi-Tavasya'"** does not in any way duplicate the work already done or being carried out elsewhere on the subject.
2. The same project proposal has not been submitted to any other agency for financial support.
3. The emoluments proposed for the manpower are as admissible to persons of corresponding status employed in the institute/university or as per the Ministry of Science & Technology guidelines.
4. Necessary provision for the scheme/project will be made in the Institute/ University/ Organization budget in anticipation of the sanction of the scheme/project.
5. If the project involves the utilization of genetically engineered organisms, we agree to submit an application through our Institutional Bio safety Committee. We also declare that while conducting experiments, the Bio safety Guidelines of the Department of Biotechnology would be followed into.
6. If the project involves field trials/experiments/exchange of specimens, etc. we will ensure that ethical clearances would be taken from concerned ethical Committees/ competent authorities and the same would be conveyed to the Department of Biotechnology before implementing the project.
7. If the Project requires any statutory permission(s) for any authority to carry out the project, the same would be obtained and intimated to DBT before taking up research activities.
8. It is agreed that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued by Department of Biotechnology, Govt. Of India.
9. We agree to accept the terms and conditions of Department of Biotechnology, Govt. Of India.
10. The institute/university agrees that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigator(s) throughout the duration of the project.
11. The Principal Investigator(s) involved in the project has sufficient service duration to carry out the project. In case his tenure get expire before completion of project necessary provision would be made to allow him to complete the project for its logical conclusion.
12. The Institute assumes to undertake the financial and other management responsibilities of the project.
13. If any biological data as specified in the guidelines is being generated in the project, same will be submitted to Indian Biological Data Centre – The National Repository, at RCB, Faridabad, in accordance to Biotech-PRIDE Guidelines 2021.
14. The details & information given in the Project proposal are true & factual.
15. It will be the responsibility of the Project Investigator/ Implementing Institute to submit a fresh declaration certificate if the project gets recommended for funding and there is any change in the points 1-14 above.

Signature of Executive Authority of "Mahatma Gandhi Mission's Institute of Health Sciences" with stamp
Date:

Prof. Rajani Mullerpatan
Principal Investigator
Date:

Prof. Rajani Prashant Mullerpatan
Principal Investigator
Date:

Dr. Dayanand Bhaurao Jadhav
Co-Investigator
Date:

Dr. Triveni V Shetty
Co-Investigator
Date:

Signature & Seal of all project coordinator(s), project investigator(s) , and executive authorities(s) of participating institutions is compulsory

Temporary Registration No. : TPN / 84231

Project Proposal On

"FIST- PROJECT (Level-B)"

Submitted to

Division :R & D Infrastructure

Programme or Scheme : FIST Life Sciences Level B C or D

Submitted by

Project Investigator:

Dr. Rajani Mullerpatan

MGM INSTITUTE OF HEALTH SCIENCES-Navi Mumbai

Part 1 : General Information

General Information:

1.Name of the Institute/University/Organisation submitting the Project Proposal :

MGM INSTITUTE OF HEALTH SCIENCES

2. State	Maharashtra
3. Principal Investigrator Name:	Dr. Rajani Mullerpatan
4. Category:	General
5. Type of the Institue :	Academic Institutions (Private)
6. Project Title (Project Level):	FIST- PROJECT (Level-B)
7. Division :	R & D Infrastructure
8. Programme Or Scheme :	FIST Life Sciences Level B C or D
9. Academic Area :	
10. Application Area :	Digital technologies, Entrepreneurship and Innovation, Health,
11. Goverment National Initiative :	Swasth Bhart, Startup India, Digital India,
12. Type of Proposal :	Proposal Against Call
13. Project Duration :	5 Years and 0 Months
14. Proposal Submit Date :	10/08/2022
15. Project Keywords :	bio-mechanics, movement science, noncommunicable diseases, education,artificial intelligence, technology validation, skill training
16. Project Summary :	

Part 2: Particulars of Investigators

Principal Investigator:

1. Name:	Dr. Rajani Mullerpatan
Gender:	Female
Date of Birth:	24/05/1972

Designation :	Professor Director
Department:	MGM School of Physiotherapy
Institute/University:	MGM INSTITUTE OF HEALTH SCIENCES
State:	Maharashtra
District:	Raigad
City/Place:	Navi Mumbai
Address:	MGM School of Physiotherapy, MGM Institute of Health Sciences, Sector 1, Kamothe, Panvel
Pin:	410209
Communication Email:	rajani.kanade@gmail.com
Alternate Email:	mgmchms@mgmsopnm.edu.in
Mobile:	9920048476
Phone:	
Fax:	
Category:	General

Co-Investigator:

1. Name:	Dr. Bela Agarwal
Gender:	Female
Date of Birth:	20/04/1972
Designation :	Professor
Department:	MGM School of Physiotherapy
Institute/University:	MGM INSTITUTE OF HEALTH SCIENCES
State:	Maharashtra
District:	Raigad
City/Place:	Mumbai

Address: MGM School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Panvel

Pin: 410209

Communication Email: bagarwal@mgmsopnm.edu.in

Alternate Email: belaagarwal@gmail.com

Mobile: 9819000674

Phone:

Fax:

Category: General

Suggested Refrees: NA

Part 3: Financial Details

Financial Details:

A. Non - Recurring

Equipment

S.	Equipments	Qty.	Justification	1 Year	Total
1 .	16 channel wireless surface EMG system	1	16 channel wireless EMG system will enable capture of real time data for developing clinical algorithms for performance enhancement in people with neuro-motor disorders, and sports research.	1750000	1750000
2 .	Dexa Scanner	1	The scanner will serve as a gold standard for validating novel device for early identification of osteoporosis in postmenopausal women and elderly.	1842400	1842400
3 .	EMG Electrodes	2	Specialized electrodes will be needed for testing of pelvic floor muscles and urogenital studies in women using vaginal electrodes.	200000	200000
4 .	Foot pressure platform	1	The portable platform has applications for widespread screening of gait in children with developmental delay, plantar pressure tissue measurement, geriatric evaluation of risk of falls in urban and rural setups.	3269000	3269000
5 .	Force plate 40x60cm	1	The portable fourth force plate will enable interdisciplinary collaborative research with mechanical engineers to develop finite element models for activities of daily living for e.g. cross-legged sitting, kneel sitting, kinetic analysis of sport activities for performance enhancement, prevention of injuries, design and validation of technology for risk of fall assessment in the elderly and biomechanical analysis of traditional sports, dance and yoga requiring recording of 4 points of contact.	1186000	1186000
6 .	High definition Laptop	3	Systems for outdoor kinematic and kinetic, EMG data capture require dedicated laptops with specific software installed for data processing. Dedicated laptops will enable large scale field studies.	300000	300000

7 .	In Shoe plantar pressure system pair	1	An in-shoe plantar pressure system is necessary for measurement of dynamic plantar pressure distribution for identification of altered weight bearing in patients with diabetes neuropathy with risk of foot ulceration, sports training to enhance performance, reduce the risk of injuries, design foot wear for specially abled children and adults.	2636288	2636288
8 .	K5 metabolic cart	1	Will be required to understand energy cost of indigenously developed novel healthcare devices such as newly designed prosthesis in patients with amputation. Energy cost of activity has also been explored to provide novel health care solutions using indigenous postures, physical activity forms, estimation of metabolic cost of sport activities and rehabilitation exercises to train athletes and people with musculoskeletal disorders.	3000000	3000000
9 .	Nerve Conduction study system	1	Will be utilized for validation of the novel comprehensive device in people with diabetic neuropathy and evaluation of neuromotor disorders.	400000	400000
10 .	Optical cameras	4	Portable optical cameras will enable indoor and outdoor kinematic data capture for real time motion analysis of outdoor sports activity and dynamic motion in real life situations for applications in geriatric care. It will also help design and validation of indigenously designed technology pertinent to movement and serve as gold-standard for developing clinical algorithms pertaining to developmental neuromotor conditions, musculoskeletal disorders and geriatric care.	4831900	4831900
11 .	Pliance sensor system	1	Prevent ulceration on weight bearing points in athletes engaging in wheelchair sports and to measure pressure across indigenously designed prosthetics.	3342912	3342912
12 .	Portable Doppler	2	The Ankle Brachial Index is a measure of severity of arterial diseases. With high prevalence of diabetes in India, early intervention following objective evaluation of Ankle Brachial Index would enable early intervention and potential prevention of foot ulcerations, amputations and increase disability free life years. The Doppler will enable development of clinical algorithm for detection of diabetic foot ulcers and prevention of foot complications.	372000	372000
13 .	Real time step activity monitor	2	Enables real time monitoring of walk activity in neuromotor disorders following rehabilitation programs and translation of effects of intervention in daily life.It is also a precious device to monitor real-time walking to validate technology designed to assist ambulation and adherence to treatment plans prescribed to people with neuro-musculoskeletal and cardiopulmonary disorders.	100000	100000
14 .	Weighing scale for wheel chair bound people	1	Our work in rehabilitation of patients with spinal cord injury, sports participation in wheel-chair bound individuals and Paralympic athletes for prescription of novel health care programs requires analysis of factors influencing response to training. Objective measurement of body composition of these patients will be useful for prescription and monitoring of rehab programs.	28000	28000
			Total	**23258500**	**23258500**

Site Preparation/ Lab Facilities (IF)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Optical Marker set	Optical markers are required for kinematic capture of all body movements.	60000	0	0	0	0	60000
2 .	Repairs and installation in lab	Installation of purchased equipment by system experts is essential expense to ensure smooth functioning of the system. The team of MGM CHMS in the past 5 years is trained by team of Engineers for trouble shooting of the equipment. The team is gained rich experience in handling the equipment's. However, to avoid sudden unforeseen repairs, team of experts experienced in handling the equipment's will be required to avoid disruption of work.	372078	372078	372078	372078	372078	1860390
		Total	**432078**	**372078**	**372078**	**372078**	**372078**	**1920390**

Networking

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total

1 .	Networking	The Institute is equipped NKN MTNL 1 Gbps speed network, however for smooth functioning of the system additional high speed internet will be required. Additionally, as the data generated from the motion analysis system is large files, additional cloud storage and internal connectivity will be required to connect the different systems within the Centre.	300000	300000	300000	300000	300000	1500000
		Total	**300000**	**300000**	**300000**	**300000**	**300000**	**1500000**

Maintenance

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Maintenance of equipment	The high end system demonstrates gradual wear and tear that occurs steadily but continuously. Therefore, they warrant continuous and timely maintenance to avoid unforeseen sudden disruption of functioning of system. Therefore, maintenance is essential expense to avoid uninterrupted completion of the defined tasks of project in 5 years.	600000	600000	600000	600000	600000	3000000
		Total	**600000**	**600000**	**600000**	**600000**	**600000**	**3000000**

Industrial R&D Support (IRD)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Industrial R and D support	Indigenous technology pertinent to application of rehabilitation in movement disorders which will and develop as a part of research and innovation activity at MGM CHMS will be linked to the industry for fine tuning development of the device. Such a link with the industry will ensure that the device developed is ready to be launched in market for the end user	40000	40000	40000	40000	40000	200000
		Total	**40000**	**40000**	**40000**	**40000**	**40000**	**200000**

Scientific Social Responsibility Activities (SSR)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Scientific Social Responsibility Activities	The vision and mission of MGMCHMS is to extend the services to the society at affordable cost and to execute the mission. The Centre continues to undertake the activities of Social responsibilities to translate the findings of scientific research for the wellbeing of the underprivileged section of the society and to address the unmet needs of rehabilitation in the society overall	20000	20000	20000	20000	20000	100000
		Total	**20000**	**20000**	**20000**	**20000**	**20000**	**100000**

Budget Head Summary in (INR)

Budget Head	Year-1	Year-2	Year-3	Year-4	Year-5	Total
1- Non-Recurring						
Equipment	23258500	0	0	0	0	**23258500**
Site Preparation/ Lab Facilities (IF)	432078	372078	372078	372078	372078	**1920390**
Subtotal (Capital)	23690578	372078	372078	372078	372078	**25178890**
2- Recurring						
Networking	300000	300000	300000	300000	300000	**1500000**
Maintenance	600000	600000	600000	600000	600000	**3000000**
Industrial R&D Support (IRD)	40000	40000	40000	40000	40000	**200000**
Scientific Social Responsibility Activities (SSR)	20000	20000	20000	20000	20000	**100000**
Subtotal (General)	960000	960000	960000	960000	960000	**4800000**

Total Project Cost (Capital + General)	**24650578**	**1332078**	**1332078**	**1332078**	**1332078**	**29978890**

Part 4: PFMS Details

PFMS Unique Code Available: Yes

PFMS Unique Code : MGMIHSDPTP

Current Ongoing Project: NA

List of Uploaded Documents:-

1. Complete Project proposal
2. Certificate from PI
3. Conflict of interest
4. Endorsement from head of Institute
5. Quotation for Equipments

FIST - 2022

Application for [please tick one] **Level B :✓** **Level C** ☐ **Level D** ☐

1.

a	Name of the Department & Year of Establishment	:	MGM School of Physiotherapy, Navi Mumbai 2008
		:	
b	Name of the University/ Institution	:	MGM Institute of Health Sciences, Navi Mumbai
c	Address for correspondence including Telephone, Telegram, FAX, e-mail etc.	:	MGM School of Physiotherapy Plot No. 1& 2, Sector -1, Kamothe, Navi Mumbai 410 209. Contact number: 022-27437866; Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
d	Year of Commencement of PG Program in the Department & its Financial Status (General/Self-financed)	:	2008 – Self Financed

2.Status of the Institute/ University (attach supporting documents)

a)	Academic Status [Affiliated College/ Autonomous College/ ✓Constituent College]		Constituent College of MGM Institute of Health Sciences (Deemed to be University u/s 3 of UGC Act 1956)
b)	Financial Status [Govt. (Central and State Govt.) / Govt. aided / ✓Private Colleges] i) Upload the copy of 2f and 12B Certificate issued by UGC along with the online submitted proposal;		Private College

3. .i) Name & Number of Faculty members in position: a) Professors, b) Readers & c) Lecturers (List only Core & Permanent Faculty Members in Department/ Centre/School with their academic qualifications)

Name of Faculty Member	Designation	Age	Highest Qualification	i10– index
Dr. Rajani Mullerpatan	Professor- Director	50	Ph.D.	17
Dr. Bela Agarwal	Professor	50	Ph.D.	3
Dr. Triveni Shetty (PT)	Associate Professor	37	MPT	0
Dr. Amrita Ghosh (PT)	Associate Professor	36	MPT	0
Dr. Shrutika Parab (PT)	Assistant Professor	30	MPT	0
Dr. Mamta Shetty (PT)	Assistant Professor	31	MPT	0
Dr Ruturaj Shete (PT)	Assistant Professor	32	MPT	0
Dr. Pooja Dogra (PT)	Assistant Professor	31	MPT	0
Dr. Payal Murkudkar (PT)	Assistant Professor	36	MPT	0
Dr. Hiranmayee Bagwe (PT)	Assistant Professor	29	MPT	0
Dr. Bhoomika Sawant (PT)	Assistant Professor	28	MPT	0
Dr. Victoria Kuttan (PT)	Assistant Professor	28	MPT	0
Dr. Hiloni Badani (PT)	Assistant Professor	27	MPT	0
Dr. Akhila Natesan (PT)	Assistant Professor	27	MPT	0
Dr. Aamreen Ryain (PT)	Assistant Professor	27	MPT	0
Dr. Neha Padia (PT)	Assistant Professor	27	MPT	0
Dr. Aarohi Joshi (PT)	Assistant Professor	26	MPT	0
Dr Ramandeep Saini (PT)	Assistant Professor	27	MPT	0
Dr. Kshitija Jadhav (PT)	Assistant Professor	27	MPT	0
Dr. Veeral Sarvaiya (PT)	Assistant Professor	26	MPT	0

MPT- Masters in Physiotherapy

ii)Sanctioned Strength- 25

4. Distinction earned by faculty members like National and International Awards, Professional Societies:

Name of the Faculty		Awards/Recognition	Organization
	International Awards		
1. Dr. Rajani Mullerpatan	1	Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme for development of the Package of Interventions for Rehabilitation 2020-21	World Health Organization
	2	Awarded Travel Grant to visit the Centre for the Study of Sport and Health at Saint Mary's University, Canada and to deliver a talk on 'Scientific Exploration of Indian Traditional Movement forms for Health Promotion' at an international symposium on Recreation, Sport and Social Health on October 4, 2019.	Saint Mary's University, Canada
	3	Awarded Travel Grant to participate in International Society of Biomechanics	International Society of Biomechanics, Glasgow
	4	Contributed to Clinician Guide Managing Back and Neck Pain in the Time of Covid-19	World Spine Care
	5	Contributed to Managing Back and Neck Pain in the Time of Covid-19 Patient Guide	World Spine Care
	6	Invited Panelist at the Spine 20 Conference, 2021, Rome, Itlay.	World Spine Care
	7	Dr. PN Berry Scholarship Award, 2002-2003	High Commission of India, London, UK
	8	Resource person in Annual Conference February, 2019	Society of Indian Physiotherapist, India
	9	Invited Panelist at the Spine 20 Conference, 2022, Bali, Indonesia. Invited talk on 'Critical actions to mobilize healthcare agencies and appropriate resources'	World Spine Care
	10	Executive Council Member, 2018-2021	International Society of Biomechanics
	11	Honorary Research Fellowship, Cardiff University, UK	Cardiff University, UK
	National Awards		
	12	Jury at BETiC EMEDHA	BETIC, IITB India
	13	Member of Research Grant Committee 2020-Till date	Society of Indian Physiotherapist, India
	14	Oration Award	Indian Association of Physiotherapists, 2010
	15	Science Shiksha Shodkhartri Mention 2022	Rethink India

Name of the Faculty		Awards/Recognition	Organization
2. Dr. Bela Agarwal	1	Expert Consensus and Recommendation for Physiotherapy Management of COVID-19 in Indian Set Up	Endorsed by Maharashtra State Council for Occupational Therapy and Physiotherapy, Mumbai, India
	2	Executive Member	The Society of Cardiovascular and Pulmonary Rehabilitation, India
	3	Science Shiksha Shodkhartri Mention 2022	Rethink India
	4	Awarded science September 2016 in recognition of review contributed to journal	Editors of Respiratory Medicine
Dr Shrutika Parab (PT)		Young Researcher Award 2022	InSc Institute of Scholar, Karnataka, India
Dr. Ruturaj Shette (PT)		Best Teacher Award	InSc Institute of Scholar, Karnataka, India
Dr. Payal Murkudkar (PT)		Best Teacher Award	InSc Institute of Scholar, Karnataka, India
Dr. Hiramayee Bagwe (PT)		Best Teacher Award	InSc Institute of Scholar, Karnataka, India

5. a) **Actual Current student strength at:**

(i) PG level –2020-2021 = 10
. 2021-2022 = 9
(Regular Students & Donation Seats)

(ii) Total No. of Full Time Ph. D scholars in each sub-discipline.

The eligibility defined by respective Health Councils in India for the position of Assistant Professor in Health Sciences is Master's degree. Hence a Team of 19 Faculty members are qualified at Masters level in various specialties of applications of movement science in health care such as Musculoskeletal, Neurosciences, Cardiorespiratory, Sports, Community Science & Women's Health.

- 2 Faculty members are qualified with PhD degree (Diabetes and OA)
- 1 faculty Member has successfully submitted PhD Thesis and awaiting Defence Viva (CP).
- **14** Faculty Members are pursuing PhD program in clinical areas of Geriatrics, Parkinsons, Vascular, Sports, Dance, Ergonomics in Community and Industry, Stroke, Down's syndrome and Women and Child Health.

It is not common to pursue fulltime PhD program in clinical faculties of health sciences in India, because of engagement of health professionals in daily clinical practice also. Therefore, it is observed across India, that Faculty Members pursue PhD program in-service.
At MGM School of Physiotherapy, Navi Mumbai PhD program commenced in 2010.

- Since then 6 scholars are awarded PhD degree by MGM Institute of Health Sciences.
- 1 PhD scholar is pursuing full-time PhD program and 5 are pursuing in-house Ph.D
- 1 in-service PhD Scholars has submitted the thesis and awaiting Defence Viva.
- 9 in-service PhD Scholars have appeared for the PhD entrance examination in Aug 2022

List of PhD scholars awarded PhD degree by MGM Institute of Health Sciences			
Sr. No.	**Name of scholars**	**Year of Registration**	**Year of award of PhD Degree**
1	Dr. Surendra Wani	2010	2019
2	Dr. Sibi Daniel	2010	2018
3	Dr. Meruna Bose	2011	2019
4	Dr. Vrushali Panhale	2012	2019
5	Dr. Sreeraj S.R.	2012	2018
6	Dr. Bela Agarwal	2014	2021
List of PhD students pursing PhD program			
7	Dr Triveni Shetty (PT)	2016	Thesis Submitted
8.	Dr. Poonam Desai (PT)	2019	Ongoing
9.	Dr. Bhoomika Sawant (PT)	2020	Ongoing
10.	Dr Mamta Shetty (PT)	2020	Ongoing
11.	Dr. Sona Sarma (PT)	2020	Ongoing
12	Dr Gaurav Maske (PT)	2020	Ongoing
List of Ph.D candidates who have appeared for Entrance examination for admission to PhD program at MGM School of Physiotherapy, MGM Institute of Health Sciences			
13	Dr. Shrutika Parab (PT)	2022	Appeared for PhD CET
14	Dr. Akhila Natesan (PT)	2022	Appeared for PhD CET
15	Dr. Hiranmayee Bagwe (PT)	2022	Appeared for PhD CET
16	Dr. Payal Murkudkar (PT)	2022	Appeared for PhD CET
17	Dr. Victoria Kuttan (PT)	2022	Appeared for PhD CET
18	Dr. Ruturaj Shete(PT)	2022	Appeared for PhD CET
19	Dr. Amrita Gosh (PT)	2022	Appeared for PhD CET
20	Dr Neha Padia (PT)	2022	Appeared for PhD CET
21	Dr. Hiloni Badani (PT)	2022	Appeared for PhD CET

b. Degree-wise actual number of passing out students in last five years:

No of students in each degree	**2017**	**2018**	**2019**	**2020**	**2021**
MPT	**5**	**8**	**8**	**10**	**9**
Ph.D	**0**	**2**	**3**	**0**	**1**

c. i)Number of Students (year-wise) who qualified in NET in M.Sc Program or GATE (more than 90% percentile) qualified in ME/ M Tech Program

UG and PG Programs	**No. of Students qualify NET/GATE/INSPIRE *etc*. during last 5 years**				
	2017-2018	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**
Master Program	**32**	**19**	**8**	**42**	

ii) Number of Full Time Ph. D research scholars with fellowships awarded from any agency in the department

S No.	Name of PhD scholar	Date of joining	Fellowship awarding agency	Fellowship amount (Rs)
1.	Ms. Poonam Desai Fulltime PhD Scholar	2019	Department of Science and Technology, Govt. India (Women Scientist Scheme-B)- DST/WOS-B/HN-37/2021/2769	INR 30,33,050.00
2.	Ms. Sona Sarma In-service PhD Scholar	2021	World Spine Care, Europe	INR 12,00,000.00

d) Placement of graduating post-graduate & PhD students in the Department.

Post – Graduate Placement

Year	Name Of Students Placed	Name of the employer with contact details
2021-22	Ms. Aamreen Ryain	MGM School of Physiotherapy, Navi Mumbai
2021-22	Ms. Neha Padia	MGM School of Physiotherapy, Navi Mumbai
2021-22	Mr. Mihir Mange	Saifee Hospital, Mumbai
2021-22	Ms. Neena Varghese	B R Harne College of Physiotherapy
2021-22	Ms. Karishma Wagh	Fire fly Tele-Rehab
2021-22	Ms. Neha Raorane	Fire fly Tele-Rehab
2021-22	Ms. Damini Aglawe	Self-Employed
2021-22	Ms. Purva Kataria	Self-Employed
2021-22	Ms. Ankita Waghela	Self-Employed
2021-22	Mr. Abhijit Kanojia	Self-Employed
2020-21	Ms. Stuti Gaikwad	Self-Employed
2020-21	Ms. Simran Kadam	Self-Employed
2020-21	Ms. Charmi Khimasia	Self-Employed
2020-21	Ms. Dipti Mumbaikar	Self-Employed
2019-20	Ms. Riya Khara	Self-Employed
2019-20	Ms. Hiloni Badani	MGM School of Physiotherapy, Navi Mumbai
2019-20	Ms. Shikha Patel	Fire fly Tele-Rehab
2019-20	Ms. Meena Kakkar	Self-Employed
2019-20	Mr. Sumedh Vaidya	Sion Hospital, Mumbai
2019-20	Ms. Rachel Nagarkar	Jupiter Hospital, Thane, Mumbai
2018-19	Ms. Richa Dharod	Self Employed
2018-19	Ms. Kashmira Gupte	Apollo Healthcare, Chembur, Mumbai
2018-19	Ms. Oshin Amberkar	Self-Employed
2018-19	Ms. Heena Bhanushali	Self-Employed

Year	Name Of Students Placed	Name of the employer with contact details
2018-19	Ms. Anuja Surve	Apollo Hospital, Belapur, Navi Mumbai
2018-19	Ms. Sneha Kirve	Fortis Hospital, Mulund, Mumbai
2018-19	Ms. Sumayya Allapurwala	IKS Healthcare
2018-19	Ms. Bhoomika Sawant	MGM School of Physiotherapy, Navi Mumbai
2018-19	Ms. Apoorva Dighe	Tilak Maharashtra Vidhyapeeth, Navi Mumbai
2018-19	Ms. Neha Sawant	Self-Employed
2018-19	Ms. Aishwarya Mahajan	DPO's NETT College of Physiotherapy, Thane
2018-19	Gulati Anisha Devinder	Self Employed
2018-19	Kanjirathingal Jinny Paul	Clinical Physiotherapist(private practice)
2018-19	Shaikh Zubeda Salahuddin	Bombay Hospital and Medical Research Centre
2018-19	Burmekar Priyanka Vithal	Self -Employed
2018-19	Gawande Krishna Bhimrao	Self -Employed
2018-19	Advani Manisha Sunder	Self -Employed
2017-18	Tandel Deepak Ramchandra	Jaslok Hospital, Mumbai
2017-18	Stanley Gerald Jones	Jaslok Hospital, Mumbai
2016-17	Pawar Lalita Prakash	Erra Gurukul Charitable trust, Thane
2016-17	Dogra Pooja Surainder	MGM School of Physiotherapy, Navi Mumbai
2016-17	Mohanty Tanochni Charan	Pursuing Ph.D
2016-17	Teli Akshata Avadhut	Self- employed, Ambernath
2016-17	Gayathri N	Ashray Special School, Sanpada, Navi Mumbai
2015-16	Blessy Ann Thomas	Self -Employed
2015-16	Thanawala Meera Sanjay	Sneha- Pediatric Clinic
2015-16	Pisal Akanksha Pandurang	Self- employed
2015-16	Johar Anisha P.	Self -Employed

Ph. D Scholar Placement

Year	Name of students placed	Name of the employer with contact details
2020-21	Dr. Bela Agarwal	Professor – MGM School of Physiotherapy, Navi Mumbai
2019-20	Dr. Vrushali Panhale	Professor-Principal- MGM College of Physiotherapy, Navi Mumbai
2019-20	Dr. Sreeraj S.R	Principal, Dr. N Y Tasgaonkar College of Physiotherapy
2018-19	Dr. Surendra Wani	MGM College of Physiotherapy, Aurangabad
2018-19	Dr. Meruna Bose	Professor at MGM School of Physiotherapy, Navi Mumbai
2017-18	Dr. Sibi Daniel	Professor at Tilak Maharashtra Vidhyapeeth, Navi Mumbai

6. **Indicate the development grant received from UGC/AICTE during the Twelfth and Thirteenth Plan.**
Nil

7. **What is the annual grant available to the department from your university/institution during the last two years?**

Year	For Research	For Teaching
2021-22	137.79 lakhs	240.48 lakhs
2020-21	68.87 lakhs	285.92 lakhs

8. **Has the Department received any major infrastructure research grant during the last five years from S&T agencies including UGC/AICTE? If yes, details.** Yes

Heads	***Name of Agency/ Scheme with year and amount***		
Building	Nil		
Equipment:	**Name of Agency**	**Scheme with year**	**Amount**
8 Channel Bagnoli wired surface Electromyography system; Delsys Inc. Ltd	Department of Biotechnology, Government of India, New Delhi	Science and Engineering Research Board, Year 2016 -2017	INR 13.69,000.00 for the equipment.
Baseline Tactile Semmes-Weinstein Monofilaments	Department of Science and Technology, Government of India, New Delhi	Women Scientist scheme (B) 2021	INR 22914.00 (Sensory impairment assessment)
Advance camera system for 2D capture	Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra	2022	INR 75,000.00
Rehabilitation Kit	Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra	2022	INR 1,00,000.00
Books	Nil		
Supplies and Materials: White Board and LED projector	Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra	2022	INR 50,000.00
Computing & Networking: Development of mobile based application for tele-rehabilitation	Department of Science and Technology, Government of India, New Delhi	Women Scientist scheme (B) 2021	INR 9,05,000.00
Development of mobile based application for Detection, REhabilitation & Monitoring- Children with Neuro-motor impairment	Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra	2022	INR 6,10,000.00
Facilities	Nil		

9. **Is the Department recognized under DRS (Departmental Research Support), DSA (Departmental Special Assistance), CAS (Centre for Advanced Study) and COSIST schemes of UGC for receiving support? Please [tick] one: None**

DRS ☐ DSA ☐ CAS ☐ COSIST ☐

10. **Research Grant received from different agencies during the last five years:**

a) Total Amount (Rs) and Number of Research Projects: INR 107,08,550.00 for 9 projects
b) Details thereof:

Name of the Investigator	Project No.	Title of the project and duration	Amount sanctioned	Funding Agency
Government Funding Agencies				
Dr. Rajani Mullerpatan Triveni Shetty	RGSTC/File-2021/DPP-249/CR-36/237	Development of mobile technology(Detect, Rehabilitate and Monitor (DREaM): Empowerment of primary caretakers of children with Cerebral Palsy; Year: 2021-2022	INR 22,54,000.00	Rajiv Gandhi Science Technology Commission, Govt. of Maharashtra
Poonam Desai Dr. Rajani Mullerpatan	DST/WOS-B/HN-37/2021/2769	Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study3 Years ;Year: 2020-2021	INR 30,42,600.00	Department of Science and Technology (Women Scientist Scheme-B)
Dr. Rajani Mullerpatan	BT/PR14641/MED/32/465/2015	Development of a Powered Trans-tibial Prosthesis Year: 2015-2020	INR 30,33,050.00	Ministry of Science & Technology, Dept of Biotechnology, New Delhi
Non- Government Funding Agencies				
Dr. Rajani Mullerpatan Triveni Shetty	Collaborative Project between Aastha Hospital & MGMCHMS, MGMSOP 2022-2025	Evaluation and Treatment intervention in children with foot disorders in the specific context of our socio-economic setting	INR 5,00000.00	Aastha Hospital, Mumbai
Dr. Rajani Mullerpatan Bela Agarwal	Collaborative project between MGMCHMS, MGMSOP & IITB 2021-2023	Validation of an indigenously developed device for measuring stiffness of plantar tissue with people with type II diabetes	INR 4,50,000.00	BETiC, IIT Bombay
Dr. Rajani Mullerpatan	SCLSG- Grant for Lecture series 2022	Prevention & Management of Disability: Translation Research is need of the hour	INR 25,000.00	Shastri Indo-Canadian Institute
Dr. Rajani Mullerpatan	**SSTSG** 2019-20	"Scientific exploration of Indian traditional movement forms for health promotion". Travel grant Year 2019-2020	INR 91,900.00	Shastri Indo-Canadian Institute

Dr. Rajani Mullerpatan Sona Sarma	World Spine Care-2020	Conservative Spine Care: Identifying spine care needs and perceived barriers to accessing evidence-based spine care in rural setting of Maharashtra, India	INR 12,00,000.00	World Spine Care
Name of the Investigator	**Project No.**	**Title of the project and duration**	**Amount sanctioned**	**Funding Agency**
Dr. Rajani Mullerpatan Bela Agarwal Triveni Shetty		The effects of labour and birth positioning on pelvic dimensions: gaining further insight to improve birth experience 2016 – 20	INR 1,12,000.00	Indo-Canadian Shastri Institute, Canada
Non- Government Funding Agencies (2014-2015)				
Dr. Rajani Mullerpatan	A copy of MoU is attached for reference	Establishment of MGM Centre of Human Movement Science Centre Year: 2014- 2015	INR 70,72,064.00 *	International Society of Biomechanics
Dr. Rajani Mullerpatan	A copy of MoU is attached for reference	Establishment of MGM Centre of Human Movement Science Centre Year: 2014- 2015	INR 40,29,407.00 *	BETiC, IIT Bombay

*Please note that International Society of Biomechanics donated equipment worth the amount mentioned above whereas BETiC, IIT Bombay loaned the equipment to support establishment of biomechanics research and training facility at MGM Centre of Human Movement Science of MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai.

11. Details of any other Resource Generation Avenues (other than Sponsored Research Grants).
experimental facilities at MGM CHMS was used to validate

Resource Generation Avenues		
A. Technology Design and Validation:		
Agencies	**Purpose**	**Amount**
IIT Madras	The experimental facility of 3D kinematic analysis and 2D analysis were utilized for validating indigenously designed wearable inertial sensor-based (i-Sens) systems for estimation of joint angle and gait parameters.	INR 75000.00
IIT Bombay-BETiC	The experimental facility of sensory profile and plantar tissue stiffness was used for clinical validation of indigenously developed device for measuring stiffness of plantar tissue for early detection of risk of plantar ulceration in people in people with type II diabetes.	INR 212000.00
Sancheti Hospital-Advance Orthopedic Centre	The experimental facility of 3D kinematic analysis, kinetic and muscle activity was used for clinical testing of modified Suryanamaskar in healthy people, with an objective of evidence-based prescription in people with musculoskeletal disorders.	INR 172000.00
Amueesh Industries	Experimental facilities of kinematic and kinetic analysis during different movements were utilized for validation of an indigenous Mechanical Actuated Stance Control Knee Ankle Foot Orthosis was developed by Aumeesh Tech Pvt. Ltd. (Society of Innovation and Entrepreneurship) an SINE -IITB and BETiC incubated healthcare startup in the field of assistive devices and rehabilitation healthcare.	INR 30,000.00
Actofit	Experimental facilities of kinematic and kinetic analysis and energy cost during gait were utilized for validation of wearable smartwatch for movement tracking (Actofit). Fitness tracker was developed using machine learning algorithms that automate comprehensive workout tracking & provides actionable insight.	INR 75000.00

Cyclos	Experimental facilities of kinematic using 2D motion analysis were utilized for validation of device Cyclos (Mobile based spine movement tracking) for cyclist developed by Mast. Kunj Dedhia, a X standard student from Dhirubhai Ambani International School, Mumbai. This innovation has won the Grand Prize at the Initiative for Research and Innovation in Science (IRIS) National Fair 2016 and has qualified to represent India at the Intel International Science and Engineering Fair 2017 in Los Angeles, USA.	INR 15000.00
B. Patient Care		
MGM Centre of Human Movement Sciences: offers exclusive testing facility for 3-D Gait testing, Foot geometry and plantar pressure distribution and postural control.		**INR 10,34,000.00**
C. Training/Workshops		
In the last 7 years, MGM CHMS conducted 14 training programs to train students, researchers and faculty members and clinicians from engineering and healthcare disciplines and offered 6 tours to students, researchers and faculty members to view the experimental facilities at MGM CHMS. Through 20 training courses/tours, the Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design and validation. Additionally, over 1500 students from Physiotherapy (including BPT & MPT), B.Tech, M.Tech, BE, Prosthetics & Orthotics(BPO) and Orthopedics(MS) benefitted from movement science biomechanics training. The Centre generated a total revenue of **INR 3,84,834.00** through 14 workshops and 6 one-day tours.		

12. Indicate the research activities of the faculty members as per the following pro-forma

Name and Designation of Faculty	**Major areas of Research**	**Number of Ph. Ds produced (in last 5 years)**
Dr. Rajani Mullerpatan Professor Director	1.Biomechanical exploration of Yogasanas and its application in healthcare. 2. Biomechanical exploration of traditional Indian sports. 3. Biomechanical exploration of Indian traditional dance forms. 4. Health of health care workers: A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic. 5. Development of a virtual platform for assessment and rehabilitation and monitoring of patients with neuro-musculoskeletal impairments such as cerebral palsy, Stroke, Parkinson's disease, Down's syndrome. 6.Development and validation of plantar tissues stiffness measurement device for early detection of diabetic neuropathy 7. Development of passive spring loaded exoskeleton for reducing muscle activity of erector spine muscles in Mathadi workers 8. Research work in validation of indigenously developed prosthesis for amputation, plantar tissue stiffness device for diabetes 9. Designing of equipment for early detection of Osteoporosis, childbirth postures. 10. Performance enhancement and Injury prevention in Sports and Dance	2 students were awarded PhD in last 5 years
Dr. Bela Agarwal Professor	1. Effect of squatting on knee articular cartilage in healthy adults 2. Biomechanical exploration of Yogasanas and its application in healthcare. 3. Biomechanical exploration of traditional Indian sports.	Awarded PhD in 2021. Recognized by MGM Institute of Health Sciences as PhD Supervisor. Ph.D Scholars will register in 2022

Name and Designation of Faculty	Major areas of Research	Number of Ph. Ds produced (in last 5 years)
Dr. Triveni Shetty (PT) Associate Professor	1. Long term monitoring of functional outcome of multi-level of orthopedic surgeries in children and adolescents with cerebral palsy 2. Development of mobile technology (Detect, REhabilitate and Monitor (DREaM): Empowerment of primary caretakers of children with Cerebral palsy 3. Biomechanical exploration of Yogasanas and its application in healthcare. 4. Biomechanical exploration of traditional Indian sports.	Successful submission of PhD Thesis in May 2022- Awaiting Defense Viva
Dr. Shrutika Parab (PT) Assistant Professor	Rehabilitation of patients with Stroke, cerebral palsy and Down's syndrome	Registered for in-service PhD program -2022
Dr. Amrita Ghosh (PT)	Adult Neurological Rehabilitation	Registered for in-service PhD program -2022
Dr. Mamta Shetty (PT)	Shoulder Rehabilitation, Medical Education	Registered for in-service PhD program -2022
Dr. Ruturaj Shete (PT)	Knee rehabilitation, Medical Education	Registered for in-service PhD program -2022
Dr. Hiranmayee Bagwe (PT)	Pulmonary and ICU rehabilitation; Medical Education	Registered for in-service PhD program -2022
Dr. Payal. Murkudkar (PT)	Cardiac Rehabilitation; Medical Education Cardiac Rehabilitation	Registered for in-service PhD program -2022
Dr.Bhoomika Sawant (PT)	Vascular Rehabilitation and Cardiac Rehabilitation	Registered for in-service PhD program -2022
Dr.Hiloni Badani (PT)	Hip Rehabilitation Hospital administration	Registered for in-service PhD program -2022
Dr. Victoria Kuttan (PT)	Musculoskeletal biomechanics	Registered for in-service PhD program -2022
Dr. Aamreen Ryain (PT)	Stroke Rehabilitation Muscular Dystrophy	None
Dr. Akhila Natesan (PT)	Dance biomechanics, Exercise physiology	Registered for in-service PhD program -2022
Dr. Ramandeep Kaur Saini (PT)	Women's Health, Geriatric rehabilitation, Industrial health	Registered for in-service PhD program -2022
Dr. Neha Padia (PT)	Down Syndrome	Registered for in-service PhD program -2022
Dr. Aarohi Joshi (PT)	Dance biomechanics, Cardiac rehabilitation	None
Dr. Viral Sarvaiya (PT)	Geriatric Rehabilitation, Industrial Physiotherapy	None
Dr Kshitija Jadhav (PT)	Chronic pain, Spine care and Rehabilitation, Shoulder rehabilitation	None

13. a) List of Research Publications only in SCI Journals coming from the Department during the last five years

1. Pilot implementation of service delivery model to integrate rehabilitation into rural setting: An experience in State of Maharashtra of middle-income country, India (Rehab theme issue) Lessons from the field. Rajani Mullerpatan, Prasad waigankar, Shrutika Parab, Bela Agarwal, Omeeshree Nagrale,Shashank dalvi. Bulletin of World health Organisation (special rehab theme issue)[accepted for publication].
2. Determination of hand function in children and adolescent with Down Syndrome- A Scoping Review. Neha Padia, Meruna Bose, Shrutika Parab(Journal of Hand Therapy(Accepted for publication)

3. Costanzo G, Misaggi B, Ricciardi L, AlEissa SI, Tamai K, Alhelal F, Alqahtani Y, Alsobayel HI, Arand M, Balsano M, Blattert TR. SPINE20 recommendations 2021: spine care for people's health and prosperity. European Spine Journal. 2022 Apr 7:1-0.

4. Mullerpatan RP, Bharnuke JK. Differences in Foot Characteristics Between Bharatanatyam Dancers and Age-Matched Non-Dancers. Medical Problems of Performing Artists. 2022 Mar 1;37(1):53-7.

5. Mullerpatan RP. National Education Policy 2020: Call for reconfiguration of physiotherapy education and research in India. Journal of Society of Indian Physiotherapists. 2022 Jan 1;6(1):1

6. Aglawe DR, Agarwal BM, Sawant BD. Physical Function in Critically Ill Patients during the Duration of ICU and Hospital Admission. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2022 Mar;26(3):314.

7. Lubna Khan, Mamta Shetty, Shifa Kherada, Reema Kava, Mubina Kazi, Prachita Walankar, Rajani Mullerpatan. Dough Kneading exposure at kitchen workstation: its Influence on handgrip strength and implications for therapy in hand rehabilitation. Work: A Journal of Prevention, Assessment & Rehabilitation.(Accepted for Publication)

8. Agarwal B, Aglawe D, Sawant B. Physical Function Assessment Tools in the Intensive Care Unit: A Narrative Review. Critical Reviews™ in Physical and Rehabilitation Medicine. 2022;34(1).

9. Patel G, Mullerpatan R, Agarwal B, Shetty T, Ojha R, Shaikh-Mohammed J, Sujatha S. Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane. Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine. 2022 Jan 8:09544119211072971.

10. Desai P, Mullerpatan R. Functioning of Older adults in Low-Middle Income Countries: A Literature Review. Critical Reviews™ in Physical and Rehabilitation Medicine.

11. An Evaluation of Functional Status Inindividual With Covid Recovery Using Post Covid 19 Functional Scale (Pcfs) Questionnaire. Dr.OmeshreeNagrale,Dr. Swarali Walawalkar Volume 3 , Issue 5, Sep-Oct 2021 , Page No : 359-363

12. Vaidya SS, Agarwal B, Singh Y, Mullerpatan R. Effect of Yoga on Performance and Physical Fitness in Cricket Bowlers. International Journal of Yoga Therapy. 2021 Sep 22.
13. Pahade AJ, Wani SK, Mullerpatan RP, Elizabeth Roach K. Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis. Hong Kong Physiotherapy Journal. 2021;41(02):139-46.2.

14. Agarwal BM, van Deursen R, Mullerpatan RP. Electromyographic evaluation of spine and lower extremity muscles during repeated and sustained bodyweight deep-squat. Trends in Sport Sciences, 2021, 28(1): 19-27.

15. Haldeman S, Nordin M, Tavares P, Mullerpatan R, Kopansky-Giles D, Setlhare V, Chou R, Hurwitz E, Treanor C, Hartvigsen J, Schneider M. Distance management of spinal disorders during the COVID-19 pandemic and beyond: Evidence-based patient and clinician guides from the global spine care initiative. JMIR public health and surveillance. 2021;7(2): e25484.5.

16. Kanjirathingal JP, Mullerpatan RP, Nehete G, Raghuram N. Effect of yogasana intervention on standing balance performance among people with diabetic peripheral neuropathy: A pilot study. International Journal of Yoga. 2021;14(1):60.6.

17. Mullerpatan R, Shetty T, Singh Y, Agarwal B. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork and Movement Therapies. 2021; 26:1-6.

18. Sawant N, Bose M, Parab S. Dexteria app. therapy versus conventional hand therapy in stroke. Journal of Enabling Technologies. 2020;14(4):221-231.

19. Dharod R, Shetty T, Shete R, Mullerpatan R. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020; 32(3).

20. Swaminathan N, Jiandani M, Surendran PJ, Jacob P, Bhise A, Baxi G, Devani P, Agarwal B, Kumar VS, Pinto NM, Damke U. Beyond COVID-19: Evidence-Based Consensus Statement on the Role of Physiotherapy in Pulmonary Rehabilitation in the Indian Context. The Journal of the Association of Physicians of India. 2020;68(12):82-89.

21. Jiandani MP, Agarwal B, Baxi G, Kale S, Pol T, Bhise A, Pandit U, Shetye JV, Diwate A, Damke U, Ravindra S. Evidence-based National Consensus: Recommendations for Physiotherapy Management in COVID-19 in Acute Care Indian Setup. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2020;24(10):905-913.

22. Mullerpatan R, Nahar S, Singh Y, Cote P, Nordin M. Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India. European Spine Journal. 2020;30(4):1004-1010.

12. Mohanty T, Mehta D, Mullerpatan R, Agarwal B. Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in Children and Adolescents with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(2):75-83.

13. Mullerpatan RP, Agarwal BM, Shetty TV. Exploration of muscle activity using surface electromyography while performing suryanamaskar. International Journal of Yoga. 2020 ;13(2):137-143.

14. Bharnuke JK, Mullerpatan RP, Hiller C. Evaluation of Standing Balance Performance in Indian Classical Dancers. Journal of Dance Medicine & Science. 2020;24(1):19-23.

15. Dighe A, Bose M, Parab S. Influence of Variations in Seat Surface Inclination on Trunk Muscle Recruitment and Reaching Ability in Children with Spastic Cerebral Palsy: Systematic Review. Website: www. ijpot. com. 2019;13(3):22.

16. Bose M, Parab SD, Patil SM, Pandey NA, Pednekar GV, Saini SS. Exploring spinal muscular atrophy and its impact on functional status: Indian scenario. Indian journal of public health. 2019;63(3):254-257.

17. Mullerpatan R, Kamath M. Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life. Critical Reviews in Physical and Rehabilitation Medicine. 2019;31(4): v-vi.

18. Shetty M, Balasundaran S, Mullerpatan R. Grip and pinch strength: reference values for children and adolescents from India. Journal of pediatric rehabilitation medicine. 2019;12(3):255-262.

19. Parab S, Bose M, Shayer S, Saini RK, Salvi M, Ravi P, Sawant P. Effect of Bharatnatyam-based Dance Therapy in Children and Adolescents with Down Syndrome. Clinical Kinesiology (Online). 2019;73(3):15-20.

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22. Mullerpatan R, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B. Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries. Crit Rev PhysRehabil Med. 2019;31(2):173-183.

23. Shah T, Shetty M, Bose M, Mullerpatan R. A Study of Fine and Manual Hand Dexterity in People with Parkinson's Disease. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):93-100.

24. Mullerpatan R, Bharnuke J, Hiller C. Gait kinematics of Bharatanatyam dancers with and without low back pain. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):1-10.

25. Agarwal B, Advani M, van Deursen R, Mullerpatan R. Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):11-22.

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41. Parab S, Bose M, Ganesan S. Influence of Random and Blocked Practice Schedules on Motor Learning in Children Aged 6–12 Years. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018;30(3):239-254

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55. Sahasrabudhe SS, Agarwal BM, Mullerpatan RP. Comparison of muscle activity and energy cost between various bodyweight squat positions. Clinical Kinesiology: Journal of the American Kinesiotherapy Association. 2017;71(2):19-25.

56. Rane SS, Paul A, Mullerpatan RP. Reference values of manual dexterity using Minnesota Rate of Manipulation Test for Indian adults. Hand Therapy. 2017;22(2):79-85.

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59. John R, Dhanve A, Mullerpatan RP. Grip and pinch strength in children with Down syndrome. Hand Therapy. 2016;21(3):85-89.

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b List of Publications in Conference Proceedings during last five years.

1. Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan, Evaluation of Joint Angles and Net Joint Moments In Rope Jumping, XXVI Congress Of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.

2. Bela Agarwal, Robert van Deursen,Rajani Mullerpatan, Influence Of Daily Squatting Exposure On Kinematics Of Deep Squat, XXVI Congress Of The International Society of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane, Australia.

3. Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN, Spine and Lower Extremity Kinematics Of Suryanamaskar, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,| Australia.

4. Rajani Mullerpatan, Juhi Bharnuke, Gait Kinematics of Indian Classical Bharatnatyam Dancers, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane, Australia.

5. Pradnya Girdhar, Physical Examination of Spine, Prevention, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach Proceedings Of Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

6. Rajani Mullerpatan, Biomechanics of Spine In Traditional Indian Movements, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach. Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

7. RajaniMullerpatan, Yuvraj Singh, Shweta Nahar, Burden of Spinal Disability In India: Southwest Maharashtra, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach. Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

8. Rajani Mullerpatan, The MGM-WSC Clinic For Underserved Population, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach. Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

9. Dr. Rajani Mullerpatan. Enhancing physical activity for overall development in children using traditional Indian Movement Science Conference on communicating Ancient Indian Knowledge system for the Holistic development of the School students for their physical, mental and spiritual well- being, May 7-8th 2019, National Institute of Advance Studies , Bengaluru.

10. Agarwal B, Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. Conference proceedings HWWE 2015 Mumbai, India. ISBN 978-93-5258-836-7.

11. RajaniMullerpatan, Yuvraj Singh, Stacey Pinto, Anila Paul, Amit Maurya, Robert VanDeursen. Foot characteristics of Indian rural school children. Proceedings of XXV Congress of the International Society of Biomechanics. PO-0086. 1523-1524,12th – 16th

12. Parab S, Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. WCNR 2018 Poster Abstracts. (2018). Neurorehabilitation and Neural Repair, 32(4–5), 363–538. https://doi.org/10.1177/1545968318765498

13. Parab S, Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. Indian Journal Cerebral Palsy [serial online] 2016 [cited 2019 Jun 8]; 2:105-25.

c) List of Patents obtained or applied for during last five years.

Sr.no	Invention title	Name of the Inventors	Patent Number	Date of Filing
1.	A device for measurement of properties of a body part	Maurya Amit Mullerpatan Rajani Bhallamudi Ravi Ghyar Rupesh	143/MUM/2015	6/04/2015
2.	A Device for screening Foot of Diabetic Patient	Nishant Kathpal Ghyar Rupesh Chetan Pakhare Yash Gupte Bhallamudi Ravi Mullerpatan Rajani	201821005692	05/02/2018
3.	Development of powered transtibial Prosthesis	Abhishek Gupta, Shishir Shah, Sagar Joshi, Rajani Mullerpatan, Swagatika Mishra	201921033581	12/03/2019

d) List of patents commercialized and its profitability earned out of commercialization (in last 15 years)

- A Device for screening Foot of Diabetic Patient was commercialized in October 2021
- Profitability will be computed only after completion of one year of the product in market.

a) List of scientific/ technical Books written by Faculty Members in the Department.

- Bela Agarwal, Physiotherapy in Cardiorespiratiory Conditions Chapter 32: Disorders of Pleura and Thoracic Cage. Page 332-351. Edited by Maria Jiandani, Megha Seth, Neepa Pandya, Priya Rangey. Jaypee Brothers Medical Publishers, The Health Science Publishers, New delhi. ISBN978-93-5465-141-0. Edition 2022
- Haldeman S, Outerbridge G, Eberspaecher S, Brady OD, Kopansky-Giles D, Nordin M, Hurwitz EL, Adjei-Kwayisi A, Mullerpatan R. Section 6, Chapter 1: World Spine Care: A Charity Providing Spine Care in Botswana, Dominican Republic, India and Ghana.
- Haldeman S, Outerbridge G, Eberspaecher S, Brady OD, Kopansky-Giles D, Nordin M, Hurwitz EL, Adjei-Kwayisi A, Mullerpatan R. Lumbar Spine Online Textbook.
- Rajani Mullerpatan (2021). 'Biomechanics of Indigenous Postures' in Margareta Nordin, Victor H Frankel (5 th ed.). Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer. 469-490. ISBN-13:978-1-97575-33-7
- Bela Agarwal, Expert Consensus for Covid -19 Management in Indian Setup-Booklet, Medworld Asia International Publications, Dotphi. 2020; ISBN 978-81-946111-3-4.
- Rajani Kanade (Dr. Mullerpatan's maiden surname was Kanade) (2000). 'Principles of Rehabilitation in Plastic Surgery'. In Pramod Kumar (ed.). Plastic Surgery Basic Principles and Tehniues. Paras Publishing. 265-292.
- Book chapter on wrist, hand and elbow injuries and rehabilitation in textbook "Principles and practice of Physical Rehabilitation Jaypee publication in the year 2020.

b) Average Impact Factor of the publications and Name of the Major Journals in which publications are made

The Average Impact Factor of all publications is = 1.43

	Major Journal of Publication:	**Impact Factor**	**Indexing**
1.	European Spine Journal.	2.63	Scopus/ PubMed
2.	Journal of Bodywork and Movement Therapies	1.4	Scopus/ PubMed
3.	Critical Reviews™ in Physical and Rehabilitation Medicine	0.08	Scopus/ PubMed
4.	International Journal of Yoga	0.67	PubMed
5.	International Journal of Diabetes in Developing Countries	0.8	Index Copernicus
6.	Journal of Dance Medicine & Science.	0.72	PubMed
7.	Indian Journal of Public Health	0.38	Scopus/ PubMed
8.	International Journal of Yoga Therapy	0.67	PubMed
9.	JMIR Public Health and Surveillance	5.4	Scopus/ PubMed
10.	Hong Kong Physiotherapy Journal.	0.97	Scopus

14. **Give a list of Equipment, which are available and functional in the Department costing Rs.10 lakh and above.**

Name of Equipment	Year of Purchase	Status	Remarks
EMED Pressure Platform (Pedobarography Platform System)	2013	Working	Purchased
Biofeedback Unit with MYOSCAN sensors	2014	Working	Purchased
COSMED & Treadmill CPET system	2015	Working	Purchased
Three Force platform system with accessories	2015	Working	Donated
Twelve Bonita 10 and 2 VGA Optical Camera	2015	Working	
Vicon Bonita Motion Analysis System	2015	Working	
Bagnoli 8- channel Wired sEMG system	2018	Working	Funded by DBT for research project
Delsys EMG works 8 channel wireless system	2018	Working	Donated

14. Library facilities - List the Journals received in your Department/ University library in the concerned discipline.

National Journal (2022)	
1	Indian Heart Journal
2	Indian Journal of Thoracic and Cardiovascular surgery
3	Indian Journal of Community Medicine
4	Indian Journal of Public Health
5	Indian Journal of Leprosy
6	Indian Journal of Critical Care Medicine
7	Indian Journal of Gerontology
8	Journal of Postgraduate Medicine
9	Journal of Obstetrics and Gynecology of India
10.	Indian Journal of Orthopedics
11.	Indian Journal of Pediatrics
12.	Indian Pediatrics (New)
13.	International Journal of Basic and Applied Physiology
14.	Journal of Association of Chest Physicians
15.	Lung India
16.	Indian Journal of Surgery
17.	Indian Journal of Minimal invasive surgery

Sr. No.	**International Journal -2022**
1.	Archives of Physical Medicine and Rehabilitation
2.	Clinical Biomechanics
3.	Journal of Orthopedic and Sports Physical Therapy (JOSPT)
4.	Journal of Physical Activity and Health
5.	Neurorehabilitation and Neural Repair
6.	Annals of Thoracic Surgery
7.	JTCVS: Journal of Thoracic & Cardiovascular Surgery
8.	Journal of Epidemiology and Community Health
9.	Journal of Public Health (Oxford) (New)
10.	Critical Care Medicine
11.	Journal of Emergency Medicine (New)
12.	Clinics in Geriatric Medicine
13.	BMJ: British Medical Journal (New)
14.	Journal of Pediatrics (New)
15.	International Journal of Sport Medicine
16.	BJS: British Journal of Surgery
17.	Tuberculosis
18.	Chest

15. **Details of computing and networking facilities available in your department and institution**.

The Centre is well equipped with computer and networking facilities including 35 Desktop Computers, 7 Laptops with Hardware Configuration – i5 8 GB ram, 500 SSD HD, 19.5 LCD, USB Keyboard+ USB
The systems are enabled with cable and fiber optic internet of 16 Gbps speed from NKN Network leased line from Govt. of India. An Internet Back-up line of 100mbps speed from Reliance JIo Fibre facility for smooth functioning of the School is available.

16. Details of facilities in Central Instrumentation Centres such as RSIC, USIC etc., if any.

MGM Institute of Health Sciences has a robust research ecosystem which offers research facilities spanning across basic research facilities to applied research facilities in various non-communicable and communicable diseases and health promotion.

MGM Skills Lab: MGM Skills Lab, established in March 2015, is a state of the art equipped Skills Training Centre, under the aegis of MGM Medical College Navi Mumbai. It offers American Heart Association (AHA) Certified Basic Life Support(BLS) and Advanced Cardiac Life Support Courses (ACLS), Basic Clinical Skills, Basic Surgical Skills and Advanced Airway Skills to health care graduate and post-graduate students and faculty members.

MGM Central Research Laboratory: The Central Research Laboratory, established by MGM School of Biomedical Sciences offers exclusive facilities to undertake genetic, molecular and biotechnological applied research in sync with the thrust areas of research of the Institute. The laboratory is well equipped with High throughputtechnique of Real-time PCR as well as technology for ELISA, DNA/RNA extraction, Electrophoresis (Vertical/Horizontal), Micr obiological assays,NAAT, DNA Hybridizationassays, EVOS FL Auto microscope, Immunological assays and Culture and Drug susceptibility studies, and Zebra fish cultivation (as animal model).These facilities have resulted in development of Rational Drug discovery, discovery of novel predictive biomarkers of diseases, Affordable and Rapid Diagnostic kit for detection of TB and Malaria, Prediction of Disease and Prophylactic Disease Management and Decoding Infectious Diseases at Host Genome level. These facilities will enable strengthening of development of robust algorithms for early identification of diseases and offering novel solutions for management.

MGMIHS Sleep Medicine and Research Center was established in 2014 incooperation with Penn Medicine, University of Pennsylvania, US under department of respiratory medi cine. The Center offers state of art Polysomnography studies to identify sleep disorders and promote health. The facilities at the Center are being explored through collaborative research projects to offer geriatric care and design educational modules to promote greater awareness of sleep related disorders.

MGMIHS OMICS Research Center
OMICS Research Center of MGMIHS is a center of excellence in drug discovery and molecular diagnostics. Center is accelerating the basic and applied research. Using various domains of OMICS such as genomics, proteomics and computational biology, this center is providing uniqueand exploratory platform for discovery research. The Center is equipped with important instruments such as spectrofluorophotometer, UV-Vis Spectrophotometer, ELISA Reader, HPLC, Fume Hood, Laminar Air flow, Biosafety Cabinet, CO_2 Incubator, Thermal cycler, Gel Electrophoresis instruments, Inverted microscope, -20^{o}C refrigerator etc. and other large number of basic and small supportive instruments. This center isalso enriched with facility for protein isolation, purification and crystallization. This center is powered by availability of animal cell culture and microbial culture facility. Centre is also equipped with an advanced proteome/protein based several bio-systems for bio-fabrication of metallic nanoparticles. Bio-fabrication based generation of quantum dots facility is major attraction of center. The facilities are being explored through collaborative projects to identify novel noninvasive biomarkers for early identification of diseases.

17. Details of Post-graduate Teaching and Research Profile & Plans of the Department for next 5 years.

MGM School of Physiotherapy Navi Mumbai, MGMIHS offers undergraduate and post-graduate training and conducts research and development activities aligned with National Education Program 2020EP 2020.

Post-graduate Teaching profile of MGM School of Physiotherapy:

It is one of the four pioneering Institutes in India to offer Choice Based Credit System curriculum in Bachelor of Physiotherapy (BPT) program and four Post Graduate Master programs (MPT) in Physiotherapy education which is designed to provide academic flexibility.
The exclusive elective courses in each Master's program (Musculoskeletal Physiotherapy-15, Neuro Physiotherapy-16, Cardiovascular and Respiratory Physiotherapy- 17, Sports Physiotherapy-14) are communicated to Association of Indian Universities (AIU) for inclusion in the National Academic Credit Bank which was proposed by UGC in 2020. Some of the exclusive courses offered are- Clinical Biomechanics, Movement Analysis and Assistive technology, Exercise Physiology, Mind and Body techniques, Sports for Fitness, Applications of Yoga in Physiotherapy, Kinanthropometry, Vestibular rehabilitation.
Movement is at the core of Physiotherapy. Hence Human Movement Science is fundamental to education, training, research and patient care. Therefore, MGM School of Physiotherapy, Navi Mumbai established MGM Centre of Human Movement Science in 2015 with intra-mural support from MGM Institute of Health Sciences (MGMIHS) and extra-mural support from International Society of Biomechanics, USA and BETIC, IIT Bombay.
In addition to curricular training, MGM Centre of Human Science regularly offers value added courses in 3D Gait Analysis, Clinical Biomechanics (16 courses conducted successfully) as a part of Post graduate training. In past 5 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 16 training courses. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1500 students from Physiotherapy (including BPT & MPT), Prosthetics & Orthotics(BPO) and Orthopedics(MS) benefitted from biomechanics training.

Furthermore, the Centre has delivered the Course in 3D Gait Analysis and Clinical Biomechanics to post-graduate students and research scholars outside MGMIHS. These courses are well received by researchers and postgraduate students in health care professions and engineering from various government and non-government institutes across various states of India.
Such inter-disciplinary post graduate training workshops presented a unique platform to postgraduate students of health and engineering disciplines across the country to come together and learn biomechanics and address unmet healthcare needs in India and countries with similar socioeconomic background.
As a part of post graduate teaching, the Centre offers state-of-art advanced facilities in Human Movement Science for training and research in order to understand its application in rehabilitation of musculoskeletal, neurological and cardio-vascular and pulmonary conditions, sports biomechanics, health promotion and fitness and technology design and validation.

Research Profile

MGM Centre of Human Science (MGMCHMS) at MGM School of Physiotherapy Navi Mumbai is declared as a Centre of Excellence of MGM Institute of Health Sciences. The Centre has established a robust research profile in fundamental biomechanics and clinical application of human movement science in rehabilitation, since its inception in 2015. Research projects are funded by various Government Funding agencies such as Department of Biotechnology, Department of Science & Technology, Rajiv Gandhi Science and Technology Commission and Non-Government Funding agencies such as World Spine Care, Shastri Indo Canadian Institution, International Society of Biomechanics, BETiC.

Research activities designed for biomechanical exploration of indigenous movements and postures practiced in India, namely: Yoga, indigenous daily life postures, traditional sports and Indian classical dance forms and clinical rehabilitation have yielded 62 original scientific papers in peer reviewed Scopus/PubMed indexed journals. The Centre was invited to publish research findings in a special volume of Journal of Critical Reviews™ in Physical and Rehabilitation Medicine (Volume 31, 2019 Issue 1: indexed in Scopus), with a theme 'Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in Middle Income Countries'.

Original fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted.

The Centre has provided robust facilities for fundamental biomechanics research to scientists from BARC, Mumbai; IIT Bombay, IITM etc.

Three patents are filed jointly with IIT Bombay for design of technology pertinent to rehabilitation. Inter-disciplinary collaborative research between Department of Mechanical Engineering, IIT Bombay and MGM School of Physiotherapy, Navi Mumbai resulted in development of a powered trans-tibial prosthesis for people with below knee amputation which was funded by Department of Biotechnology.

A proposal by Early Translation Accelerator (ETA) (established at BETIC, IIT Bombay), is supported by BIRAC, New Delhi, to support its further development in a commercially viable product and license it to an industry partner. Pilot work is in process for clinical testing of a device for early detection of risk to ulceration among people with diabetic neuropathy.

An external, self-wearable, low-cost, spring loaded passive exoskeleton was designed to reduce trunk muscle fatigue in manual laborers. The device was tested on healthy people and Mathadi workers with and without low back pain and results revealed 25% reduction in onset of fatigue. Patent application is in process.

Findings of these research projects are applied in various clinical areas such as osteoarthritis, cerebral palsy and geriatrics- i) evaluation of squat for maintenance of lower extremity muscle strength, joint motion, mobility and walking capacity among people with knee osteoarthritis; ii) a mobile-based tool is being developed for home-based monitoring of function of children with cerebral palsy undergoing single event multiple level surgery; iii) biomechanics and energy cost of two modifications of traditional Suryanamaskar for application in elderly people (a collaborative project with Sancheti College of Physiotherapy, Pune).

Nearly 500 patients (traumatic sports/dance or mechanical injury, cerebral palsy, stroke, Parkinson's disease, amputations, diabetic neuropathy, osteoarthritis, joint replacement) have benefitted from robust evaluation for gait analysis (at one-third of prevailing cost), balance assessment, foot geometry and pressure evaluation at markedly subsidized cost. Quantified objective reports helped surgeons, physiotherapists and prostheticians and orthoticians to plan targeted surgical interventions and therapy to optimize function after trauma/disorder.

In addition to patient care, the Centre has supported individual innovators and organizations to validate 11 ingeniously designed devices against gold standard to address unmet needs in clinical rehabilitation of patients with poliomyelitis (1), lower extremity amputations (3), diabetes (1), backache (1), health promotion (1), athletic performance (1) and gait (1). Amongst these 11 devices, 'Diabetic Foot Screening Device' and 'Mechanical Actuated Stance Control Knee Ankle Foot Orthosis' for people with polio' attracted funding from BIRAC for small-scale production and commercialization. Individual innovators ranged from entrepreneurs to our youngest listed innovator who was a standard X school student, who bagged Grand Prize at the Initiative for Research and Innovation in Science (IRIS) National Fair 2016 (New Delhi) and qualified to represent India at the Intel

International Science and Engineering Fair 2017 held in Los Angeles, USA. Efforts to validate indigenously designed innovative, robust and competent technology and health care solutions designed by clinicians and engineers across various higher academic institutes (IIT Madras, IIT Guwahati, IIT Bombay, etc.) in India support the 'Make in India', 'Innovate India' and 'Start-up India' initiatives of Government of India.
The dedicated team of 6 Physiotherapy faculty members and 1 Research Associate complemented by mechanical Engineers from IIT Bombay, Queen's University, Canada; Human movement scientists from Cardiff University, UK along with 16 Ph.D. scholars, 14 MPT scholars, 7 M.Tech scholars and 24 BPT Scholars contributed to the growth of MGMCHMS in the past 5 years. A cohesive inter-disciplinary effort between healthcare professionals and engineers is a highlight of the team work at MGMCHMS resulting in translational healthcare research. It provides a unique platform for interdisciplinary research, which is ignited at the level of Master's program in health and engineering i.e. namely M.Tech and MPT programs.

Overall, the Centre is geared to be recognized as the Centre of Excellence in Human Movement Science at national level. Additionally, it is equipped with expertise, skill and resources to assume position of a National Centre for validation of technology in the area of rehabilitation of movement disorders.
The research profile of MGM Centre of Human Movement Science is of national and international merit and has received credibility through scientific publications in Scopus and Pubmed indexed journals, registered copyrights, and filed patents. The association of the Centre with International Society of Biomechanics and collaborative research projects with Universities abroad, namely Cardiff University, UK; Queens University, Canada and University of Sydney, Australia are a testimony to robust collaborative research conducted at the Centre.

Future 5-year plan:

The science of Biomechanics i.e. Human Movement Science has developed in the western world over the past half century. The impact of this science is visible in improved health care and sports performance and indigenous development of technology. Applications of movement related technology are wide for e.g. artificial intelligence, joint implants, artificial limbs, orthoses, external and internal prostheses, etc. However, we cannot pick up devices off the shelf which are developed in the west; because the needs in India are diverse and exclusive with respect to local socio-economic, contextual and cultural factors in daily living.

Therefore, we need to develop this science in India. Currently, in India, the science of Biomechanics is evolving in silos in premier engineering institutes and a few health institutes. An interdisciplinary approach to biomechanics is an urgent need of the hour to address our pertinent unmet needs in healthcare, sports performance and technology design and validation. Hence, we need to train and develop an interdisciplinary taskforce in biomechanics throughout the country to develop such indigenous health care solutions and technology for rehabilitation of people and sports performance enhancement.

Therefore, MGM Centre of Human Movement Science was established 5 years ago with a vision of developing such an interdisciplinary taskforce to develop applications of clinical biomechanics in sports and clinical rehabilitation. Building on its groundwork in the past 5 years, MGMCHMS has planned future initiatives in training, research, patient care and technology design and validation to boost 'Make in India', 'Innovate India' and 'Start-up India' initiatives launched by Government of India.

Training:
The MGMCHMS is scaling its existing efforts to bridge the gap in integrated biomechanics knowledge of health and engineering graduates through following activities-
The Centre offers a credit choice based module on Clinical Biomechanics to graduates and research scholars in a hybrid mode environment.

The Team at MGMCHMS is compiling a Textbook of Biomechanics of Indigenous Movements; which will serve as a resource material to inform this science to students, researchers, clinicians and engineers working in provision of healthcare and design of movement pertinent technology. It is an expansion of the Chapter 'Biomechanics of Indigenous Postures' contributed by the Centre to the Textbook authored by Margareta Nordin, Victor H Frankel (5th ed.). Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer (2021); which is circulated globally in five languages.

As a part of Scientific Social Responsibility, research findings of biomechanical exploration of Yogasanas are in the process of publication in form of a booklet titled 'Suryanamaskar: Facts & Finds' in lay language for easy reference of clinicians, Yoga practitioners and grass root level healthcare workers to execute evidence based Yoga practice (Awaiting ISBN number).

Equipped with state-of-the art facilities, faculty expertise and full-time scholars of Master's program in Sports Physiotherapy, MGMCHMS is geared to make exclusive contribution in sports biomechanics training for performance enhancement and injury prevention and management in sports, which is aligned with Mission of Sports Authority of India (SAI) for health promotion of athletes targeting Olympics 2025. The Centre is interacting with SAI.

A joint course on 'Principles of Bioengineering & Biomechanics for Orthopaedic Surgeons' is designed by MGMCHMS along with Departments of Anatomy and Orthopedics at MGMIHS and Johnsons and Johnson (J&J) for Orthopaedic Surgeons. The course is being discussed by Board of Studies at MGMIHS and Board of J & J.

We have initiated exchange programs with international institutes of repute to facilitate student mobility and widen horizons of post graduate students and develop MGM Centre of Human Movement Science as a Centre of Excellence in interdisciplinary Biomechanics training in India and Asia.

Research:

The thrust areas of research at MGMCHMS are fundamental integrated biomechanics, early detection and rehabilitation of people with commonly encountered non-communicable disorders to maximize their capacity for independent living using artificial intelligence; sports performance enhancement for able bodied and specially-abled children and adults, understanding Yogasanas biomechanics, dance performance enhancement and movement pertinent technology design and validation.

Fundamental integrated biomechanics: The Centre is geared to integrate biomechanics with biochemical components and neural connections of human body. Pilot work is already performed in the area of knee biomechanics to explore the effect of commonly performed daily activity of deep squat on articular cartilage of knee joints and its implications for knee osteoarthritis. Promising results indicate clinical diagnostic value of non-invasive sweat biomarker for early detection of osteoarthritis. Further research is in progress to develop squat prescription to prevent further decline in function associated with osteoarthritis.

Artificial intelligence for early detection, monitoring function and maximal performance of human movement: Based on existing vast clinical information on profile of movement in healthy people and people with movement disorders, the Team has developed clinical algorithms which are used with artificial intelligence for maximal performance of human movement.

- Mobile-based app for early detection, measurement, function monitoring and rehabilitation of children with cerebral palsy.
- Mobile-based app for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function.
- Early detection of prodromal symptoms of Parkinson's disease.
- Early detection of peripheral arterial disease in high risk people.
- Tele-rehabilitation of people with knee osteoarthritis to delay decline in function.

Enhance Sports Performance of able-bodied people using data analytics approach: MGMCHMS has the capacity for providing a DNA print of the body profile of sportsperson at the beginning of sports career, identifying a human body shape for a specific sport, guiding performance enhancement, identification of risk of injury, prevention of injury and rehabilitation of injury through robust scientific measures. Research project is in progress to apply data analytics approach for identification of suitable sport among rural and urban children.

Sports promotion for specially-abled people: MGMCHMS can contribute towards sports biomechanics for Paralympic sports by identifying available functional capacity of specially-abled people, guiding training of specially-abled people to enhance collateral functional abilities and performance enhancement, identification of risk of injury, prevention of injury and rehabilitation of injury. Field work in this area is in progress.

MGMCHMS has the exclusive capacity to contribute to talent Scouting at micro level & nurturing talent towards excellence, support training with scientific & sports equipment and scientific personnel and monitor and enhance performance with a scientific evaluation system & to implement various schemes of the Ministry of Youth Affairs & Sports e.g. Khelo India, Assistance to National Science Foundation, FIT India.

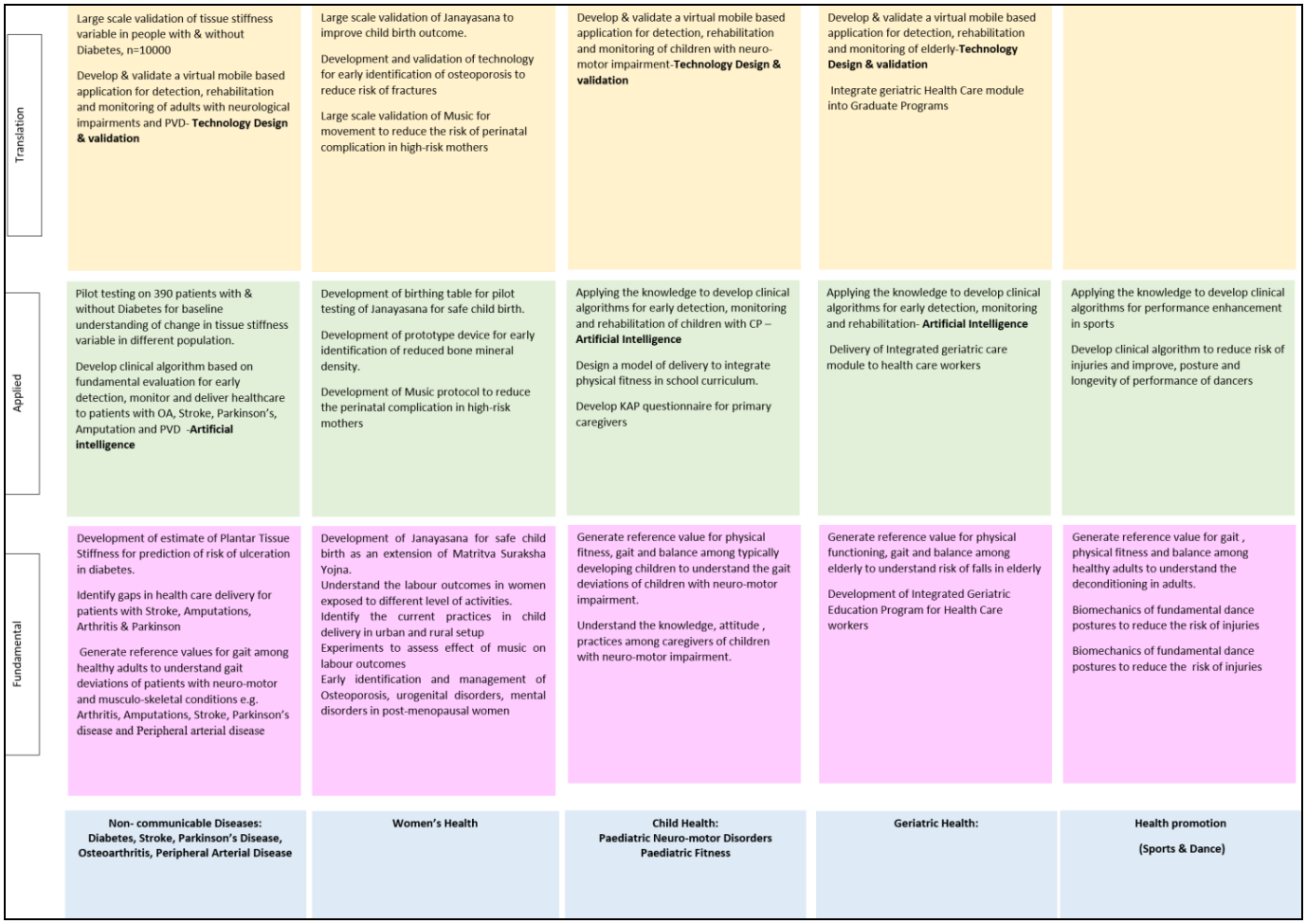
COVID 19: COVID 19 pandemic has awakened us to notice our negligible investment in public health. In order to strengthen our efforts to adopt movement as a therapeutic device for health promotion and reduction of burden of non-communicable diseases and delay disability caused by movement disorders, we have planned to scale the collaborative interdisciplinary research model. Successful outcome of interdisciplinary research model engaging health and engineering research scholars of Masters and PhD programs has motivated us to plan larger number of interdisciplinary research projects to achieve the goal of applied translational research to enhance function of people with movement disorders and reduce disability.

Technology design and validation: e-Hackathons in rehabilitation technology are in the planning for designing innovative technology for enhancement of movement performance and reduction of disability caused by movement disorders. The Centre has reached out to engineering institutes across India (through AICTE) and Innovation Centers across India to inform them of availability of robust, gold-standard technology available for validation of technology pertinent to rehabilitation.

In addition to the training and research activities planned for the next 5 years, MGM Centre of Human Movement Science is taking a lead in forming a vibrant National Society of Human Movement Science for health and wellness in order to develop this science in India and represent internationally as an affiliate Society of International Society of Biomechanics.

Apart from the above research themes, the Centre is working towards strengthening the existing experimental facilities and developing certain exclusive experimental facilities such as Plantar Tissue Stiffness, Bone Mineral Density Assessment, Muscle mechanics (Diaphragm in respiratory conditions, Artisans, Performing Artists), Sports Biomechanics, Dance Biomechanics, Biomechanics of Defecation and Voiding, Postural Control Analysis, Advance Kinematics, Advance Kinetics, Biomechanics of Activity of Daily Living, Women and Child Care, Yogasana assessment, Energy Cost of Movement.

To summarize, MGMCHMS has successfully established an interdisciplinary ecosystem for development of Biomechanics to innovate indigenous solutions for health and wellness. In order to boost the activities and initiatives in this field and make a remarkable and meaningful contribution, we look forward to support from DST in order to make India an Atmanirbhar Bharat in health, which will be better equipped to cope with any unforeseen future disasters.



18. The research profile of the Department may fall in the following categories. Please [tick]:

Make in India ✓ Swachch Bharat☐ Digital India✓ Swastha Bharat✓ Start-up✓ India

19. Details of Strength of the Department/ School/ Centre and Deliverables in the proposal:

i) Existing Faculty and Infrastructure strengths of Dept/ Centre/ School justifying the Proposal:

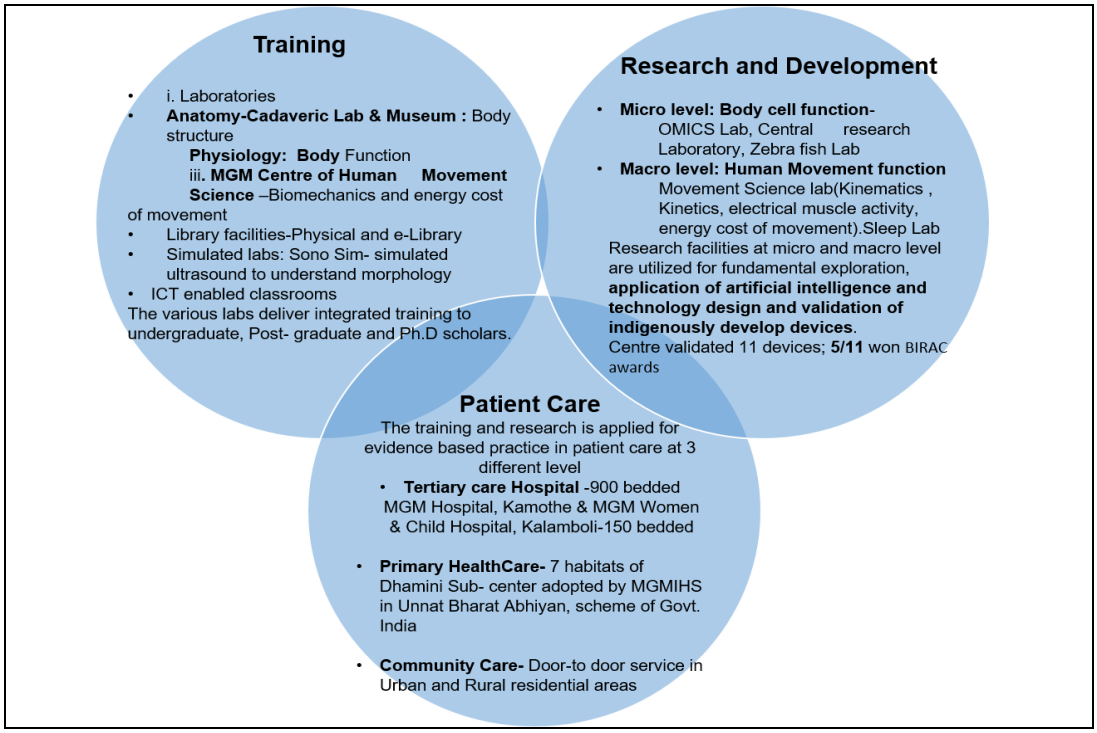
a. Existing Faculty:

The eligibility defined by respective Health Councils for Assistant Professor in Health Sciences is Masters degree. Hence a Team of 19 Faculty members are qualified at Masters level in various specialties of applications of movement science in health care such as Musculoskeletal, Neurosciences, Cardiorespiratory, Sports, Community Science & Women's Health.

- 2 Faculty members are qualified with PhD degree (Diabetes and OA)
- 1 faculty Member has successfully submitted PhD Thesis and awaiting Defense Viva (CP).
- 15 Faculty Members are pursuing PhD program in clinical areas of Geriatrics, Parkinsons, Vascular, Sports, Dance, Ergonomics in Community and Industry, Stroke, Down's syndrome and Women and Child Health.

b. **Infrastructure:**

Existing ecosystem in training, research and development (technology design and development) and application in patient care (at tertiary care level and primary care level):



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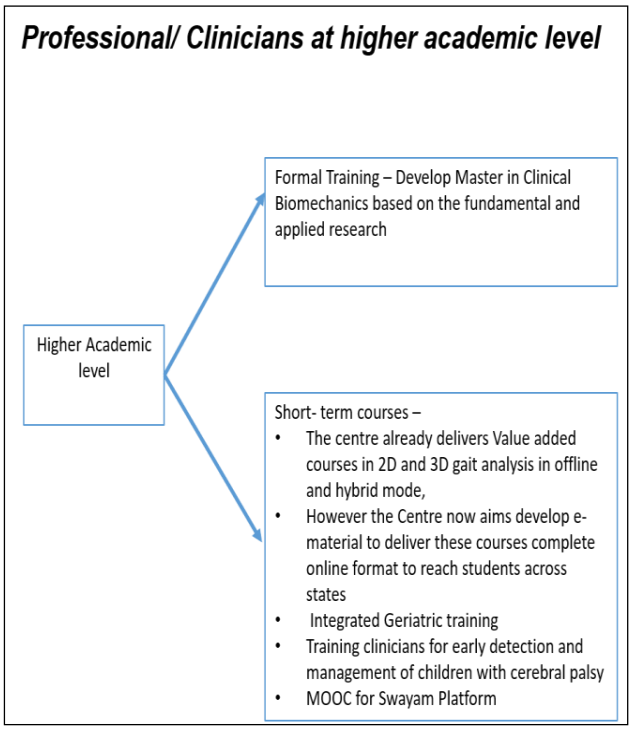
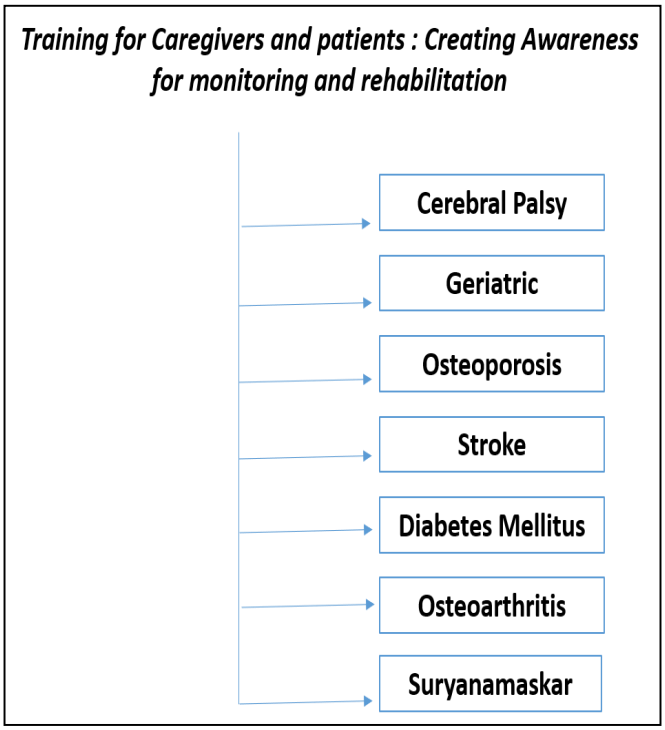
ii) Specific Objectives of the Proposal in relation of above strengths:

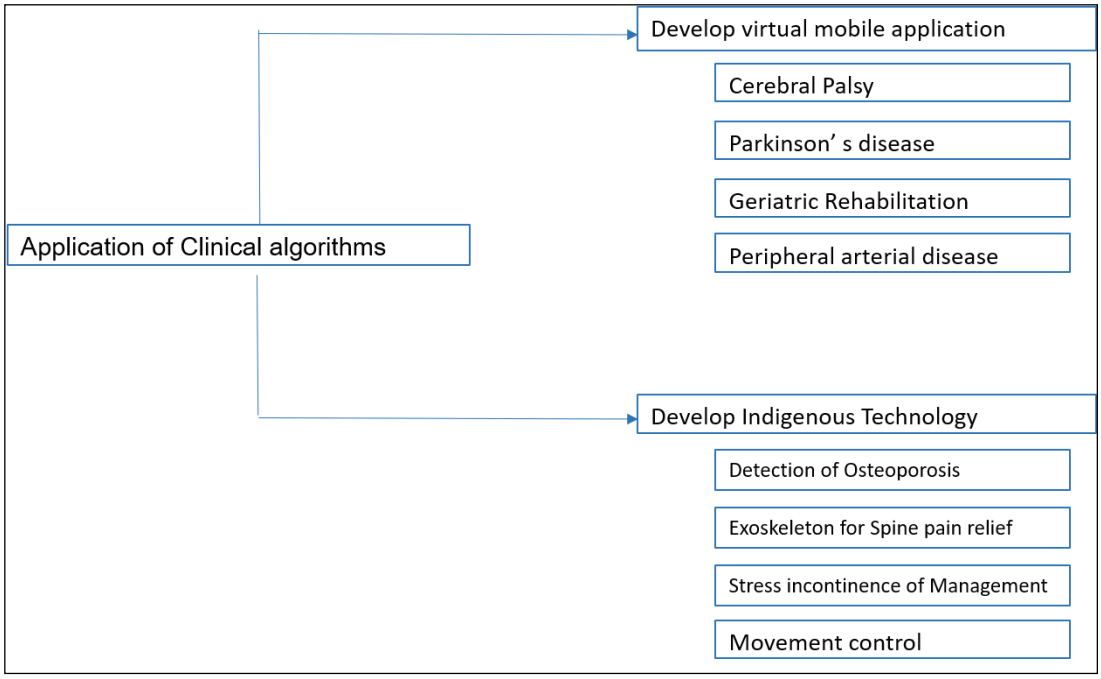
- **Training:**

The Centre aims to develop formal training courses and short-term courses for Professional/ Clinicians and Engineers at higher academic level.





- **Research and development (technology design and development):**



- **Application in patient care (at tertiary care level and primary care level):** The developed technology design will be validated on patient population from urban (including 900 bedded MGM Hospital, Kamothe and 150 bedded MGM Women and child Hospital, Kalamboli) and rural settings (villages adopted by MGM through Unnat Bharat Abhiyan)

iii) **Expected Academic Outcomes (experimental facilities to be created, UG/PG programs supported as well as research themes to be enabled by these facilities, publications with impact factor) from the implementation of the proposed proposal:**

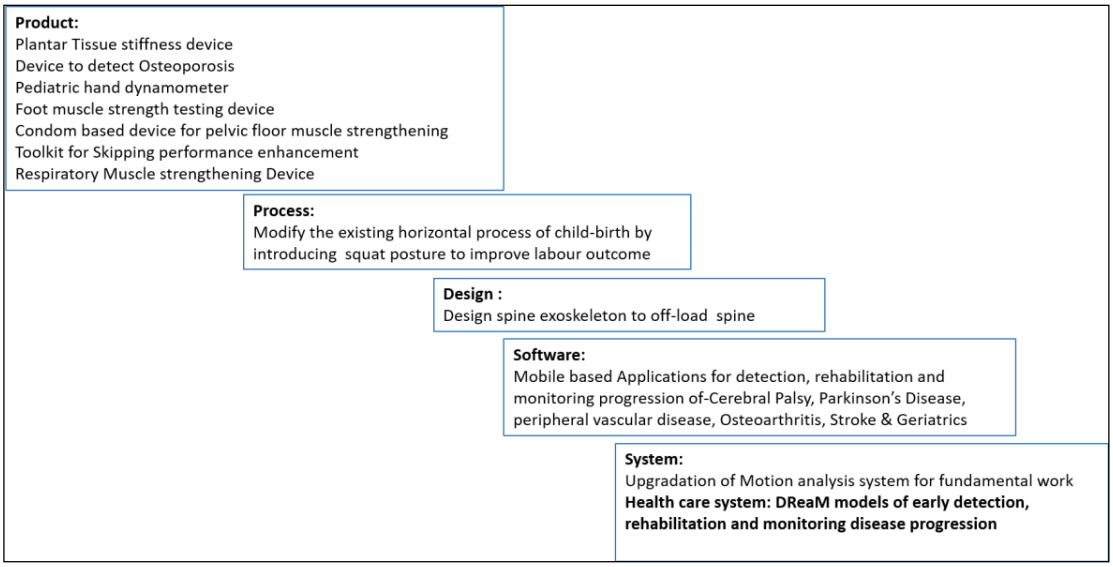
Experimental facility	**Research theme**	**Publications**
Tissue stiffness	Risk of ulceration	Journal of Diabetes
Bone Mineral Density	-Detection of osteoporosis. -Prevention of osteoporotic fractures management of osteoporosis	Journal of Bone and Joint Surgery
Deeper muscle testing (diaphragm)	-Mechanics of breathing	Respiratory Research
Breathing mechanics in performing Artists	Respiratory Mechanics in performing artist	Respiratory Research
In-vitro evaluation of foetal movement	-Early Detection of movement disorders and -In-vitro management of movement disorders -Monitoring movement disorders	Journal of Biomechanics

Intra corneal Pressure and Muscle activity	-Prevention and management of glaucoma related Headaches caused by screen use	Journal of Glaucoma
Biomechanics of postures facilitating defecation and voiding	-Uro-gynaecological applications	Gait and posture
Yogasana evaluation	-To able prescribe Yogasana for therapeutic purposes in people.	Brochures and Books for Yoga Practitioners
Squat testing	-Squatting as a functional test and health benefits of squatting to prevent OA	Clinical Biomechanics
Sport biomechanics	Performance enhancement and injury prevention	Sports Biomechanics
Dance biomechanics	Performance enhancement and injury prevention	International Journal of Dance Medicine
Postural control analysis	Risk of fall	Gait and Posture

All the above experimental facilities support various UG & PG programs in health science, Yoga and engineering disciplines by-

1. providing state of the art robust to conduct research project work for dissertation and Thesis;
2. contributing to knowledge building by providing demonstrations of live (including online) objective measurements and rich hands-on training of measurements for comprehensive in-depth understanding of human movement science and its applications in health care.
3. Existing facilities in kinematics, kinetics, electrical Muscle activity, Energy cost, Foot geometry and pressure already support BE(Mechanics, Biomedical Engineering, Computer science, BPT, P& O, ME (Mechanics, Biomedical Engineering, Computer science0, MPT, MS Orthopaedics programs by providing facilities to conduct research projects and gain understanding of movement science. Further advancement in expanding the capacities of these experimental facilities will allow wider, non-constrained planning of innovative research questions.
4. Emerging facilities such as BMD, Tissue stiffness and combination of ICP and muscle activity will open doors to original research work to address unmet needs in detection and management of risk of ulceration, osteoporosis and headaches caused by screen use (hazards of screen use)

iv) Definite Product/Process/Design/Software/System Development efforts that will be added by the proposal:



v) Potential beneficiaries (specify industry segment and/ or strategic programs) or societal paybacks envisaged at the end of the project, if supported:

It is envisaged that the outcome of the project will potentially benefit various segments of health-pertinent industry and health education sector; contribute strategic programs for detection, rehabilitation and monitoring NCDs which can be integrated into respective existing National Health Policies implemented at State and Central level in India and ultimately reduce the rising socio-economic cost burden of NCDs in India and countries with similar socio-economic conditions.

Industry :

- Medical device Innovation Industry will benefit from technology designed and validated
- Software companies will benefit from need-based applications
- Healthcare sector will benefit from cost-effective solutions developed for detection, management and monitoring chronic NCDs
- Sports industry segment will benefit from context specific toolkits for performance enhancement
- Health education sector will benefit from training to achieve knowledge and conduct research

Strategic programs:

Integration of DREaM approach into National Rural Health Mission and contribute towards specific health initiatives and programs implemented by Govt. such as

- Rastriya Bal swasthya Karyakaram
- Janani Suraksha Yojana
- National Elderly Care
- Khelo India

Societal Paybacks:

- Reduced hospitalisation related to NCD's thereby reducing financial burden.
- Planning early discharge from hospital
- Early detection of neuromotor disorders such as cerebral palsy, Parkinson's disease, stroke
- Reduce risk of falls in elderly and empower independent living
- Empowering parents / caregivers of children with neuromotor disorders such as cerebral palsy

20. Has the department applied in previous year and not been recommended for support? If yes, indicate (in 200 words) year, and the major developments in the department in last 3 years

In 2021, the proposal seeking support in FIST program at Level O from MGMCHMS, at MGM School Physiotherapy (2021) was not considered because MGMSOP is a constituent Unit of a deemed to be University and not a PG College.

Major developments in MGMSOP, NM in the area of postgraduate training and research and development are-

In 2022, NAAC Awarded A^{++} grade to MGMIHS. MGMCHMS was recognized as distinctiveness of the Health Institute by the NAAC Peer Team for its innovative and meaningful applications in interdisciplinary health care research, technology design and training of clinicians and engineers

Year	**Research & Development**			**Collaborations**
	Masters Level	PhD	EMR grants	**Collaborations**
2021-2022	Outreach programs COVID-19 Recognition: WHO	Submitted 1 PhD Thesis successfully	5- 2 PACE- Birac; 1 DHR – Institution support; 1 DHR – Grant in Aid; Supra SERB Sanction of one grant from RGSTC- Govt. of Maharashtra - Development of mobile technology (Detect, REhabilitate and Monitor (DREaM)): Empowerment of primary caretakers of children with Cerebral palsy Indo-Canadian Shastri Institute- Webinar: Translational Research and Epidemiology	Initiated partnership with Public Health Institutes working in rural and tribal regions of Maharashtra Added one more collaboration with Engineering Institute in addition to existing ones with IITB, IITM-Pillai Engineering College. Initiated partnership with Public Health Institutes working in rural and tribal regions of Maharashtra Added one more collaboration with Engineering Institute in addition to existing ones with IITB, IITM-Pillai Engineering College.
2020-2021	Outreach programs 1st batch of CBCS graduated	Graduation of one PhD Scholar Registration of 5 PhD	9 EMR grants Applied Sanction of One EMR Grant from DST women scientist	Continued Collaboration with International Society of Biomechanics; World Spine Care; IIT Bombay; IIT Madras; Cardiff University

		Scholars Fellowship from World Spine Care	B- Fundamental work in geriatric health-Jan 2022-DST-Women's Scientist Scheme: Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function- A pilot study Closure of DBT	
2019-2020	1st Batch of CBCS curriculum enrolled in 2019	1 full-time PhD registered	3	Continued Collaboration with International Society of Biomechanics; World Spine Care; IIT Bombay; IIT Madras; Cardiff University

.

Year	**Publications Scopus/Pubmed**	**Textbooks/Proceedings**	**Copyrights applied/registered**	**Patents applied/registered**
2021-2022	**7**	**2**	**4**	**1**
2020-2021	**14**	**1**	**11**	**1**
2019-2020	**19**	**1**	**1**	**1**

22. Has the Department received support under the FIST Program in previous years in any level? If so, indicate: **Nil**
    i) Project No.
    ii) Amount Received and Expenditure (Rs in lakh)
    iii) Financial papers (UC/ SE/ Refund of unspent grants) and Project Completion Report (PCR), submitted - Yes/ No.
    ii) Impact of that support in Department's profile & growth (as per **Annexure – 1**).

23. Details of funds requested for 5 years:

Details of funds requested for 5 years:

Grant Head		**Budget Heads**	**Total**	**Year 1**	Year 2	Year 3	Year 4	Year 5
			Total INR Cost					
A Capital (C)	**A1**	**Equipment**						
		Force Plate(40x60cm)	1186000	1186000				
		4 3D outdoor capture Vero Vicon Cameras	4828285	4828285				

		In Shoe plantar pressure system(2 pairs of insoles)	2636288	2636288				
		Pliance sensor system	3342912	3342912				
		Foot Pressure Platform	3269000	3269000				
		K5 metabolic cart	3000000.00	3000000.00				
		16 channel wireless EMG system	1750000	1750000				
		DEXA scanner	1842400	1842400				
		Portable Doppler	186000	186000				
		Nerve Conduction Study system	400000	400000				
		Real time step activity monitor (2 units)	100000	100000				
		Laptop with hard disk (units)	300000	300000				
		Weighing scale for wheel chair bound people (1 units)	28000	28000				
		EMG Electrodes	200000	200000				
		Total for A1	**23258500.00**					
	A2 (Fixed %)	Infrastructure Max. @ 8% of Equipment cost (Capital)	1920390.00	432078.00	372078.00	372078.00	372078.00	372079.00
	A3 (Fixed % and Level)	Networking Max. @ 5% of Project cost (Capital)	1500000.00	300000.00	300000.00	300000.00	300000.00	300000.00
B General (G)	B1 (Fixed @ Project cost)	Industrial R&D support ***** [@Rs.1.0 L (Project cost[$] ≤ Rs 100.0 L)] [@Rs.2.0 L (Project cost[$]>Rs 100.0 L)]	200000.00	40000.00	40000.00	40000.00	40000.00	40000.00
	B2 (Fixed)	SSR Activities[$#] (@Rs. 1.0 L)	100000.00	20000.00	20000.00	20000.00	20000.00	20000.00
	B3 (Fixed % @ Project cost)	Maintenance [@10% Project cost]	3000000.00	600000.00	600000.00	600000.00	600000.00	600000.00
TOTAL: [A (Capital) + B (General)]			**29978890.00**					

***** Incentive grants for extending utilization of FIST facilities for the industries/ MSMEs/ Start-ups etc.

[#] Incentive grants for carrying out activities pertaining to the Scientific Social Responsibility (SSR)

[$]Exclusive of Maintenance cost

24. **Details of each Budget Heads with full justifications for each item as given at Sr No. 23 including details of similar support from any other sources.**

Justification:

MGM School of Physiotherapy has invested heavily in infrastructure full-time faculty members and equipment to develop the science of biomechanics for application in health and wellness. The School covers the cost for salary and maintenance of all equipment. We seek support to step up this facility to generate a task force within the country to undertake research and conduct integrated raining for healthcare professionals and engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable diseases and enhance sports performance.

1. Force Plate(40x60cm):
The portable fourth force plate will enable interdisciplinary collaborative research with mechanical engineers to develop finite element models for activities of daily living for e.g. cross-legged sitting kneel sitting kinetic analysis of sport activities for performance enhancement prevention of injuries design and validation of technology for risk of fall assessment in the elderly and biomechanical analysis of traditional sports dance and yoga requiring recording of 4 points of contact.

2. **Optical Infrared Cameras:** Portable optical cameras will enable indoor and outdoor kinematic data capture for real time motion analysis of outdoor sports activity and dynamic motion in real life situations for applications in geriatric care. It will also help design and validation of indigenously designed technology pertinent to movement and serve as gold-standard for developing clinical algorithms pertaining to developmental neuromotor conditions musculoskeletal disorders and geriatric care.

3. **In-Shoe plantar pressure system (2 units):**
An in-shoe plantar pressure system is necessary for measurement of dynamic plantar pressure distribution for identification of altered weight bearing in patients with diabetes neuropathy with risk of foot ulceration sports training to enhance performance reduce the risk of injuries design foot wear for specially abled children and adults.

4. **Pliance sensor system:**
Prevent ulceration on weight bearing points in athletes engaging in wheelchair sports and to measure pressure across indigenously designed prosthetics

5. **Foot pressure platform**: The portable platform has applications for widespread screening of gait in children with developmental delay plantar pressure tissue measurement geriatric evaluation of risk of falls in urban and rural setups.

6. **K5 metabolic cart:** Will be required to understand energy cost of indigenously developed novel healthcare devices such as newly designed prosthesis in patients with amputation. Energy cost of activity has also been explored to provide novel health care solutions using indigenous postures physical activity forms estimation of metabolic cost of sport activities and rehabilitation exercises to train athletes and people with musculoskeletal disorders.
6. **Laptops:** The existing 3 laptops are used to their maximum capacity for data storage and software applications. Two additional laptops will provide required e-space for additional software and on-field outdoor data collection for sports applications.

7.**Pliance sensor:** The equipment offers pressure distribution measurement between hard soft and curved surfaces. The system consists of a flexible and elastic measuring sensor mat a multi-channel analyser a calibration device and a software package for the computer. The pliance analyser allows individual calibration curves for each sensor individual dynamic amplification control and crosstalk suppression resulting in accurate and reproducible pressure values of the seated localized pressure locations of patients in wheelchairs. The knowledge will assist in selecting the appropriate cushions and correct adjustments of the wheelchair to fit the individual patient with spinal cord injuries chronic neurological conditions and in geriatric patients. It will also help in ergonomic applications for seating design in the industry and sports for specially abled people.
The system shares the base station with in shoe system will use the same base station

8.16- channel wireless EMG system: 16 channel wireless EMG system will enable capture of real time data for developing clinical algorithms for performance enhancement in people with neuro-motor disorders and sports research.

9. Dexa Scanner: The scanner will serve as a gold standard for validating novel device for early identification of osteoporosis in postmenopausal women and elderly.

10. Portable Doppler: The Ankle Brachial Index is a measure of severity of arterial diseases. With high prevalence of diabetes in India early intervention following objective evaluation of Ankle Brachial Index would enable early intervention and potential prevention of foot ulcerations amputations and increase disability free life years. The Doppler will enable development of clinical algorithm for detection of diabetic foot ulcers and prevention of foot complications.

11. Nerve conduction study system: Will be utilized for validation of the novel comprehensive device in people with diabetic neuropathy and evaluation of neuromotor disorders.

12. **Real time step activity monitor (2 units):** Enables real time monitoring of walk activity in neuromotor disorders following rehabilitation programs and translation of effects of intervention in daily life.It is also a precious device to monitor real-time walking to validate technology designed to assist ambulation and adherence to treatment plans prescribed to people with neuro-musculoskeletal and cardiopulmonary disorders.

13. High definition laptop: Systems for outdoor kinematic and kinetic EMG data capture require dedicated laptops with specific software installed for data processing. Dedicated laptops will enable large scale field studies.

14. **Weighing scale for wheel chair bound people:** Our work in rehabilitation of patients with spinal cord injury sports participation in wheel-chair bound individuals and Paralympic athletes for prescription of novel health care programs requires analysis of factors influencing response to training. Objective measurement of body composition of these patients will be useful for prescription and monitoring of rehab programs.

15. EMG Electrodes: Specialized electrodes will be needed for testing of pelvic floor muscles and urogenital studies in women using vaginal electrodes.

16. Optical marker set: Optical markers are required for kinematic capture of all body movements.

Installation & repairs: Installation of purchased equipment by system experts is essential expense to ensure smooth functioning of the system. The team of MGM CHMS in the past 5 years is trained by team of Engineers for trouble shooting of the equipment. The team is gained rich experience in handling the equipment's. However to avoid sudden unforeseen repairs team of experts experienced in handling the equipment's will be required to avoid disruption of work.

Networking: The Institute is equipped NKN MTNL 1 Gbps speed network however for smooth functioning of the system additional high speed internet will be required. Additionally as the data generated from the motion analysis system is large files additional cloud storage and internal connectivity will be required to connect the different systems within the Centre.

Industrial R & D support: Indigenous technology pertinent to application of rehabilitation in movement disorders which will and develop as a part of research and innovation activity at MGM CHMS will be linked to the industry for fine tuning development of the device.Such a link with the industry will ensure that the device developed is ready to be launched in market for the end user

SSR: The vision and mission of MGMCHMS is to extend the services to the society at affordable cost and to execute the mission. The Centre continues to undertake the activities of Social responsibilities to translate the findings of scientific research for the wellbeing of the underprivileged section of the society and to address the unmet needs of rehabilitation in the society overall
Maintenance: The high end system demonstrates gradual wear and tear that occurs steadily but continuously. Therefore they warrant continuous and timely maintenance to avoid unforeseen sudden disruption of functioning of system. Therefore maintenance is essential expense to avoid uninterrupted completion of the defined tasks of project in 5 years.

25. Specify the recipient of the Grant (Registrar/ Director / Any other) by attaching an endorsement from Head of Institution/ University. Attached

Information submitted as above are true and correct.

Signature of the
Head of the Department

MGM School of Physiotherapy NAVI MUMBAI

Signature of the
Head of the Institution

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Science
Navi Mumbai - 410209

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A++' Grade
Sector – 1, Kamothe, Navi Mumbai - 410 209
Tel 022-27437622, 022-27437607, Fax 022 - 27431094
E-mail :research@mgmuhs.com; Website : www.mgmuhs.com

Endorsement Letter from the Registrar of the University/Head of the Institute/ Principal of the College

This is to certify that:

I. **Dr. Rajani Mullerpatan the Director of School/ Centre MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai** will assume full responsibility for implementing this project proposed under FIST Program of the Department of Science and Technology, New Delhi during **2022-2027**

II. The date of starts of the Project from the date on which the University/Institute receives the bank draft/cheque/RTGS from the Department of Science & Technology.

III. The Head or Coordinator will be governed by the rules and regulations of the University/Institute and will be under administrative control of the University/ Institute for the duration of the FIST project.

IV. The grant-in-aid by the Department of Science & Technology will be used to meet the expenditure on the FIST project and for the period for which the project has been sanctioned as indicated in the sanction letter/ order.

V. No administrative or other liability will be attached to the Department of Science & Technology at the end of the FIST project.

VI. The University/ Institute will provide basic infrastructure and other required facilities to the investigator for implementing the FIST project.

VII. The University/ Institute will take into its books all assets received under this sanction and its disposal would be at the discretion of Department of Science & Technology.

VIII. Institute assumes to undertake the financial and other management responsibilities of the FIST project.

IX. Organizing institute will participate in the monitoring/ reviewing of the FIST Project whenever they were asked to do so.

Seal of University/Institute Signature
Registrar of University/Head of Institute/ Principal of the College

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

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Endorsement from PI and Summary Sheet for FIST-2022

Application for [please tick one] Level A Level B ✓ Level C Level D

- Subject Area (for Level B, C and D): **Health Science & Technology**
- Name of the Department (for Level B): **MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai**
- Year of Establishment:2008
- Name of the University/ Institution (for Level B): **MGM Institute of Health Sciences, Navi Mumbai**
- Address for correspondence including Telephone, Telegram, FAX, e-mail etc.

  MGM School of Physiotherapy
  MGM Institute of Health Sciences
  Plot No. 1& 2, Sector -1, Kamothe, Navi Mumbai 410 209.
  Contact number: 022-27437866
  Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
- Status of the Institute/ University/ College (attach supporting documents)
  - Academic Status [College (Affiliated/ Autonomous/ Constituent) or Institute/University/ Deemed University]
    Constituent Unit of MGM Institute of Health Sciences
    (Deemed to be University u/s 3 of UGC Act 1956)
  - Financial Status [Government (Central or State Govt.)/ Govt. Aided / Private Colleges]
    Private College
- Total budget: INR 3 crore

Information as above is true and is correct.

Signature of the
Head of the Department/ Principal of the College

MGM School of Physiotherapy NAVI MUMBAI

Department of Science & Technology

TERMS AND CONDITIONS for the scheme

"Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST)"

The scheme entitled "Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions – (FIST)" was launched in the year 2000 to strengthen S&T infrastructure with adequate funding and associated flexibility. Over the years, the FIST Program has played a pivotal role in the strengthening of both the teaching and research infrastructure in different academic and research institutions. However, with the shift in priorities and the S&T needs of the country, restructuring of the program was necessary in the context of the current National interests, National Missions, Sustainable Development Goals, and its scope to strengthen the vibrant economy towards building up of a self-reliant India.

Keeping all these factors in mind, the FIST Program has been restructured.

The Terms and Conditions:

1. The beneficiary Departments/ PG Colleges accepting the FIST Project would be considered for any subsequent cycle of support **only after a period of 10 years from the date of sanction of the current Project**. So, in case, any beneficiary wishes to forego the current recommendation of support and seek fresh assessment towards better prospective support may do so before signing of this document.

2. The grant being released under the scheme is for strengthening infrastructure of the identified department for research and shall be spent exclusively for this purpose. The Dept./ College shall constitute a **"Project Implementation Group (PIG)"** with 4-5 Faculty Members including younger faculty members under the overall supervision of the Head/ Chairman/ Dean of the Dept. The **PIG** would be responsible and accountable to DST for all aspects of implementation of such project during its 5 years project duration. The Department shall inform FIST Program Secretariat on the composition of the **PIG** before releasing of funds etc.

3. Proposals from Government Organizations recommended for support either at Level 'A' or 'B' would be provided 100% funding by DST.

4. For proposals seeking FIST support from Non-Government Organizations (including all Government aided PG Colleges) at any Level (A/B/C/D) as well as for Departments of Government organizations (Level 'C' and Level 'D') can be considered for funding provided **25%** of the total support as recommended by the Expert Committee or actual expenditure within the final sanctioned budget (whichever is less) comes from the respective University/ College/ Institute. Any over expenditure above the final sanctioned amount [including DST commitment @75% of sanctioned budget] would be borne by the Grantee Institute.

5. Facility created under FIST support shall not be kept with the custody of an individual faculty member in the Department and shall be made accessible to all the faculty members all the time.

6. There should not be any deviation from the Budget Heads as approved by DST. In case, if it is very necessary, a request can be made to the DST for consideration.

7. The grants-in-aid under "FIST" are to provide infra-structural facilities for research activities in the department. Therefore, ***no provision of Overhead Charges*** is admissible. **Please note that the scheme does not allow any provision for building/ construction and recruitment of staff** etc.

8. The grants-in-aid for "***Networking and Computational Facilities***" being released under the scheme should be utilized for creating a "***Central Computer Lab***" in the identified Department/ College and accessible for Students and Faculty research activities with the following guidelines:
[Server + Hub + Modem and UPS] & [Several PCs or Net-Computers proportional to number of students enrolled]. Internet Connectivity (to be provided by Institution). The Institution should also ensure that the grant is not used for just providing PCs to each faculty member of the Department.

9. All the assets acquired from the grant will be the property of the Government of India and should not, without the prior sanction of the Department, be disposed off or encumbered or utilized for purposes other than those for which the grant has been sanctioned.

10. All efforts should be made to procure the equipment and other items at the earliest to avoid cost escalation due to foreign exchange fluctuation and should abide all procedures laid out by the GFR 2017. In case it is found that the Department is not able to use the funds within two years of its release, the Department of Science & Technology shall have the right to withdraw the project from the Department/ University.

11. Servers, Desktops, Workstations, Printers etc. under Networking may be procured through GeM (Government E-Market) platform. Guidelines issued by the Ministry of Finance from time to time on restrictions regarding import of equipment will need to be followed in tune with the norms specified under the Global Tender Enquiry (GTE).

12. The Institute will furnish to Department of Science & Technology, Utilization Certificate, and an audited Statement of Accounts (in DST format) pertaining to the grant (along with Progress Report) within three months following the end of each financial year.

13. After receiving the grant by the Department/ Centre, Department of Science & Technology will examine the technical & financial progress including utilization of the grant on an annual basis with an appropriate mechanism. The beneficiary PG Colleges and Departments of University/ Institutes should maintain logbooks that should be periodically shared with the FIST Secretariat to keep track of usage details. The

Department reserves the right to terminate the support at any stage if it is convinced that the grant has not been properly utilized or appropriate progress is not being made.

14. A register of the permanent/semi-permanent assets acquired wholly or mainly out of this grant should be maintained in the prescribed form and a copy thereof furnished to this Department. Such register of assets and the accounts maintained shall be available or open to scrutiny by Audit.

15. DST reserves sole rights on the assets created out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST. All the procurement should be as per procedure laid down in GFR 2017.

16. To maintain transparency and accountability, the facilities acquired from FIST Grant should be mapped to Indian Science Technology and Engineering facilities Map i.e. I-STEM portal (www.istem.gov.in) and should be accessible to the scientific community and industry. DST should be informed after mapping the research facilities in the I-STEM Portal.

17. Special seminar/s on usage and upkeep of scientific instruments might be conducted from time to time by the beneficiary organization to ensure smooth functioning as well as maximum uptime of the established facility.

18. A task-force with representation from IFD, PCPM/ any Division of DST along with any scientist of the R&D Infrastructure Division would undertake random check on the status of utilization of the major facilities supported by DST, as and when needed.

19. The Grantee Institution should promote services of FIST facilities to the demands of outside faculties, researchers, scientists and students at other academic institutes, universities, nearby colleges national laboratories, R&D Labs, Startups, and Industries to enable them to carry out R&D activities to promote FIST collaborative research endeavors.

20. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division with UC id generated in PFMS Portal. The subsequent/final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

21. The Comptroller and Auditor General of India, at his discretion, shall have the right to access to the book accounts for this support. The Department shall open an interest earning Bank account for operation of funds being transferred by DST. The interest thus earned should be reflected appropriately in the Financial Statement of each year submitted to the Department of Science & Technology and the same need to be deposited back to Consolidated Fund of India by using the Non-Tax Receipt Portal (NTRP)

i.e., www.Bharatkosh.gov.in

22. Any unspent amount sanctioned/ interest accrued would be surrendered to the Government through the Bharatkosh site (www.Bharatkosh.gov.in) and the receipt of the same may be enclosed with financial documents. Any carry forward of funds to the next financial year may be considered only with the specific approval of the Department on receipt of proper financial documents/Interim progress report from the university.

23. The Grantee Institution (GI) is directed to use the Expenditure-Advance-Transfer (EAT) module of PFMS, and next release will be made only after mapping and following EAT modules by the GIs.

24. Due acknowledgement of technical support / financial assistance resulting from FIST grant of Department of Science & Technology should mandatorily be highlighted by the grantee organization in bold letters in all publications/ thesis /Patents/Prototypes, Media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

25. To give visibility to the identified department, the department may be called as "DST-FIST Sponsored Department". **The Public Notice displaying the Logo of the FIST Program may be suitably displayed in this regard**.

Signed by

Head of the Department/ Centre Institute or Principal of College

Signed by

Head of the University / Registrar or Head of Finance

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

MGM School of Physiotherapy NAVI MUMBAI

*Chairman of Trust/ Board/ Management

* *Only for Non-Govt. (Including Private and Aided) Institutes/ Colleges/ Organizations supported under 75:25 mode as per the FIST Award Letter*

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410 209

Tel 022-27432471, 022-27432994, Fax 022 - 27431094

E-mail : registrar@mgmuhs.com | Website : www.mgmuhs.com

Amended Memorandum of Association (MoA)/Rules

[As per UGC (Institutions Deemed to be Universities) Regulations, 2019]

(Approved as per BOM-63/2021 dated 17/02/2021)

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Amended Memorandum of Association (MoA)/Rules

[As per UGC (Institutions Deemed to be Universities) Regulations, 2019]

Memorandum of Association (MoA)

1. NAME, ADDRESS AND REGISTRATION DETAILS OF THE TRUST/SOCIETY REGISTERED FOR THE DEEMED TO BE UNIVERSITY:

Name: MGM Institute of Health Sciences, Navi Mumbai

Address:

MGM Educational Campus
Sector 1, Kamothe, Navi Mumbai, Pin – 410209
Dist: Raigad, State: Maharashtra
Phone Number : (022)27432471/27432994
E-Mail: registrar@mgmuhs.com
Website: www.mgmuhs.com

Registration Details:

1. Society Registration Act 1860, vide Registration No. MAHARASHTRA 177/06 (Raigad) dated 31/03/2006 and
2. Bombay Public Trust Act, 1950 vide Registration No. F-5466 (Raigad) dated 02/05/2006

2. NAME OF THE INSTITUTION DEEMED TO BE UNIVERSITY ALONG WITH ITS APPROVED CONSTITUENT UNITS/OFF-CAMPUSES/OFF-SHORE CAMPUSES:

(i) Name of the Institution Deemed to be University:
MGM Institute of Health Sciences, Navi Mumbai

(ii) Constituent Units:

At Navi Mumbai Campus:

a. MGM Medical College
b. MGM School of Biomedical Sciences
c. MGM School of Physiotherapy
d. MGM New Bombay College of Nursing
e. MGM Institute's University Department of Prosthetics and Orthotics

At Aurangabad Campus:

f. MGM Medical College
g. MGM School of Biomedical Sciences
h. MGM School of Physiotherapy
i. MGM College of Nursing

3. APPROVED CONSTITUENT UNITS / OFF-CAMPUSES / OFF-SHORE CAMPUSES WITH UGC LETTER/ MHRD NOTIFICATION AND DATES

i. MGM Medical College, Navi Mumbai
ii. MGM Medical College, Aurangabad

MHRD Notification Number: F. 9-21/2005-U.3 (A) dated 30/08/2006

4. DEFINITIONS

i. "Act" means the University Grants Commission Act, 1956 [Act 3 of 1956].

ii. "Campus" means campus of MGM Institute of Health Sciences (Institution Deemed to be University) at its Headquarter at Navi Mumbai and at Aurangabad, wherein its major facilities, faculty, staff, students and its Academic Departments are located at both these places.

xi. Where, an Institution Deemed to be University wishes to surrender its status of 'Institution Deemed to be University', it may do so with the prior permission of the Government; and similarly, withdrawal of any Constituent Unit(s) of the Institution Deemed to be University from the purview of an Institution Deemed to be University, shall require the Sponsoring body to take the prior permission of the Government.

Provided that such surrender or withdrawal, as the case may be, shall take effect only after the last batch of students on the rolls of the Institution Deemed to be University or its Constituent Unit(s), as the case may be, have been accorded opportunity to qualify for the completion of the programme of study and award of degree.

xii. In the event of conflict of opinion with regard to interpretation of these Regulations, the opinion of the Commission shall be final.

49. LEGAL PROCEEDINGS

i. For the purpose of Section 6 of the Societies Registration Act, 1860, the person in whose name the Institution Deemed to be University may sue or be sued shall be the Registrar, who shall have the power to enter into agreements, sign documents and authenticate records on behalf of the Institution Deemed to be University, and shall exercise such powers and perform such duties, as may be prescribed by these Regulations.

ii. No suit or legal proceedings shall lie against the Government, or the Commission, or the Institution Deemed to be University, or an Officer of the Institution Deemed to be University, or a member of the authority of the Institution Deemed to be University, in respect of anything done or purported or intended to be done in pursuance of any of these Regulations.

50. REMOVAL OF DIFFICULTY

UGC reserves the right to remove difficulty/ies in the course of implementation of UGC (Institutions Deemed to be Universities) Regulations, 2019 in consultation with the Government of India, Ministry of Human Resource Development.

*****

Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act, 1956)
Navi Mumbai- 410 209

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

(TO BE PUBLISHED IN THE GAZETTE OF INDIA PART-I SECTION-1)

F. No. 9-21/2005-U.3 (A)
Government of India
Ministry of Human Resource Development
Department of Higher Education

Shastri Bhawan, New Delhi,
30 August 2006

NOTIFICATION

In exercise of the powers conferred by Section 3 of the University Grants Commission Act, 1956, the Central Government, on the advice of the University Grants Commission, hereby declare the MGM Institute of Health Sciences, Navi Mumbai consisting of two constituent medical colleges i. e. i) Mahatma Gandhi Mission's Medical College, Navi Mumbai (Maharashtra) and ii) Mahatma Gandhi Mission's Medical College, Aurangabad (Maharashtra) as Deemed to be University for the purpose of the aforesaid Act, provisionally, for a period of five years, from the date MGM Institute of Health Sciences, Navi Mumbai disaffiliates its Mahatma Gandhi Mission's Medical College, Navi Mumbai from Maharashtra University of Health Sciences, Nasik for its under graduate courses and from University of Mumbai for its post graduate courses and disaffiliates its Mahatma Gandhi Mission's Medical College, Aurangabad (Maharashtra) from Maharashtra University of Health Sciences, Nasik for its under graduate courses and from Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad for its post graduate courses and subject to conditions mentioned at S. No. 7 of the endorsement of this notification. This declaration is also subject to review by a Review Committee to be appointed by the University Grants Commission (UGC).

2. Government of India or the University Grants Commission will not provide any Plan or Non Plan grants to the MGM Institute of Health Sciences, Navi Mumbai or any of its constituent institutions.

30.08.2006

(Sunil Kumar)
Joint Secretary to the Government of India

Attested
4/9/06

The Manager,
Government of India Press,
Faridabad (Haryana).

Copy forwarded for information to: -

1. The Secretary, University Grants Commission, New Delhi.

Continued.... 2/-

Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

2. The Member Secretary, Medical Council of India (MCI), New Delhi.

3. Director, Distance Education Council, Indira Gandhi National Open University, Maidan Garhi, New Delhi.

4. Vice Chancellor, University of Mumbai, Mumbai (Maharashtra).

5. Vice Chancellor, Maharashtra University of Health Sciences, Nasik (Maharashtra).

6. Vice Chancellor, Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad (Maharashtra).

7. Director, MGM Institute of Health Sciences, Navi Mumbai (Maharashtra):

   (i) MGM Institute of Health Sciences, Navi Mumbai will continue to abide by the norms and guidelines laid down by the UGC for institutions notified as Deemed to be Universities.

   (ii) The affiliating State Universities i.e. University of Mumbai, Mumbai, Maharashtra University of Health Sciences, Nasik, and Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad are to agree to examine and grant the degrees to those students of MGM Institute of Health Sciences, Navi Mumbai, who are already enrolled with them prior to the date of this notification, on successful completion of courses / programmes they are pursuing at present with the two constituent colleges of MGM Institute of Health Sciences, Navi Mumbai, namely i) Mahatma Gandhi Mission's Medical College, Navi Mumbai and ii) Mahatma Gandhi Mission's Medical College, Aurangabad.

   (iii) All norms of MCI will continue to be in force and complied with.

8. Principal Secretary (Technical &Higher Education), Government of Maharashtra, Mantralaya, Mumbai.

9. All Ministries/Departments of the Government of India.

10. All State Governments and Union Territories.

11. Registrars of all Universities & Deemed Universities.

12. Press Information Bureau, Shastri Bhawan, New Delhi-110001

13. The Secretary-General, Association of Indian Universities, A.I.U. House, 16 Kotla Marg, New Delhi - 110002.

14. Guard file / Notification file/ National Informatics Centre.

15. File No. F. 9-31/2005-U.3 (A).

Madhukar Sinha 30-08-06

(Madhukar Sinha)
Director

Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

THE UNIVERSITY GRANTS COMMISSION

ACT, 1956

(3 of 1956)

[3rd March, 1956]

An Act to make provision for the co-ordination and determination of standards in Universities and for that purpose, to establish a University Grants Commission.

Be it enacted by Parliament in the Seventh Year of the Republic of India as follows:-

CHAPTER I

PRELIMINARY

Short title and commencement

1. (1) This Act may be called the University Grants Comission Act, 1956.

(2) It shall come into force on such date[1] as the Central Government may, by notification in the Official Gazette, appoint.

Definitions

2. In this Act, unless the context otherwise requires-

(a) "Commission" means the University Grants Commission established under section 4;

(b) "executive authority" in relation to a University, means the chief executive authority of the University (by whatever name called) in which the general administration of the University is vested;

(c) "Fund" means the Fund of the University Grants Commission constituted under section 16;

(d) "member" means a member of the University Grants Commission and includes the Chairman[2] (and Vice-Chairman];

(e) "prescribed" means prescribed by rules made under this Act;

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1. 5th November, 1956, *vide* notification No. S.R.O. 2608, dated the 1st November, 1956, *see* Gazette of India, 1956, Pt. II, Sec. 3, p.1882.
This Act has been extended to Pondicherry by Act 26 of 1968, s. 3 and Sch. I.
2. Ins. by Act 33 of 1972, s. 2 (w.e.f. 17-5-1972).

(f) "University" means a University established or incorporated by or under a Central Act, a Provincial Act or a State Act, and includes any such institution as may, in consultation with the University concerned, be recognised by the Commission in accordance with the regulations made in this behalf under this Act.

Application of Act to institutions for higher studies other than Universities

3. The Central Government may, on the advice of the Commission, declare by notification in the Official Gazette, that any institution for higher education, other than a University, shall be deemed to be a University for the purposes of this Act, and on such a declaration being made, all the provisions of this Act shall apply to such institution as if it were a University within the meaning of clause (f) of section 2.

CHAPTER II

ESTABLISHMENT OF THE COMMISSION

Establishment of the Commission

4. (1) With effect from such date as the Central Government may, by notification in the Official Gazette, appoint, there shall be established a Commission by the name of the University Grants Commission.

(2) The said Commission shall be a body corporate having perpetual succession and a common seal, and shall by the said name sue and be sued.

Composition of the Commission

[1][5. (1) The Commission shall consist of –

(i) a Chairman,

(ii) a Vice-Chairman, and

(iii) ten other members,

to be appointed by the Central Government.

(2) The Chairman shall be chosen from among persons who are not officers of the Central Government or of any State Government.

(3) Of the other members referred to in clause (iii) of sub-section (1) –

(a) two shall be chosen from among the officers of the Central Government, to represent that Government;

1. Subs. by Act 33 of 1972, s. 3, for s. 5 (w.e.f. 17-6-1972)

National Institutional Ranking Framework
Ministry of Human Resource Development
Government of India

India Rankings 2020: University (Rank-band: 101-150)

Institution list in alphabetical order

Name	City	State
Amity University	Jaipur	Rajasthan
Amity University	Gurugram, Haryana	Haryana
Annamalai University	Annamalainagar	Tamil Nadu
Assam University	Silchar	Assam
Avinashilingam Institute for Home Science & Higher Education for Women	Coimbatore	Tamil Nadu
Babasheb Bhimrao Ambedkar University	Lucknow	Uttar Pradesh
Central University of Kerala	Kasaragod	Kerala
Central University of Rajasthan	Kishangarh	Rajasthan
Central University of Tamil Nadu	Tiruvarur	Tamil Nadu
Charotar University of Science & Technology	Changa	Gujarat
D. Y. Patil Educational Society	Kolhapur	Maharashtra
Dharmsinh Desai University	Nadiad	Gujarat
Dhirubhai Ambani Institute of Information and Communication Technology	Gandhinagar	Gujarat
Dr. B.R. Ambedkar University Delhi	Delhi	Delhi
English & Foreign Languages University	Hyderabad	Telangana
Indraprastha Institute of Information Technology Delhi	New Delhi	Delhi
Jawaharlal Nehru Technological University	Anantapur	Andhra Pradesh
Jaypee Institute of Information Technology	Noida	Uttar Pradesh
Jaypee University of Information Technology	Solan	Himachal Pradesh
Karunya Institute of Technology and Sciences	Coimbatore	Tamil Nadu
KLE Technological University	Dharwad	Karnataka
M. G. R. Educational and Research Institute	Chennai	Tamil Nadu
Maharaja Sayajirao University of Baroda	Vadodara	Gujarat
Mangalore University	Mangalore	Karnataka
Manipur University	Imphal	Manipur
Meenakshi Academy of Higher Education and Research	Chennai	Tamil Nadu
MGM Institute of Health Sciences	Navi Mumbai	Maharashtra
Nagaland University	Zunheboto	Nagaland
Nirma University	Ahmedabad	Gujarat
PES University	Bengaluru	Karnataka
Pravara Institute of Medical Sciences	Ahmednagar	Maharashtra
Presidency University	Kolkata	West Bengal
Pt. Ravishankar Shukla University	Raipur	Chhattisgarh
Rajiv Gandhi University	Itanagar	Arunachal Pradesh
Rashtriya Sanskrit Vidyapeeth	Tirupati	Andhra Pradesh
Sambalpur University	Sambalpur	Odisha
Shivaji University	Kolhapur	Maharashtra
Shoolini University of Biotechnology and Management Sciences	Solan	Himachal Pradesh
Shri Mata Vaishno Devi University	Katra	Jammu and Kashmir
Sikkim Manipal University	Gangtok	Sikkim

Name	City	State
Sikkim University	Gangtok	Sikkim
Sri Devraj Urs Academy of Higher Education and Research	Kolar	Karnataka
Sri Krishnadevaraya University	Anantapur	Andhra Pradesh
Sri Venkateswara Institute of Medical Sciences	Tirupati	Andhra Pradesh
Sumandeep Vidyapeeth	Vadodara	Gujarat
Tumkur University	Tumkur	Karnataka
Veer Surendra Sai University of Technology	Burla	Odisha
Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology	Chennai	Tamil Nadu
Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Chennai	Tamil Nadu
Vinayaka Mission's Research Foundation	Salem	Tamil Nadu

MGM
Mahatma Gandhi Mission

Registrar MGMIHS <registrar@mgmuhs.com>

Final Grade Declared

1 message

Admin-Naac <noreply.onlineassessment@gmail.com>
To: "MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI" <registrar@mgmuhs.com>

Tue, Jul 19, 2022 at 12:00 PM

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

F.19.26/EC(SC-78)/DO

19th July 2022

The Vice Chancellor/ Director
MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI
Navi Mumbai - 410209
Maharashtra

Dear Vice Chancellor / Director,

Greetings from NAAC!

I am glad to inform you that the outcome of the Assessment and Accreditation (A&A) exercise of your institution has been processed and approved by the Standing Committee constituted by the Executive Committee to examine the peer team reports and declare the accreditation results. Your institution has been **Accredited** with a **CGPA** of **3.55** on a seven point scale at **A++ Grade** valid for a period of **5 years** from **19 - 07 - 2022**. The original certificate of accreditation will be dispatched to the institution in due course. The Assessment Outcome Document (AOD) of your institution is available on the portal and the same may be downloaded and displayed on your institutional website. I am sure that the detailed peer team report handed over to you during the exit meeting along with the AOD will enable the institution to initiate further quality enhancement measures.

As per the guidelines of NAAC, it is mandatory for accredited institutions to retain the Self-Study Report (SSR) uploaded on the institutional website for A&A by NAAC until the completion of validity period of A&A. The SSR along with data templates should not be password protected and accessible to all the stakeholders. Institutions are also requested to take note of the mandatory requirement of submitting Annual Quality Assurance Report (AQAR) and uploading them on the institutional website on regular basis. Failing to submit the AQARs annually, institutions will not be eligible for the next cycle of accreditation. For details on the revised guidelines, please visit our website: www.naac.gov.in from time to time.

With best wishes,
Yours sincerely,
(Dr.S.C.Sharma)

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PROJECT IMPLEMENTATION GROUP

The Project Implementation Group (PIG) is constituted with the following faculty members who will be responsible and accountable for the smooth implementation of the DST FIST Project at the Department/ Centre/ School/ PG College.

S. No.	Name of Faculty Member	Designation, Affiliation, Phone, email id
1	Dr. Rajani Mullerpatan (Principal Investigator)	Professor- Director, MGM School of Physiotherapy, Department of Musculoskeletal Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
2	Dr. Bela Agarwal (Co-Investigator)	Professor-, MGM School of Physiotherapy, MGM Institute of Health Sciences, Department of Cardiovascular and Respiratory Science Physiotherapy Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
3	Dr Triveni Shetty (PT) (Member of PIG)	Associate Professor, MGM School of Physiotherapy, Department of Neuroscience, Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
4	Dr. Shrutika Parab (PT) (Member of PIG)	Assistant Professor, MGM School of Physiotherapy, Department of Neuroscience Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
6	Dr. Akhila Natesan (PT) (Member of PIG)	Assistant Professor, MGM School of Physiotherapy, Department of Cardiovascular and Respiratory Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
7	Dr. Victoria Kuttan (PT) (Member of PIG)	Assistant Professor, MGM School of Physiotherapy, Department of Musculoskeletal Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in

Signature of the
Head of the Department/ Principal of the College

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

Dr. Rajani P Mullerpatan (PhD, MSc PT)

Professor-Director
MGM School of Physiotherapy
MGM Institute of Health Sciences
Navi Mumbai 410 209, India

Telephone: +91 99200 48476 Email. : rajani.kanade@gmail.com

Date of Birth: May 24, 1972 **Nationality: Indian**

PROFESSIONAL QUALIFICATIONS:

Degree (onwards)	University	Subject (s)	Year of Passing	% of Marks
Ph.D.	Cardiff University, UK	Physiotherapy	March 2007	-
Diploma	Cardiff University, UK	Research Methods and Medical Statistics	July 2005	-
MSc (PT)	University of Mumbai, India	Physiotherapy	May 1995	55
BSc (PT)	University of Mumbai, India,	Physiotherapy	November 1992	60

Contribution to Physiotherapy profession in the past 24 years of career involves work in academic, clinical, research and administration sectors. My areas of expertise include research methods and medical statistics, clinical kinesiology, scope of Physiotherapy in clinical rehabilitation.

Awards & Member

- Executive Council Member, International Society of Biomechanics (2017-2019)
- Ex-Member of Europe Didactic Foot Study Group
- Honorary Research Associate, Cardiff University, UK, 2011-2013
- Indian Association of Physiotherapists Oration Award, 48th Annual Conference of Indian Association of Physiotherapists, 2010.
- Dr. PN Berry Scholarship, High Commission of India, London, UK, 2002-2003.

PROFESSIONAL EXPERIENCE:

Previous Appointments

Current Affiliation
Professor-Director — 2008-till date
MGM Centre of Human Movement Science (2015 onwards)
MGM School of Physiotherapy, Navi Mumbai, India

Lecturer
School of Medical Sciences, University of Nottingham — July 2006-June 2008

Full Time Researcher PhD studentship
Research Centre for Clinical Kinesiology, Cardiff University, UK — April 2003-June 2006

Full Time Research Scholar — July 2002 - Mar 2003
Dr. P N Berry Scholarship High Commission of India, London, UK

Lecturer — Sep 2000 – June 2002
Topiwala National Medical College, Mumbai, India

Head of Dept & Assistant Professor — May 1999- May 2000
Kasturba Medical College, Manipal Academy of Higher Education, India

Assistant Professor — Sep 1996 -April 1999
Kasturba Medical College, Manipal Academy of Higher Education, India

Projects :

Sr. No	Title	Research Scholars/Fellow (Year)
PhD Scholar Research Projects Supervised by Dr. R P Mullerpatan		
1	Comprehensive analysis of shoulder muscles among people with type II diabetes **(2010-2018)**	In-service PhD Scholar
2	Effect of squatting on knee articular cartilage in healthy adults **(2014 - 2020)**	In-service PhD Scholar
3	Long term monitoring of functional outcome following multi-level orthopedic surgeries in children with cerebral palsy **(2016 - till date)**	In-service PhD Scholar
4	Level of functional outcome in geriatric people from urban and rural setting (**2019 - till date**)	Full time PhD scholar
5	Early detection, patient education and management of Peripheral Vascular Disease using mobile application based tele-rehabilitation **(registered in academic year 2021-2022)**	In-service PhD Scholar
6	Exploration of Challenges and solutions for effective competent Physiotherapy training using CBCS curriculum among millennial learners **(registered in academic year 2021-2022)**	In-service PhD Scholar
7	How attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work **(registered in academic year 2021-2022)**	-
Master's (MPT) Scholar Research Projects		
1	Development of a Two-dimensional method for evaluating movements of temporomandibular joint	2020-2022
2	Influence of Classical Kathak Dance training on postural control	2020-2022
3	Review of physical fitness and biomechanical demands in Indian classical dancers	2019-2021
4	Review of kinesthetic function among people with diabetes mellitus with and without frozen shoulder	2019-2021

5	Review of determinants of hand function in children and adolescents with Down's syndrome-	2019-2021
6	A Review on Efficacy of Yoga intervention on middle aged and older adults	2020-2021
7	Effect of Yoga on Low Back Pain, Physical and Psychological (Anxiety, Depression and Quality of Life) Function in Postpartum Women	2018-2020
8	Exploration of Upper extremity function among people with shoulder dysfunction with Diabetes Mellitus and effect of Gomukhasana on shoulder function	2018-2020
9	The effect of Yoga on neck Pain, Muscle Strength, Function and Psychosocial Factor in Sedentary Workers with chronic Mechanical Neck	2018-2020
10	Comparison of Plantar Cutaneous Sensory Thresholds in Bare Foot and Shod Adults	2017-2019
11	Evaluation of Performance Based and Patient Reported Outcomes After Total Hip Replacement and Total Knee Replacement in India	2017-2019
12	Comparison of Erector Spinae Muscle Activity in Healthy Adults and Mathadi Workers with Mechanical Low Back Pain with and Without Spring Loaded Passive Exoskeleton	2017-2019
13	Comparison between the Effectiveness of Suryanamaskar and Exercises on Pain, Strength, Function and Psychosocial Factors in Patients with Chronic Non-Specific Low Back Pain	2017-2019
14	Comparison of effects of Yoga intervention and balance exercises on standing balance in people with diabetic peripheral neuropathy	2016-2018
15	Functional Performance in People with Hip pain	2016-2018
16	Evaluation of Palmar Abduction in Three Wrist Positions Among Healthy Adults	2016-2018
17	Survey of Spine Pain in Indian Rural Population	2015-2017
18	Evaluation of Balance in Indian Classical Dancers and Age- Matched Controls: A Comparative Study	2015-2017
19	Survey of Spinal Pain in Indian Rural Population	2015-2017
20	Squatting Milestone in Children and Measurement of Its Development	2015-2017
21	Evaluation of Daily Walking Activity in People with Parkinson's Disease	2014-2016
22	Evaluation of Medial Longitudinal Arch in Urban and Rural Children	2014-2016
23	Normative Data of Grip and Pinch Strength for Healthy Indian Pediatric Population	2013-2015
24	Effect of Osteoarthritis on Health-Related Fitness	2013-2015
25	A Study of Fine and Manual Hand Dexterity Among People with Parkinson's Disease	2013-2014
26	Functional Outcome in People with Lower Limb Amputation in Urban and Rural	2013-2014
27	Evaluation of Cardio-Pulmonary Function and Lower Limb Muscle Activity in Different Squat Positions	2013-2014
28	Foot Structure and Function in Mallakhamb Gymnasts	2012-2013
29	Evaluation of Long-Term Functional Outcome in People with Unilateral Below knee Amputation	2012-2013
30	Manual Hand Dexterity: Normative Data for Healthy Indian Adults	2012-2013
31	Effect of Mulligan Bent Leg Raise Maneuver on Back Extensor Performance During Bending Activity in Patients with Non-Specific Low Back Pain: A Quantitative E.M. G	2011-2012
32	Effect of Foot Postures on activity of Tibialis Anterior, in Single Limb Stance using Surface EMG	2010-2011

Funded Research Projects :

No	Project Title	Principal Investigator	Funding Agency / Institutes	Total Fund Received (INR)	Research Fellow	Objectives
Completed Projects						
1.	Development of powered transtibial prosthesis (2015 – till date)	Dr. Rajani Mullerpatan	Department of Biotechnology , New Delhi, India	33,00,000	1 Research fellow for 3 years	Design Bi-articular actuation mechanism with energy storage and return foot and knee brace for transtibial prosthesis
2.	The effects of labor and birth positioning on pelvic dimensions: gaining further insight to improve birth	Dr. Rajani Mullerpatan	Indo-Canadian Shastri Institute, Canada	1,12,000	1 Research fellow 1 Research Associate 1 Field	Use motion capture device to investigate the effects of birthing positions on pelvic dimensions in a group of non-pregnant Indian

	experience (2016 – 2018)				visit coordinator for 12 months	subjects. Better understand rural Indian women's current experiences and aspirations around childbirth.
3.	Biomechanical exploration of 3 types of Suryanamaskar (2017-19)	Dr. Rajani Mullerpatan	Sancheti College of Physiotherapy , Pune, India	1,72,000		Evaluate kinematics, kinetics of traditional, Chair and Wall Suryanamaskar using 3D motion analysis system Compare kinematics, kinetics, energy expenditure, quality of life, muscle activity between 3 types of Suryanamaskar
4.	Gait Analysis using i-sens wearable system and 3 D motion analysis (2017-19)	Dr. Rajani Mullerpatan	IIT Madras, Chennai, India	75,000		Compare gait kinematics and kinetics using a new wearable inertia sensor (i-Sens) system that has been developed at IIT Madras with the 3D multi-camera motion capture system in healthy adults
5.	Establishment of MGM Centre of Human Movement Science (2014 – 2015	Dr. Rajani Mullerpatan	International Society of Biomechanics ,IIT Bombay, Mumbai, India	99,05,830 Equipment donation		Generate a task force within the country to undertake research & conduct integrated training for healthcare professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders
Ongoing project						
6.	Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study	PhD scholar; Supervised by Dr Rajani Mullerpatan	Women Scientist Scheme- B, Department of Science & technology, New Delhi, India	30,42,600	1 Research Fellow sanctioned for 3 years	Maximization of Independent function, self-empowerment of community dwelling elderly people for monitoring physical function and tele-monitoring using mobile based application.
7.	Validation of an indigenously developed device for measuring stiffness of plantar tissue in people with Type II diabetes (2019 – till date)	Dr. Rajani Mullerpatan	IIT Bombay, MGM IHS, Mumbai, India	1,70,519(IITB) + 1,50,000(MGM)	1 Research Fellow appointed for 6 months	Early detection of diabetic neuropathy and prevention of consequent foot complications.
8.	How attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work	PhD scholar; Supervised by Dr Rajani Mullerpatan	World Spine Care, Europe	12,56,805	1 Junior research fellow appointed for 3 years	Explore how attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work

PUBLICATIONS

Research articles:

1. Patel G, Mullerpatan R, Agarwal B, Shetty T, Ojha R, Shaikh-Mohammed J, Sujatha S. Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane. Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine. 2022 Jan 8:09544119211072971.
2. Lubna Khan, Mamta Shetty, Shifa Kherada, Reema Kava, Mubina Kazi, Prachita Walankar, Rajani Mullerpatan. Dough kneading exposure at kitchen workstation: its influence on handgrip strength and implications for therapy in hand rehabilitation. WORK: A Journal of Prevention, Assessment & Rehabilitation. Accepted for publication. 29 Nov 2021.
3. Scott Haldeman, Margareta Nordin, Patricia Tavares, **Rajani Mullerpatan** et al. Distance Management of Spinal Disorders During the COVID-19 Pandemic and Beyond: Evidence-Based Patient and Clinician Guides from the Global Spine Care Initiative. JMIR Public Health Surveill. 2021 Feb 17;7(2): 25484. doi: 10.2196/25484.
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Textbook chapter:

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Scientific presentations:

1. **How does pelvic segment definition affect joint angles and moments**
   Andrea Hemmerich, **Rajani Mullerpatan**, Tara Diesbourg, Bela Agarwal, Emily Geens, Triveni Shetty, Geneviève Dumas, 41st Annual Meeting of the American Society of Biomechanics, Boulder, CO, USA, August 8th - 11th 2017

2. **Gait Kinematics of Indian Classical Bharatnatyam Dancers**.
   Rajani Mullerpatan and Juhi Bharnuke. XXVI Conference of International Society of Biomechanics, 2017, Brisbane.

3. **Spine and Lower extremity Kinematics of Suryanamaskar.**
   Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN. XXVI Conference of International Society of Biomechanics, 2017, Brisbane.

4. **Influence of Daily Squatting Exposure On Kinematics of Deep Squat.**
Bela Agarwal, Robert van Deursen and **Rajani Mullerpatan**. XXVI Conference of International Society of Biomechanics, 2017, Brisbane.

5. **Evaluation of joint angles and net joint moments in rope jumping.**
Triveni Shetty, Bela Agarwal, Bindya Sharma, **Rajani Mullerpatan** XXVI Conference of International Society of Biomechanics, 2017, Brisbane.

6. **Foot characteristics of Indian rural school children.**
Rajani Mullerpatan, Yuvraj Singh, Stacey Pinto, Anila Paul, Amit Maurya, Robert Van Deursen. Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai, Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India, Physiotherapy, Cardiff University, Cardiff, United Kingdom. XXV Congress of International Society of Biomechanics, Glasgow, UK, July 2015.

7. **Biomechanics of childbirth and upright positioning during labour: global health implications**.
Hemmerich A, Dumas GA, **Mullerpatan R.** Mechanical and Materials Engineering, Queen's University Kingston, Canada, MGM Institute of Health Sciences, Navi Mumbai. XXV Congress of International Society of Biomechanics, Glasgow, UK, July 2015

8. **An investigation into foot structure and function of Indian Mallakhamb players.**
Mullerpatan RP, Pawar PS, Singh YL. MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai,India.XXIV Congress of International Society of Biomechanics, Natal, Brazil, Aug 2013.

9. **Gait velocity: An index of functional performance in people with diabetic neuropathic foot complications**
Kanade RV, Price PE, Harding KG, van Deursen RWM Research Centre for Clinical Kinaesiology, Wound Healing Research Unit, Cardiff University, Wales, UK. O25: **DFSG 2008**. Lucca, Italy 11-14 September

10. **What happens to the contra-lateral foot following unilateral plantar ulceration Kanade RV,** Price PE, Harding KG, van Deursen RWM - Research Centre for Clinical Kinaesiology, Wound Healing Research Unit, Cardiff University, Wales, UK. ESM July **2006**. Bevaria, Munich, Germany.

11. **Offloading The Diabetic Foot Using Forefoot Offloading Shoes**
Sicco Bus, Robert van Deursen, **Rajani Kanade**, Marieke Wissink, Erik Manning. Diabetic Foot Unit, Department of Surgery, Twenteborg Hospital, Almelo, he Netherlands & Research Center for Clinical Kinesiology, University of Wales College of Medicine, Cardiff, UK. **XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics.** July 31 - August 5, 2005, Cleveland, Ohio.

12. **Plantar Pressure Distribution In Indian People Walking With Varied Extent Of Footwear Use. Mullerpatan RP.** MGM School of Physiotherapy, MGMIHS, Navi Mumbai, India**. ESM 2012, Aalborg, Denmark.**

13. **Physiotherapy Profession: Shift of Paradigm. Mullerpatan RP.** MGM School of Physiotherapy, MGMIHS, Navi Mumbai, India**.** Indian Association for Physiotherapists Congress 2010, Mangalore, India.

14. **Relationship between daily walking and energy expenditure among people with diabetic Neuropathy with foot complications. Kanade RV,** Price PE, Harding KG, van Deursen RWM.

World Confederation for Physical Therapy- Asia Western Pacific Region & Indian Association for Physiotherapists Congress 2009, Mumbai, India.

15. **What happens to the contra-lateral foot following unilateral partial foot amputations Kanade RV,** Price PE, Harding KG, van Deursen RWM
Research Centre for Clinical Kinaesiology, Wound Healing Research Unit,
Cardiff University, Wales, UK. ESM July **2006**. Bevaria, Munich, Germany.

16. **Daily walking activity following partial foot amputations in diabetic people Kanade RV,** Price PE, Harding KG, van Deursen RWM
Research Centre for Clinical Kinaesiology, Wound Healing Research Unit,
Cardiff University, Wales, UK. O25: **DFSG 2005**. Kassandra, Chalkidiki, Greece 7-10 September.

17. **Daily Walking Activity In The Presence Of Diabetic Foot Ulcers**
van Deursen RWM, Price PE, Harding KG, **Kanade RV** Research Centre for Clinical Kinaesiology, Wound Healing Research Unit,
Cardiff University, Wales, UK. O33: **DFSG 2005**. Kassandra,
Chalkidiki, Greece. 7-10 September.

18. **Functional outcome in people with diabetic neuropathy at different stages of Complications.** van Deursen RWM, **Kanade RV,** Price PE, Harding KG,
Research Centre for Clinical Kinaesiology, Wound Healing Research Unit,
Cardiff University, Wales, UK. **XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics.** July 31 - August 5, 2005, Cleveland, Ohio

19. **Functional outcome in people with trans-tibial amputations related to Diabetes. Kanade RV,** Price PE, Harding KG, van Deursen RWM
Research Centre for Clinical Kinaesiology, Wound Healing Research Unit, University of Wales College of Medicine, Cardiff, UK. O24: **DFSG 2004**. Regensburg, Germany. 2-5 September.

20. **Risk of plantar ulceration to the surviving foot in the patients with diabetic neuropathy following trans-tibia amputation.**
Kanade RV, Price PE, Harding KG, van Deursen RWM Research Centre for Clinical Kinaesiology, 2Wound Healing Research Unit, Cardiff University, Wales, UK. **ESM July 2004**. Leeds, UK.

21. **UK Burn Therapy Audit: Review of Therapy Practice. Kanade RV.**
Cardiff University, Wales, UK**. 37th Annual British Burn Association Meeting, April 2004, Manchester, UK**

22. **Role of Physiotherapy in the Rehabilitation of Oral Cancer. Kanade RV.**
College of Allied Health Sciences, MAHE, Manipal. **Annual IAP Conference. Chennai. 1999**

23. **Efficacy of patellar taping in the treatment of Patello-femoral pain syndrome in Indian population.**
Kanade RV. LTMMC & LTMGH Hospital, Mumbai**. Annual IAP Conference. Chandigarh 1995.**

Invited presentations:

1. **Biomechanical exploration of movements : Clinical implications for rehabilitation**
Rajani Mullerpatan, Society of Indian Physiotherapist, 27th January 2018, Kolkata.

2. **Contribution of Physiotherapy to address India's burden of Non communicable disease.** Rajani Mullerpatan, National Physiotherapy Conference, 9th – 10th March 2018, Punjab University

3. **Scope of Research in Physiotherapy Practice. Kanade-Mullerpatan RV.** MGM School of Physiotherapy, Navi Mumbai**.** Scientifica Feb 2010. Sancheti College of Physiotherapy, Pune.

4. **Role of Physiotherapy in Health Promotion & Ergonomic Planning. Kanade-Mullerpatan RV.** MGM School of Physiotherapy, Navi Mumbai**.** Mother Diary Factory, Navi Mumbai. Jan 2010.

5. **Role of Research in searching effective interventions in rural health: Physiotherapy Perspective. Kanade-Mullerpatan RV.** MGM School of Physiotherapy, Navi Mumbai Maharashtra State Physiotherapy Conference, Pravara Institute of Medical Sciences, Pravara. Nov 2010.

6. **Evidence Based Practice in Physiotherapy. Kanade-Mullerpatan RV.** MGM School of Physiotherapy, Navi Mumbai. World Confederation for Physical Therapy- Asia Western Pacific Region & Indian Association for Physiotherapists Congress 2009, Mumbai, India.

7. **Role of Physiotherapy in the management of Diabetes. Kanade-Mullerpatan RV.** MGM School of Physiotherapy, Navi Mumbai. MGM New Bombay Hospital Vashi. Diabetes Day. 2008.

8. **Transtibial amputation in diabetes: Evaluation of functional outcomes.** Kanade RV. Cardiff University, UK. Scientific Study Day, BACPAR AGM, **Nov 2004**, Wolverhampton, UK

9. **Electrotherapy in Oncology: A field to explore. Electrotherapy Research Day.** Kanade RV. Cardiff University, UK. May 2003, Solihull, Birmingham, UK

10. **Role of Physiotherapy in the rehabilitation of patients treated with radiotherapy. Kanade RV**. TNMMC & BYL Nair Hospital. Radiotherapy CME. 2001.

11. **Role of Physiotherapy in the rehabilitation of patients with oral cancer. Kanade RV**. TNMMC & BYL Nair Hospital. Bombay Branch of IAP. 2000.

12. **Role of Physiotherapy in the rehabilitation of patients following PLIF. Kanade RV**. LTMMC & LTMGH Mumbai. National PLIF Workshop. 1996.

Dr. Bela Agrawal
PhD, M.Sc (PT) (Cardiovascular and Respiratory Physiotherapy)
Professor

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MGM Institute of Health Sciences,
Sector 1, Kamothe, Navi Mumbai
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Educational qualification:

- Completed Bachelors in Physiotherapy- BSc (PT) from Seth G.S. Medical College, Mumbai affiliated to the University of Bombay in Nov1992
- Masters in Cardiovascular and Pulmonary Physiotherapy- MSc (PT) from L.T.M.M. College, Mumbai affiliated to the University of Bombay in May1995.
- Awarded PhD from MGM Institute of Health Sciences, Navi Mumbai, in June 2021.

Professional Organization Membership:

- Life member of Indian Association of Physiotherapists- Membership Number- 2219
- Member of Maharashtra State OTPT Council, Membership Number - 2010/04/PT/000296
- Member of Society of Indian Physiotherapists, Membership Number – 0213
- Executive Council member of Society of Cardiovascular and Pulmonary Rehabilitation 2022 onwards

Academic Experience:

- Working in the profession for 29 years in various setups which include hospitals, teaching institutes and private clinics
- More than 17 years of teaching experience which included teaching graduate, post graduate students as
- Assistant Professor at Seth G.S. Medical College, Physiotherapy Department, Mumbai from 2.09.1996 to 14.02.1997
- Assistant Professor at T.N. Medical College, Physiotherapy Department from 15.02.1997- 30.04.1997
- Assistant Professor at L.T.M.M. College, Physiotherapy Department from 5.10.2000 to 6.12.2006
- Associate Professor at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai from 9.04.2012 till 29.07.2019.
- Professor at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai from 30.07.2019 till date

- Principal in-charge at MGM School of Physiotherapy from April 2014 to May 2019.

Clinical Experience:

- Junior Physiotherapist at L.T.M.M. College and Hospital, Physiotherapy Department from 6.12.1993-28.01.1997; 27.06.117-30.09.2000
- Consultant Physiotherapist at Sai Kripa Hospital, Mumbai from 01.12. 2009- 30.12. 2010
- Consultant Physiotherapist at Deep Ganga Holistic Healing Center, Mumbai from 01.01. 2011- 30.03. 2012

Research Interest:

- The current focus of research is developing assessment tools for specially-abled people and exploring newer methods of enhancing cardiopulmonary endurance fitness.
- Exploration of biomechanical aspects of traditional Indian movement forms.
- Developing a fitness battery which will be applicable to all age groups and relevant to the Indian lifestyle.
- Application of fitness testing in patients suffering from chronic ailments like musculoskeletal problems, neurological diseases and cardiopulmonary.
- Exploring respiratory muscle strengthening and energy cost of activity in geriatric people and people with neurological disorders such as Parkinson's disease.

Intellectual Property - Copyrights	
1	MGM Ground Level Activity Exposure Questionnaire. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L-76907/2018 dated 27.07.2018
2	Pediatric Fitness Testing Report Females 13-18 years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L-91340/2020 dated 21.05.2020
3	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 Years and Adolescents: 13-17 Years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L- L-92917/2020 dated 17.07.2020
4	MGM Pediatric Fitness Testing Report: Males 13-18 Years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L- L-93923/2020 dated 21.08.2020
5	Physiotherapy Management of Covid-19 in Indian Setup. Mariya P Jiandani, **Bela Agarwal**, Gaurang Baxi, Sudeep Kale, Jaimala Shetye, Abhijit Diwate, Umanjali Damke, Savita Ravindra, Titiksha Pol, Anjali Bhise, Unnati Pandit, Prajakta Patil, Razia Nagarwala, Pratibha Gaikwad. L-95459/2020 dated 06/10/2020
6	Pediatric Fitness testing Report: Males 6-12 Years. **Bela Agarwal**, Bhoomika Sawant, Rajani Mullerpatan. L-97874/2020 dated 21/12/2020
7	MGM Reference values for Gait Kinematic variables in Healthy Indian Adults. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-103652/2021 dated 25/05/2021
8	MGM Measurements Among Individuals Ages 5-65 Years 5-65 Years. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-105704/2021 dated 23/07/2021
9	MGM Reference Values for Kinematics and Muscle Activity During Suryanamaskar. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-105719/2021 dated

	23/07/2021
10	MGM Ground Level Activity Exposure Questionnaire- Brief English Version. **Bela Agarwal**, Rajani Mullerpatan. L-109398/2021 dated 17.12.2021

Publications	
1	**Bela M. Agarwal**, Raman P. Yadav, Sanketa D. Tambe, Chandana C. Kulkarni, & Rajani P. Mullerpatan. Evaluation of Early Knee Osteoarthritis Using Biomechanical and Biochemical Markers. Critical Reviews™ in Biomedical Engineering, 49(6):29–39 (2021).
2	Patel, Gunjan; Mullerpatan, Rajani; **Agarwal, Bela**; Shetty, Triveni; Ojha, Rajdeep; Shaikh Mohammed, Javeed; Sujatha, S. Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane. Proc Inst Mech Eng H. 2022 May;236(5):686-696. doi: 10.1177/09544119211072971.
3	Damini Aglawe, Bhumika Sawant, **Bela Agarwal.** Physical function in critically ill patients during the duration of ICU and hospital admission. Accepted for publication in Indian Journal of Critical Care Medicine.
4	**Bela Agarwal**, Damini Aglawe, Bhumika Sawant. Physical Function Assessment Tools in the Intensive Care Unit: A narrative review. Journal. Accepted for publication in Critical Reviews™ in Physical and Rehabilitation Medicine.
5	Sumedh S. Vaidya, **Bela Agarwal**, Yuvraj Singh, Rajani Mullerpatan. Effect of Yoga on Performance and Physical Fitness in Cricket Bowlers. International Journal of Yoga Therapy — No. 31 (2021)
6	**Bela Manish Agarwal**, Robert Van Deursen, Rajani Prashant Mullerpatan. Electromyographic evaluation of spine and lower extremity muscles during repeated and sustained bodyweight deep-squat. Trends in Sport Sciences.2021; 28(1): 19-27.DOI: 10.23829/TSS.2021.28.1-3.
7	Rajani Mullerpatan, Triveni Shetty, Yuvraj Singh, **Bela Agarwal**. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies 26 (2021) 1e6.
8	Narassimman Swaminathan, Mariya Jiandani, Praveen J Surendran, Prasob Jacob, Anjali Bhise, Gaurang Baxi, Poorvi Devani, **Bela Agarwal**, V Sunder Kumar, Nicole MariaPinto, Umanjali Damke, Prahlad Prabhudesai. **Beyond COVID 19: Evidence-Based Consensus on post covid pulmonary rehabilitation in the Indian context**. J Assoc Physicians India. 2020 Dec;68(12):82-89.
9	Jiandani MP, **Agarwal B**, Baxi G, Kale S, Pol T, Bhise A, Pandit U, Shetye JV, Diwate A, Damke U, Ravindra S, Patil P, Nagarwala RM, Gaikwad P, Agarwal S, Madan K, Jacob P, Surendran PJ, Swaminathan N. Evidence-Based National Consensus: Recommendations for Physiotherapy Management in COVID-19 in Acute Care Indian Setup. Indian J Crit Care Med 020;24(10):905–913
10	Expert Consensus and Recommendation for Physiotherapy Management of COVID 19 in Indian setup. Mariya P Jiandani, **Bela Agarwal**, Gaurang Baxi, Sudeep Kale, Jaimala Shetye, Abhijit Diwate, Umanjali Damke, Savita Ravindra, Titiksha Pol, Anjali Bhise, Unnati Pandit, Prajakta Patil, Razia Nagarwala, Pratibha Gaikwad. ISBN: 978-81-946111-3-4, Medworld Asia International Publications, 1st Edition June2020
11	Tanochni Mohanty, Dhruv Mehta, Rajani Mullerpatan, & **Bela Agarwal**. Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in

	Children and Adolescents with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation Medicine, 32(1):75–83 (2020)
12	Mullerpatan RP, **Agarwal BM**, Shetty TV. Exploration of muscle activity using surface electromyography while performing Surya Namaskar. Int J Yoga 2020;13:137-43.
13	Nair S, **Agarwal B**, Chatla J, Mullerpatan R . Health-Related Physical Fitness of People With Type 2 Diabetes Mellitus. Critical Reviews™ in Physical and Rehabilitation, Medicine. 2019; 31 (1); 11-21
14	Mullerpatan R, Sonkhia M, Thomas B, Mishra S, Gupta A, **Agarwal B**. Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries. Crit Rev Phys Rehabil Med. 2019;31(2)
15	Shetty T, Parab S, Ganesan S; **Agarwal B**, Mullerpatan R. Lower Extremity Muscle Strength and Endurance in Ambulatory Children With Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 1-10
16	**Agarwal B**, Advani M, Deursen RV, Mullerpatan R. Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis;; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31(1):23-34
17	Mullerpatan RP, **Agarwal BM**, Shetty T, Nehete GR, Narasipura OS. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. Int J Yoga. 2019 May-Aug;12(2):124-131.
18	Rajani Mullerpatan, Meera Thanawala, **Bela Agarwal**, Sailakshmi Ganesan. Development of deep-squat milestone in typically developing children. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 62-67
19	Oshin Amberkar, **Bela Agarwal**, Yuvraj Singh, Ruturaj Shete, Rajani Mullerpatan. Level of sports participation and performance among people with spinal cord injury. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 49-55
20	Gayathri Naryanan, Meruna Bose, Shrutika Parab, **Bela Agarwal**, Rajani Mullerpatan. Energy expenditure using three different walking techniques in individuals with spinal cord Injury. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 32-39
21	Pisal A, **Agarwal B**, Mullerpatan R. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Critical Reviews™ in Physical and Rehabilitation, Medicine; 2018; 30 (3):207-218.
22	**Bela M. Agarwal**, Robert van Deursen, Rajani P. Mullerpatan. Influence of habitual deep squatting on kinematics of lower extremity, pelvis and trunk International Journal of Health and Rehabilitation Sciences, March 2018;7(1):1-19.
23	Nancy Fernandes Pereira, Shobha Gaikwad , Andrea Hemmerich , Rajani P Mullerpatan and **Bela Agarwal**. Birthing experience of women who have undergone normal deliver in a selected community of India. International Journal of Innovative Knowledge Concepts, February 2018; 6(2):120-125.
24	**Agarwal B**, Mukri A, Shah M et al. Effect of Inspiratory muscle training in individuals with Parkinson's disorder. Int J Health Sci Res. 2017; 7(6):178-185.
25	Sahasrabudhe SS, **Agarwal BM**, Mullerpatan RP. Comparison of Muscle Activity and Energy Cost between Various Bodyweight Squat Positions. Clinical Kinesiology,2017; 71(2):19-24
26	Shruti P Nair, **Bela Agarwal**, Monal Shah, Shradha Sawant, Nikita Sinha, Vijayendra Rajguru, Rajani Mullerpatan Level of physical exercise capacity, respiratory muscle strength and peak expiratory flow rate in healthy adolescents -. MGM Journal of Medical Sciences 2016, April-June,3(2):66-71.

27	**Bela Agarwal**, Monal Shah, Nilesh Andhare and Rajani Mullerpatan-Incremental Shuttle walk test: reference values and predictive equation for healthy adult Indians . Lung India, 2016, IP: 14.139.125.214
28	**Agarwal B**, Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. ISBN 978-93-5258-836-7 Conference proceedings HWWE 2015
29	**Bela Agarwal**, Meghana Chowdhry, Rajani Mullerpatan - Effect of movement therapy on academic stress in physiotherapy students. MGM Journal of Medical Sciences Oct-Dec 2014 Vol 1 number 4;189-192
30	Bela Garg - Physiotherapy in respiratory conditions – NAPCON Journal 2001
31	Jaimala Shetye and Bela Garg - Objective Assessment of improvement following pulmonary rehabilitation –The Journal of IAP 1999-2000;Vol1 , 13-16
32	Bela Garg, Maria Mascarenus and Surekha Pol - Cardiac Rehabilitation – Physical Therapy Rehabilitation 1996

Books and Book Chapters	
1	Bela Agarwal, Expert Consensus for Covid -19 Management in Indian Setup-Booklet, Medworld Asia International Publications, Dotphi. 2020; ISBN 978-81-946111-3-4.
2	Bela Agarwal. Physiotherapy in Cardiopulmonary Conditions. Chapter 32-Disorders of Pleura and Thoracic Cage. Pg 332-351. Edited by Mariya Jiandani, Megha Seth, Neepa Pandya, Priya Rangey. Jaypee Brothers Medical Publishers, The Health science Publishers, New Delhi. ISBN 978-93-5465-141-0. Edition 2022

Conference Proceedings	
1	Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan, Evaluation of Joint Angles And Net Joint Moments In Rope Jumping, XXVI Congress Of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.
2	Bela Agarwal, Robert van Deursen And Rajani Mullerpatan, Influence Of Daily Squatting Exposure On Kinematics Of Deep Squat, XXVI Congress Of The International Society of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.
3	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN, Spine and Lower Extremity Kinematics Of Suryanamaskar, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,| Australia.
4	Agarwal B , Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. Conference proceedings HWWE 2015 Mumbai, India. ISBN 978-93-5258-836-7.

Co-Investigator in Funded Research Projects

Sr. No	Title	Project type	Year	Co-Investigator	Principal Investigator	Institution	Status
1	The effects of labor and birth positioning on pelvic dimensions: gaining further insight to improve the birth experience	Extramural project	2016-2017	Bela Agarwal, Triveni Shetty	Andrea Hemmerich Genevieve Dumas, Dr. Rajani Mullerpatan	Queen's University, MGM CHMS	Completed
2	Development of a Powered Trans-tibial Prosthesis	Extramural projects	2016	Bela Agarwal, Megha Bandawade	Abhishek Gupta, Dr. Rajani Mullerpatan	IIT-B, MGM CHMS	Ongoing
3	Effect of squatting on knee articular cartilage in healthy people	PhD	2014	Bela Agarwal	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Completed
7	Experimental biomechanics of human squatting	M Tech	2015-2016	Ajinkya Patil, Bela Agarwal	Dr. Rajani Mullerpatan	IIT-B, MGM CHMS	Completed
12	Comparison of functional performance among people with unilateral/bilateral total knee replacement and conservatively managed osteoarthritis of knee	MPT	2015-2017	Shruti Rane	Dr. Bela Agarwal	MGM School of Physiotherapy, MGM CHMS	Completed
14	Spine and Lower extremity Kinematics of Suryanamaskar	Inhouse	2017	Triveni Shetty ,Bela Agarwal	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Ongoing
15	Evaluation of joint angles and net joint moments in rope jumping	Inhouse	2017	Triveni Shetty,Bela Agarwal, Yuvraj Singh	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Completed

16	Exploring biomechanics of Yogasana	In house		Bela Agarwal, Triveni Shetty	Rajani Mullerpatan	MGM CHMS	Ongoing

CME / Workshops Conducted		
Sr. No.	**Topic / Theme**	**Date**
1	Guest speaker for a webinar title 'Harnessing the power of digital health to improve awareness, prevention and management of CVD globally' organized by ST. Andrews College of Physiotherapy, Pune, India	29th September 2021
2	Delivered a talk titled 'Neurological and systemic sequelae in patients with COVID' in a webinar on Post COVID Rehabilitation	18th September 2020
3	Physiotherapy in Intensive Care Unit (ICU)	6-8th December 2018
4	Pulmonary rehabilitation	9th September2017
5	Hands on workshop of "Cardiopulmonary Assessment & Exercise Training"	21st & 22nd March 2014
6	'Respiratory Physiotherapy' at The XIII National conference of "Growth Development and Behavioural Pediatrics Academy GDBPCON XIII	5-7th December 2014
7	Clinical Biomechanics at MGM Center of Human Movement Sciences, MGM Super Specialty Hospital, Navi Mumbai	1-3rd April 2016
8	Cardio Pulmonary Assessment and Exercise Training MGM New Bombay Hospital, Navi Mumbai	21st - 22nd March 2014
9	Cardiopulmonary and Neurologic Physiotherapy treatment techniques Monitoring physical fitness in children and adolescents GDBCON conference organized by MGM Department of Pediatrics, MGM Institute of Health Sciences, Navi Mumbai	5 – 7th Dec 2014
10	Physiotherapy in the ICU at MGM New Bombay Hospital, Navi Mumbai	5-6th April 2013
11	Physiotherapy in the ICU at LTMM College and LTMG Hospital ,Mumbai	On 6 occasions from 2000-2006
12	Physiotherapy in the ICU at Sancheti College of Physiotherapy, Pune	2004
13	Participated as faculty in "Pulmonary Critical Care "NAPCON at LTMM College and LTMG Hospital, Mumbai	2001
14	Participated as Faculty in "Update in Cardiothoracic nursing "for nurses at Leelabai College of Nursing SNDT University, Mumbai	2000,2001

15	Participated as Faculty in "Paediatric Intensive Care Management Maharashtra State IAP conference at Seth G.S. Medical College, KEM Hospital, Mumbai	1996
16	Conducted Cardiac Rehabilitation workshop for Physiotherapists at Amar Jyoti Rehabilitation Center, New Delhi	1996

Courses, workshops and webinars attended		
Title	**Date**	**Venue**
Webinar on ''Mission Fit India'	12th Feb2021	MGM Institute of Health Sciences, Navi Mumbai
Online Teaching Learning and Evaluation with Moodle and MOOC Platform	13-14th July 2020	Virtual Training by Education Promotion Society of India, New Delhi
Certificate Course in Research Methodology	Jan 2017-March 2017	Online Course conducted by Alexis Foundation
Basics in Clinical Biomechanics	26-28th February 2016	MGM Center of human Movement Sciences, MGM Super Specialty Hospital, Navi Mumbai
"Workshop on Global Perspectives on Medical Education and its relevance to India"	6 Jan 2015	MGM Medical College, Navi Mumbai
Understanding gait in Cerebral Palsy	18-19th April 2015	Jupiter Gaitlab, Thane

Conference Presentations	
1	Bela Agarwal, Rajani Mullerpatan. Prevalence of musculoskeletal pain among people with varying squat exposure; at Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
2	Bela Agarwal, Robert van Deursen, Rajani Mullerpatan. Effect of varying squat exposure on muscle strength and endurance; at 5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
3	Bela Agarwal, Kishore Raut, Rajani Mullerpatan. Development of MGM Ground Level Activity Questionnaire; at 5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
4	Bela Agarwal, Robert Van Deursen and Rajani Mullerpatan. Influence of Daily Squatting Exposure 0n Kinematics of Deep Squat. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.
5	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN. Spine and Lower extremity Kinematics of Suryanamaskar . Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.
6	Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan. Evaluation Of Joint Angles And Net Joint Moments In Rope Jumping. Conference Proceedings

	XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.
Conferences Attended	
1	British Indian Orthopedic Society Virtual Meeting on 2nd -3rd July 2021, Cardiff , UK. Accredited by Royal College of Surgeons of England
2	Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
3	Society of Indian Physiotherapists SIP-e-Con, 17th Jan 2021 held at Amar Jyoti Institute of Physiotherapy, Delhi
4	5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
5	MGM-World Spine Care Conference - Prevention, Early Detection and Management of Spinal Disability: A Patient-centric Integrated Approach on 18-19th January 2019 at MGM Institute of Health Sciences, Navi Mumbai
6	Chairperson at FootCon, GMC Gymkhana, Marine Drive, Mumbai on 16-17th Dec 2017
7	XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.

Awards	
Awarded the Kamala Bhagwat Sohonie Science Shikshika Shodhkartri Mention 2022 by Rethink India on occasion of the International Day of Women and Girls in Science in Feb2022.	
2nd prize in paper presentation	"Prevalence of musculoskeletal pain among people with varying squat exposure". Bela Agarwal, Rajani Mullerpatan, at Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, Organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
2nd prize in poster presentation	'Effects of growth spurt on clinical outcome measures of pulmonary function and exercise capacity' at National GDBP Conference organized by Indian Association of Pediatrics-MGMIHS (Pediatric Department) held in MGM College on 6th December,2014.
University of Bombay Second Rank holder at MSc (PT) University of Bombay Third Rank holder at First year BSc (PT) University of Bombay Third Rank holder at Second year BSc (PT) University of Bombay Third Rank holder at Third year BSc (PT)	

University Nominations and Additional Activities	
1	Judge at Environmental Day Competition-Time for Nature held on 5th June 2020 by MGM Institute of Health Sciences
2	Winner at Idea Competition held in 2018-19
3	Appointed as Member of the Best Scientific Paper Award Committee, MGMIHS December 2020

4	Nominated as member of Academic Council July 2021
5	Appointed Co-Chairperson of Board of Studies Physiotherapy, Prosthetics and Orthotics from Jan 2022
6	Appointed as Coordinator of Intellectual Property Rights, MGM HIS
7	Member Secretary of Scientific Advisory Committee-Nursing &Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Postgraduate Research Projects Supervised

S: No	Name of the candidate	Title of the topic	Academic Year
1	Damini Aglawe	Evaluation of physical activity in critically ill patients during ICU stay and post ICU discharge	2019-2021
2	Abhijeet Kanojia	A review on effect of Suryanamaskar on physical fitness in children	2019-2021
3	Mihir Mange	Effect of telemetric '3 S' intervention on physical fitness, psychological well-being and quality of Life in Healthy adults	2019-2021
4	Neha Raorane	Effect of 12 weeks of barefoot exercises on lower extremity functional fitness and running performance in sub-elite marathon runners	2018-2020
5	Sumedh Vaidya	Effect of yoga on bowling performance and physical fitness in cricket bowlers	2018-2020
6	Bhumika Sawant	Squatting intervention in people with chronic respiratory dysfunction	2017-19
7	Oshin Amberkar	Development and Evaluation of a Conceptual Model to Improve Sports Participation and Performance in People with Spinal Cord Injury	2017-19
8	Manisha Advani	Influence of sustained occupational postures on knee pain and functional performance	2016-18
9	Zubeda	Functional performance in people with hip pain	2016-18
10	Shruti Rane	Comparison of knee function in people with conservatively managed osteoarthritis of knee and people with unilateral TKA	2015-17
11	Deepak Tandel	Inter tester and Intra tester reliability of incremental wheelchair propulsion test	2015-17
12	Jones Stanley	Developing an incremental wheelchair propulsion test for evaluation of cardio respiratory endurance in people with spinal cord injury	2014-16
13	Mohanty Tanochni	Health related physical fitness in ambulatory children and adolescents with cerebral palsy	2014-16

14	Jadhav Sneha	Effect of Osteoarthritis on Health realted Fitness	2013-15
15	Andhare Nilesh	Normative values for inspiratory pressure & Maximum expiratory pressure in age group of 31-70 yrs	2012-14
16	Afrin Mukhri	To study effect of inspiratory muscle strength in Parkinson	2012-14
17	Monal Shah	Normative Values for Six Minute Walk Test, Incremental Shuttle Walk Test and Peak Expiratory Flow Rate: In Mumbai Population in the Age Group of 17-30 Years.	2011-13

Undergraduate Research Projects Supervised			
Sr. No.	**Title of Project**	**Name of student**	**Month / Year**
1	Physical activity profile in post tuberculosis patients – magnitude of problem(prevalence)	Khadija, Zehra, Ria, Reem	2016-17
2	Musculoskeletal problems in post tuberculosis patients – magnitude of problem(prevalence)	Shreya, Mitali, Nisha, Jacqlene	2016-17
3	Ground level activities in various occupations in urban & rural population	Maithili,Sejal, Aisha,Faiza, Pooja,Devika,Shruti, Sanchita	2016-17
4	Temporo-spatial variables in squatting	Ritu,Pooja, Mohsina, Rajal	2016-17
5	Six minute walk test in patients affected with stroke & back pain	Bhoomika, Shraddha, Hely, Dhvani	2016-17
6	Immediate effect of PNF and MFR along with conventional therapy on respiratory functions in patients with COPD	Samiksha, Mamta, Neha, Vishakha,	2016-17
7	Evaluation of Respiratory muscle strength in chronic neurological conditions in children	Interns Roll no. 31-36	2015-16
8	Comparison of VO2 peak in 6 min walk test, incremental shuttle walk test and modif amoung healthy individuals in the age group 20-60 years	Interns Casual Batch	2015-16
9	ISWT in children and adolescent (6-17years)	A Surabhi, Ancy Vincent, B Uttkarsha, Bindhu C.C., Birajdar Huda	2014-15
10	6 MWT in children (6-9 years): Rural versus Urban	Bobadi Snehal, Chandurkar Shrut, C Sayali, C Smirti, D Nabha	2014-15
11	Evaluation of fitness in people with Diabetes Mellitus	Doshi Priya, D Anthea, Elvino John, Gindra Pooja, Gill Harpreet	2014-15
12	Effect of self monitoring of physical fitness on physical activity levels	Joshi Sanchita, Kaku Jyoti, Katalkar Priyadarshani, K Chetali, Khan Aqsa	2014-15
13	Evaluation of ankle dysfunction in adults using CAITY	Mane Ankita, Mohanty Nancy, Nair Rajlakshmi, Nale Dhanashree, Nikam Prathamesh	2014-15
14	Evaluation of fitness in women at different critical milestones- Puberty, Pregnancy and menopause	Nivya Joseph,Panchal Riddhi Panmand Mohinee, Parab	2014-15

		Shrutika Patel Dipiti	
15	Evaluation of fitness in thyroid dysfunction and metabolic syndrome	Patole Priyanka ,Penkar Ujal ,Rupika Gopinathan ,Sanghavi Rashi,Shah Dhavni	2014-15
16	Evaluation of fitness in physically elite population among children and adults	Shetty Sanjana ,Shruthi P,Siddiqui Samrin, Simi Mohanan, Sonawane Snehal	2014-15
17	Effect of practice sessions on ISWT	Talankar Reema ,Preeti Yadav	2013-14
18	Assessment of Physical fitness in the age group of 20-60 years using the test battery.	Manta Shetty, Poonam Desai, Saloni Thakkar, Tasmiya Shaikh, Pooja V	2013-14
20	Assessment of physical fitness in age group of 9-15 years using fitness test battery	Bilimoria Zarine E. Dand Darshita	2013-14
21	Assessment of physical fitness in age group of 9-15 years using fitness test battery	Sawant Abhishek A, Shete Ruturaj , Shetty Priyanka, Shinde Kashmira , Thanawala Meera, Tulsankar Gauri	2013-14

01.01.2022

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Apercu

Pursuing PhD from MGM Institute of Health Sciences (since 2016) Post graduate in physiotherapy with specialization in Neurosciences with over 14 years of experience in clinical filed and 6 years academic and research experience. Strong theoretical knowledge and clinical exposure through work experience at medical college and allied roles.

Areas of Expertise

Neurorehabilitation
Clinical Biomechanics
Kinesiology / Movement Sciences
3D & 2D Motion analysis system
Vestibular Rehabilitation
General Management
Interpersonal Skills
Movement analysis of traditional movements

Key Achievements

- Eight papers published in International Indexed Journals and 3 copyrights registered.
- Best PhD paper Award from MGM Institute of Health Sciences for year 2019-2020
- Platform and poster presentations at national and international conferences including ISB, SIPCON, IFNR. Recently, one research project was shortlisted for poster presentation at India Science Festival organized by Government of India, DST Women Scientist Conclave.
- Under the guidance of Mentor Dr Rajani Mullerpatan, registered a copyright on Temporal-spatial parameters of gait and filed 4 more in gait analysis as co-author

Professional Experience

MGM School of Physiotherapy, MGM Institute of Health Sciences, NM — Aug-2015 till date

Associate Professor

- Undergraduate and post-graduate student training for neuro-physiotherapy, kinesiology, Kinesiotherapy and sports biomechanics and movement sciences. Duties involved assessment & treatment, discussions & bed-side teaching, case presentations.
- Co-ordination of all activities at MGM Centre of Human Science.
- Teaching experience includes for graduate/post graduate students as well as project/dissertation guidance
- Extension include: Initiation of MGM Cerebral palsy support group and reviving of stroke support group.
- Successfully trained students/ clinicians and academicians through 7 workshops in Clinical Biomechanics and Basics in 2D and 3D gait analysis

Academics

Professional Qualification

- Post-graduation (Neuroscience), TNMC College , Nair Hospital, MUHS
- Post-graduate Diploma in Rehabilitation, All India Physical Medicine & Rehabilitation, Haji Ali

- Graduation in Physiotherapy, Dr. D. Y Patil College of Physiotherapy, MUHS

Publications

1.	Patel G, Mullerpatan R, Agarwal B, Shetty T, Ojha R, Shaikh-Mohammed J, Sujatha S. Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane. Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine. 2022 Jan 8:09544119211072971.
2.	Rajani Mullerpatan, Triveni Shetty, Yuvraj Singh, Bela Agarwal. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies. 26 (2021) 1-6.
3.	Dharod R, Shetty T, Shete R, Mullerpatan R. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(3).
4.	Rajani P Mullerpatan, Bela M Agarwal, Triveni V Shetty. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga; 2020 13 (2): 137-143.
5.	Mullerpatan R, **Shetty T**, Ganesan S, Johari A. Review of lower extremity function following SEMLS in children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2).
6.	**Shetty T**, Johari A, Ganesan S, Mullerpatan R. Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1).
7.	Iyer P, **Shetty T**, Ganesan S, Nair S, Rao N, Mullerpatan R. Exploration of sports participation in children with mild intellectual disability. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1).
8.	**Shetty T**, Parab S, Ganesan S; Agarwal B, Mullerpatan R. Lower Extremity Muscle Strength and Endurance in Ambulatory Children with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 1-10
9.	Mullerpatan RP, Agarwal BM, **Shetty T**, Nehete GR, Narasipura OS. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. Int J Yoga. 2019 May-Aug;12(2):124-131.
10.	Mullerpatan RP, Agarwal BM, **Shetty TV**. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga. 2020 May 1;13(2):137.
11.	Dharod R, **Shetty T**, Shete R, Mullerpatan R. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(3).
12.	Rajani Mullerpatan, **Triveni Shetty**, Yuvraj Singh, Bela Agarwal. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies. 26 (2021) 1-6.
13.	Rajani Mullerpatan, Bela Agarwal, **Triveni Shetty**, Omkar SN. Spine and Lower Extremity Kinematics of Suryanamaskar. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.
14.	**Triveni Shetty**, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan. Evaluation of Joint Angles and Net Joint Moments in Rope Jumping. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.

Personal Information

Date of Birth – 11th March 1985

Nationality - India

Marital Status – Married

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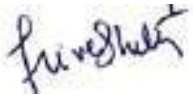
Declaration:
I hereby declare that the information furnished above by me is true to the best of my knowledge.

Date: 6th September 2021



Dr. Triveni Shetty (PT)
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MGM Institute of Health Sciences

Dr.Shrutika Dilip Parab (MPT- Neuro)

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Career Objective:

To succeed in an environment of growth and excellence and earn a job which provides me job satisfaction and help me achieve personal as well as organizational goals. Seeking quality environment where my knowledge can be shared and enriched.

Work Experience:

- Assistant Professor at MGM School of Physiotherapy, Navi Mumbai (Oct 2017- Present).
- Clinical Physiotherapist at Reliva Physiotherapy and Rehab (May 2015 - Oct 2017).
- Clinical Physiotherapist at Dr.Sonawane's Orthopedics Hospital, Seawoods (March -June 2015).

Educational Qualifications:

Sr. No.	Institute	Course	Year of Passing	Percentage
1.	St. Xavier's High School	S.S.C.	2008	**81.3 %**
2.	Tilak Junior College	H.S.C.	2010	**69.6 %**
3.	M.G.M. School Of Physiotherapy	I BPTh (Part-I)	2011	**76.6 %**
4.	M.G.M. School Of Physiotherapy	I BPTh (Part-II)	2012	**74 %**
5.	M.G.M. School Of Physiotherapy	II BPTh	2013	**69.5 %**
6.	M.G.M. School Of Physiotherapy	III BPTh	2014	**70.5 %**
7.	M.G.M University Department of Physiotherapy.	MPT (Neuro Physiotherapy)	2015-17	**60%**

Academic Projects:

- Effect of random and blocked practice schedules on motor learning in children (2016-17)
- Research Project on level of physical fitness in Geriatrics. (2014)
- Current trends of physical fitness in menopausal females (2015)

Awards and Recognition:

- Awarded as the **"Chancellor's Best Graduate Gold Medal"** BPTh. Batch 2010-14, Felicitated by Honorable Ex-Union minister Mr. Sharad Chandra Pawar.
- Certified Basic Life Support Provider (2018)

Research Profile:

Research interest: Areas of research include focused studies on assessment; evidence based management along with cardiovascular impairments and exercise limitations in Neurological conditions in adult and pediatric neurological conditions.

Project Supervisor/ Guide of projects of Department of Neuro Physiotherapy:

1. Ongoing Postgraduate projects 2019-2020: **2**
2. Completed Postgraduate projects 2017-2020: **3**
3. Completed Undergraduate projects 2017-2020: **6**

Journal Reviewer:

1. Adapted Physical Exercise Quarterly
2. Journal of Pediatric Rehabilitation Medicine

Publications/ Conference Proceedings:

1. **Parab S,** Bose M, Ganesan S. Influence of Random and Blocked Practice Schedules on Motor Learning in Children Aged 6–12 Years. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018; 30 (3). (**Pubmed, Scopus**)
2. Bose M, Chhibber S, **Parab S**. Electrophysiological Study to Evaluate Cross Education in Lower Extremity Using Mirror Movements in Stroke. International Journal of Health Sciences & Research. 2018; 8 (5). (**Pubmed, Index Copernicus, Google Scholar**)

3. Shetty T, **Parab S,** Ganesan S, Agarwal B, Mullerpatan R. Lower extremity muscle strength and endurance in ambulatory children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31 (1). (**Pubmed,Scopus**)

4. Narayanan G, Bose M, **Parab S**, Agarwal B, Mullerpatan R. Energy expenditure using three different walking techniques in individuals with Spinal Cord Injury. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019. (**Pubmed,Scopus**)

5. Dighe A, Bose M, **Parab S**, Influence of Variations in Seat Surface Inclination on Trunk Muscle Recruitment and Reaching Ability in Children with Spastic Cerebral Palsy: Systematic Review. Indian Journal of Physiotherapy and Occupational Therapy; 2019, Vol. 13 (3). (**Pubmed,Scopus**)

6. Bose M, **Parab SD**, Patil SM, Pandey NA, Pednekar GV, Saini SS. Exploring spinal muscular atrophy and its impact on functional status: Indian scenario. Indian journal of public health. 2019 Jul 1;63(3):254. (**Pubmed, Scopus**)

7. **Parab S**, Bose M, Shayer S, Saini RK, Salvi M, Ravi P, Sawant P. Effect of Bharatnatyam-based Dance Therapy in Children and Adolescents with Down Syndrome. Clinical Kinesiology (Online). 2019 Oct 1;73(3):15-20. **(Scopus)**

8. Sawant N, Bose M, Parab S. Dexteria app. therapy versus conventional hand therapy in stroke. Journal of Enabling Technologies. 2020 Nov 6.

Conference Proceedings:

1. **Parab S,** Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. WCNR 2018 Poster Abstracts. (2018). *Neurorehabilitation and Neural Repair*, *32*(4–5), 363–538. https://doi.org/10.1177/1545968318765498 **(Scopus, MEDLINE, CINAHL)**

2. **Parab S,** Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. Indian Journal Cerebral Palsy [serial online] 2016 [cited 2019 Jun 8]; 2:105-25. (**Scopus, MEDLINE, CINAHL)**

Research Achievements:

- **Awarded for Best Research Paper** 2018-19 by MGM Institute of Health Sciences,Navi Mumbai

- **Oral paper presentation** National level at Indian academy of Cerebral palsy conference (IACPCON) 2016, Bangalore.

- **Poster Presentation, International** at 10th World Congress for Neurorehabilitation 2018, Mumbai.

- **Oral paper presentation at National** level at Indian Federation of Neuro-rehabilitation Conference 2019, Mumbai
- **E-Poster selected for presentation** at 11th World Congress for Neuro Rehabilitation jointly with 35th Congress of the French Society of Physical and Rehabilitation Medicine 2020

Workshops & Conferences Attended:

- Attended online training on COVID-19: Operational Planning Guidelines and COVID-19Partners Platform to support country preparedness and response, April 2020
- Delegate at National Conference Indian Federation of Neuro-rehabilitation Conference 2019, Mumbai.
- Organizing Committee Member and Delegate at conference on 'Spine Care: Prevention, Early Detection & Management of Spine Disability: A patient-centric Integrated Approach' at MGM Institute of Health Sciences, Navi Mumbai on 18th and 19th of January 2019.
- Attended hands-on workshop on handling skills in "First year of life" (2018).
- Attended hands-on Workshop on Vestibular Rehabilitation (2018).
- Attended hands-on "Workshop on Qualitative Research Analysis" (2018).
- Attended conference on Revised Accreditation Framework of NAAC held at Deogiri College, Aurangabad (2018).
- Attended the 10th World Congress for Neurorehabilitation 2018, Mumbai.
- Attended the 11th Annual Conference of The Indian Academy of Cerebral Palsy at Bangalore (2016).
- Attended hands-on workshop on Sensory Integration.(2016)
- Attended hands-on workshop on Neurodevelopmental Therapy in Pediatrics.(2016)
- Attended Basic one-day Aquatic therapy workshop.(2017)
- Attended workshop on "Using the ball for therapeutic intervention for children with movement disorders" conducted by Barbara Hodge PT, C/NDT. (2016)
- Completed Basic and Advanced course in Clinical Biomechanics.(2016)
- Completed training in SPSS- For data analysis in medical profession.(2016)

- Attended seminar on diagnosis and management for back-ache conducted by Indian association of Physiotherapists, Mumbai branch.(2016)
- Attended hands-on workshop on Bobath and adult hemiplegia. (2015).
- Certified Kinesio Taping Therapist. Attended "Hands-on Kinesiological Taping Technique" Workshop Organized by Physical Therapy Research & Educational Foundation, India.(2015)
- Completed level 1 course of Dry Needling conducted by Indian Academy of Dry Needling.(2015)
- Attended the symposium on "Physiotherapy in Burns" at National Burns Centre, Airoli, Navi Mumbai.(2013)
- Participated as a delegate in CPD on "Clinical & Research update in Musculoskeletal Pain" at MGM School of Physiotherapy.(2013)
- Participated as a delegate at GDBPCON 2014.

Administrative Portfolios managed in current Institute:

- ❖ IQAC Co-ordinator
- ❖ In charge Criteria II NAAC
- ❖ Examination In-charge
- ❖ Mentorship In-charge
- ❖ In-charge of Grievance Redressal Cell
- ❖ Member of Academic Committee
- ❖ BLS Trainer for MGM School of Physiotherapy at MGM Skills Lab
- ❖ Environmental Studies -College Coordinator

Personal Details:

- Date of Birth: 02 August 1992
- Gender: Female
- Marital Status: Married
- Languages Known: English, Hindi and Marathi
- Nationality: Indian

Declaration: I hereby declare that the information furnished above by me is true to the best of my knowledge.

Date: 13-7-2021 **Dr.Shrutika Parab (PT)**

AKHILA NATESAN (PT)

MPT (Cardiovascular and Respiratory Physiotherapy)

Address –

101, Crown Jewel, Yogi Hills,
Mulund (west),
Mumbai 400080
Email: akhila.natesan05@gmail.com
Mob. No. 9167314945/ 8169880180

CURRICULUM VITAE

CAREER OBJECTIVE:

I am a motivated and hardworking Physiotherapist wanting to be associated with an organization that gives me the opportunity to show my proficient skills, improve my knowledge and be a part of a team that works dynamically towards the growth of the organization.

EDUCATIONAL QUALIFICATION:

Masters in Physiotherapy (MPT) – Cardiovascular and Respiratory Physiotherapy

PROFESSIONAL SUMMARY:

- Currently working as Assistant Professor at MGM School of Physiotherapy, Navi Mumbai. MGMIHS.
- Worked as Physiotherapist for three months at Comprehensive thalassemia care, Pediatric Haematology Oncology and Bone marrow transplant care center, Borivali, Mumbai.
- During academic years at
  - Topiwala National Medical College and B.Y.L Nair Charitable Hospital, Mumbai – (MPT – Cardiovascular and Respiratory Physiotherapy)
  - Government Medical College and Hospital, Nagpur (BPT)
  - Seth G.S Medical College and K.E.M Hospital, Mumbai (Internship – 4 months).

Explored the following fields –

- **COVID care – in Intensive, Ward and post COVID phase.**
- **Intensive Care Units**– Trauma, Cardiovascular and Thoracic Surgery, Cardiology, Respiratory, General and Special Surgery Recovery (Orthopaedic, Neurosurgery, Oncosurgery), Medical, Paediatric, Neonatal, Artificial Kidney Dialysis Unit.
- **Ward based care, OPD care &Tele Rehab** – Cardiac, Respiratory, Traumatic and Non traumatic orthopaedic, adult and paediatric neurologic conditions, Burns.
- Have been trained in effective assessment, clinical reasoning, documentation and treatment skills.
- Trained to make evidence based treatment plan for the patients/ clients based on the physical diagnosis made and goals of patient and family members.

ACADEMIC ACHIEVEMENTS:

- **Presented and stood third in National Level Case Report/ Series Competition** (2020) organized by Indian Association of Physiotherapist Women's Cell, Maharashtra State.
- Won **third prize in National Level Essay Competition** (2020) organized by P.T School and Centre, Government Medical College and Hospital, Nagpur.

PROFESSIONAL MEMBERSHIP :

Member of **Maharashtra State OTPT council (Reg. NO. PR-2017/11/PT/006246).**

PROJECT PROFILE:

Project 1: (Master Program) - Comparison of Immediate Effects On Six Minute Step Test with Pursed Lip Breathing and without Pursed Lip Breathing In Obstructive Airway Disease Patients.

Project 2: (Internship Program) - Study on the effects of McKenzie exercises as compared to yoga postures in patients with mechanical low back pain.

RESEARCH AND PUBLICATIONS:

Published -

1. Mistry HM, Natesan A ,Verma CV. "Early Intervention of Physiotherapy Helps To Reduce Hospital Stay and Improve Functional Capacity of Patients with Severe COVID – ARDS."Indian J Med Sci, doi: 10.25259/IJMS_274_2020.
2. Chhaya Verma, Rachna Arora, Hetal Mistry et al. " Changes in mode of oxygen delivery and physiological parameters with physiotherapy in COVID-19 patients- A retrospective study" Indian J of Critical care Medicine, IJCCM_20_1224_R2.

- Part of data collection and reporting team for the article - Verma CV, Arora RD, Shetye JV, Karnik ND, Patil PC, Mistry HM, et al. Guidelines of physiotherapy management in acute care of COVID-19 at dedicated COVID center in Mumbai. Physiother - J Indian Assoc Physiother 2020;14:55-60.

Submitted for publication –

1. Hetal Mistry, Akhila Natesan. Impact of Physical Activity Levels on Length of Hospital Stay in Patients with Severe COVID ARDS – International Journal of Health and Allied Sciences (IJHAS) on 28th Nov 2020.

SEMINARS & WORKSHOPS ATTENDED:

1. Completed 8 days of Certificate Course in Orthopaedic Manual Therapy (COMT) by Capri Institute of Manual Therapy on 13th April to 23rd April 2017, held in Mumbai.
2. Attended 3 days of Research Methodology Workshop under MUHS. (2017)
3. Attended 2 days of Educational Methodology Microteaching Workshop under MUHS.(2017)
4. Participated in seminar on "Communication Skills in Clinical and Professional Practice – Need of Time" on 7Th September 2018 in Mumbai.

5. Attended one day workshop on "Scientific Writing & Publication" on 30th September 2018.
6. Attended workshop on "Neuro Developmental Kinesiology" on 14th October 2018 by Mumbai Branch of Indian Association of Physiotherapists.
7. Attended National Workshop on Cardiac Rehabilitation on 12th – 13th April 2019 by Department of Physiotherapy, SOAHS, MAHE, Manipal – Bangalore.
8. Workshop on Cardio-Pulmonary Cerebral Resuscitation held at Nair Hospital, Mumbai 2020.
9. Completed online course on "How to setup and run a cardiac rehabilitation and prevention program" by Ergoline Academy on 3rd Oct 2020.

QUALIFICATION DETAILS:

NAME OF COURSE	INSTITUTION	UNIVERSITY	PERCENTAGE	
Masters of Physiotherapy in Cardiovascular and Respiratory Physiotherapy (MPT)	Physiotherapy School & Centre, Topiwala National Medical College & BYL Nair Charitable Hospital	Maharashtra University of health sciences , Nashik (MUHS)	1st Year Final Year	65.8% Awaited
Bachelor of Physiotherapy (BPTh)	Physiotherapy School & Centre, Government Medical College and Hospital, Nagpur.	Maharashtra University of health sciences , Nashik (MUHS)	1st year	65.4%
			2nd year	69.1%
			3rd year	61.8%
			Final year	70.6%
HSC	Vani Vidyalaya	Maharashtra State Board	86%	
SSC	Vani Vidyalaya	Maharashtra State Board	87%	

OTHER:

- Volunteered with H.E.A.L institute at Standard Chartered Mumbai Marathon in 2017.
- Worked as Locum Physiotherapist In Om Physiotherapy & Weight Monitoring Centre, Dr. Savita Kshirsagar Clinic, Mulund East in year 2019, 2020.
- Participated and won in cultural events in school and graduation years.

PERSONAL DETAILS:

Date of Birth : 5th May 1995
Languages known : Tamil, English, Hindi and Marathi.

CURRICULUM VITAE

- **Personal Information:**

Name: Dr. Victoria Kuttan (PT)

Date of Birth: 08/07/1994

Marital status: Married

Address: R64, K. L. Colony Gandhinagar Kopri , Thane East, Maharashtra 400603

Contact no: 8452881656

Email ID: victoriakuttan66@gmail.com , victoriak@mgmsopnm.edu.in

- **Academic Background:**

Year	Year of passing	Number of attempts	Marks secured	Percentage
First	2013	1	585/800	68.9
Second	2014	1	496/700	70.85
Third	2015	1	354/500	70.80
Fourth	2016	1	620/820	76.50
1st MPT	2018	1	288/450	64.04
MPT Final	2019	1	424/550	77.09

- **Year of passing BPT:**2016
  MUHS University Rank Holder in MPT in Musculoskeletal Physiotherapy : 2019
  Registration Number

- **Work Experience:** As an assistant professor : from 18th February 2020 till date

- **Professional Organisation Membership: -**

Name of **Professional Organisation**	Registration/license number
Maharashtra State OTPT ,	2017/11/PT/006274
Indian association of Physiotherapist	L-50158

- **Conferences/Seminars /Workshop/course attended:**

- Faculty Development Program(FDP) , Shiksha 2.0, Sri Sri UNIVERSITY –Humar Resource Development Centre(HRDC), 18th June-17th July 2022
- Attended webinar on Prevention of disability : Translational research is the need of hour,11th March 2022, Shastri Indo-canadian Institute
- Workshop on Cancer Rehabilitation and emphasis on Lymphoedema management by Dr Shailendra Mehta, 26-28 August 2021
- Oncology Rehabilitation webinar 2020: Breast Cancer, Society of Oncophysiotherapy, 1st and 8th November 2020
- National Research Conference for Physiotherapy Teachers,2020
- Webinar on Evidence based practice, Dr Shrinivas Punbaji, Mid Michigan Health Services, USA,12th June
- Webinar : Aqua centric therapy from 28th April to 7th May
- Dissertation Writing. 23rd June 2019, DVVPF's COPT, Ahmednagar
- Evidence based Management of Osteoarthritis, 15-16th November 2018
- Resident a teacher –Basic Workshop in Education Methodology , MUHS, DVVPF's COPT , Ahmednagar 11-12th March 2019 (Karolinska Institute)
- Upper and Lower quarter Clinical Neurodynamics, Michael Shacklock ,Austrailia(6th -9th June 2018)
- Pre conference workshop in Exercise testing and prescription at 54th annual conference of Indian association of physiotherapy 17th -18th February 2018
- Evidence based Management of Osteoarthritis, 15-16th November 2018 (Karolinska Institute)
- State Level Research Conference MUHS, Nashik; 16th February 2018
- MUHS, MET; Basic Workshop in Research Methodology 18th -20th December, 2017
- National Conference of physiotherapy 16th -17th December 2017
- 54th Annual conference of Indian Association of Physiotherapy (IAP)- 19th,20th and 21st February 2016
- 4th international conference and workshop of physical therapy, - themed: PAIN, PALLIATION, MOBILITY .All India Institute of Medical Sciences (AIIMS), New Delhi.2015
- Prosthetic and Orthotics, 7th September 2015 at PDVVPF's COPT, Ahmednagar.
- AVISKAR – Research festival -2015 conducted by Maharashtra University of Health Sciences (MUHS), Nashik
- Recent advances in knee surgery (2014 – PDVVPF's medical college)

- **Papers or posters presented:**
- National Conference of physiotherapy 16th -17th December 2017
- 54th Annual conference of Indian Association of Physiotherapy (IAP)- 19th,20th and 21st February 2016
- 4th international conference and workshop of physical therapy, - themed: PAIN, PALLIATION, MOBILITY .All India Institute of Medical Sciences (AIIMS), New Delhi.2015
- AVISKAR – Research festival -2015 conducted by Maharashtra University of Health Sciences (MUHS), Nashik

Publications:

Sr.No	Title of publication	Authors	Journal. Year ; Issue
1	Does the position of knee angle alter the muscle fiber size?.	**Victoria. Kuttan**,Dr. Deepak Anap,Dr. Sushil Kachevar	Indian Journal of Basic and Applied Medical Research. 2017; 6(2):405-411.
2	Normative value of timed up and go test in school going children in the age group of 5-12 years in Ahmednagar district .	**Victoria. Kuttan**,Dr Suvarna Ganvir	VIMS health science journal.2017;4(4):187-189
3	Quantitative measurement of joint space width in knee Osteoarthritis.	**Victoria Kuttan** ,Deepak Anap	Lambart academic publishing.ISBN :978-3-330-02157-0
4	Knee Osteoarthritis revisited; but only after KL grading is tested: A Retrospective analysis	**Victoria. Kuttan,** Dr. Deepak Anap, Dr. Sushil Kachevar	Interational journal of clinical and biomedical research .2019;5(2):9-13
5	Does appropriate footwear prevent Knee pain?	**Victoria. Kuttan**	VIMS J Physical Th.June 2019;1:1
6	Immediate effect of instrument assisted soft tissue mobilization on hamstring muscle extensibility – pre and post test design.	Purva Katariya,Deepak anap,**Victoria Kuttan**	VIMS J Physical Th.June 2019;1:54-60
7	Feasibility of lateral wedge insole v/s neutral insole in combination with neuromuscular training on pain and function in patients with medial Compartment Osteoarthritis of Knee – A Pilot Double Blinded Randomized Control Trial	**Victoria Kuttan** ,Deepak Anap	IJBAMR,September 2019;8(4):213-224
8	Hemiplegic Shoulder Pain – A Case report	**Victoria Kuttan** ,Deepak Anap	VIMS Health Sci Journal 2019;6(4):106-110
9	Don't Let the pain stop you from walking .Combat Knee Osteoarthritis with neuromuscular training and lateral wedge insole	**Victoria Kuttan** ,Deepak Anap	Medworld Asia International Publication ISBN :978-81-94611-4-1
10	Assessment and comparison of agility in cricketers depending on their playing position –an observational pilot study	Shloka Jaywant, **Victoria Kuttan**	International Journal of Science & Healthcare Research .2022;7(3):61-65

OBJECTIVE AND SKILLS/MAIN TASK PERFORMED

1. Provides a high level of clinical expertise in physiotherapeutic management of patients using safe, effective and evidence based interventions in accordance with the professional guidelines.
2. Design, develop and deliver individualized physiotherapy treatment plan based on the physician's referral, clinical records and evaluation and observation of patient's functional status.
3. Communicates effectively with patients and care givers providing accurate and appropriate information to promote understanding of their condition and of the aims of the interventions and services.
4. Maintains comprehensive, accurate and up to date patient records.
5. Liaise with other disciplines in hospital, community and voluntary agencies promoting multidisciplinary working, good communication and exchange of information.
6. Attends multidisciplinary meetings, case conferences and ward rounds as required
7. Implement and participate in Quality Assurance and risk management activities.
8. Adheres to professional. Departmental and hospital standards and guidelines.
9. Demonstrates good time management balancing clinical and non-clinical aspects of the post.
10. Maintains and deve2lops professional competence by attending educational programs.
11. Recommends and provides equipments as required and take responsibility for the care and maintenance of the equipments.
12. Provides support, supervision and teaching for junior staff and assistants.
13. Maintains good communication and co-operation with other members of the physiotherapy team.
14. Provides treatments in hospital on an out-patient and in-patient basis.

To The HR,

Dear Sir/ Madam, I am currently working as an assistant professor in Muscloskeleletal Physiotherapy ,MGM School of Physiotherapy ,MGMIHS, Navi Mumbai

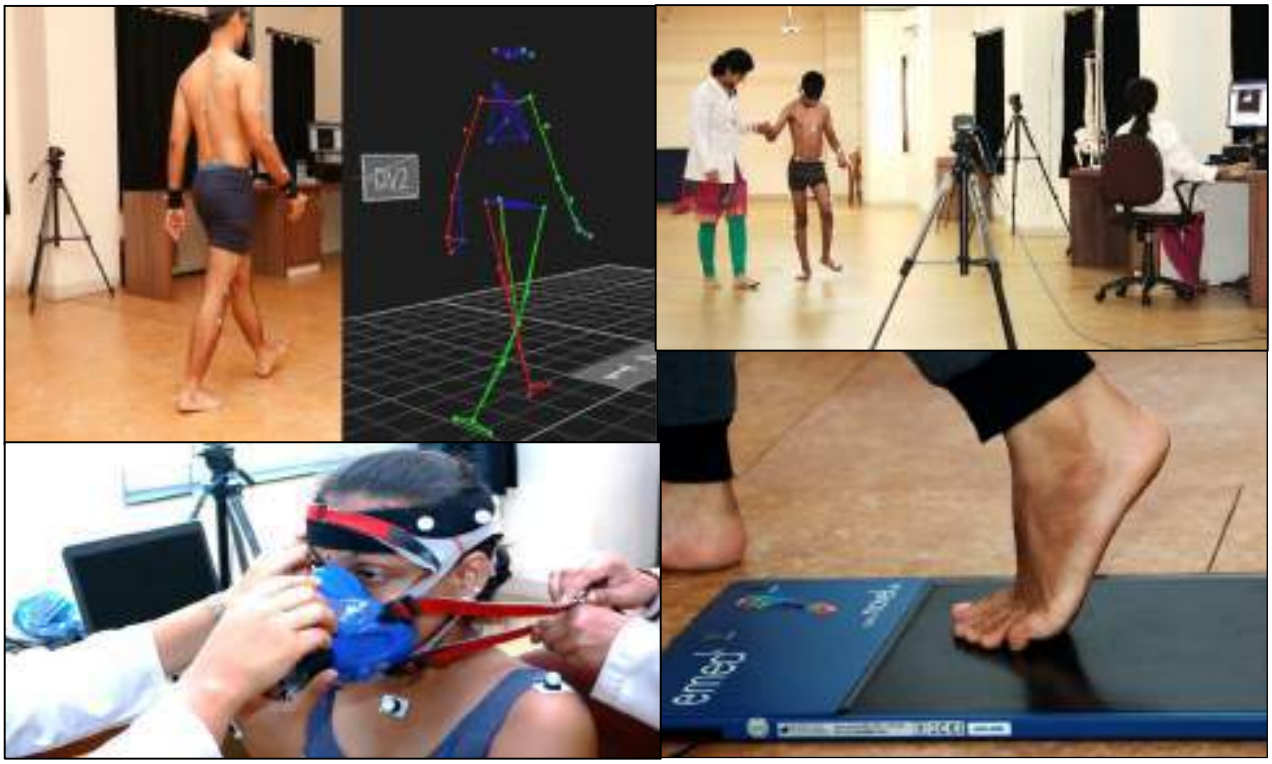
Thanking you
Dr Victoria Kuttan(PT)

MGM School of Physiotherapy

MGM Institute of Health Sciences, Navi Mumbai

MGM Institute of Health Sciences'
Distinctiveness

MGM Centre of Human Movement Science



2015-2022

Contents

Preamble

Human movement science has grown rapidly over the last half a century in the western countries. Scientists from a wide spectrum of healthcare fields (physiotherapy, surgery, prosthetics-orthotics, anatomy, etc.) and engineering (mechanical, biomedical, aeronautical, etc.) have contributed with robust research to evolve this field. Applications of human movement science range from health promotion, clinical rehabilitation, sports and dance injury, orthotic and prosthetic design, medical device innovations, etc.

In India, the science of human movement is growing gradually. Health and Engineering Institutes like IITs (mechanical, biomedical and aeronautical engineering departments), IISc, Bangalore; BARC; DRDO, NITIE, SRASSC, Manipal Academy, Physiotherapy Institutes, SAI etc. are pursuing academic and research activities in human movement science. However, each institute is working in isolation within a specific mandate of funded projects; resulting in scattered growth of biomechanics throughout India. High-end fundamental research and elite applied clinical work is going on at a few health and engineering institutes, in addition to focused efforts towards indigenous development of robust and affordable prosthesis. However, a need for concerted, cohesive inter-disciplinary effort to develop appropriate healthcare solutions is still perceived.

Engineers and healthcare professionals need to work together to achieve this goal. Medical device innovation has already gained momentum in India with dedicated Centre's like BETiC, TCS Innovation Labs, etc. which seek complementary support from MGM Centre of Human Movement Science. An exemplary partnership between MGM Centre of Human Movement Science and BETiC, IITB is trying to address an urgent need of integrating clinical biomechanics in healthcare for past 5 years.

MGM Centre of Human Movement Science is committed to develop this science in India, disseminate fundamental knowledge and study applications of movement science in health promotion and rehabilitation, to address unmet local and global needs of people from across all economic strata of society. The Team of enthusiastic Physiotherapists, Human movement scientists and Mechanical engineers is working towards creating indigenous simple bold healthcare solutions; designed to engage the mechanical marvel of human body itself to keep people mobile and functionally independent. The philosophy is driven by the fact that technology cannot afford to reach every part of the world, which is challenged by health problems caused by movement disorders. Hence, we explore movement to promote it as a therapeutic device for health promotion and clinical rehabilitation.

On the other hand, The Centre is engaged in applying knowledge of human movement science in design and validation of technology for health promotion, early detection and rehabilitation of people living with movement impairments. Collaboration with national and international health and engineering institutes with high research repute strengthens our multidisciplinary approach to develop relevant movement science applications.

Our 6 year report encompasses the progress of MGM Centre of Human Movement Science since 2015. We present this report to students, researchers and professionals from health care and engineering fields with an aim of engaging them in the goal of generating a multi-disciplinary task force within the country for undertaking research and developing movement science further in India.

Dr. Rajani Mullerpatan & Team of MGM Centre of Human Movement Science

Preface

Dr. Anil Kakodkar
Chairman, Rajiv Gandhi Science and Technology Commission

"I have participated in most of your annual meetings if not all of them. Every time I have been watching progress and new things. Today I get a sense that the Centre has got an existence of its own. The Centre is growing with its collaborative work not just with Indian Institutes but across various nodes even abroad. I am extremely delighted to be a part of this discussion. I want to make a few suggestions and comments for your consideration. Healthcare program that we have around is essentially a sick care program and not a healthcare program. Healthcare program should have preventive part which is currently missing. We can look at the program as human wellness program which can include biomechanics, human movement science, traditional Indian and art such as classical Indian dance forms. The field is quite broad and everything can't be brought under this umbrella on day 1. But things can be started off in this direction. For example, at one centre there was a research conducted on postures of Suryanamaskar by an orthopaedic surgeon who suggested addition of relevant poses for better joint mobility in existing 12-pose Suryanamaskar cycle and named it as Samarthanamaskar as he was a devotee of Swami Samartha Ramdas. Several people complain of knee problems and the Indian habit of squatting and how it becomes difficult after total knee arthroplasty. I have seen surgeons performing hemi-replacements of knee joint and patients are able to perform squatting post-operatively. I think these are some of the benefits of understanding human movement science. The Centre that you have created has a huge potential in developing human movement science. The ecosystem that you have built around the Centre with several partner institutions in various areas of specialization and different disciplines, gives us a great opportunity to move forward in that direction. In that context, I want to endorse what Dr. Ravi said earlier. You have within MGM campus, various institutions such as engineering colleges, medical colleges and you are a University in itself and I think you must leverage your autonomy by creating academic, research, research translation and industry engagement programmes where human movement science can be looked at in a very holistic way. Centre is already conducting activities for academic training, research, technology and device validation. The Centre has already started research on traditional sports, classical dance and day to day ground level activities. While talking about the overall subject of human wellness, we should also integrate biomechanics, biochemical aspects and neural connection of human body. There is a great connection between artificial intelligence to human health. Creating facilities for supporting human wellness for people who are differently-abled rather than apparently mechanical looking gadgets incorporating human intelligence with artificial intelligence technology. Relationship between human brain and external computer can work in coordination. These can be some powerful tools for development. In terms of Human

movement science, there can be human neurological control or artificial control. Since you are an inter-disciplinary team, people doing PhD and Masters level projects in a joint mode i.e. medical fraternity and engineering fraternity working together is an area you might like to carry forward. The last point that I wish to make is more general. You have come this far and if I had to ask you what's your strength. Your strength is the great ecosystem that you have built around. The point is that suppose it was Dr. Rajani, faculty member in Physiotherapy Department of MGM doing a regular job, clearly all this was not possible. Suppose Dr. Rajani had interest in research in the area of biomechanics and you would have decided to do the possible research in your department then you would have not come this far. The main reason for success of this Centre is the ecosystem that you have built. For Indian Science and technology to go forward, the so called "Atmanirbhar Bharat" will not be possible by creating slogans. Atmanirbhar Bharat will only be possible by creating such ecosystems. All complimentary elements which are required for translation of technology/information from lab to market, all of them should be a part of that ecosystem. And you have successfully created a fairly good ecosystem. If you are broadening your vision, you probably need to expand your ecosystem around you. You have come this far by yourself with your excellent work. You are on a jumping board now. So you can jump very high and I wish you all the very best for your success. Last year we championed saying let's take this society forward, take it along with everybody who is involved. If there is difficulty in making that happen then I suggest you change the name of the society Biomechanics to a broader version Human Wellness or Human wellness or science and create a new initiative. Let the old thing remain where it is and create a new Centre because sometimes the old becomes a bottle neck and a hurdle. So you have given enough opportunity to take everybody along. If you see a quick success then you go along with it. If you don't see that happening, then broaden the horizon and create a new society by its own name."

Dr. Anil Kakodkar

Chairman, Rajiv Gandhi Science and Technology Commission

An Indian nuclear physicist and mechanical engineer awarded Padma Shri (1998), Padma Bhushan (1999), Padma Vibhushan (2009).

Former Chairman, Atomic Energy Commission of India
Former Secretary to the Government of India
Former Director of Bhabha Atomic Research Centre
Chairman, Board of Governors of the Indian Institute of Technology, Bombay

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Executive Summary

MGM Centre of Human Movement Science (MGMCHMS) has accomplished 5 successful years since its establishment in 2015. It was established by MGM School of Physiotherapy, a Constituent Unit of MGM Institute of Health Sciences, Navi Mumbai on 5th Oct 2015. The Centre was funded by International Society of Biomechanics and BETiC, IIT-Bombay to address an urgent need to integrate clinical biomechanics in Indian healthcare.

The vision is to generate a task force within the country to undertake research and develop human movement science in India, by conducting integrated training for clinicians and engineers. The Centre assumes uniqueness in India, by conducting four major activities under one roof in parallel, namely: training, research, clinical service and technology design and validation.

In past 6 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 20 training courses. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1500 students from Physiotherapy (including BPT & MPT), BTech, MTech, BE, Prosthetics & Orthotics(BPO) and Orthopedics(MS) benefitted from biomechanics training.

Research activities designed for biomechanical exploration of indigenous movements and postures practiced in India, namely: Yoga, indigenous daily life postures, traditional sports and Indian classical dance forms (11) and clinical rehabilitation (6) have yielded 78 original scientific papers in peer reviewed Scopus/PubMed indexed journals. The Centre was invited to publish research findings in a special volume of Journal of Critical Reviews™ in Physical and Rehabilitation Medicine (Volume 31, 2019 Issue 1: indexed in Scopus), with a theme 'Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in Middle-Income Countries'. Furthermore, the research output is compiled into a chapter titled 'Biomechanics of Indigenous Postures' in the Textbook of Basic Biomechanics of the Musculoskeletal System, 5ed, Publishers: Wolters Kluwer which is due for publication in Jan 2021.
Original fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted. Two patents are filed for design of technology pertinent to rehabilitation.

Inter-disciplinary collaborative research between Department of Mechanical Engineering, IIT Bombay and MGM School of Physiotherapy, Navi Mumbai resulted in development of a powered trans-tibial prosthesis for people with below knee amputation which was funded by Department of Biotechnology.

An external, self-wearable, low-cost, spring loaded passive exoskeleton was designed to reduce trunk muscle fatigue in manual laborers. The device was tested on healthy people and Mathadi workers with and without low back pain and results revealed 25% reduction in onset of fatigue. A proposal is shortlisted by Early Translation Accelerator (ETA) (established at BETIC, IIT Bombay), supported by BIRAC, New Delhi, to support its further development in a commercially viable product and license it to an industry partner. Pilot work is in process for clinical testing of a device for early detection of risk to ulceration among people with diabetic neuropathy.

Our efforts continue to explore-i) the value of squat, a traditionally practiced Indian movement for maintenance of lower extremity muscle strength, joint motion, mobility and walking capacity among people with knee osteoarthritis; ii) to help children with cerebral palsy undergoing single event multiple level surgery, a tool is being developed for home based monitoring of function; iii) biomechanics and energy cost of two modifications of traditional Suryanamaskar for application in elderly people (a collaborative project with Sancheti College of Physiotherapy, Pune).

Over 1000 patients (traumatic sports/dance or mechanical injury, cerebral palsy, stroke, Parkinson's disease, amputations, diabetic neuropathy, osteoarthritis, joint replacement) have benefitted from robust evaluation for gait analysis (at one-third of prevailing cost), balance assessment, foot geometry and pressure evaluation at markedly subsidized cost. Quantified objective reports helped surgeons, physiotherapists and prostheticians and orthoticians to plan targeted surgical interventions and therapy to optimize function after trauma/disorder.

In addition to patient care, the Centre has supported individual innovators and organizations to validate 11 ingeniously designed devices against gold standard to address unmet needs in clinical rehabilitation of patients with poliomyelitis (3), lower extremity amputations (3), diabetes (1), backache (1), health promotion (1), athletic performance (1) and gait (1). Amongst these 9 devices, 'Diabetic Foot Screening Device' and 'Mechanical Actuated Stance Control Knee Ankle Foot Orthosis' for people with polio' attracted funding from BIRAC for small-scale production and commercialization. Individual innovators ranged from entrepreneurs to our youngest listed innovator who was a standard X school student, who bagged Grand Prize at the Initiative for Research and Innovation in Science (IRIS) National Fair 2016 (New Delhi) and qualified to represent India at the Intel International Science and Engineering Fair 2017 held in Los Angeles, USA.

The dedicated team of 5 Physiotherapy faculty members and 2 Research Associate complemented by mechanical Engineers from IIT Bombay, Queen's University, Canada; Human movement scientists from Cardiff University, UK along with 7 Ph.D. scholars, 17 MPT scholars, 7 M. Tech scholars and 24 BPT Students contributed to the growth of MGMCHMS in the past 5 years. A cohesive inter-disciplinary effort between healthcare professionals and engineers is a highlight of the team work at MGMCHMS resulting in translational healthcare research.

Presently it is geared to be recognized as the Centre of Excellence in Human Movement Science at national level. Additionally, it is equipped with expertise, skill and resources to assume position of a National Centre for validation of technology in the area of rehabilitation of movement disorders.

In the future, we envisage scaling our efforts for training and research to promote movement as a therapeutic device for health promotion and rehabilitation of people through a culturally palatable approach.

Dr. Rajani Mullerpatan

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MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

MGM CENTRE OF HUMAN MOVEMENT SCIENCE

Sector-30, Plot 46, Vashi, Navi Mumbai

MGM SCHOOL OF PHYSIOTHERAPY
Sector-1, Kamothe, Navi Mumbai

VISION

The aim is to generate a task force within the country to undertake research & conduct integrated training for health care professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders

MISSION

The mission is to provide people with robust & comprehensive movement-analysis facilities following injury/disorder at an affordable cost for precise clinical-decision-making.

MGM Institute of Health Sciences Board

Shri Kamalkishor Kadam, Chancellor

"MGM Institute of Health Sciences is proud of MGM Centre of Human Movement Science, as its Centre of Excellence. Exclusive multi-disciplinary work in training, research, patient care and technology design & validation in application of human movement science in healthcare, conducted under one roof makes the Centre unique and distinctive to MGMIHS. Focused efforts in the past 5 years resulting in noteworthy contribution to development of human movement science and its application to patient care, warrants recognition as National Centre of Excellence in Human Movement Science. Robust gold-standard technology and expertise at the Centre makes it eligible to emerge as a National Centre for Validation of Technology designed for rehabilitation of movement disorders. Due support from State and Central Government funding agencies will foster further collaborative research to promote movement as a therapeutic tool for health promotion and rehabilitation and design movement enhancement technology to benefit people from all economic strata across the globe"

Prof. Shashank D Dalvi, Vice- Chancellor

"MGM Centre of Human Movement Sciences (MGM CHMS) has completed five years, with flying colors. Biomechanics is emerging branch and there are large number of areas which needs exploration. Latest equipment's, collaboration with IIT Bombay, has made it possible. Reference data or Gold standards for comparison are not available in the field of Biomechanics that needs to be prepared. In validation of technology in the area of rehabilitation of movement disorders, this Centre can play pivotal role. In management of various diseases like Parkinsonism, Cerebral Palsy, this Centre is working hard. As this Centre is having international recognition, all modern equipment's required for study purpose, hard-working faculty of MGM School of Physiotherapy, this is one of the Centre of Excellence of MGM Institute of Health Sciences, Navi Mumbai. On this occasion, I wish all the success in future journey of MGMCHMS Centre of MGM School of Physiotherapy, constituent unit of MGM Institute of Health Sciences, Navi Mumbai."

Dr. Sudhir.N. Kadam, Medical Director

"MGM Institute of Health Sciences encourages exclusive initiatives in health care as it pursues its mission of delivering evidence based compassionate care to our population at an affordable cost. MGM Centre of Human Movement Science is one of our exclusive facilities, which is nurturing academic, research, patient care and technology design activities under a single roof. I was involved in planning this Centre to address an urgent need to integrate applications of human movement science in healthcare in India. It has been a pleasure to witness the growth of MGMCHMS right from its inception. I urge clinicians, researchers and academicians in Maharashtra, rest of India and across the globe to use this facility to create innovative solutions of local need and global merit for best possible patient care. Congratulations on its 5-year milestone and best wishes to MGM CHMS to grow into a Centre of Excellence for Human Movement Science! "

Dr. Nitin Kadam, Pro Vice Chancellor

"MGM Centre of Human Movement Science has aptly initiated the movement at the upcoming hospital of MGM Trust at Vashi. It is my pleasure to witness growth of this Centre from its inception on paper into reality! We are proud to offer this exclusive specialized service at MGM Superspecialty Hospital to patients with movement disorders. We feel confident that this facility will go a long way in improving treatment outcome of our patients. Ongoing, robust research activities will continuously monitor and evaluate of MGMCHMS to ensure effective service. My best wishes to MGMCHMS for all success."

Collaborators

BETiC (IITB):

BETiC is a multi-disciplinary biomedical engineering and technology incubation Centre which facilitates rapid translation of innovative ideas from surgeons into high-quality low-cost medical devices suitable for the local population. BETiC is funded by the Rajiv Gandhi S&T Commission of Maharashtra Government and the Department of S&T, New Delhi.

Prof. B. Ravi (Institute Chair Professor and Head, BETiC, IIT Bombay):

"It is really heartening to see the excellent progress at MGM CHMS in the last 5 years. Commendable progress by extremelycapable and committed team. This has evolved into one of the finest facilities in the country, perhaps across Asia, for scientificstudy of human movement. Dr. Rajani and her committed teamare to be commended for their efforts as well as impact so far. Valuable clinical data has been generated, useful for both diagnostics and treatment for a range of disorders prevalent inIndia. Equally important, the facilities have benefitted hundreds of medical and engineering students as well as professionals, byexposing and training them in clinical biomechanics - an important interdisciplinary field that is rapidly taking root in India. BETiC, IIT Bombay is proud to be associated with CHMS by setting up and sharing common facilities, collaborative projects and training programs. It brings me honor and I am very happy to be associated right from the beginning of MGM Centre of Human Movement Sciences. In particular, the Centre has enabled clinical validation of many innovative products developed at BETIC and other R&D labs in the country. We are happy to see the growing network of leading researchers from other national institutes, who are forming similar partnerships with CHMS.

International Society of Biomechanics

The International Society of Biomechanics (ISB) was founded at Penn State University on August 30, 1973 to promote the study of all areas of biomechanics at the international level.
The ISB promotes and supports international contacts amongst scientists, the dissemination of knowledge, and the activities of national organizations in the field of biomechanics. The ISB has a broad view of the science and application of biomechanics, believing that biomechanics has a major role in the study of all biological systems, from the level of the whole organism down to molecular size scales. Therefore, the Society's membership includes scientists from a large variety of disciplines including anatomy, physiology, engineering (biomedical, mechanical, mechatronics, etc.), orthopedics, rehabilitation medicine, sports science, sports medicine, ergonomics, electrophysiological kinesiology and others.

Dr. Tony Arndt
President, International Society of Biomechanics

"MGM Institute of Health Sciences encourages exclusive initiatives in health care as it pursues its mission of delivering evidence based compassionate care to our population at an affordable cost. MGM Centre of Human Movement Science is one of our exclusive facilities, which is nurturing academic, research, patient care and technology design activities under a single roof. I was involved in planning this Centre to address an urgent need to integrate applications of human movement science in healthcare in India. It has been a pleasure to witness the growth of MGMCHMS right from its inception. I urge clinicians, researchers and academicians in Maharashtra, rest of India and across the globe to use this facility to create innovative solutions of local need and global merit for best possible patient care. Congratulations on its 5-year milestone and best wishes to MGM CHMS to grow into a Centre of Excellence for Human Movement Science!

John H Challis, Ph.D.

Former President, International Society of Biomechanics

ISB has a history of supporting biomechanics projects all around the world. When Dr. Rajani Mullerpatan approached the ISB about assistance in setting-up the MGM Centre of Human Movement Science, it was a project which we enthusiastically embraced. As a former President of the ISB, I witnessed Dr. Rajani Mullerpatan at meetings of the ISB Executive Council presenting the case for the Centre in a thorough and enthusiastic way. She was a great and effective advocate for this project. Five years after its inception, the Centre boasts an impressive state of the art facility with a dedicated team providing important services. The range of projects is impressive from clinical work, to projects specific to the Indian lifestyle. From inception to realization this project has met and generally exceeded the expectations of the ISB – this is a testament to Centre personnel. Congratulations to the Centre as it celebrates its fifth anniversary.
Biomechanics Lab, Penn State University, USA

Faculty Profile

Prof. Director Dr. Rajani Mullerpatan

Dr. R Mullerpatan (BSc PT-1992, MScPT-1995, Mumbai University, PhD -2007, Cardiff University) leads MGM School of Physiotherapy at MGM Institute of Health Sciences, Navi Mumbai (since 2008). After completing her doctoral program at Research Centre for Clinical Kinesiology at Cardiff University, UK (2007), she is currently focused on development of Biomechanics in India to meet local healthcare needs of Indian population. She has collaborated with leading national and international institutions in UK, Canada & Australia to promote training and research in health promotion, clinical biomechanics, clinical rehabilitation and technology design. Her passion and commitment along with a dedicated Team drives activities of clinical service, research and training at MGMCHMS (2008 onwards).

Dr. Bela Agarwal: Dr. Bela Agarwal's expertise lies in the area of cardiorespiratory and pulmonary. Physiotherapy, the science of exercise physiology and exercise testing. A graduate from Seth.GS Medical College, Mumbai and a post graduate from Lokmanya Tilak Municipal Medical College, Mumbai in 1992, she has been working in the profession for 22 years at acclaimed teaching institutes, hospitals and clinics. She is a Professor at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai since the past 5 years in a part time capacity and is also pursuing doctoral studies at MGMSOP in the area of clinical biomechanics. She has keen interest in studying energy expenditure of movements and relating motion analysis to functional performance and capacity enhancement. (2012 onwards).

Dr. Triveni Shetty (PT):

Dr. Triveni Shetty (PT), graduated from Dr. D.Y Patil College of Physiotherapy under MUHS, completed her Masters in Neurosciences from T.N.M.C, Medical College, Nair Hospital in 2013. She also holds a Diploma in Rehabilitation-Physiotherapy degree from All India Institute of Physical medicine and Rehabilitation. With keen interest in pediatrics and movement analysis of developmental disorders, she is currently working as a Associate Professor and is an in- house research scholar pursuing her Ph.D. unthe der the guidance of Dr. Rajani Mullerpatan. She is working with MGMCHMS team since its inception and plays a key role in capturing and processing data from VICON motion analysis system. (2015 onwards).

Faculty Profile

Dr. Akhila Natesan (PT):

Dr. Akhila N (PT), graduated from Government Medical College, MUHS in 2017, completed her Masters in Cardiorespiratory Physiotherapy from T.N.M.C, Medical College, Nair Hospital in 2021. She is currently working as an Assistant Professor at MGM School of Physiotherapy since September 2021 and a core teammember of MGMCHMS. Her expertise lies in the area of traditional Indian dance and she is currently exploring dance biomechanics of Indian classical dance forms. (2021 onwards).

Dr. Victoria Kuttan (PT):

Dr. Victoria K (PT), graduated from D.V.V.P. F's College of Physiotherapy, Maharashtra University of Health Sciences in 2017 completed her Masters in Musculoskeletal Physiotherapy from the same institution, in 2020. She is an Assistant Professor at MGM School of Physiotherapy since January 2022 and a core teammember of MGM Centre of Human Movement Science. Her expertise lies in the area of biomechanical exploration in various musculoskeletal disorders. (2022 onwards).

Dr. Shrutika Parab (PT):

Dr. Shrutika Dilip Parab (PT) qualified as Masters of Physiotherapy (MPTh) in 2017 under MGM Institute of Health Sciences (MGMIHS), Navi Mumbai. Her post-graduate thesis focused on the Influence of Random and Blocked Practice Schedules on Motor Learning in Children Aged 6–12 Years. She has completed Bachelors of Physiotherapy (BPTh) from MGM School of Physiotherapy, Navi Mumbai in the year 2015. She has been Awarded the "Chancellor's Best Graduate Gold Medal" Batch 2010-14 and was felicitated by Honorable Ex-Union Minister Mr. Sharad Chandra Pawar. She is working as an Assistant Professor at Department of Neurophysiotherapy, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai. (2017 onwards).

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PhD Scholar

Dr. Triveni Shetty (PT): Enrollment: 2016

Dr. Triveni Shetty (PT), is currently working as an Associate Professor and is an in- house research scholar. With a keen interest in neuro-pediatric rehabilitation, she is pursuing her Ph.D. under the guidance of Dr. Rajani Mullerpatan (2015 onwards).

Dr. Poonam Desai (PT)- Enrollment: 2019

Dr. Poonam Desai (PT) completed Master of Physiotherapy in Musculoskeletal Sciences from Sunandan Divatia School of Science, Narsee Monji Institute, Mumbai. With keen interest in Geriatrics she is currently pursuing her PhD under the guidance of Dr. Rajani Mullerpatan. (June 2019 onwards).

Dr. Gaurav Mhaske (PT)- Enrollment: 2021

Dr. Gaurav (PT) completed Master of Physiotherapy in Neurosciences from KLEU Institute of Physiotherapy, Belagavi, Karnataka in 2015. He is currently working as Assistant Professor in MGM's Institute of Physiotherapy, Aurangabad and is pursuing his PhD under the guidance of Dr. Rajani Mullerpatan. (July 2021 onwards).

Dr. Sona Kolke (PT)- Enrollment: 2021

Dr. Sona (PT) completed Master of Physiotherapy in Musculoskeletal physiotherapy from Lokmanya Tilak Municipal Medical College, Mumbai in 1995. She is currently working as Associate Professor in Sancheti Institute College of Physiotherapy, Pune and is pursuing her PhD under the guidance of Dr. Rajani Mullerpatan. (July 2021 onwards).

Dr. Bhoomika Sawant (PT)- Enrollment: 2021

Dr. Bhoomika (PT) completed Master of Physiotherapy (MPTh) in Cardiovascular and Pulmonary Physiotherapy and Fitness in 2019 under MGM School of Physiotherapy, Navi Mumbai with a keen interest in cardiorespiratory rehabilitation she is pursuing her PhD under the guidance of Dr. Rajani Mullerpatan. (July 2021 onwards).

Dr. Rinkle Malani (PT)-Enrollment: 2021

Dr. Rinkle (PT) is Principal of MGM School of Physiotherapy, Aurangabad. She has keen interest in the field of chronic pain assessment and management and she is pursuing her PhD under the guidance of Dr. Rajani Mullerpatan. (July 2021 onwards).

Dr. Mamta Shetty (PT)- Enrollment: 2021

Dr. Mamta (PT) completed Master of Physiotherapy (MPTh) in Musculoskeletal Physiotherapy from Terna Physiotherapy College, Navi Mumbai, affiliated to Maharashtra University of Health Sciences (MUHS) in the year 2017. She is currently working as Assistant Professor and is an in- house research scholar.

Research Scholar

Senior Research Fellow

Dr Bindya Sharma (PT)

Dr. Bindya Sharma(PT) worked as an Assistant Professor for Musculoskeletal Physiotherapy Dept at Pad. Dr D.Y. Patil College of Physiotherapy. She worked as Senior Research Fellow in MGMCHMS for a brief period. (March 2017-August 2017).

Dr. Megha Sonkhia (PT)-

Dr. Megha (PT) graduated from M.G.M. Medical College, Indore, completed her Masters in Musculoskeletal science from Swami Vivekananda National Institute of rehabilitation Trading and Research. Megha has worked as an Assistant professor and guest faculty. She has a keen interest in research and worked as Senior Research Fellow in MGMCHMS (Aug 2017-Feb 2019).

Dr. Blessy Thomas (PT)

Dr. Blessy Thomas (PT), graduate from MGM College of Physiotherapy, Aurangabad in 2014 and post-graduate from MGM School of Physiotherapy, Navi Mumbai in 2016; worked as a Physiotherapist for 1.5yrs in Multispecialty hospitals. She has keen interest in research and worked as Senior Research Fellow in MGMCHMS (Mar 2019-Mar 2020).

Junior Research Fellow

Dr. Gavin Fernandes (PT)

Dr. Gavin Fernandes (PT), an alumnus of MGM School of Physiotherapy, MGM Institute of Health Sciences graduated in the year 2020. He is currently working as a Project Research Assistant at BETiC, IIT Bombay for the validation of indigenously developed device for assessing the plantar tissue stiffness in collaboration with MGM Centre of Human Movement Science. (2021 onwards)

Dr. Misbah Shaikh (PT):

Dr. Misbah Shaikh (PT), graduated from MGM College of Physiotherapy, Maharashtra University of Health Sciences in 2021. She is currently working as a research assistant for the validation of indigenously developed device for assessing the plantar tissue stiffness. (2022 onwards)

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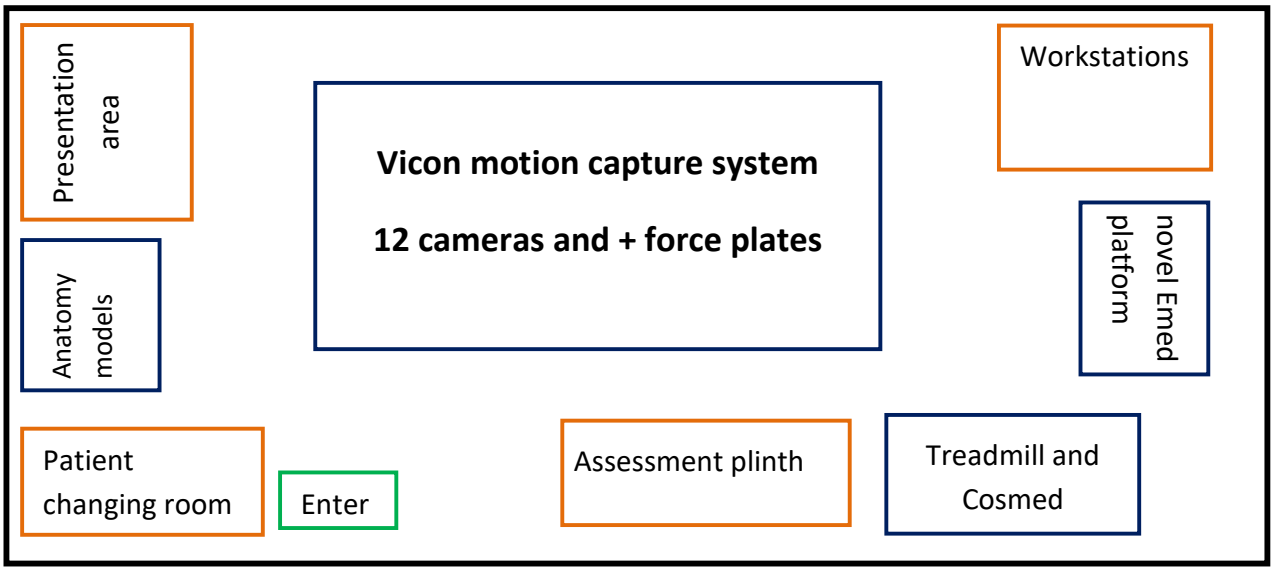
Facilities

MGM CHMS is spread over 2116 sq. feet area, equipped with robust state of art technology for comprehensive evaluation of human motion. MGM CHMS is located on the first floor of MGM super specialty hospital in Vashi, Navi Mumbai. The lab is 92 ft. long x 23 ft. wide x 13 ft. high.



Layout of MGM Centre of Human Movement Science

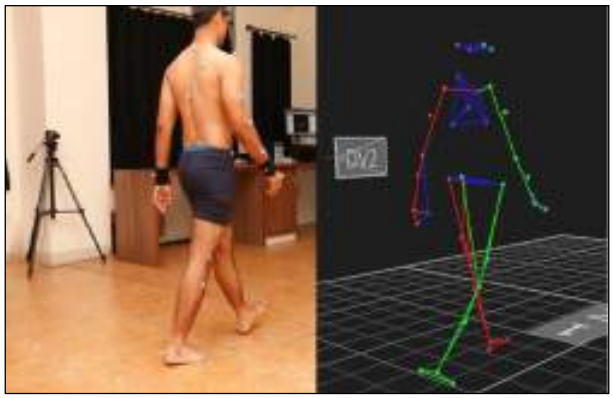
❖ Vicon motion capture system and AMTI force plates:

MGM CHMS motion analysis system is a robust gold standard equipment which includes- 12 [Bonita] 240 fps optical cameras (VICON, UK), 2 VGA video camera and three force platforms (AMTI, USA).

VICON motion analysis system has the potential to offer objective and unbiased gait information that can assist clinical decision-making. In addition, motion analysis can be used to influence decision making for orthopedic surgery and assess post treatment progress. AMTI biomechanics force platforms are designed to measure forces, moments and are sensitive to accelerations. Force plates can be used individually or as a walkway to record multiple footfalls.

VICON along with AMTI force plates is a state of art system for comprehensive motion analysis and allows reliable assessment of kinematics and kinetics of human movement. The system is extensively used in research setting for evaluation of motion in all three planes.

The MGMCHMS is also equipped with Vicon Polygon reporting software. This is an integrated visualization and report editing tool that enables quick and easy creation of a gait report. Polygon analyzes trial data that has been created with Vicon motion capture and processing software. Though the software contains modeled data generated by Vicon biomechanical modeling software (such as Plug-in gait, bodybuilder and OLGA); MGM CHMS has generated custom based template for gait analysis with reference values generated from Indian population, thus providing a better understanding of the deviations pertaining to our population.



❖ Novel e-med system for plantar pressure analysis:

E-med® Pedography platform at MGM Centre of Human Movement Science is gold standard system for foot geometry and plantar pressure distribution (Novel e-med, Germany). E-med ® Pedobarography platform (frequency 100Hz, resolution: 4 sensors/cm 2, sensor area: 574x320mm) is an accurate electronic system for recording and evaluating foot geometry and plantar pressure distribution under static and dynamic conditions. It consists of calibrated capacitive sensors that provide robust, objective and reliable information on foot function.

The Emed platform is extensively used for scientific research on foot geometry and pressure distribution. The system provides maximum and average plantar pressure over total foot as well as regional pressure distribution over forefoot, midfoot, hindfoot, hallux and toes. Apart from measurement of foot geometry, important measures such as arch index, hallux angle, coefficient of spreading etc can also be computed which are unavailable from traditional foot print system. Pedobarography measurement has significant applications in footwear design, sports biomechanics to correct altered landing pattern.

❖ Electromyography system:

Delsys Bagnoli EMG System: Delsys Bagnoli EMG DSY-DS-B03 is a 8 channel wire-less device which can be connected to VICON software so that it is helpful in various range of biomechanical research activity such as muscle activity in gait cycle, sports biomechanics.

The ProComp Infiniti: The ProComp Infiniti SA7500 encoder is an eight (8) channel, multi-modality device for real-time computerized biofeedback and data acquisition. It has 8 protected pin sensor inputs with two channels sampled at 2048 s/s and six channels sampled at 256 s/s. The ProComp Infiniti encoder is able to render a wide and comprehensive range of objective physiological signs used in clinical observation and biofeedback. All sensors are completely noninvasive and require little or no preparation for use.

❖ Step Activity Monitor:

The Step Activity Monitor (SAM) by Orthocare Innovations is a highly accurate ankle worn ambulatory activity monitor, the size of a small pager. The StepWatch works with a docking station and software that handles stet-up, downloading, display, analysis, and many other functions. It detects steps for a wide variety of normal and abnormal gait style and cadence ranging from a slow shuffle to a fast run. It has a capacity to monitor and store data for a month.

❖ Trunk Leg Dynamometer:

The Trunk leg dynamometer is an objective instrument for assessing trunk and leg strength. Due to its design, it provides an accurate and safe way to take measurements. A trunk dynamometer measures isometric and concentric strength and muscular endurance of the extensors and flexors of the lumbar and thoracic spine. The oversized body includes a solid base for safety as well as cushion handgrips for comfort. Chain adjusts for height differences or to vary the point of force application. Strength indicator remains at subject's maximum reading until reset. The scale measures to 660 lbs. or 300kg

❖ Vibrothesiometer:

Digital Vibrothesiometer is a robust objective non-invasive tool to detect neuropathy. The vibrometer helps to detect the loss of vibration perception threshold (VPT) accurately. This device is equipped with an electronic tuning fork which has vibration strength that slowly increases till the patient faces the vibration sensation. The digital vibrometer is integrated with a software system that enables storage of data and multiple reports of various patients.

❖ Body Composition Analyser(A202 Tanita):

Tanita is the standard and market leader for body composition analyzers. A Tanita body composition monitor provides valuable measurements regarding body fat, skeletal muscle mass and water content. These measurements indicate body fat, muscles metabolism, bone structure and body water. The equipment provides a quick non- invasive method to assess body composition, an important component of physical fitness.

❖ Oxygen Consumption Analyzer (Fitmate Med, COSMED):

Fitmate Med by COSMED, Italy is an electronic device developed for assessing resting metabolism, cardio-respiratory fitness (VO2max) and basic spirometry (FVC, SVC, MVV). It allows personalized weight management programs and exercise prescriptions according to the ACSM's latest recommendations. It is sensitive equipment that provides accurate respiratory gas analysis and real time oxygen consumption. Energy expenditure of activity is computed and comprehensive analysis of cardio-respiratory and metabolic systems allows for monitoring treatment outcomes and prescription of evidence based activity. This non–invasive, indirect measure permits evaluation of sub-maximal and maximal exercise performance. It involves measurements of gas exchange, primarily oxygen uptake i.e. VO_2, minute ventilation, heart rate, respiratory frequency and energy expenditure. VO2 at maximal exercise (peak VO2) is considered the best index of aerobic capacity and cardio-respiratory function. It is a sensitive measure which can be used to understand cardio-respiratory function in health and disease.

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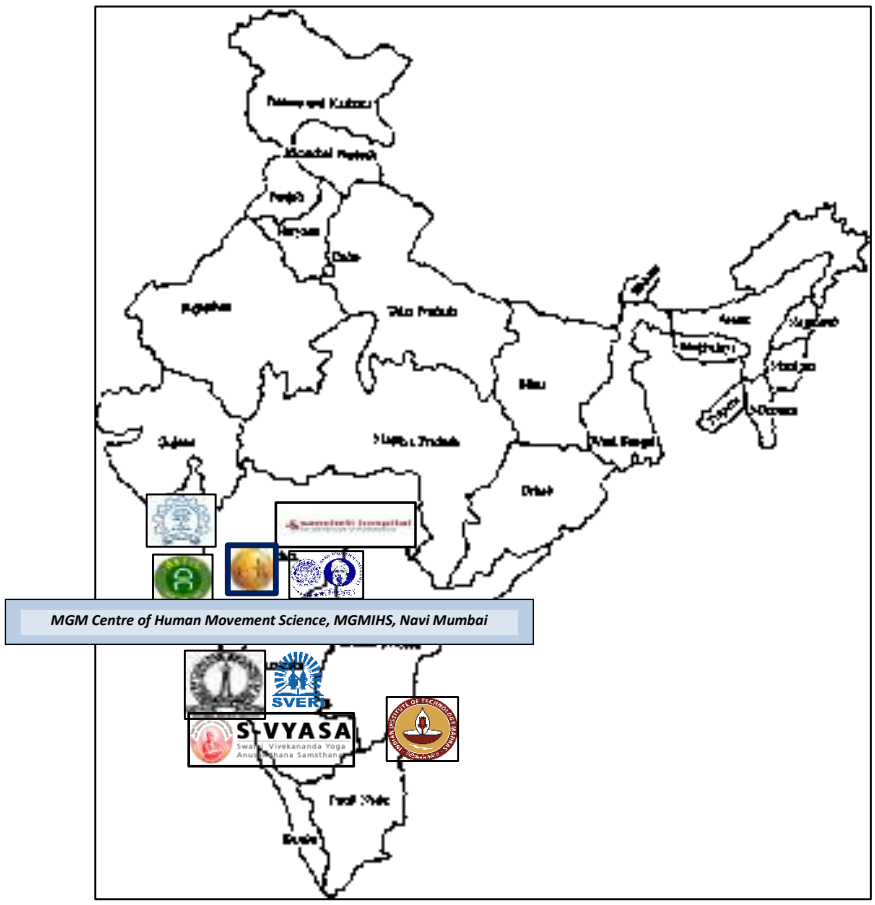
National collaborations & Linkages



BETiC, IIT B– Prof. Ravi, Institute Chair Prof., Founder-BETiC IIT Bombayb.ravi@iitb.ac.in

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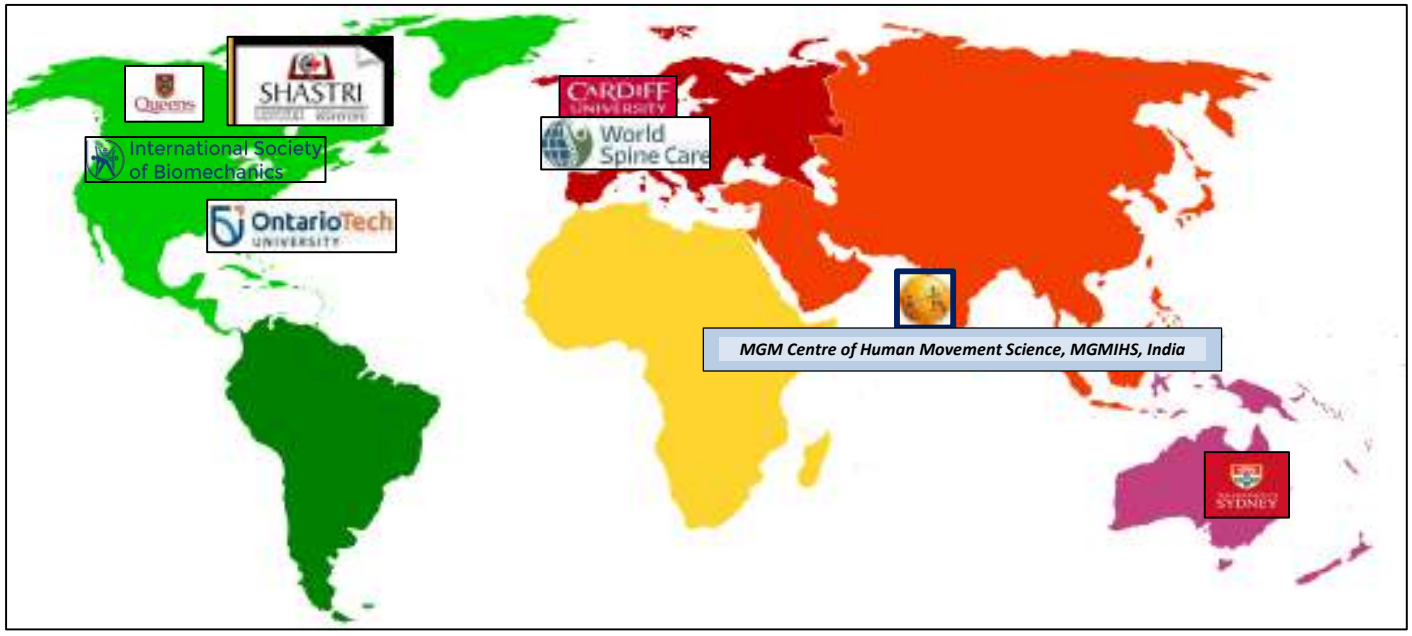
S-VYASA, Banglore - Dr.N. K. Manjunath, Head of Research Dept,nkmsharma@svyasa.org

Sancheti Hospital, Pune Dr. Apruv Shimpi(PT), apurv008@gmail.com

SNDT Women's University, Mumbai, Nancy Fernandes, nancy.fernandes@ltnursingsndt.ac.in

Shri Vithal Education and Research Institute, Pandharpur,Dr. Ranjitsinha Gidde rrgidde@coe.sveri.ac.in

International collaborations



International Society of Biomechanics — Toni Arndt, President, International Society of Biomechanics, toni.arndt@gih.se

World Spine Care — Prof. Margareta Nordin, World Spine Care, Europe-dmn2@nyu.edu

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SYDNEY — Dr. Claire Hiller, Director of Dance Research, University of Sydney, Australia
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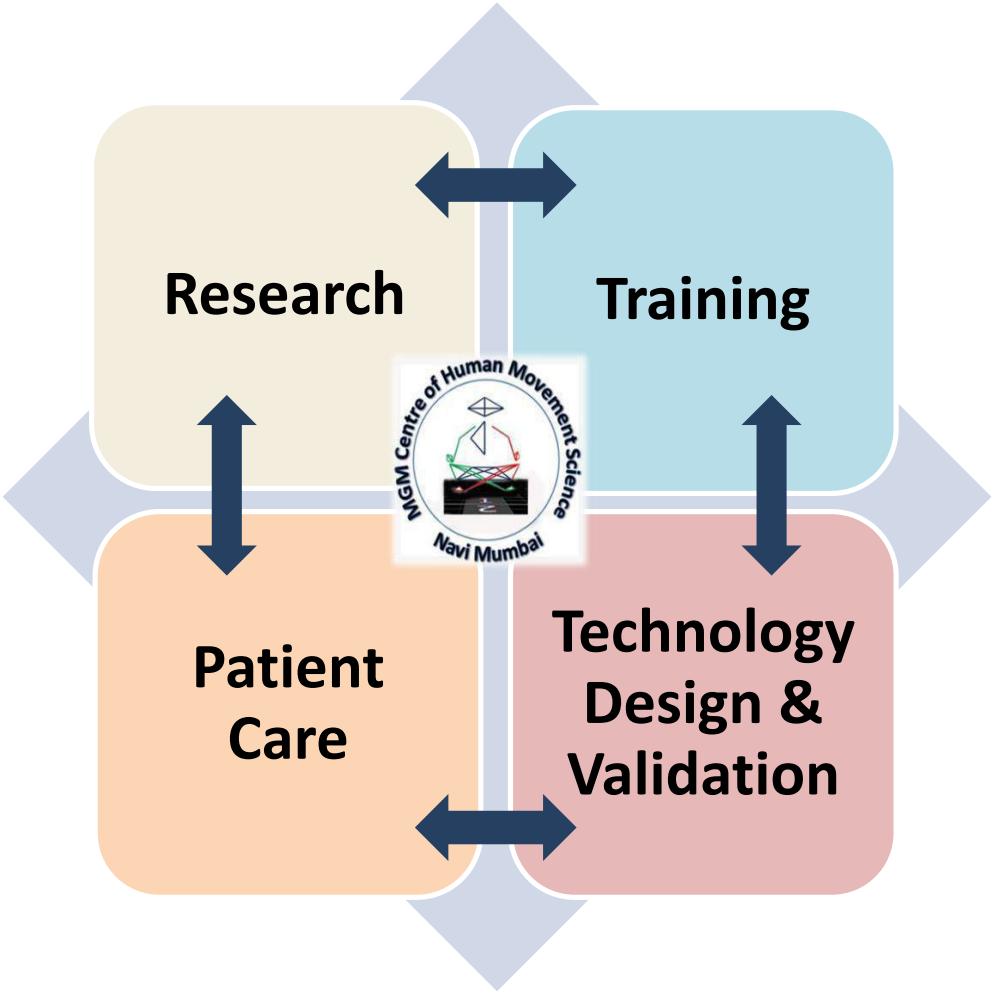
CARDIFF UNIVERSITY — Dr. Robert Van Deursen, Professor of Rehabilitation Science, Cardiff University, UK vandeursenR@cardiff.ac.uk

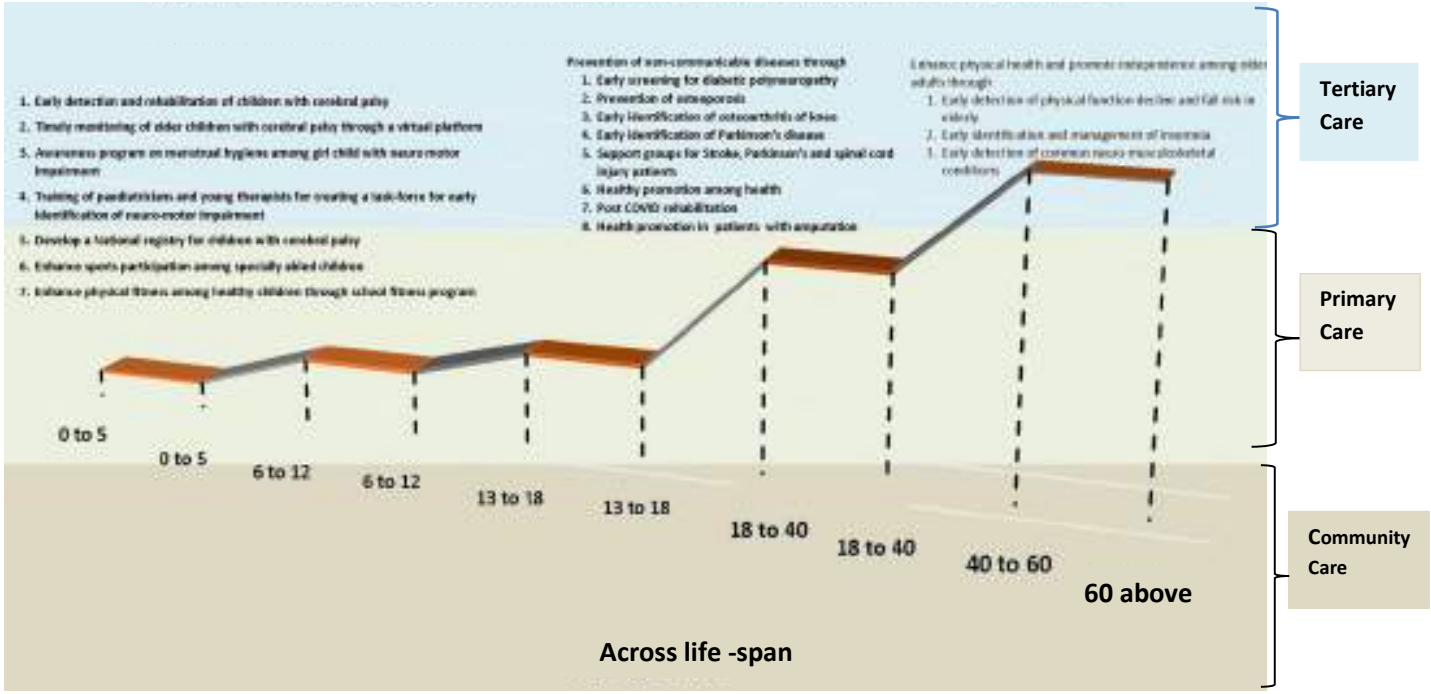
Queens — Dr. Andrea Hemmerich, Professor, Department of Mechanical Engineering, Queens University, Canada a.hemmerich@alumni.utoronto.ca

OntarioTech UNIVERSITY — Prof. Pierre Cote, Faculty of Health Sciences, Ontario Tech University, Canada
pierre.cote@ontariotechu.ca

Distinctiveness of
MGM Centre of Human Movement Science
Four activity domains



Breadth and Depth of Human Movement Application in Healthcare



Across Body Systems

Neurological system: Stroke, Parkinson's disorder, Cerebral palsy, Downs syndrome, Balance disorders etc.

Cardiorespiratory system: Fitness, Post COVID Rehabilitation, Yoga for respiratory health

Musculoskeletal system: Osteoarthritis, Osteoporosis, PVD, Amputation, Diabetes neuropathy

Women's Health: Across Lifespan

0-5 years (Birth)
1.Understand Knowledge attitude practice to increase survival & acceptance of girl child with neuro-motor disability.
2.Develop DREaM application.

6-12 years (Puberty)
3. Maintaining health through integration of fitness variables in health tracking.
4.Fitness in school curriculum.

13- 18 years (Puberty):
1.Maintaining Menstrual Hygiene in girls with neuro-motor disability.

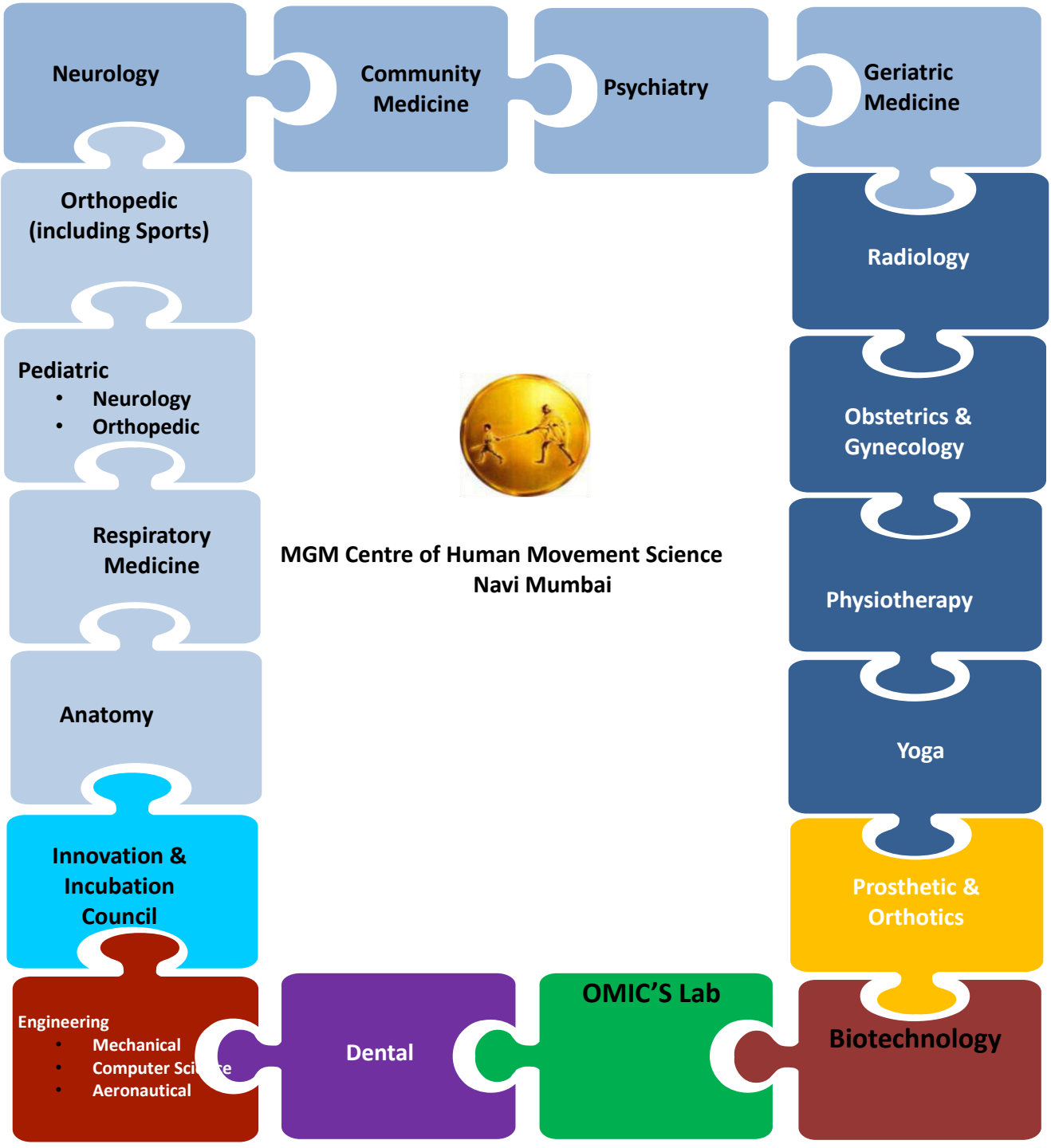
18- 45 years (Child-bearing age)
1.Development of Janayasana for safe child birth as an extension of Matritva Suraksha Yojna.
2. Healthy Mother – Healthy Child: Fitness in ANC & PNC

45- 50 years (Peri-menopausal):
1.Early detection and management of osteoporosis.
3.Health promotion

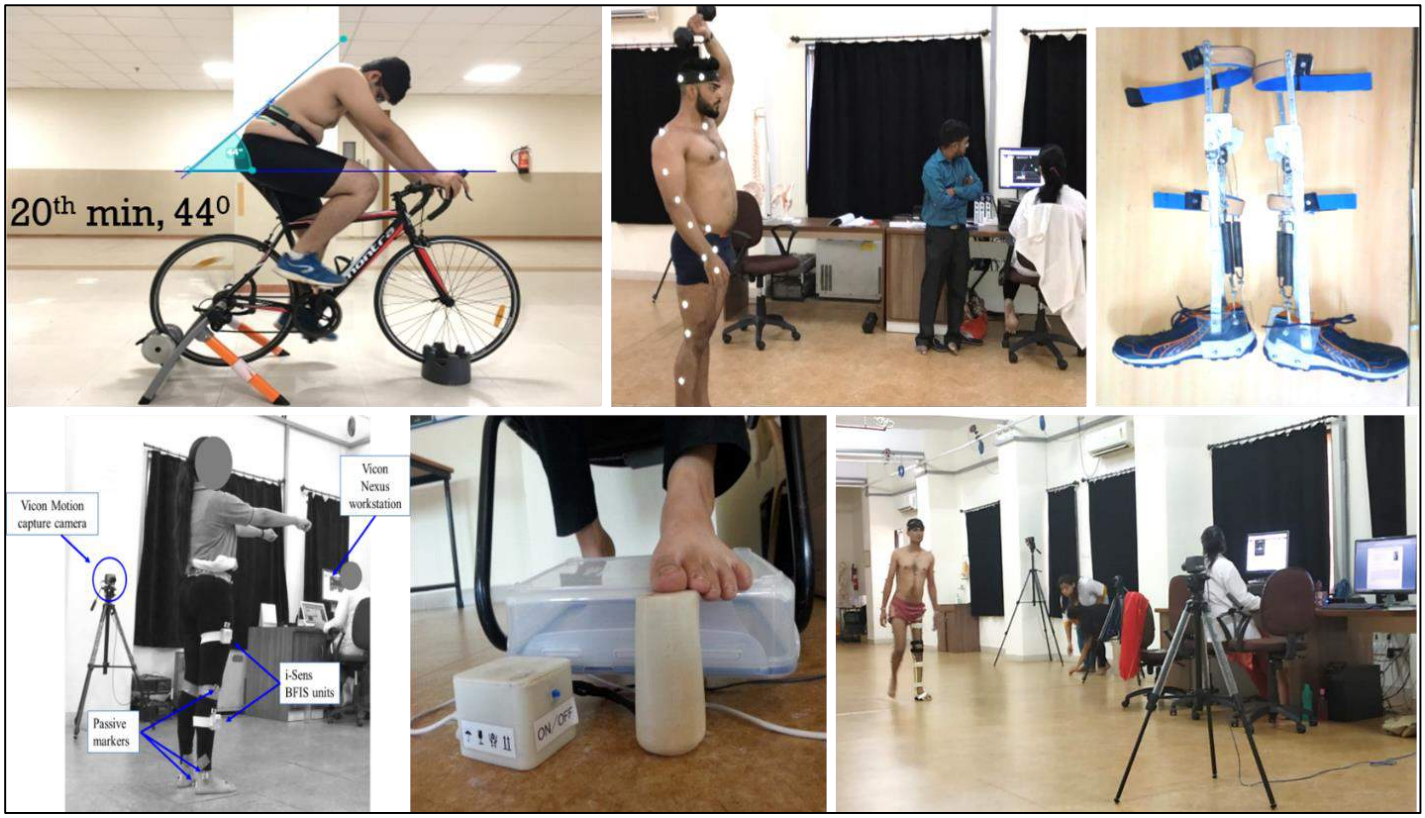
50 years & above (post-menopausal):
1.Evidence informed exercise for bone health

Interdisciplinary Work

MGM Centre of Human Movement Science engages various disciplines of Health and Engineering within MGM Institutes of Health Sciences across various institutes of MGM Trust and throughout India to develop indigenous innovations to address unmet healthcare needs



Technology Validation



MGM Centre of Human Movement Science is equipped with robust gold-standard technology and expertise necessary to validate technology designed for health promotion and rehabilitation of people with movement disorders. The Centre has successfully validated 11 indigenous devices designed by innovators from School (Ambani School, Mumbai), academic and research institutes of technology (IITB, IITM), Technology incubation Centre's (BETiC) and Industry (Actofit, Navi Mumbai). Successful illustration of technology validation in past 6 years is attracting major industry innovators for this purpose.

Training

In past 6 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 20 training courses including tours to MGMCHMS. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1500 students from Physiotherapy (including BPT & MPT), BTech, MTech, BE, Prosthetics & Orthotics(BPO) and MS(Orthopedics) benefitted from biomechanics training.

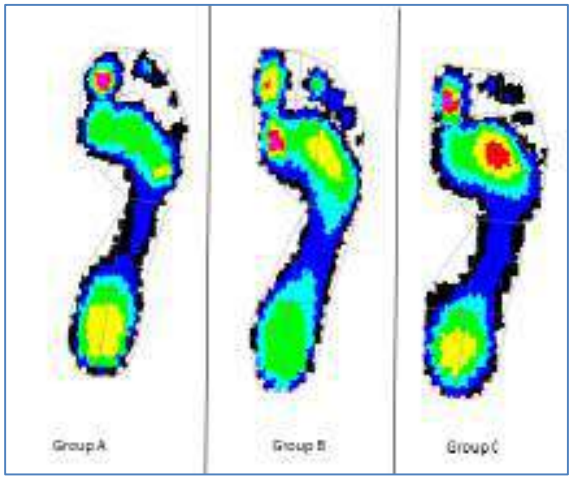
Curricular training

IV BPT students being trained on 3D gait analysis for healthy and patient population

Research

The Centre conducts research in 4 major thrust areas: i) biomechanical exploration of traditional ground level activities and its scientific application; ii) biomechanical exploration of Yoga (Suryanamaskar) and its scientific application in healthcare; iii) biomechanical exploration of traditional sports and its scientific application in healthcare and iv) biomechanical exploration of traditional dance form (Bharatanatyam) and its scientific application in healthcare. Research activities in these areas have yielded 78 original scientific papers in peer reviewed Scopus/PubMed indexed journals. Complete research output is compiled into a chapter titled 'Biomechanics of Indigenous Postures' in the Textbook of Basic Biomechanics of the Musculoskeletal System, 5ed, Publ: Wolters Kluwer which is due for publication in Jan 2021.

Fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted, have huge potential for application in future research and design of healthcare solutions including therapy and tool kits for rehabilitation, sports, education and daily personal care. Three patents are filed for design of technology pertinent to rehabilitation. In past 6 years, MHMCHMS has evaluated over 2000 participants for various research activity and its clinical implementation in the area of cerebral palsy, women's health, diabetes mellitus, spine pain, lower limb amputations, dancer's health as well as development of indigenous medical assistive devices through various intramural, extramural and collaborative funded research projects.



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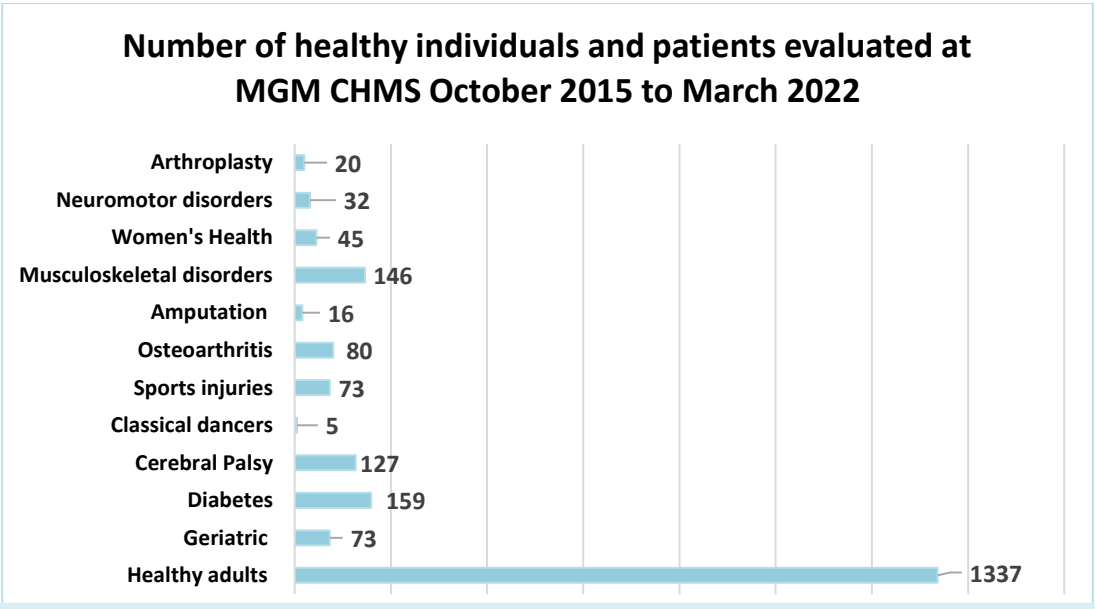
Patient care

MGM Centre of Human Movement Science is committed to develop Biomechanics in India in all 3 domains i.e. academic, research and clinical. MGM Centre of Human Movement Science teams did the tremendous work in all three domains. 1337 consented healthy participants (aged between 5-75 yr) were analyzed to generate normative reference data for Indian population and this is still ongoing. Total 761 patients have been tested for gait evaluation, balance testing and foot pressure analysis.

Gait analysis of Child with cerebral palsy

Energy cost of gait of patient with amputation



Graphs presents number of patients and healthy participants evaluated at MGM CHMS 2015-2022

Eminent Visitors

L-R: Dr.R Mullerpatan,Dr. S. D Dalvi (Hon'ble VC, MGMIHS, Prof Ravi B, BETic, IITB, Dr. Anil Kakodkar, Director, RGSTC, Govt of India)

"Very happy to see the newly set up facility, look forward to a major thrust in interdisciplinary work, All the best !"
- Dr. Anil Kakodkar, Director, RGSTC

L-R: Dr. Prabhat Ranjan, Executive Director, TIFAC, Prof Ravi B, BETic, IITB Dr Asim Tiwari, R Mullerpatan,

L-R: Bela Agrawal, Prof. Margareta Nordin, Vice President of the World Spine Care

''Excellent visit, congratulations to the laboratory in biomechanics in India!"
- Prof. Margareta Nordin

L-R: Dr. R. Mullerpatan, Prof. Genevieve Dumas, Professor, Dept of Mechanical Eng., Queens University, Dr. Andrea Hemmerich, Queens University.

L-R: T Shetty, Dr. R Mullerpatan, B Agarwal, Dr. Khadaga Gurung, President of Nepal Physiotherapy Association

''Thank you Dr. Rajani. It's a great innovation. Thank you so much!"

Dr Rajani Mullerpatan with Prof. Manohar Panjabi, Professor Emeritus, Dept. of Orthopedics and Rehabilitation and Mechanical Engineering, Yale University- Spine Biomechanics, Boston, MA, USA

"It was exciting for me to learn about research being done by young people. I wish you good luck with all your projects. You are planting seeds for future spine biomechanics in India."

Eminent Visitors

L-R: Prof. Robert van Deursen, Dr. Raman Yadav, Dr. Vipla Puri, Dr. R Mullerpatan, .

"It has been a wonderful experience to be a part of building up of great facility so that clinical biomechanics can take off in Mumbai and hopefully as a result of this, India can become a leader in research specific to the culture and customs of the country. I look forward to a continued collaboration on this very worthy project"

- Prof Robert van Deursen, Cardiff Universitv. UK

"Thank you for the wonderful warm welcome and have enjoyed the facility and research. Thank you"

-Prof John Reid

L-R: Giridhar Sharma, Prof Anirban Guha, ME dept. IIT B,
Dr. K. Kurien Issac, Prof., IIST, Dr. R Mullerpatan
"Excellent facility. Congrats. Hope to collaborate"-
K Kurien Issac

Dr. D H Dastoor, Senior Physiotherapist, Ex-HOD, Seth G S Medical College and KEM Hospital inaugurating 3D Gait analysis workshop with Dr Rajani Mullerpatan on 1st July 2017 at MGM CHMS

L-R :, Dr. R Mullerpatan, Dr. Claire Hiller, Senior Lecturer, University of Sydney

"Great set up. All the best for ground breaking research"
-Dr. Claire Hiller

L-R: Dr. Scott Haldeman, President of World Spine care, Dr. Kim Reid, T. Shetty, Prof Manohar Panjabi, Dr. R Mullerpatan

Dr. Roshan Vania (PT), HOD Neurophysiotherapy Dept, Bombay Hospital
Session with final year BPT students
"

L-R: Dr. R Mullerpatan, Padmashri Dr. Kanak Rele, Founder- Director, Nalanda Dance & Research Centre, Dr Bela Agarwal (PT)

L-R: Dr. R Mullerpatan, T Shetty, Dr. S Sujata, Prof, IITM, Prof. Marcus Pandy, Chair of Mechanical & Biomedical Eng., University of Sydney.

Thank you for allowing me to visit your world class facility. It was an honor to be here and meet with all of you"
-Prof. Marcus Pandy

Acknowledgements

The dream of MGM Centre of Human Movement Science (MGMCHMS) was conceived and nurtured by several visionaries to develop Human Movement Science in India for academic and societal benefit. The Centre will remain grateful to each one of them for its existence and growth.
MGM Institute of Health Sciences(MGMIHS) took a strong initiative to develop Human Movement Science in India and established MGMCHMS in October 2015 with generous support from International Society of Biomechanics and BETiC IITB. Chairman of MGM Trust & Chancellor, MGMIHS, Shri Kamalkishore Kadam and previous and present members of MGMIHS, particularly-Former Chancellor Prof. K.G.Narayan Khedkar and Former Vice Chancellor Dr. Sudhir Kadam, Vice-Chancellor, Prof. Shashank Dalvi, Former Vice Chancellor Prof. R.D. Bapat, Pro Vice-Chancellor Dr. Nitin Kadam, Former Pro Vice Chancellor Lt. Gen Dr. S.K. Kaul, Former Pro Vice Chancellor Research Dr. Chander Puri, believed in integrating biomechanics in healthcare and supported this dream. The Registrar of MGMIHS, Dr. Rajesh Goel, Research Director, Dr. Sabita Ram and Medical Superintendent of MGM Hospital Kamothe, Lt. Gen Dr. K.L. Salgotra has always helped enthusiastically in execution of various activities.

Dr. Anil Kakodkar inaugurated the Centre in recognition of the need for developing biomechanics in India to address unmet needs in healthcare. The Team looks up to his commitment to guide and support the mission of MGMCHMS. Prof. B. Ravi, Founder & PI, Biomedical Engineering and Technology Innovation Centre (BETIC) has been a rock pillar, since the inception of MGMCHMS and continues to be unassumingly supportive and our guiding lighthouse!

The Team is grateful to International Society of Biomechanics(ISB) who helped this initiative with massive support for equipment and expertise for planning and installation of the motion capture system. Former members: President, Prof. Anthony Van Bagert, President, Prof. John Challis, Affiliate Societies Officer, Dr. Andrea Hemmerich and Dr. Bart Koopman from ISB played exclusive roles in creating this facility. Prof. Robert van Duersen, ISB Member supported the Centre immensely, right from planning and installation of equipment and continues to participate in the research activities from Cardiff University, UK. We express our deep gratitude to Mr. Andy Ray, Vicon, UK; Mr. Gary Blanchard, AMTI, USA and Mr. Peter Seitz, novel, Germany for their generous equipment donations to get MGMCHMS started with necessary equipment.

MGMCHMS is thankful to its collaborators, particularly, Dr. Rupesh Ghyar, BETiC and Prof. Abhishek Gupta from IIT Bombay; Dr. S.N.Omkar, Indian Institute of Science Bangalore; Dr. Sujatha Srinivasan, IIT Madras and Dr. Kanagraj, IIT Guwhati for engineering expertise.
We are thankful to expert clinicians who utilize this facility for robust objective investigation of movement disorders particularly Dr. Ashok Johari, Director, The Enable International Centre for Paediatric Musculoskeletal Care, Dr. Tushar Agarwal, Pediatric Orthopedic Surgeon along with Dr. Roshan Vania (PT), Head of Dept, Neurophysiotherapy, Bombay Hospital and Dr. Rahul Kadam, Dr. Bhushan Patil and Dr. Atul Bhaskar, Orthopedic Surgeons.

The Centre continues to strive for excellence with untiring, utmost efforts of its dedicated Team, which includes core members- Dr. Bela Agarwal (PT), Dr. Triveni Shetty (PT) and Dr.Juhi Bharnuke (PT). We will remember Dr. Jyoti Chatla (PT), who supported the Centre in the beginning and are grateful to all our research associates (Dr. Bindiya Sharma (PT), Dr. Megha Solanki (PT) and Dr. Blessy Thomas (PT)), PhD scholars, MPT Scholars, Faculty members, Interns and students of MGM School of Physiotherapy and PhD and M.Tech Scholars of IIT Bombay. The Team thanks all our friends, well-wishers and family members who have immensely supported us always.

****

Value added Courses Offered:

3D Gait Analysis – Adding skill to your future toolbox of e-evaluation

Clinical Biomechanics

Course Title:	Clinical Biomechanics and Human Movement Analysis
Course Description	Value Added Course **Mode**: Online/Blended
Course Duration	4 weeks
Credits	8
Hours	24 Theory + 16 Practical = 40 hours 6+4 hours/week = 10 hours/week 6+2 =8 credits
Course Instructors	Dr Rajani Mullerpatan, Dr Bela Agarwal (PT), Dr Triveni Shetty (PT) and Dr Juhi Bhamuke (PT), MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai
Beneficiaries	Bachelor of Physiotherapy, Master of Physiotherapy, BTech and MTech students
Course Objectives	Understanding normal and pathological joint motion, gait and biomechanical determinants of motion Methods of motion capture and analysis Gain skills in 2D motion capture

Other courses offered:

Detection, Awareness and Management of Cerebral Palsy

Value Added Course

Title	**Detection , Awareness and Management of Cerebral Palsy**
Department	MGM School of Physiotherapy , MGM IHS , Navi Mumbai
Venue	MGM School Of Physiotherapy , Navi Mumbai
Course objectives	1. Understand normal development. 2. Identify high risk babies / babies at risk of development of cerebral palsy (based on etiologies) 3. Identify the red flags for diagnosis of cerebral palsy (based on developmental sign and symptoms) 4. Understand Cerebral palsy, level of function, severity & needs of children with cerebral palsy. 5. Understand whom to refer / referral framework for children with cerebral palsy

One-day Virtual Training Webinar on 2D analysis of Motion

How to reach us:

Address: MGM Centre of Human Movement Science, 1 st floor, MGM Super specialty Hospital, Sector 30A, Plot 46, Opposite Sanpada Railway Station, Navi Mumbai, Maharashtra 400705
Website: https://www.mgmsopnm.edu.in/humanMovementSciences.html

e-mail ID: chmsmgm@gmail.com OR mgmchms@mgmsopnm.edu.in
Contact Number: 022 2743-7866

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A++' Grade
Sector – 1, Kamothe, Navi Mumbai - 410 209
Tel 022-27437622, 022-27437607, Fax 022 - 27431094
E-mail :research@mgmuhs.com; Website : www.mgmuhs.com

CERTIFICATE FROM THE INVESTIGATOR

PROJECT TITLE: **FIST for Movement Application in Science & Technology for Education & Research in Health**
Running Title: FIST for MASTER Health

1. We agree to abide by the terms and conditions of the DST grant.

2. We did not submit this or a similar project proposal elsewhere for financial support.

3. We have explored and ensured that equipment and basic facilities will actually be available as and when required for the purpose of the project. We shall not request financial support under this project, for procurement of these items.

4. We undertake that spare time on permanent equipment will be made available to other users.

5. We have enclosed the following materials:

ITEMS		NUMBER OF COPIES
(a)	Endorsement from the Head of the Institution (on letter head)	One
(b)	Certificate from Investigator	One
(c)	Certificate from Investigator regarding conflict of interest	One
(d)	Name and address of experts/institution interested in the subject/ outcome of the project	One
(e)	Copies of the proposals	One hard Copy

Date : 9th August 2022

Place: Navi Mumbai

Name & Signature of Principal Investigator
Dr. Rajani Mullerpatan

Name & Signature Of Co-Investigator(s)
Dr Bela Agarwal

MGM School of Physiotherapy NAVI MUMBAI

DEPARTMENT OF SCIENCE AND TECHNOLOGY
POLICY ON CONFLICT OF INTEREST

FOR REVIEWER & COMMITTEE MEMBER or APPLICANT or DST OFFICER ASSOCIATED/ DEALING WITH THE SCHEME/ PROGRAM OF DST

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics, are objective measures that is intended to protect the integrity of the decision making processes and minimize biasness. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence/ unprejudiced dealings, prior to, during and subsequent to the currency of the programme to be entered into with a view to enable public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to prevent corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. **Coverage of the Policy**:

a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable on all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in evaluation of proposals and subsequent decision making process.
b) This policy aims to minimize aspects that may constitute actual Conflict of Interests, apparent Conflict of Interests and potential Conflict of Interests in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflict of interests that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor etc.)

2. **Specifications as to what constitutes Conflict of Interest**.

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

(i) Due to any reason by which the Reviewer/Committee Member cannot deliver fair and objective assessment of the proposal.

(ii) The applicant is a directly relative# or family member (including but not limited to spouse, child, sibling, parent) or personal friend of the individual involved in the decision making process or alternatively, if any relative of an Officer directly involved in any decision making process / has influenced interest/ stake in the applicant's form etc..

(iii) The applicant for the grant/award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.

(iv) The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.

(v) The Reviewer/Committee Member is a Head of an Organization from where the applicant is employed.

(vi) The Reviewer /Committee Member is or was, associated in the professional career of the applicant (such as Ph.D. supervisor, Mentor, present Collaborator etc.)

(vii) The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.

(viii) The applicant has joint research publications with the Reviewer/Committee Member in the last three years.

(ix) The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.

(x) The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.

The Term "Relative" for this purpose would be referred in section 6 of Companies Act , 1956.

3. **Regulation**:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. Self-regulatory mode is however recommended for stake holders involved in scientific research and research management, on issues pertaining to Conflict of Interest and scientific ethics. Any disclosure pertaining to the same must be made voluntarily by the applicant/Reviewer/Committee Member.

4. **Confidentiality**:

The Reviewers and the Members of the Committee shall safeguard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party, unless the Committee recommends otherwise and records for doing so.

5. Code of Conduct

5.1 To be followed by Reviewers/Committee Members:

(a) All reviewers shall submit a conflict of interest statement, declaring the presence or absence of any form of conflict of interest.
(b) The reviewers shall refrain from evaluating the proposals if the conflict of interest is established or if it is apparent.
(c) All discussions and decisions pertaining to conflict of interest shall be recorded in the minutes of the meeting.
(d) The Chairman of the Committee shall decide on all aspects pertaining to conflict of interests.
(e) The Chairman of the Committee shall request that all members disclose if they have any conflict of interest in the items of the agenda scheduled for discussion.
(f) The Committee Members shall refrain from participating in the decision making process and leave the room with respect to the specific item where the conflict of interest is established or is apparent.
(g) If the Chairman himself/herself has conflict of interest, the Committee may choose a Chairman from among the remaining members, and the decision shall be made in consultation with Member Secretary of the Committee.
(h) It is expected that a Committee member including the Chair-person will not seek funding from a Committee in which he/she is a member. If any member applies for grant, such proposals will be evaluated separately outside the Committee in which he/she is a member.

5.2 To be followed by the Applicant to the Grant/Award:

(a) The applicant must refrain from suggesting referees with potential Conflict of Interest that may arise due to the factors mentioned in the specifications described above in Point No. 2.
(b) The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.

5.3 To be followed by the Officers dealing with Programs in DST:

While it is mandatory for the program officers to maintain confidentiality as detailed in point no. 6 above, they should declare, in advance, if they are dealing with grant applications of a relative or family member (including but not limited to spouse, child, sibling, parent) or thesis/ post-doctoral mentor or stands to benefit financially if the applicant proposal is funded. In such cases, DST will allot the grant applications to the other program officer.

6. **Sanction for violation**

3.1 **For a) Reviewers / Committee Members and b) Applicant**

Any breach of the code of conduct will invite action as decided by the Committee.

3.2 **For Officers dealing with Program in DST**

Any breach of the code of conduct will invite action under present provision of CCS (conduct Rules), 1964.

7. **Final Appellate authority**:

Secretary, DST shall be the appellate authority in issues pertaining to conflict of interest and issues concerning the decision making process. The decision of Secretary, DST in these issues shall be final and binding.

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A++' Grade
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Tel 022-27437622, 022-27437607, Fax 022 - 27431094
E-mail :research@mgmuhs.com; Website : www.mgmuhs.com

8. Declaration

I have read the above "Policy on Conflict of Interest" of the DST applicable to the Reviewer/ Committee Member/ Applicant/ DST Scheme or Program Officer # and agree to abide by provisions thereof.

I hereby declare that I have no conflict of interest of any form pertaining to the proposed grant *

I hereby declare that I have conflict of interest of any form pertaining to the proposed grant *

* & # (Tick whichever is applicable)

Name of the Reviewer/ Committee Member or Applicant or DST Officer
(Strike out whichever is not applicable)

10 Aug 2022
(Signature with date)

MGM School of Physiotherapy NAVI MUMBAI

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A++' Grade
Sector – 1, Kamothe, Navi Mumbai - 410 209
Tel 022-27437622, 022-27437607, Fax 022 - 27431094
E-mail :research@mgmuhs.com; Website : www.mgmuhs.com

ENDORSEMENT FROM THE HEAD OF INSTITUTION

Project Title: **FIST for Movement Application in Science & Technology for Education & Research in Health**
Running Title: FIST for MASTER Health

1. Certified that the Institute welcomes participation of Dr. Rajani Mullerpatan as the Principal Investigator and Dr. Bela Agarwal as the Co-Investigator for the project and that in the unforeseen event of discontinuance by the Principal Investigator, the Co-Investigator will assume the responsibility for the fruitful completion of the project (after obtaining consent in advance from DST).

2. Certified that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant, will be extended to investigator (s) throughout the duration of the project.

3. Institute assures financial and other managerial responsibilities of the project.

4. Certified that the organization has never been blacklisted by any department of the State Government or Central Government.

Name and Signature of Head of Institution

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Date: 9th August 2022

Place: Navi Mumbai

REMARKS: In regard to research proposals emanating from scientific institutions/laboratories under various scientific departments the Head of the institution is required to provide a justification indicating clearly whether the research proposals falls in line with the normal research activities of the institution or not and if not, the scientific reasons which merit its consideration by DST.

ADDRESS :
SCO- 181/182, Madhya Marg,
Sector 8C, Chandigarh - 160008

PH : +91 9855389080

PRICE QUOTATION

4WAY MEDITECH INDIA LLP

QUOTE TO :

MGM School of Physiotherapy
Ms. Akhila
Sector 1 rd, MGM campus, Kamothe,
Panvel, Navi mumbai, Maharashtra - 410209
GST no:

DATE : 02/08/2022
QUOTE NO : # FW - 2282
VALID DATE : 15/08/2022

This Quotation is prepared by : Mr. Sandeep Sodhi

No.	Product Name	Quantity	Unit Price(Rs)	Total price(Rs)
1	Pre Owned Hologic Discovery C BMD/ Dexa Unit	1	Rs.16,45,000/-	Rs.16,45,000/-
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				Rs. 16,45,000/-
12				
	GST	12%		Rs. 1,97,400/-
	In Words: Only			Rs.18,42,400/-

Terms And Conditions :

1. Customer will be billed after indicating acceptance of this quote.
2. Payment term: 100% advance Payment.
3. Cheque bounce charges:- If cheque returns due to any reasons 2% of total invoice value will be charged as penalty.
4. Jurisdiction: Any disputes/ Claims arising out of this financial agreement in case of Non-compliance and payment terms shall be under the Jurisdiction of Hon'ble Panjab and Haryana High Court, India.
5. Sundry expenses for installation staff to be completed by the BUYER.

By signing below you agree to accept the terms & conditions set by the company :

Customer signature

If you any enquiries about this quotation , Please contact + 91 98553-89080.

THANK YOU FOR YOUR BUSINESS!

(Screen 5/5)

स्वास्थ्य अनुसंधान विभाग
DEPARTMENT OF HEALTH RESEARCH

Deptartment of Health Research (DHR)

Ministry of Health and Family Welfare (MoHFW)

Online detailed proposal of "GIA"

Date of submission: 29-Jul-2022 03:57:11 PM

Proposal Id: 2022-1349, Proposal Title: Prediction and Management of Diabetic Neuropathy in Urban, Rural and Tribal People of Raigad District, Maharashtra: The Foot-MaP Study

Name of PI (IN BLOCK LETTERS)	DR RAJANI PRASHANT MULLERPATAN	**Designation**	Director
Email	RAJANI.KANADE@GMAIL.COM	**Contact**	9920048476
Date of Birth	24-May-1972	**Date of Superannuation**	01-May-2032
Nature of Employement	Permanent	**Institute**	MGM Institute of Health Sciences

Proposal Details

Advertisement	CALL FOR RESEARCH PROPOSALS UNDER “GRANT-IN-AID SCHEME FOR INTER-SECTORAL CONVERGENCE AND COORDINATION FOR PROMOTION AND GUIDANCE ON HEALTH RESEARCH” FOR THE YEAR 2022-23	**Title of the Research Proposal**	Prediction and Management of Diabetic Neuropathy in Urban, Rural and Tribal People of Raigad District, Maharashtra: The Foot-MaP Study
Institute Type	Private	**Valid DSIR Certificate (Validity)**	YES (25-Mar-2025)
Research Area	Diabetes		
Detailed Proposal	1659090052_358098547.pdf View		
Total Project Duration (in Months)	36 Months	**Data Collection/Analyzing Data (in Months)**	24/12 Months
Objective of Study	Objective 1: To generate a reference band for plantar tissue stiffness for people with Diabetes with and without peripheral neuropathies and healthy adults. Objective 2 : To clinically validate plantar tissue stiffness as an outcome variable for predicting progression of foot ulceration. Objective 3: To evaluate the effect of a 12-week home program intervention on plantar tissue stiffness, sensory cutaneous threshold, vibration perception threshold and thermal sensation among people with peripheral neuropathies. Objective 4: To investigate if plantar tissue stiffness variable can detect minimal clinically detectable change in tissue stiffness characteristics of people with peripheral neuropathies post twelve week intervention.		
Expected Outcome	10,000 people from urban, rural and tribal setting in Raigad district will benefit from screening for diabetic foot complications. An estimated 870 people with diabetes, will benefit from comprehensive diabetic foot testing (including, sensory, vascular and stiffness) to detect risk of foot ulceration and prevent/delay occurrence of foot ulceration. 258 people with diabetic neuropathy will benefit from an intervention designed for foot care education and exercise program to reduce stiffness of plantar tissue and make it less prone to risk of ulceration. Determine minimal clinical detectable size of change in plantar tissue stiffness following an intervention. Prevention/delay in occurrence of foot ulceration will help to reduce the number of people with diabetic neuropathy developing foot ulceration and ultimately lower extremity amputation. Although preventable, prevalence of this complication ranges between 4%-27% amongst all diabetic patients. Collateral benefit of exercise intervention will result in improvement in glycemic control which will also protect people with diabetes from other diabetes related complications such as ischemic heart disease. Plantar tissue stiffness will emerge as a novel, single, clinical indicator to detect changes occurring in diabetic-foot (Hansen’s disease and alcohol toxicity) caused by both reduced sensory and vascular supply. Booklets and e-education material which can be used for educating both literate and ill-literate people with diabetes in India and countries with similar socio-economic conditions. Develop a foot evaluation station at each CHC and District NCD Cells and District NCD Clinics within Maharashtra and other states in India and countries with similar socio-economic conditions facing a similar burden of diabetes.		

Ethical Clearance	Yes	**Participating Agencies (Project Type)**	3 (Collaboration)
Fund received by DHR before	N	**Fund received by Other Agency before**	Y
Number of ongoing projects as Principle Investigator	5	**Do you agree to link the project with Indian Clinical Trial And Education Network (INTENT)?**	YES
Is Institutional Ethics Committee registered with CDSCO?	YES	**Number of multicentric RCTs conducted by PI**	0

Investigator Details

#	Institute	Designation	Email	Contact No.	Role in Proposal
1	MGM Institute of Health Sciences	Director	rajani.kanade@gmail.com	9920048476	PI
2	MGM Institute of Health Sciences	Professor	maninder.setia@karanamconsultancy.in	8976062646	Co-PI
3	Indian Institute of Technology (IIT)	Professor	prof.b.ravi@betic.org	9819642647	Co-PI
4	Ayati Devices Private Limited	Director	nishant.kathpal@ayatidevices.com	8297109010	Co-PI

Documents consideration

#	Proposal Id	Document Name	Uploaded Document	Remarks
1	Scientific and Industrial Research Organisation (SIRO) OR Department of Scientific and Industrial Research (DSIR) Certificate (for NGO/Private Institutions only)	View	29-07-2022	SIRO Certificate
2	Declaration and Attestation Form	View	29-07-2022	Declaration and Attestation
3	Undertaking for staff recruitment	View	29-07-2022	Undertaking for staff recruitment
4	Non-availability certificate of equipment	View	29-07-2022	Non-availability certificate of equipment
5	Institutional Ethical Clearance and project Approval Certificate	View	29-07-2022	Ethical letter
6	Undertaking of project limits	View	29-07-2022	Undertaking of project limits
7	Name of the Statutory Auditor of the Host Institute	View	29-07-2022	Name of the Statutory Auditor of the Host Institute
8	Mandate Form and Cancelled cheque	View	29-07-2022	Mandate Form and Cancelled cheque
9	Detail of multicentric RCTs conducted by PI	View	29-07-2022	Detail of multicentric RCTs conducted by PI
10	Research Experience of PI during last 10 years	View	29-07-2022	Research Experience of PI during last 10 years

Budget Details

Year	Institute Name	Recurring Coningency/Consumables	Staff (Manpower)	Non-Recurring Contingency	Equipment	Travel (One time in a year)	Other Charges	Total

Budget Details

Year	Institute Name	Recurring Coningency/Consumables	Staff (Manpower)	Non-Recurring Contingency	Equipment	Travel (One time in a year)	Other Charges	Total
Year:1	MGM Institute of Health Sciences	2900000.00	1249680.00	220000.00	2240000.00	1000000.00	760968.00	**8,370,648.00**
Year:2	MGM Institute of Health Sciences	877500.00	1249680.00	200000.00	76000.00	1000000.00	340318.00	**3,743,498.00**
Year:3	MGM Institute of Health Sciences	125000.00	1630680.00	900000.00	0	500000.00	315568.00	**3,471,248.00**
	Total Budget:	**3,902,500.00**	**4,130,040.00**	**1,320,000.00**	**2,316,000.00**	**2,500,000.00**	**1,416,854.00**	**15,585,394.00**

Staff (Manpower) Budget Breakup Details

#	Budget Year	Institute	Designation	No. of Person(nos)	Require Month(nos)	Cost Per Person(Rs.)	Total Cost(Rs.)
1	Year: 1	MGM Institute of Health Sciences	Laboratory Assistant	1	12	0	304,800.00
2	Year: 1	MGM Institute of Health Sciences	Project Associate-I	2	12	39,370	944,880.00
3	Year: 2	MGM Institute of Health Sciences	Laboratory Assistant	1	12	25,400	304,800.00
4	Year: 2	MGM Institute of Health Sciences	Project Associate-I	2	12	39,370	944,880.00
5	Year: 3	MGM Institute of Health Sciences	Project Associate-II	1	12	44,450	533,400.00
6	Year: 3	MGM Institute of Health Sciences	Laboratory Assistant	1	6	25,400	152,400.00
7	Year: 3	MGM Institute of Health Sciences	Project Associate-I	2	12	39,370	944,880.00
						Total (Rs.):	**4,130,040.00**

Recurring(Consumables) Contingency Budget Breakup Details

#	Budget Year	Institute	Contingency Name	Total Cost(Rs.)	Justification
1	Year: 1	MGM Institute of Health Sciences	Electrode gel, adhesive tapes, sterilium	250,000.00	Electrode gel, adhesive tape and sterilium will be required while performing nerve conduction velocity studies while screening 10000 participants

Total (Rs.):	**3,902,500.00**

Recurring(Consumables) Contingency Budget Breakup Details

2	Year: 1	MGM Institute of Health Sciences	HbA1c blood test	2,500,000.00	HbA1c test will help to determine glycemic control of the participants included in the survey. The cost of each test is INR 500 at MGM Hospital. The institute will provide the cost at 50% of actual cost for the purpose of the project. Therefore a cost of INR 2500000 will be required for 10000 tests @ rate of INR 250
3	Year: 1	MGM Institute of Health Sciences	Maintainance and repair	100,000.00	Stimu software will require annual maintenance and upgradation
4	Year: 1	MGM Institute of Health Sciences	Stationary Print outs	50,000.00	Print proformas will be required for survey tool for 10000 participants and evalaution sheets
5	Year: 2	MGM Institute of Health Sciences	Electrode gel, adhesive tapes, sterilium	75,000.00	Electrode gel, adhesive tape and sterilium will be required for performing nerve conduction velocity studies while monitoring 870 participants, 3 times, over 1 year
6	Year: 2	MGM Institute of Health Sciences	HbA1c blood test	652,500.00	HbA1c will be performed in approximately 870 people with diabetes every 12 weeks to monitor risk of neuropathy and effect of intervention. As per the 50% subsidized cost of HbA1c test offered by MGM Hospital for the purpose of the project the required cost is 250x870x3=652500
7	Year: 2	MGM Institute of Health Sciences	Maintainance and repair	100,000.00	Stimu software will require annual maintenance and upgradation
8	Year: 2	MGM Institute of Health Sciences	Printouts and stationary	50,000.00	Print proformas will be required for evaluation proforma pre and post intervention for 500 participants
9	Year: 3	MGM Institute of Health Sciences	Stationary and print outs	25,000.00	Print proformas will be required for participants
10	Year: 3	MGM Institute of Health Sciences	Maintainance and repair	100,000.00	Stimu software will require annual maintenance and upgradation
			Total (Rs.):	**3,902,500.00**	

Non-Recurring Contingency Budget Breakup Details

#	Budget Year	Institute	Contingency Name	Total Cost(Rs.)	Justification
1	Year: 1	MGM Institute of Health Sciences	Portable Hard drive 2	20,000.00	Data of 10000 participants will be stored in hard drives. Videography education material to be shown to participants will be stored on the drives.
2	Year: 1	MGM Institute of Health Sciences	Laptop 2 units	200,000.00	Research data will be captured and stored using the laptops which will be carried by researchers to urban and rural areas.

Total (Rs.):	**1,320,000.00**

Non-Recurring Contingency Budget Breakup Details

3	Year: 2	MGM Institute of Health Sciences	Education Booklet	200,000.00	Education booklet will be prepared in English, Hindi and Marathi languages which will be printed and provided to participants undergoing intervention.
4	Year: 3	MGM Institute of Health Sciences	Application Development	500,000.00	Information gained from the survey of 10000 people will be used to develop normative reference band which will be used to monitor people with diabetes usinf a mobile based application. Developement of the app will require programming system and cloud storage.
5	Year: 3	MGM Institute of Health Sciences	Article Processing Fee for publication of research findings	400,000.00	It is expected that the information gained from the project will be disseminated through minimum 2 scientific publications BMC Open Access/Diabetologia/ Diabetes Care/ Nature or other Open Access journals
			Total (Rs.):	**1,320,000.00**	

Equipment Budget Breakup Details

#	Budget Year	Institute	Equipment Name	Equipment Model	Equipment Manufacturer	Equipment Type	Total Cost(Rs.)	Justification
1	Year: 1	MGM Institute of Health Sciences	Portable doppler 2 units			Imported	700,000.00	Portable doppler will enable precise measurement of Ankle Brachial Index and distal blood flow
2	Year: 1	MGM Institute of Health Sciences	Vibrothesiometer 2 units	Vibrotherm DX Biothesiometer	Diabetic Foot Care Pvt Ltd	Imported	100,000.00	Two units of the equipment will be required to measure sensory perception of people with neuropathy at urban and rural areas
3	Year: 1	MGM Institute of Health Sciences	Semmes Weinstein Monofilament Kit 2 units			Imported	44,000.00	Two units of the equipment will be required to measure sensory perception of people with neuropathy at urban and rural areas
4	Year: 1	MGM Institute of Health Sciences	Portable NCV system 2 units			Domestic	800,000.00	Two units of the equipment will be required to record nerve conduction velocity of people with neuropathy at urban and rural areas
5	Year: 1	MGM Institute of Health Sciences	TempTouch Temperature probe 2 units			Domestic	20,000.00	Two units of the equipment will be required to record skin temperature of people with neuropathy at urban and rural areas
6	Year: 1	MGM Institute of Health Sciences	Audio-Video Photography system			Domestic	500,000.00	The system will be required for developing educational material for people with peripheral neuropathy
						Total (Rs.):	**2,316,000.00**	

Equipment Budget Breakup Details

7	Year: 1	MGM Institute of Health Sciences	Stimu Device 2units		Domestic	76,000.00	The equipment will be used to record plantar tissue stiffness
8	Year: 2	MGM Institute of Health Sciences	Stimu Device 2units	Ayati Devices Pvt Ltd	Domestic	76,000.00	Two units of the equipment will be required to measure plantar tissue stiffness of people with neuropathy at urban and rural areas
					Total (Rs.):	**2,316,000.00**	

Mandate Form Details

#	Name of Account Holder (As per bank record)	Email Id of Designated Authority	Designation of Head of Institute	Account Number	Bank Name	IFSC	Branch Name and Address
1	MGM Institute of Health Sciences (Research)	mgmschoolofphysiotherapy@mgmsopnm.edu.in	Professor-Director	0183104000347532	Affirmation by Institute for Opening account in Nationalized bank	IBKL0000183	MGM School of Physiotherapy, MGM Institute of Health Sciences MGM Educational Campus, Plot number 1 & 2, Kamothe, Taluka Panvel, Raigad district

Declaration

I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A++' Grade
Sector – 1, Kamothe, Navi Mumbai - 410 209
Tel 022-27437622, 022-27437607, Fax 022 - 27431094
E-mail :research@mgmuhs.com; Website : www.mgmuhs.com

Proposal ID: 2022-1349

Title of Research Proposal: Prediction and Management of Diabetic neuropathy in Urban, Rural and Tribal people of Raigad District, Maharashtra: The Foot MaP study

Declaration & Attestation

1. We have read the terms and conditions for DHR Research Grant. All necessary Institutional facilities and support will be provided if the research project is approved for financial assistance.
2. We agree to submit within one month from the date of termination of the project the final report and a list of articles, both expendable and non-expendable, left on the closure of the project.
3. We agree to submit audited statement of accounts duly audited by the auditors as stipulated by the DHR.
4. It is further certified that the equipment(s) required for the project have not been purchased from the funds provided by DHR for another project(s) in the Institute.
5. We agree to submit all the raw data (along with descriptions) generated from the project to the DHR within one month from the date of completion/termination of the project. Further, all conditions stipulated in the sanction will be strictly complied with.
6. Actual Date of start of the project as indicated in the Sanction Order or inability to start the project on the specified date will be intimated to DHR positively within one week by registered post/ speed post as well as by email.
7. We hereby certify that the research proposal entitled " rediction and Management of Diabetic neuropathy in Urban, Rural and Tribal people of Raigad District, Maharashtra: The Foot MaP study " was not submitted to even partially to any other funding agency for financial assistance.
8. In case of failure to comply with any of the above said provisions, DHR will have all rights to ban the concerned Principal Investigator(s)/ Institute(s) for future funding from DHR for any specified period.

Signature of the:

(a) Principal Investigator (s): Dr Rajani Mullerpatan

(b) Co-Investigator (s) :Prof Ravi B

Mr Nishant Kathpal

Dr Maninder Setia

(c) Head of the Department:

Date:

Signature of the Head of the Institution with seal

Pro.Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

Gmail **CHMS MGM <chmsmgm@gmail.com>**

Fwd: Submission of Codal documents-reg.

2 messages

Rajani Kanade <rajani.kanade@googlemail.com> Tue, Jan 17, 2023 at 1:50 PM
To: CHMS MGM <chmsmgm@gmail.com>

---------- Forwarded message ---------
From: **DHR WOMEN** <dhrwomen@gmail.com>
Date: Tue, 17 Jan 2023 at 12:51
Subject: Submission of Codal documents-reg.
To: <satyajitmp@gmail.com>, <ysnaidu@yahoo.com>, <sandeep.k@icmr.gov.in>, <showkeen.muzamil82@gmail.com>, <arohi_285@yahoo.co.in>, <mansibiotech79@gmail.com>, <jtripathy1983@gmail.com>, <rajani.kanade@gmail.com>, <dr.himanshugupta@mgmsbsnm.edu.in>
Cc: <aruna.sen@gov.in>, <upendra.mohfw@gmail.com>, <admnofficer.hrd@gmail.com>

Dear Fellows,

This is with reference to your proposal submitted to the Department of Health research for seeking support. In this regard, it is informed that your proposal has been approved by the Approval Committee of the Department for financial support under the **" Support to Institute for Imparting Training (SIIT) "** category, subject to fulfilment of following documents:

i. Acceptance letter, duly forwarded by head of the institute (please refer point no. iv of Term & Conditions)
ii. Terms & Conditions duly signed on each page by the fellow and head of the host institute and by fellow and mentor on the last page.
iii. Bank details **(Government/Public sector Bank Only)** of the institute, **Saving Bank Account is mandatory.** (Mandate From-).
iv. Cancelled cheque of the Host Institute's bank account.

The copies of terms & conditions and mandate form of DHR are attached herewith for your reference. Please send all the documents **as one PDF file** through return email before 25.01.2023.

Note: - You are requested to read the terms and conditions carefully before signing and submitting the documents.

Regards

Program Officer of HRD Scheme,
Project Monitoring and Implementation Unit HRD Scheme,
Department of Health Research, Ministry of Health and Family Welfare,
Indian Red Cross Society Building, 1, Red Cross Road,
New Delhi-110001

--
Dr.Rajani Mullerpatan (PhD, MSc PT)

Prof-Director
MGM School of Physiotherapy
MGM Center of Human Movement Science

MGM Institute of Health Sciences
Navi Mumbai.
Tel: 8976768866
email: mgmschoolofphysiotherapy@gmail.com
https://www.mgmsopnm.edu.in/humanMovementSciences.html
Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme on the development of the Package of Interventions for Rehabilitation

2 attachments

Mandate Form DHR (1) (1).pdf
418K

Terms & Condition.pdf
81K

CHMS MGM <chmsmgm@gmail.com> Tue, Jan 17, 2023 at 1:55 PM
To: CHMS MGM <mgmchms@mgmsopnm.edu.in>

[Quoted text hidden]

2 attachments

Mandate Form DHR (1) (1).pdf
418K

Terms & Condition.pdf
81K

F.No. R.12019/08/2022-HR
Government of India
Ministry of Health & Family Welfare
Department of Health Research

Declartion of Result in respect of call for online research proposals in the area of Women Scientist/Support to Institute/NRI/Short Term fellowship under HRD Scheme of Department of Health Research during the financial year 2022-23-reg.

List of Successful Proposals under HRD Scheme

Women Scientist		Support to Institute		NRI		Short Term	
S.No.	Proposal id	S.No.	Proposal id	S.No.	Proposal id	S.No.	Proposal id
1.	2022-1120	1.	2022-1018	1.	2022-1015	1.	2022-1019
2.	2022-1123	2.	2022-1036	2.	2022-1016	2.	2022-1021
3.	2022-1129	3.	2022-1042	3.	2022-1017	3.	2022-1025
4.	2022-1133	4.	2022-1043	4.	2022-1021	4.	2022-1028
5.	2022-1139	5.	2022-1045				
6.	2022-1141	6.	2022-1046				
7.	2022-1143	7.	2022-1049				
8.	2022-1145	8.	2022-1050				
9.	2022-1147	9.	2022-1051				
10.	2022-1153						
11.	2022-1158						
12.	2022-1163						
13.	2022-1164						
14.	2022-1169						
15.	2022-1170						
16.	2022-1179						
17.	2022-1180						
18.	2022-1181						
19.	2022-1182						
20.	2022-1185						
21.	2022-1188						
22.	2022-1194						
23.	2022-1195						
24.	2022-1199						
25.	2022-1203						
26.	2022-1204						
27.	2022-1206						
28.	2022-1208						
29.	2022-1209						
30.	2022-1210						
31.	2022-1212						
32.	2022-1214						
33.	2022-1216						
34.	2022-1218						
35.	2022-1221						
36.	2022-1226						
37.	2022-1227						
38.	2022-1228						

डी. आर. मीना/D. R. Meena
निदेशक/Director
स्वास्थ्य अनुसंधान विभाग/Dept. of Health Research
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Ministry of Health and Family Welfare
भारत सरकार/Govt. of India
नई दिल्ली/New Delhi

स्वास्थ्य अनुसंधान विभाग
DEPARTMENT OF HEALTH RESEARCH

Deptartment of Health Research

Ministry of Health and Family Welfare

Online application Preview "Support to Institutions"

Proposal is in Draft Stage

Proposal Id: 2022-1050, Title: Integrated Geriatric Training: Equipped to address 5 Geriatric Giants (Immobility, Instability, Incontinence, Insomnia, Impaired cognition)

PERSONAL/BASIC INFORMATION	
Photograph	
Full Name	**Dr Rajani Prashant Mullerpatan** *(Director)*
Date of Birth	24-05-1972
Gender	Female
Category	GEN
Is differently abled?	No
Nationality	Indian
Aadhar No.	503179985357 View
CONTACT INFORMATION	
Mobile Number	9920048476
Email Address (User login id)	rajani.kanade@gmail.com
Landline Number	
Fax Number	
PERSONAL ADDRESS INFORMATION	
Address Line1	Mahatma Gandhi Missions Institute of Health Sciences, MGM School of Physiotherapy, Plot Nu 1&2, Sector1, Kamothe
Address Line2	Mahatma Gandhi Missions Institute of Health Sciences, MGM School of Physiotherapy, Plot Nu 1&2, Sector1, Kamothe
City/Town	Navi Mumbai
District	
State	MAHARASHTRA
Pincode	410209
Country	India
DETAILS OF THE INSTITUTE WHERE THE PROPOSED RESEARCH WILL BE IMPLEMENTED	
Nature of Employment	Research Scholar (NRI)
Department:	Department of Physiotherapy-MGM School of Physiotherapy
Institute Name	MGM Institute of Health Sciences
Institute's Location (District, State)	RAIGAD, MAHARASHTRA

#	Qualication	University/Institute Name	Institute/College Name	Passing Ye
ESSENTIAL QUALFICATION DETAILS				
1	Doctor of Philosophy	Other University (Cardiff University, United Kingdom)		2007
2	Master of Physiotherapy	University of Mumbai		1995
3	Bachelor of Physiotherapy	University of Mumbai		1992
BASIC QUALFICATION DETAILS				

Research Experience Details

#	Research Institute Name	Position	From Date	To Date	Duration
1	MGM Institute of Health Sciences	Professor-Director	01-May-1995	11-Jul-2022	27.20
				Total year of Research Experience	**27.2**

Publications

#	Title	Author List	Journal Name	Page Number	Year	Volume	Issue Number	Author Type	Impact Factor	ISSN No.	R
1	Differences in Foot Characteristics Between Bharatanatyam Dancers and Age-Matched Non-Dancers	Rajani P Mullerpatan , Juhi K Bharnuke	Medical Problems of Performing Artists	53-57	2022						
2	Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane	Gunjan Patel, Rajani Mullerpatan,Bela Agarwal, Triveni Shetty,Rajdeep Ohja, Javed Shaikh Mohammed, S-Sujatha	Sage Journals	686-696	2022						
3	Evaluation of Early Knee Osteoarthritis Using Biomechanical and Biochemical Markers	Bela M. Agarwal, Raman P. Yadav, Sanketa D. Tambe, Chandana C. Kulkarni, & Rajani P. Mullerpatan	Critical ReviewsTM in Biomedical Engineering	29–39	2021						
4	Dough kneading exposure at kitchen workstation: its influence on handgrip strength and implications for therapy in hand rehabilitation	Lubna Khan, Mamta Shetty, Shifa Kherada, Reema Kava, Mubina Kazi, Prachita Walankar, Rajani Mullerpatan	WORK: A Journal of Prevention, Assessment & Rehabilitation. Accepted for publication	29	2021						
5	Distance Management of Spinal Disorders During the COVID-19 Pandemic and Beyond: Evidence-Based Patient and Clinician Guides from the Global Spine Care Initiative	Scott Haldeman, Margareta Nordin, Patricia Tavares, Rajani Mullerpatan et al	JMIR Public Health Surveill	25484	2021						

6	Effect of yogasana intervention on standing balance performance among people with diabetic peripheral neuropathy: A pilot study	Jinny P Kanjirathingal, Rajani P Mullerpatan, Girish Nehete, Nagarathna Raghuram	International Journal Of Yoga	60-70	2021
7	Lower extremity joint loading during Bounce rope skip in comparison to run and walk	Rajani Mullerpatan, Triveni Shetty, Yuvraj Singh, Bela Agarwal	Journal of Bodywork and Movement Therapies	1-6	2020
8	Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players	Richa Dharod,Triveni Shetty, Ruturaj Shete, Rajani P Mullerpatan	Begell House Journals	183-192	2020
9	Exploration of muscle activity using surface electromyography while performing Suryanamaskar	Rajani P Mullerpatan, Bela M Agarwal, Triveni V Shetty	International Journal Of Yoga	137-143	2020
10	Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India	Rajani Mullerpatan, Shweta Nahar, Yuvraj Singh, Pierre Cote, Margareta Nordin	European Spine Journal	1004-10	2020
11	Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in Children and Adolescents with Cerebral Palsy	Tanochni Mohanty, Dhruv Mehta, Rajani Mullerpatan, Bela Agarwal	Begell House Journals	75-83	2020
12	Evaluation of Standing Balance Performance in Indian Classical Dancers	Bharnuke, Juhi K. ; Mullerpatan, Rajani P. ; Hiller, Claire ; ;	Journal of Dance medicine and Science	19-23	2020
13	Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life	Rajani P. Mullerpatan Markad Kamath	Begell House Journals	0	2019
14	Grip and pinch strength: Reference values for children and adolescents from India	M. Shetty, Sharon Balasundaran, R. Mullerpatan	Journal of Pediatric rehabilitation medicine	255-262	2019
15	Review of Lower Extremity Function Following SEMLS in Children with Cerebral Palsy	Rajani P. Mullerpatan, Triveni Shetty, Sailaxmi Ganesan, Ashok Johari	Begell House Journals	157-171	2019

16	Evidence-Based Rehabilitation of Spine-Pain Disorders among Underserved Individuals in Navi Mumbai, India: A Two-Year– Observational Report	Mullerpatan R, Girdhar P, Singh Y, Salgotra KR, Wilkey A, Nordin M	Crit Rev PhysRehabil Med	0	2019
17	Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries	Mullerpatan R, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B	Crit Rev PhysRehabil Med	0	2019
18	A Study of Fine and Manual Hand Dexterity in People with Parkinson's Disease	Tosha Shah, Mamta Shetty,Meruna Bose,Rajani P. Mullerpatan	Begell House Journals	93-100	2019
19	Gait Kinematics of Bharatanatyam Dancers with and without Low Back Pain	Rajani P. Mullerpatan,Juhi Bharnuke, Claire Hiller	Begell House Journals	0	2019
20	Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis	Bela M. Agarwal, Manisha Advani, Robert van Deursen,Rajani P. Mullerpatan	Begell House Journals	0	2019
21	Health-related physical fitness of people with type 2 diabetes mellitus	Shruti Nair, Bela Agarwal, Jyoti Chatla, Rajani Mullerpatan	Begell House Journals	23-33	2019
22	Energy expenditure using three different walking techniques in individuals with spinal cord Injury	Gayathri Narayanan, Meruna Bose, Shrutika Parab, Bela Agarwal, Rajani Mullerpatan	Begell House Journals	35-41	2019
23	Level of sports participation and performance among people with spinal cord injury	Oshin Amberkar, Bela Agarwal, Yuvraj Singh, Ruturaj Shete, Rajani Mullerpatan	Begell House Journals	43-51	2019
24	Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment	triveni Shetty, Rajani Mullerpatan,Ashok Johari,Sailakshmi Ganesan	Critical Reviews™ in Physical and Rehabilitation Medicine. Begell House Journals	53-62	2019
25	Development of the Deep Squat Milestone in Typically Developing Children	Rajani P. Mullerpatan,Meera Thanawala,Bela M. Agarwal,Sailakshmi Ganesan	Critical Reviews™ in Physical and Rehabilitation Medicine. Begell House Journals	63-73	2019

26	Lower extremity muscle strength and endurance in ambulatory children with cerebral palsy	Triveni Shetty, Shrutika Parab, Sailakshmi Ganesan, Bela Agarwal, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation Medicine. Begell House Journals	75-84	2019
27	Exploration of sports participation in children with mild intellectual disability	Priyanka Iyer, Triveni Shetty, Sailaxmi Ganesan, Shruti Nair, Nagamani Rao, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation Medicine. Begell House Journals	85-92	2019
28	Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis	Agarwal B, Advani M, van Deursen R, Mullerpatan R et al	Critical Reviews™ in Physical and Rehabilitation Medicine. Begell House Journals	85-92	2019
29	Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Critical Reviews™ in Physical and Rehabilitation Medicine	Akanksha Pisal,Bela M. Agarwal,Rajani P. Mullerpatan	Begell House Journals	207-218	2018
30	The Global Spine Care Initiative: methodology, contributors, and disclosures. European Spine Journal	Johnson CD, Haldeman S, Nordin M, Chou R, Côté P, Hurwitz EL, Green BN, Kopansky-Giles D, Randhawa K, Cedraschi C, Ameis A, Mullerpatan R	European spine journal	786-795	2018
31	The Global Spine Care Initiative: a systematic review for the assessment of spine-related complaints in populations with limited resources and in low-and middle-income communities	Nordin M, Randhawa K, Torres P, Yu H, Haldeman S, Côté P, Torres C, Modic M, Mullerpatan R, Cedraschi C, Chou R	European Spine Journal	816-27	2018
32	The Global Spine Care Initiative: classification system for spine-related concerns	Haldeman S, Johnson CD, Chou R, Nordin M, Côté P, Hurwitz EL, Green BN, Kopansky-Giles D, Cedraschi C, Aartun E, Mullerpatan R, Acaroğlu E	European Spine Journal	889-900	2018
33	The Global Spine Care Initiative: care pathway for people with spine-related concerns	Haldeman S, Johnson CD, Chou R, Nordin M, Côté P, Hurwitz EL, Green BN, Cedraschi C, Acaroğlu E, Mullerpatan R,	European Spine Journal	901-14	2018

34	The Global Spine Care Initiative: resources to implement a spine care program	Kopansky-Giles D, Johnson CD, Haldeman S, Chou R, Côté P, Green BN, Nordin M, Acaroğlu E, Ameis A, Cedraschi C, Mullerpatan R, Hurwitz EL	European Spine Journal	915-24	2018
35	The Global Spine Care Initiative: model of care and implementation	Johnson CD, Haldeman S, Chou R, Nordin M, Green BN, Côté P, Hurwitz EL, Kopansky-Giles D, Acaroğlu E, Cedraschi C, Mullerpatan R, Ameis A	European Spine Journal	925-45	2018
36	Survey of musculoskeletal disorders among Indian dancers in Mumbai and Mangalore	Journal of Dance Medicine & Science	Nair SP, Kotian S, Hiller C, Mullerpatan R	67-74	2018
37	Birthing experience of women who have undergone normal delivery in selected community of India	Fernandes N, Gaikwad S, Hemmerich A, Mullerpatan R, Agarwal B	International Journal of Innovative, Knowledge Concepts	0	2018
38	Influence of Focus of Attention During Acquisition of Motor Skills in Children of 3–9 Years	Gupte S, Mullerpatan R, Ganesan S	Critical Reviews™ in Physical and Rehabilitation Medicine	0	2018
39	Influence of habitual deep squatting on kinematics of lower extremity, pelvis and trunk	Agarwal BM, Deursen RV, Mullerpatan RP	Int J Health Rehabil Sci	12-22	2018
40	Effect of Inspiratory Muscle Training in Individuals with Parkinson's Disorder	Agarwal B, Mukri A, Shah M, Ganesan SL, Mullerpatan R	Int J Health Sci Res	178-85	2017
41	Comparison of muscle activity and energy cost between various bodyweight squat positions. Clinical Kinesiology	Sahasrabudhe SS, Agarwal BM, Mullerpatan RP	Journal of the American Kinesiotherapy Association	19-25	2017
42	Reference values of manual dexterity using Minnesota Rate of Manipulation Test for Indian adults	Rane SS, Paul A, Mullerpatan RP	Hand Therapy	79-85	2017
43	Incremental shuttle walk test: Reference values and predictive equation for healthy Indian adults	Agarwal B, Shah M, Andhare N, Mullerpatan R	Lung India: Official Organ of Indian Chest Society	36	2016

44	Level of Physical Exercise Capacity, Respiratory Muscle Strength and Peak Expiratory Flow Rate in Healthy Adolescents	Nair SP, Agarwal B, Shah M, Sawant S, Sinha N, Rajguru V, Mullerpatan R	Bibliotecha Virtual em saude	0	2016
45	Effect of Adolescence on Clinical Outcome Measures of Pulmonary Function and Exercise Capacity	Nair SP, Agarwal B, Shah M, Sawant S, Sinha N, Rajguru V, Mullerpatan R	MGM Journal of Medical Sciences	0	2016
46	Prevalence of shoulder dysfunction among Indian people with type II diabetes	Wani S K ,Mullerpatan R	International Journal of Diabetes in Developing Countries	386	2015
47	Review of Physiotherapy awareness across the globe	Paul A, Mullerpatan R	International Journal of Health Sciences and Research	294-301	2015
48	Effect of Movement Therapy on Academic Stress in Physiotherapy Students	Agarwal, B, Chowdhry M, Mullerpatan, RP, & Kaul SK	Journal of the Medical Sciences	189-192	2014
49	Grip and pinch strength: Normative data for healthy Indian adults	Mullerpatan RP, Karnik G, John R	Hand therapy	11-6	2013
50	Plantar pressure relief in the diabetic foot using forefoot offloading shoes	Bus S, Robert van Deursen RWM, Kanade RV, Wissink M, Manning E, van Baal JG, Harding KG	Gait & Posture	618–622	2009
51	Investigation of standing balance in patients with diabetic neuropathy at different stages of foot complications	Kanade RV, van Deursen RWM, Harding KG, Price PE	Clinical Biomechanics	1183-1191	2008
52	What happens to the contra-lateral foot with diabetic plantar ulceration?	Kanade RV, van Deursen RWM, Harding KG, Price PE	Clinical Biomechanics	676-677	2008
53	What happens to the contra-lateral foot following diabetic foot amputations?	Kanade RV, van Deursen RWM, Price PE, Harding KG	Clinical Biomechanics	677-678	2008
54	Re-amputation occurrence in the diabetic population in South Wales, UK	Kanade RV, van Deursen RW, Burton Jo, Davies V, Harding K, Price P	International Wound Journal	344-352	2007

55	Difficulties in recruiting subjects with partial foot amputations for kinesiological research	Kanade RV, van Deursen RW, Harding K, Price P	The Foot	224-225	2006
56	Walking performance in people with diabetic neuropathy: benefits and threats	Kanade RV, van Deursen RW, Harding K, Price P	Diabetologia	1747-1754	2006
57	Risk of plantar ulceration in diabetic patients with single-leg amputation	Kanade RV, van Deursen RW, Price P, Harding K	Clinical Biomechanics	306-13	2006
58	Mandibular Splint: Correction of jaw deviation following hemimandibulectomy	Karna R, Vijaykumar DK, Kanade RV	Indian Journal of Plastic Surgery	11-15	2002
59	Role of Physiotherapy in the Rehabilitation of Oral Cancer	Kanade RV	Journal of Indian Association of Physiotherapists	13-18	1999

Awards

#	Award Name	Awarded by	Agency Type
1	Dr. PN Berry Scholarship Award	High Commission of India, London, UK	International
2	Indian association of Physiotherapist Award	Indian association of Physiotherapist	National
3	Honorary Research Associate	Cardiff University, United Kingdom	International
4	Executive council member	International Society of Biomechanics	International
5	Member of Education Committee	SPINE20	International
6	Member of the Development Group for Low Back Pain	WHO Rehabilitation Programme for development of the Package of Interventions for Rehabilitation	International

Project Carried out

#	Name of Project	Sanction No.	Funding Agency	Funding Amount (Rs.)	Start Date	End Date	R
1	Development of a Powered Trans-tibial Prosthesis	BT/PR14641/MED/32/465/2015	Ministry of Science & Technology, Dept of Biotechnology, New Delhi	3033050.00	08-Aug-2016	31-Mar-2020	
2	Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study	DST/WOS-B/HN-37/2021/2769	Department of Science and Technology (Women Scientist Scheme-B)	2415008.00	05-Jan-2022	05-Jan-2025	
3	Development of mobile technology (Detect, REhabilitate and Monitor (DREaM)): Empowerment of primary caretakers of children with Cerebral palsy	RGSTC/File-2021/DPP-249/CR-36/237	Rajiv Gandhi Science and Technology Commission, Government of Maharashtra	2254000.00	10-May-2022	10-May-2024	

Proposal Technical Details

Title of training	Integrated Geriatric Training: Equipped to address 5 Geriatric Giants (Immobility, Instability, Incontinence, Insomnia, Impaired cognition)		
Institute Type	Private	**Valid DSIR Certificate** (Validity)	yes (31-03-2025)
Area of Training	Geriatrics	**Subject Area**	AGEING
Proposal Duration (in Years)	5		

Any prior experience / expertise in providing training courses / programmes (both conventional and online) in above areas of research: Please state the durati the category of participants in the given tabular format

#	Area	Duration	Type of Program	Category of Participar
1	Doctor of Medicine (MD) program in Geriatric Medicine	36	Conventional	Post graduate
2	Insomnia- Sleep Studies	36	Conventional	Doctoral Faculty
3	Geriatric Physiotherapy	6	Conventional	Post graduate
4	Immobility and balance in Geriatrics (A module in Value added course: 3 D gait analysis)	2	Online	Undergraduate
5	Geriatric Physiotherapy- Clinical Biomechanics	6	Conventional	Undergraduate
6	Geriatric Physiotherapy-2D analysis module for motion capture	6	Conventional	Post graduate
7	Physiotherapy for geriatric care	6	Conventional	Undergraduate
8	Certificate course in Geriatric Medicine: Gerontology,COVID,Dry Eye, Asthama	1	Conventional	Post graduate
9	Research Methods	6	Online	Post graduate
10	Basics of Research methodology and Biostatistics	6	Online	Undergraduate
11	SPSS training	1	Conventional	Post graduate

THE TRAINING MODULES FORMAT

#	Topics	Schedule	Trainging Provided
1	Module 1: Concepts in Geriatric care	Duration: 4 hours, Mode of Training: Online, Text Resource :Own text resource material will be created, Video Resource: Own video resource, Evaluation outcome:MCQ's based on text resource material	Session 1: Topic 1:Definition and classification of geriatrics, social concepts of aging, Importance of s networks in old age, successful aging, societal myths regarding older adults and aging and nutrition i geriatrics. Topic 2: Theories of aging. Topic 3: Physiology of aging: Musculoskeletal system, Neurologi system, Cardiovascular and Respiratory system, Effect on special senses Learning outcome: To be ab define and classify geriatrics, explain the theories of aging, explain the physiological mechanism of a

2	Module 1.1: Concepts in geriatric care	Duration: 2 hours, Mode of delivery: Online, Learning outcomes: To be able to precisely explain clinical manifestations of common geriatric conditions and their effect on various system and on physical function, Own text and video resource material	Common Geriatric conditions: Osteoporosis, Osteoarthritis, Spondylosis, Spondylolisthesis, Parkinsc disease, Dementia, Alzheimer's, Chronic obstructive pulmonary disease, Diabetes Mellitus, Hyperten fractures
3	Module 2: Immobility and Role of Physiotherapy in Geriatric Care: Inactive to active lifestyle	Duration: 3 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment.	Session 3 Theory: 1. Physiological changes in the Musculoskeletal system related to immobility 2. Sys responsible for immobility 3. Contextual {e.g. environmental and psycho-social cultural} factors that risk factors responsible for dysfunction and morbidity related to elderly Learning Outcome: 1. To be a explain the physiological changes in the Musculoskeletal system related to immobility 2. To be able t role of various systems in immobility. 3. To be able to explain the role of contextual factors in dysfunc morbidity among elderly
4	Module 3:Outcome measures to assess immobility and role of Physiotherapy in geriatric care	Duration: 3 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-To conduct appropriate immobility assessment and explain role of physiotherapy	Outcome measure to assess function of the elderly, Role of Physiotherapy in geriatric care: Institutior community-based, hospital-based care.NGOs and Health-related legal rights and benefits for the eld
5	Module 4: Instability: Early fall risk screening and prevention	Duration: 6 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-to explain concept of instability, etiology of instability demonstrate instability assessment	Session 5:Instability: Definition, neurophysiology, balance strategies. Session 6: Outcome measures t instability
6	Module 5: Stress incontinence: Wet to dry	Duration: 5 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-to explain the basic concept of incontinence and assessment of incontinence	Session 7 Incontinence: Pelvic floor anatomy, Types of incontinence, pathophysiology, complications manifestations, lower urinary tract infection, diagnosis and management. Session 8: Outcome measu assess incontinence
7	Module 6: Insomnia: Good sleep for good health	Duration: 5 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-to explain the basic concept of insomnia, conduct insomnia assessment and exercise program	Session 9: Physiology and architecture of sleep, Importance of sleep, Consequences of Sleep depriva International classification of sleep disorders (ICSD) in brief. Session 10:Insomnia definition, signs an symptoms, diagnosis and treatment in the elderly, Sleep hygiene, Cognitive behavioral therapy (CBT) Insomnia with co-morbidities in old age, Insomnia and drugs or medication in old age
8	Module 7: Cognitive impairment	Duration: 4 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-to explain the concept of cognitive impairment and to conduct cognitive impairment assessment	Session 11: Cognition: Definition, neurophysiology, signs and symptoms, consequences Session 12: C impairment assessment and management
9	Module 8: Research Methodology: Holding hands for creating knowledge	Duration: 8 hours, Mode of delivery: Online, Resource material: Own text and video resource material; Evaluation method: MCQ based assessment. Learning outcome-to explain concept of research methodology, perform literature search, prepare proposal	Session 12: Introduction to Research, definition, Scope, Importance, Literature Review, Research Des Session 14: Tools and Methods of Data Collection, Scaling techniques, Formulating a Research Proble Designing a Questioner, Sampling techniques. Session 15:Writing a Research Proposal, How to write Papers for Peer-reviewed Journals. Session 16: Sample size estimation, Introduction to spreadsheet application Excel; Features & function using formulae
10	Module 9: Integrated hands-on module: Practice makes skills better	Duration: 30 hours, Mode of delivery: Practical Demonstration, Resource material: Video resource material; Evaluation method: Skill evaluation. Learning outcome-to demonstrate evaluation of motion, muscle strength, balance, incontinence, cognition, sleep	Session 17: Evaluation of Mobility -Clinical Assessment: Range of motion goniometry and 2D analysis Kinovea; Session 18: Evaluation of Muscle Strength and Cognition-Manual muscle testing, Dynamom EMG, MMSE and Mini Cog; Session 19: Evaluation and Management of Instability -3D: Balance assessr using VICON system, video cameras and AMTI force plates, Balance assessment scales; Session 20: Ev and Management of Incontinence-Biofeedback, Kegels exercise, vestibular ball exercises; Session 21: Insomnia Assessment-Polysomnography, Nutritional Assessment
11	Module 10: Integrated hands-on module: Research methods, Field visit, Comprehensive Evaluation and Valedictory Function	Duration: 30 hours, Mode of delivery: Practical Demonstration, Experiential Learning, Group Discussion; Resource material: Videos; Evaluation method: Skill assessment	Session 22: Research Methodology-SPSS, Formulation of research question and drafting a research p Session 23: Field Visit to rural areas; Session 24: Field Visit to Geriatric Home; Session 25: Formulating project-Conceptualization of research project for geriatric care; Session 26: Comprehensive Skill Eval and Valedictory Function

Existing faculty members, their details, positions, posts available with the institution for imparting proposal programme.

#	Faculty Name	Designation	Email Id	Contact Number	E
1	Dr. Rajani P Mullerpatan	Professor-Director -MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai, Maharashtra	rajani.kanade@gmail.com	99200 48476	
2	Dr. Rita M Khadkikar	Associate Professor – Department of Physiology	ritumk@gmail.com	9619597074	
3	Dr. Piyush Singhania	Professor and Head-Department of Urology	piyushsnghn@yahoo.co.in	9324964818	
4	Dr. Bela Agrawal	Professor-Cardiovascular and Respiratory Physiotherapy	bagarwal@mgmsopnm.edu.in	9819000674	
5	Dr. Triveni Shetty (PT)	Associate Professor	phd_tshetty@mgmsopnm.edu.in	9920633288	
6	Dr. Poonam Desai (PT)	Full time Ph.D Scholar in Geriatric Physiotherapy	phd_poonamdesai@mgmsopnm.edu.in	9892894986	
7	Dr. Priyanka Pareek	Assistant professor-Dept. of Clinical Nutrition	priyankafn1681@yahoo.com	8143640995	
8	Dr. Varsha Reddy Jayar	Assistant Professor, Medical Advisor -SDUMC, Kolar (Visiting faculty, MGMIHS)	varsha.jayar@gmail.com	7909116665	
9	Dr. Amruta Lovekar	MA in Gerontology (Guest Faculty at MGM IHS)	amruta.lovekar@gmail.com	9833136536	
10	Dr. Sachin Desai	Associate Professor	desai.v.sachin@gmail.com	8792708265	
11	Dr Rakesh Ghildiyal	Professor	rakghil@gmail.com	9820230538	
12	Dr. Shweta Kanchan	Associate Professor	drshwetakanchan@gmail.com	8808390589	
13	Dr. Veerti Shah	Assistant Professor	virti1287@gmail.com	9820248390	

No. of Participants	10
Mode of Selection	Interview
Brief Justification	Magnitude of Problem: Globally, elderly population has increased rapidly over last few decades due to an increase in life expectancy.1WHO reports t 2030, population of older adults will reach 1.4 billion; which will increase to 2.1 billion by 2050.2 By 2050, number of older adults in low-middle-inco countries will increase more than 250% compared to 71% increase in high-income countries.2 By 2025, geriatric population is expected to be 840 mi developing countries.3 Similarly, in India, ageing population is rising exponentially. Ministry of Statistics and Program Implementation, Govt. of Indi reported that proportion of people above 60 years or more increased to 10.1% in 2021 and is likely to increase further to 13.1% in 2031(Elderly in Inc Report)4. The report also noted a significant increase in old-age dependency ratio, which increased from 10.9% in 1961 to 14.2% in 2011, which is pr to increase to 15.7% and 20.1% in 2021 and 2031, respectively 4. A steadily growing rise in old-age dependency ratio will place huge financial and ma burden on India; a country which is already constrained in resources necessary for elderly-care. Therefore, holistic, comprehensive geriatric-care air functional independence in daily life warrants an urgent need for integrated geriatric training. Profile of problem: Ageing affects structure and functi most body systems. Major health problems of geriatric population can be classified into five geriatric giants5 namely: immobility, instability, inconti intellectual impairment and insomnia. These giants refer to major chronic disabilities of old age, which cause negative impact on physical, mental a function of older adults and overall health-related quality-of-life. Comprehensive geriatric-care engaging multidisciplinary health-professional-team (geriatricians in family medicine, physiotherapists, nurses, social gerontologists) has demonstrated improvement in functional outcome of frail seni both acute care and rehabilitation settings and patient satisfaction.7 However, we face a huge challenge of limited skilled health-professionals. In In currently a few universities offer Geriatric Medicine/Geriatric Physiotherapy specialty degree programs and training fellowships. It is estimated that geriatrician is required per 50,000 population, or 6,000 older adults aged 60 years and above6. In India, it is estimated that we need 27,600 Geriatric-specialists to provide standard –geriatric care for its growing older population of 138 crore people6. In order to bridge the gap of limited resources, M of Health and Family Welfare provides training resources for elderly-care such as: Training Manual on Elderly Care for Community Health-Officers at Ayushman Bharat Health and Wellness Centers, short term training handbook for Geriatric Care Assistant (eligibility:10+2 Science), PG Diploma in In Geriatric Care for graduates and Certificate courses in Geriatric Care for Caregiver/ Bed Assistants by National Institute of Social Defence, Ministry of Justice and Empowerment. Additionally, Institutes like Tata Institute of Social Studies also offer Diploma in Gerontology for 10+2 pass candidates. H focused information on in-depth evaluation and management of 5 geriatric giants necessary for functional independence is limited in most of these programs. The Training Manual on Elderly Care for Community Health Officers provides cursory information on overall geriatric assessment using questionnaires and scales. In routine clinical setting, specialized gerontologist, geriatric physiotherapists, etc. work exclusively in area of geriatric-m or geriatric-physiotherapy. However, they possess domain-specific skills; because there is lack of integrated training essential to deliver comprehen geriatric evaluation and management. Therefore, it is deemed essential to design an Integrated Geriatric training program, which is targeted toward evidence-based evaluation and management of five geriatric giants. The current training program incorporates robust clinical evaluation supplemen objective instrumented analysis packaged in a feasible hybrid mode to equip health professionals with comprehensive knowledge and skill in order address the growing unmet needs of geriatric care in India.

Available Infrastructure	a. Existing laboratory facilities to be (Please attach a brief biodata used importing training) b. Back-up existing internet facilities to provide online course c. Hostel d. Other (The course of Geriatric rehabilitation is organized in 10 modules-26 sessions (each module will be covered in one week including 2 field vis hours (3 credits) Highlights of the Course: The proposed course is highlighted with following exclusive salient training features such as- • A cohesive expert, experienced, renowned faculty members, • Original, exclusive knowledge content of modules based on research studies conducted on elder in India in urban and rural population, • State of art advanced laboratory facilities which will add value to hands-on training experience of skills and Extensive comprehensive prior experience of the Team in training in areas of geriatric medicine, geriatric physiotherapy and research methods and biostatistics. • Integrated field visits for first-hand experiential learning in elderly care. Training through knowledge transfer and hand-on skill for eva and management of the 3 geriatric giants / 3 modules of the program is designed based on evidence gathered from original studies conducted on u rural elderly population of India. The training material will be recorded and delivered using the existing infrastructure and laboratory facilities availa MGM Centre of Human Movement Science along with support sought from Dept. of Health Research. The MGM Centre is a unique exclusive Centre ir geared for gaining understanding in body and function impairments caused by ageing and design technology solutions to improve mobility and red of falls of the elderly people. Currently it is working on developing technology solution for Early Detection, Rehabilitation and Monitoring of elderly funded project by Department of Science and Technology (DST), Govt of India. The Centre is equipped with state of art facilities for 3D motion analy includes- 12 camera motion system (Vicon, UK) and 2D motion analysis system for understanding kinematics of movement impairments caused by during common activities of daily living such as walking and others; 8-channel wireless Surface-EMG system (Delsys, USA) to understand changes in activity; 3 force-plate system (AMTI, USA) to gain precise understanding in balance impairments during commonly performed activities and gain dee insight in risk for falls. The MGMIHS also has a robust state-of-art sleep lab equipped for deeper and wider understanding of evaluation and manage insomnia in the elderly people. The Modules are designed using exclusive scientific original evidence-based information from the robust technolog capacity and performance of elderly people in India. Additionally, the system is equipped with 3 AMTI force-plates that enables testing and training balance among individuals. The L-shaped arrangements of the force-plates enables testing of balance under various conditions. The system enable of individuals on physical and cognitive dual tasks of balance as well. The 2D analysis software at the Centre allows objective assessment of outdoo of mobility and range of motion at various joints in the sagittal and frontal plane. Delsys- 8 channel wireless EMG biofeedback system enables under muscle recruitment pattern and thereby understand the physiology of muscle weakness and muscle fatigue in various conditions during rest and ac The exclusive facilities of MGM Centre of Human Movement Science will be used to deliver knowledge content and hands-on skills necessary for eva and management of 3 geriatric giants immobility, instability and incontinence. Sleep Lab of MGMIHS is 1st state of art polysomnography Centre of N Mumbai and Raigad district equipped with advanced laboratory facilities to deliver knowledge content and hands-on skills necessary for evaluation management of insomnia. It is a level I sleep lab in collaboration with University of Penn, Philadelphia. The technicians at the sleep lab are trained b faculty from Pennsylvania University. The multidisciplinary team of Psychiatrist, Geriatrician, Social Gerontologist, Neurologist and Physiotherapist contribute to comprehensive evaluation and management of impaired cognition. The Institute is also equipped with expert faculty members in Res Biostatistics at National and International level and a licensed version of SPSS software in order to offer robust training to participants on Research Methodology and Biostatistics. Collectively, the integrated training course will offer knowledge base and hands–on practical and clinical skills; whic prepare the participants to offer competent comprehensive geriatric care, conduct further meaningful research in geriatric care and design technolo solutions to enhance existing elderly care to meet unmet health needs of our growing elderly population.)
Advertisement of the training programme	1657868524_508713693.pdf View

Uploaded Documents

#	Proposal Id	Document Name	Uploaded Document	Remarks
1	Mandate Form	View	14-07-2022	Mandate form
2	Declaration & Attestation	View	14-07-2022	Declaration and Attestation
3	Certificate by Head of Institute	View	14-07-2022	Certificate by HOI
4	DSIR Recognition Certificate	View	14-07-2022	SIRO
5	Undertaking by Applicant	View	14-07-2022	Undertaking for PI

A: Grant for gap filling/up gradation of facilities (one time grant up to Rs.50.00 lakh)

#	Item	Budget (INR)	Description/Justification
1	Manpower-Remuneration for experts from institutions for consultation (2000 INR per hour	1545000.00	The manpower remuneration is computed based on additional hours required to prepare course material over and above regular working hours at the Institution and expertise available to deliver specific course content such as Social Gerontology and Incontinence in the elderly. The remuneration is computed as per Institutional guidelines based on level of expertise and years of teaching experience as follows- Professor INR 4000/hour, Associate professor INR 3000/hour and Assistant Professor/PhD Scholar INR 2000/hour

2	Equipment: EMG,Dynamometer, Vibrothesiometer,Tuning fork,Hammer,PEFR,BPapp,Sthethescope	976850.00	The Institute is equipped with state of art 3D motion capture system, an EMG system for capturing muscle activity, and a Polysomnography system for sleep studies. Existent systems are being used to train physiotherapy graduates, postgraduates, and Ph.D. scholars and are constantly being used for research projects. Therefore providing training to the participants will demand a few additional equipment to supplement the existing ones in the laboratories. A biofeedback EMG system will be required to demonstrate and train participants in relaxation techniques for the elderly. Dynamometers will be required to train evaluation of muscle strength and other small equipment such as a tuning fork, hammer, Peak flow meter, BP apparatus, and stethoscope will be required for training in clinical evaluation.
3	Consumables	125000.00	Electrode gel will be required while demonstrating sleep studies, Adhesive tapes will be used during 2D and 3D motion capture and EMG, print out of evaluation forms and stationery will be required, and one portable hard drive will be required for data storage.
4	Contingencies	125000.00	Inflation in training material production, Rise in Website maintenance cost, Additional data storage spaces required (if any)
5	Building an online Portal for delivering a training module	770520.00	Currently, the Institution utilizes freely available online portals for the delivery of e-content. However, the proposed training modules will require the development of a dedicated learning management system for effective, uninterrupted, and smooth delivery of content. Website development and management will incur expertise and the cost of maintenance.
6	Development of interactive video resource	1000000.00	The theoretical aspects of integrated geriatric training will be offered using an online mode. Instructional videos will be prepared to supplement live sessions and to share material for self-directed learning to the participants. Evaluation and management techniques will be demonstrated via video sessions and provided to the learners for future use.
7	Institution overhead	454237.00	The Institute's overheads include electricity charge, maintenance and repair, and costs of use of infrastructure developed by the Institution in the form of State of Art Centers of Excellence ie MGM Center of Human Movement Science, and MGM Sleep Laboratory in collaboration with the International Society of Biomechanics, IIT Bombay, University of Pennsylvania, USA. 10% of the total budget is computed as Institutional Overheads.
Total(INR)		**4,996,607.00**	

Budget details

Year	Fix Fellowship Amount (@ 0.00 per month)	Staff/Manpower	Consumables	Minor Equipment	Travel	Other Charges	Total Budget
Year:1	0	0.00	1,120,520.00	600,000.00	0.00	240,637.00	1,961,157.00
Year:2	0	388,750.00	300,000.00	90,000.00	0.00	50,900.00	829,650.00
Year:3	0	388,750.00	200,000.00	40,000.00	0.00	50,900.00	679,650.00
Year:4	0	388,750.00	200,000.00	86,850.00	0.00	50,900.00	726,500.00
Year:5	0	388,750.00	200,000.00	160,000.00	0.00	50,900.00	799,650.00
							Total: 4,996,607.00

Staff/Manpower budget breakup

Year	Staff/Manpower	No. of Staff/Manpower	Staff/Manpower required for Months	Amount (Rs.)
2	PI/Project Coordinator-I (for Non-Govt./Voluntary Organization)	1	2	77,750.00
2	Principal Project Associate	1	2	77,750.00
2	Senior Project Associate	1	2	58,314.00
2	Project Assistant	1	2	58,314.00
2	Project Associate-I	1	2	38,874.00
2	Project Associate-II	1	2	38,874.00
2	Project Scientist-I	1	2	23,326.00
2	Project Scientist-II	1	2	7,774.00
2	Project Scientist-III	1	2	7,774.00

Staff/Manpower budget breakup				
Year	Staff/Manpower	No. of Staff/Manpower	Staff/Manpower required for Months	Amount (Rs.)
3	PI/Project Coordinator-I (for Non-Govt./Voluntary Organization)	1	2	77,750.00
3	Principal Project Associate	1	2	77,750.00
3	Senior Project Associate	1	2	58,314.00
3	Project Assistant	1	2	58,314.00
3	Project Associate-I	1	2	38,874.00
3	Project Associate-II	1	2	38,874.00
3	Project Scientist-I	1	2	23,326.00
3	Project Scientist-II	1	2	7,774.00
3	Project Scientist-III	1	2	7,774.00
4	PI/Project Coordinator-I (for Non-Govt./Voluntary Organization)	1	2	77,750.00
4	Principal Project Associate	1	2	77,750.00
4	Senior Project Associate	1	2	58,314.00
4	Project Assistant	1	2	58,314.00
4	Project Associate-I	1	2	38,874.00
4	Project Associate-II	1	2	38,874.00
4	Project Scientist-I	1	2	23,326.00
4	Project Scientist-II	1	2	7,774.00
4	Project Scientist-III	1	2	7,774.00
5	PI/Project Coordinator-I (for Non-Govt./Voluntary Organization)	1	2	77,750.00
5	Principal Project Associate	1	2	77,750.00
5	Senior Project Associate	1	2	58,314.00
5	Project Assistant	1	2	58,314.00
5	Project Associate-I	1	2	38,874.00
5	Project Associate-II	1	2	38,874.00
5	Project Scientist-I	1	2	23,326.00
5	Project Scientist-II	1	2	7,774.00
5	Project Scientist-III	1	2	7,774.00
				Total: 1,555,000.00

Consumables budget breakup			
Year	Particular	Justification	Amount (Rs.)

Consumables budget breakup			
Year	Particular	Justification	Amount (Rs.)
1	Hard Drive	Data storage	12,000.00
1	Adhesive Tapes	Motion capture	2,000.00
1	Electrode Gel	Sleep studies	1,000.00
1	Stationery	Printouts of outcome measure tools	10,000.00
1	Building an online Portal for delivering a training module and video resource and contingency	developing online portal and learning materia	1,095,520.00
2	Hard drive	Data Sorage	12,000.00
2	Adhesive Tapes	Motion Capture	2,000.00
2	Electrode Gel	Sleep Studies	1,000.00
2	Stationary	Print out of outcome measure tools	10,000.00
2	Building an online Portal for delivering a training module and video resource and contingency	developing online portal and learning materia	275,000.00
3	Hard drive	Data storage	12,000.00
3	Adhesive Tapes	Motion Capture	2,000.00
3	Electrode Gel	Sleep Studies	1,000.00
3	Stationary	Print outs of outcome measure tool	10,000.00
3	Building an online Portal for delivering a training module and video resource and contingency	developing online portal and learning materia	175,000.00
4	Hard Drive	Data Storage	12,000.00
4	Adhesive Tapes	Motion Capture	2,000.00
4	Electrode gel	Sleep Studies	1,000.00
4	Stationary	Print out of outcome measure tools	10,000.00
4	Building an online Portal for delivering a training module and video resource and contingency	developing online portal and learning materia	175,000.00
5	Hard drive	Data Storage	12,000.00
5	Adhesive tapes	Motion Capture	2,000.00
5	Electrode gel	Sleep Studies	1,000.00
5	Stationary	Print out of outcome measure tools	10,000.00
5	Building an online Portal for delivering a training module and video resource and contingency	developing online portal and learning materia	175,000.00
			Total: 2,020,520.00

Equipment budget breakup						
Year	Particular	Equipment Model	Equipment Manufactrurer	Equipment Type	Justification	Amount (Rs.)

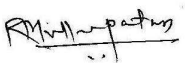
Equipment budget breakup						
Year	Particular	Equipment Model	Equipment Manufactrurer	Equipment Type	Justification	Amount (Rs.)
1	Surface EMG	Trigno Biofeedback Q8368	Delsys Ltd, USA	Imported	Biofeedback studies	600,000.00
2	Jamar Hand Grip Dynamometer			Imported	Muscle strength evaluation	90,000.00
3	Vibrothesiometer			Domestic	Clinical evaluation in geriatrics	40,000.00
4	Pinch grip dynamometer			Imported	Clinical evaluation of geriatric people	86,850.00
5	Power track dynamometer	JT-CM305-CM300	J Tech Medical	Imported	Individual muscle strength testing	160,000.00
						Total: 976,850.00

Mandate Form Details

#	Name of Account Holder (As per bank record)	Email Id of Designated Authority	Designation of Head of Institute	Account Number	Bank Name	IFSC	Branch Name and Address
1	MGM Institute of Health Sciences (Research)	mgmschoolofphysiotherapy@mgmsopnm.edu.in	Professor	0183104000347532	Affirmation by Institute for Opening account in Nationalized bank	IBKL0000183	MGM School of Physiotherapy, MGM Institute of Health Sciences MGM Educational Campus, Plot number 1 & 2, Kamothe, Taluka Panvel, Raigad district

Declaration

☑ I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.



Proposal Reference No.: BT/TEMP8441/PACE-26/22

FACE SHEET

Title Of The Proposal
Empowerment of primary caretakers of children with cerebral palsy using Mobile-based technology DREaM of CP: Detect, REhabilitation and Monitoring of Cerebral Palsy
Proposal Category
AIR-Academic Innovation Research
Applicant Institute
MGM Institute of Health Sciences
Applicant Type
OTHER
Proposal Duration
24 (months)
Relevant Area
Healthcare-Devices and Diagnostics
Support Requested From BIRAC
Grant-In-Aid
Solely/ Collaborative
Solely by in house R&D unit of industrial firm

Names Of The Project Coordinator And Other Key Investigator(s) Involved In The Project					
Project Coordinator Details					
Sl. No.	**Name**	**Designation**	**Organization**	**E-Mail**	**Resume**
Project Coordinator					
1	Dr. Rajani Mullerpatan	Director - Proposal	MGM Institute of Health Sciences	rajani.kanade@gmail.com	View File
Applicant Team Members					
1	Mrs. Triveni Shetty	Associate Professor	MGM Institute of Health Sciences	tshetty@mgmsopnm.edu.in	View File
Declaration Document					
View File					

INSTITUTION DETAILS

Name of the Institution : **MGM Institute of Health Sciences**

Contact Details			
Address1:	MGMIHS	**Address2:**	Sector 1
Street/Village:	Kamothe	**City/Town:**	Navi Mumbai
State:	MAHARASHTRA	**Country:**	India
Pincode/Zip:	410209	**Landline:**	022--7437866
Fax:	--	**Website:**	www.mgmuhs.com

Brief Background of the Institution

Year of Establishment of the Institution

1989

Recognition or Accriditation Status

NAAC Grade A

Registration or recognition certificate from a statutory body

View File

R&D Activity

MGM INSTITUTE OF HEALTH SCIENCES

(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

Sector-1, Kamothe, Navi Mumbai – 410 209, Tel: 022-27432471/27431994, Fax: 022-27431094
Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

DECLARATION

We, the undersigned, participating in the project entitled " Empowerment of primary caretakers of children with cerebral palsy using mobile-based technology: DREaM *of* CP (**D**etection, **RE**habilitation and **M**onitoring *of* **C**erebral **P**alsy)" certify that the particulars submitted in the application are true and correct. We have read the guidelines, terms and conditions governing the scheme and undertake to abide by them. We would do our utmost to support and to ensure effective participation of scientists from respective organizations towards the goal oriented, time bound, and progress of the said project. The financial assistance, if provided, shall be put to the declared use. We certify that

a) the research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
b) A proposal is submitted to the Rajiv Gandhi Science and Technology Commission, Govt of Maharashtra for TRL 1 and TRL 2 (for development of the mobile application and pilot testing) for financial support. (Status of the Project: The project was presented to the review committee on 14/2/2022 after being shortlisted, and awaits a response from the committee)
c) the emoluments for the manpower proposed are those admissible to persons of corresponding status employed in the institute or as per the Ministry of Science & Technology guidelines (given below)– *Applicable only for Public Partner/s.*
d) necessary provision for the scheme/project will be made in the Institute budget in anticipation of the sanction of the scheme/project.
e) if the project involves field trials/experiments/exchange of specimens, etc. we will ensure that ethical clearances would be taken from concerned ethical Committees/Competent authorities and the same would be conveyed to the Department of Biotechnology before implementing the project and all national guidelines such as Ethical Guidelines of ICMR, GM Product Guidelines of Govt. of India would be strictly followed.
f) if the project involves the utilization of genetically engineered organisms, we agree to submit an application through our Institutional Biosafety Committee. We also declare that while conducting experiments, the Biosafety Guidelines of the Department of Biotechnology would be followed into to.
g) the institution agrees that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigator(s) throughout the duration of the project.
h) the institution assumes to undertake the financial and other management responsibilities of the project.
i) the institution agrees that the agreement, as per norms of the scheme, shall be executed with

MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
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Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

the department towards the implementation of the project.

Signatories Company and all Collaborators (Name, Designation, Signature & Seal): **None**

Project Coordinator:

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Key Investigator(s)

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

31/3/2021

Dr. Triveni Shetty (PT), Associate Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Forwarding authorities of the company/companies/ institution(s)

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

MGM INSTITUTE OF HEALTH SCIENCES

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Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

DECLARATION

We, the undersigned, participating in the project entitled " Empowerment of primary caretakers of children with cerebral palsy using mobile-based technology: DREaM *of* CP (**D**etection, **RE**habilitation and **M**onitoring *of* **C**erebral **P**alsy)" certify that the particulars submitted in the application are true and correct. We have read the guidelines, terms and conditions governing the scheme and undertake to abide by them. We would do our utmost to support and to ensure effective participation of scientists from respective organizations towards the goal oriented, time bound, and progress of the said project. The financial assistance, if provided, shall be put to the declared use. We certify that

a) the research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
b) A proposal is submitted to the Rajiv Gandhi Science and Technology Commission, Govt of Maharashtra for TRL 1 and TRL 2 (for development of the mobile application and pilot testing) for financial support. (Status of the Project: The project was presented to the review committee on 14/2/2022 after being shortlisted, and awaits a response from the committee)
c) the emoluments for the manpower proposed are those admissible to persons of corresponding status employed in the institute or as per the Ministry of Science & Technology guidelines (given below)– *Applicable only for Public Partner/s.*
d) necessary provision for the scheme/project will be made in the Institute budget in anticipation of the sanction of the scheme/project.
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f) if the project involves the utilization of genetically engineered organisms, we agree to submit an application through our Institutional Biosafety Committee. We also declare that while conducting experiments, the Biosafety Guidelines of the Department of Biotechnology would be followed into to.
g) the institution agrees that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigator(s) throughout the duration of the project.
h) the institution assumes to undertake the financial and other management responsibilities of the project.
i) the institution agrees that the agreement, as per norms of the scheme, shall be executed with

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Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

the department towards the implementation of the project.

Signatories Company and all Collaborators (Name, Designation, Signature & Seal): **None**

Project Coordinator:

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Key Investigator(s)

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

31/3/2021

Dr. Triveni Shetty (PT), Associate Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Forwarding authorities of the company/companies/ institution(s)

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Proposal Reference No.: BT/TEMP8424/PACE-26/22

FACE SHEET

Title Of The Proposal
Empowerment of community-dwelling elderly people for maximization of physical function using mobile-based technology: DREaM of E Detection, REhabilitation and Monitoring of Elderly
Proposal Category
AIR-Academic Innovation Research
Applicant Institute
MGM Institute of Health Sciences
Applicant Type
OTHER
Proposal Duration
24 (months)
Relevant Area
Healthcare-Devices and Diagnostics
Support Requested From BIRAC
Grant-In-Aid
Solely/ Collaborative
Solely by in house R&D unit of industrial firm

Names Of The Project Coordinator And Other Key Investigator(s) Involved In The Project					
Project Coordinator Details					
Sl. No.	**Name**	**Designation**	**Organization**	**E-Mail**	**Resume**
Project Coordinator					
1	Dr. Rajani Mullerpatan	Director-Professor	MGM Institute of Health Sciences	rajani.kanade@gmail.com	View File
Applicant Team Members					
1	Ms. Poonam Desai	Ph.D.Scholar	MGM Institute of Health Sciences	prdesai160691@gmail.com	View File
Declaration Document					
View File					

INSTITUTION DETAILS

Name of the Institution : **MGM Institute of Health Sciences**

Contact Details			
Address1:	MGMIHS	**Address2:**	Sector 1
Street/Village:	Kamothe	**City/Town:**	Navi Mumbai
State:	MAHARASHTRA	**Country:**	India
Pincode/Zip:	410209	**Landline:**	022--7437866
Fax:	--	**Website:**	www.mgmuhs.com

Brief Background of the Institution

Year of Establishment of the Institution

1989

Recognition or Accriditation Status

NAAC Grade A

Registration or recognition certificate from a statutory body

View File

R&D Activity

MGM INSTITUTE OF HEALTH SCIENCES

(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

Sector-1, Kamothe, Navi Mumbai – 410 209, Tel: 022-27432471/27431994, Fax: 022-27431094
Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

DECLARATION

We, the undersigned, participating in the project entitled " Empowerment of community-dwelling elderly people for maximization of physical function using mobile-based technology: DREaM *of* E (Detection, REhabilitation and Monitoring *of* Elderly)" certify that the particulars submitted in the application are true and correct. We have read the guidelines, terms and conditions governing the scheme and undertake to abide by them. We would do our utmost to support and to ensure effective participation of scientists from respective organizations towards the goal oriented, time bound, and progress of the said project. The financial assistance, if provided, shall be put to the declared use. We certify that

a) the research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out elsewhere on the subject.

b) A proposal has been submitted for TRL 1 & 2 (for development of a mobile-based application for pilot testing) to the Department of Science and Technology, Government of India-Women Scientist Scheme-B for financial support. (Status of the Project: Ongoing. Sanction order received on 05.01.2022)

c) the emoluments for the manpower proposed are those admissible to persons of corresponding status employed in the institute or as per the Ministry of Science & Technology guidelines (given below)– *Applicable only for Public Partner/s.*

d) necessary provision for the scheme/project will be made in the Institute budget in anticipation of the sanction of the scheme/project.

e) if the project involves field trials/experiments/exchange of specimens, etc. we will ensure that ethical clearances would be taken from concerned ethical Committees/Competent authorities and the same would be conveyed to the Department of Biotechnology before implementing the project and all national guidelines such as Ethical Guidelines of ICMR, GM Product Guidelines of Govt. of India would be strictly followed.

f) if the project involves the utilization of genetically engineered organisms, we agree to submit an application through our Institutional Biosafety Committee. We also declare that while conducting experiments, the Biosafety Guidelines of the Department of Biotechnology would be followed into to.

g) the institution agrees that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigator(s) throughout the duration of the project.

h) the institution assumes to undertake the financial and other management responsibilities of the project.

MGM INSTITUTE OF HEALTH SCIENCES

(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

Sector-1, Kamothe, Navi Mumbai – 410 209, Tel: 022-27432471/27431994, Fax: 022-27431094
Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

i) the institution agrees that the agreement, as per norms of the scheme, shall be executed with the department towards the implementation of the project.

Signatories Company and all Collaborators (Name, Designation, Signature & Seal)
None

Project Coordinator:

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Key Investigator(s)

31 Mar 2022

Dr. Rajani Mullerpatan, Director-Professor, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

31-03-2022

Pooram Desai, Ph.D. Scholar, MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai

Forwarding authorities of the company/companies/ institution(s)

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

(Email Verified)

PI/Fellow's Panel

- PI/Fellow Profile
- Proposal Submission
- Submit New Proposal
- Submit Concept Proposal
- Logout

Call for Concept Proposals on COVID-19 (Applied)

Export Excel

Show 10 entries

Search:

#	Concept Proposal ID	PI	Email	Concept Title	Proposal Type	Broad Area	Subject Area	Date of Submission	Present Status	Action
1	2021-5500	Dr Rajani Mullerpatan Prashant Mullerpatan	rajani.kanade@gmail.com	Health of health care workers - A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic	Adhoc	Epidemiology And Communicable Diseases	CLINICAL RESEARCH	30-06-2021 04:07:52 pm		View

Showing 1 to 1 of 1 entries

Previous 1 Next

Wednesday, June 30, 2021 4: 08: 07: PM

Indian Council of Medical Research (ICMR)

Deptartment of Health Research
(Ministry of Health and Family Welfare)

Application for Adhoc Concept Proposal

Concept Proposal in Draft Stage

Concept Id: 2021-5500 **Concept Proposal Title:** Health of health care workers - A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic

Personal Details of PI

Name of PI (IN BLOCK LETTERS)	DR RAJANI MULLERPATAN PRASHANT MULLERPATAN	**Designation**	Director Professor
Email	rajani.kanade@gmail.com	**Contact**	9819000674
Date of Birth	24-May-1972	**Date of Superannuation**	24-May-2037
Nature of Employement	Permanent	PI Complete Profile	
Institute	MGM Institute of Health Sciences		

Proposal Details

Advertisement	YES	**Title of the Research Proposal**	Health of health care workers - A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic
Institute Type	Private	**Valid DSIR Certificate (Validity)**	YES (31-Mar-2037)
Broad Area	Epidemiology And Communicable Diseases	**Major Discipline**	CLINICAL RESEARCH
Concept Proposal	1625049361_1545455290.pdf View		
Project Duration (in Months)	18 Months	**Data Collection/Analyzing Data (in Months)**	6/12 Months
Objective of Study	Enhancing physical and mental fitness of the health care workers through a mobile based virtual platform and create a sustainable and resilient taskforce to fight newer emerging variants of COVID 19 pandemic and reduce risk of COVID 19 infection among HCW.Design a feasible program for post COVID rehabilitation of healthcare workers integrated within their work schedule via mobile based technology to engage them back into healthcare taskforce to fight COVID 19 pandemic.Longitudinal follow up of health care workers which will allow to understand the short term and long term exercise response of health care professionals exposed continuously to clusters of patients infected with COVID 19 in hospital setting	

Expected Outcome	Customized virtual platform fitness programs to improve technology based health related fitness of healthcare workers. Improved work efficiency through physical health and reduce mental stress of healthcare workers. Reference values for health related fitness of healthcare workers in India in various working age groups. Response of healthcare workers to training program integrated within work schedule. Understand patterns of health behavior of healthcare workers. Reduced absenteeism and inform time taken to return to work. Experiences of healthcare workers during the process of training and rehabilitation. Feed data to arrive at predictive percentile values for target to be achieved by people who have been affected by COVID-19. Longitudinal data will inform effect of engaging HCWs in health related behavior following COVID 19 and implications for future rehabilitation programs. Findings will steer development of guidelines for rehabilitation of HCWs and return to work following infectious diseases. The effective model of fitness training emerging from the study can be scaled at various levels and implemented by all healthcare organizations across the country to build a healthy and resilient healthcare taskforce to fight against unprecedented health emergencies.
Ethical Clearance	Yes

Fund received by ICMR before	No	**Fund received by Other Agency before**	Yes

Declaration

☑ I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.

Temporary Registration No. : TPN / 69946

Project Proposal On

"FIST- PROJECT (Level-0)"

Submitted to

Division :R & D Infrastructure

Programme or Scheme : FIST PG College Level O

Submitted by

Project Investigator:

Dr. Rajani Mullerpatan

MGM INSTITUTE OF HEALTH SCIENCES-Navi Mumbai

Part 1 : General Information

General Information:

1.Name of the Institute/University/Organisation submitting the Project Proposal :

MGM INSTITUTE OF HEALTH SCIENCES

2. State	Maharashtra
3. Principal Investigrator Name:	Dr. Rajani Mullerpatan
4. Category:	General
5. Type of the Institue :	Academic Institutions (Private)
6. Project Title (Project Level):	FIST- PROJECT (Level-0)
7. Division :	R & D Infrastructure
8. Programme Or Scheme :	FIST PG College Level O
9. Academic Area :	Life Science, Medical Sciences,
10. Application Area :	Health,
11. Goverment National Initiative :	Make in India, Startup India, Innovate India,
12. Type of Proposal :	Proposal Against Call
13. Project Duration :	5 Years and 0 Months
14. Proposal Submit Date :	06/09/2021
15. Project Keywords :	Biomechanics, Human Movement Science, Rehabilitation, Performance Enhancement, Sports/Dance/Yoga Biomechanics, Post-graduate training, Technology design, Technology Validation, Interdisciplinary trans

16. Project Summary :

Part 2: Particulars of Investigators

Principal Investigator:

1. Name:	Dr. Rajani Mullerpatan
Gender:	Female
Date of Birth:	24/05/1972

Designation :	Professor Director
Department:	MGM School of Physiotherapy
Institute/University:	MGM INSTITUTE OF HEALTH SCIENCES
State:	Maharashtra
District:	Raigad
City/Place:	Navi Mumbai
Address:	MGM School of Physiotherapy, MGM Institute of Health Sciences, Sector 1, Kamothe, Panvel
Pin:	410209
Communication Email:	rajani.kanade@gmail.com
Alternate Email:	mgmchms@mgmsopnm.edu.in
Mobile:	9920048476
Phone:	
Fax:	
Category:	General

Co-Investigator:

1. Name:	Dr. Bela Agarwal
Gender:	Female
Date of Birth:	20/04/1972
Designation :	Professor
Department:	MGM School of Physiotherapy
Institute/University:	MAHATMA GANDHI MISSION INSTITUTE OF HEALTH SCIENCES
State:	Maharashtra
District:	Mumbai Suburban
City/Place:	Navi Mumbai

Address: MGM School of Physiotherapy, MGM Institute of health Sciences, Sec 1, Kamothe, Navi Mumbai

Pin: 410209

Communication Email: bagarwal@mgmsopnm.edu.in

Alternate Email: chmsmgm@gmail.com

Mobile: 9819000674

Phone:

Fax:

Category: General

Suggested Refrees: NA

Part 3: Financial Details

Financial Details:

A. Non - Recurring

Equipment

S.	Equipments	Qty.	Justification	1 Year	Total
1 .	Force Plate(40x60cm)	1	MGMCHMS has 3 force plates. The fourth force plate will enable us to undertake interdisciplinary collaborative research with mechanical engineers to develop finite element models for commonly performed postures of daily living for e.g. cross-legged sitting, kneel sitting, etc. Kinetic analysis of such postures requires an assembly of 4 force plates to record 4 points of contact. Additionally, this is a portable force-plate, therefore can be taken outdoors for kinetic analysis of various sports	1100000	1100000
2 .	In Shoe plantar pressure system	2	In-shoe plantar pressure system is necessary for measurement of dynamic plantar pressure distribution which can inform the clinicians, sports coaches, trainers and athletes about appropriate footwear necessary to enhance performance, reduce risk of injuries, evaluate and prescribe appropriate foot-wear to people with diabetic neuropathy, adults and children with various foot disorders, design appropriate foot orthotics, prosthesis and footwear specific to our culture and environment demands.	1500000	1500000
3 .	Infrared Optical Cameras	4	MGMCHMS is equipped with 12 Bonita Cameras. Four Vantage V5 cameras are portable cameras that serve dual purpose of indoor and outdoor kinematic data capture. Hence they can be outdoors for real time motion analysis of outdoor sports activity. Compatibility with the existing system makes it suitable for indoor usage as well, as more infra-red cameras will reduce these gaps and. The data from 3D cameras provide robust data necessary for finite element modelling	3500000	3500000

4 .	K5 metabolic cart	1	The K5 metabolic cart will enable estimation of metabolic cost of sport activities and rehabilitation exercises to train athletes and people with musculoskeletal disorders. Information on carbon-dioxide production will assist fatigue studies with applications in industrial health, sports and ergonomics of activities in health care and industrial sector.	2600000	2600000
5 .	Laptop with hard disk	3	The existing 3 laptops are used to their maximum capacity for data storage and software applications. Three additional laptops will provide required e-space for additional software and on-field outdoor data collection for sports applications.	300000	300000
6 .	Pliance sensor	1	The equipment offers pressure distribution measurement between hard, soft and curved surfaces of wheelchair users. The knowledge will assist in selecting the appropriate cushions and correct adjustments of the wheelchair to fit the individual patient with spinal cord injuries, chronic neurological conditions and in geriatric patients. It will also help in ergonomic applications for seating design in the industry and at home in addition to Paralympic sports.	1500000	1500000
7 .	Portable Doppler	1	The Ankle Brachial Index is a measure of severity of arterial diseases. With high prevalence of diabetes in India, early intervention following objective evaluation of Ankle Brachial Index would enable early intervention and potential prevention of foot ulcerations, amputations and increase disability free life years. The Centre is a large catchment area for urban and rural villages in and around Navi Mumbai and Raigad district.	72800	72800
8 .	Real time step activity monitor	2	Step Activity Monitors are used for real-time accurate ambulatory activity monitoring of normal and abnormal gait disorders and cadence with data storage for a month. Additional units are necessary to understand whether benefits of hospital-based conservative or surgical care and rehabilitation programs is actually translated to daily life by real time monitoring of walk activity and to monitor real-time walking to validate technology designed to assist ambulation.	100000	100000
9 .	Wall mounted Dynamometer	1	The existing dynamometer at the Centre provides an objective instrument for assessing isometric and concentric strength and muscular endurance of the extensors and flexors of the lumbar and thoracic spine. However, objective evaluation of muscles of the upper and lower extremity is deficient. A wall mounted dynamometer will provide objective evaluation of muscle strength for applications in sports rehabilitation, musculoskeletal disorders and neurological disorders.	900000	900000
10 .	Weighing scale for wheel chair bound people	1	Our work in rehabilitation of patients with spinal cord injury, sports participation in wheel-chair bound individuals and Paralympic athletes for prescription of novel health care programs requires analysis of factors influencing response to training. Objective measurement of body composition of these patients will be useful for prescription and monitoring of rehab programs.	50000	50000
			Total	**11622800**	**11622800**

Site Preparation/ Lab Facilities (IF)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Installation and repairs	Installation of purchased equipment by system experts is essential expense to ensure smooth functioning of the system	500000	0	0	0	0	500000
2 .	Repairs	The team of MGM CHMS in the past 5 years is trained by team of Engineers for trouble shooting of the equipment. The team is gained rich experience in handling the equipment's. However, to avoid sudden unforeseen repairs, team of experts experienced in handling the equipment's will be required to avoid disruption of work.	0	107456	107456	107456	107456	429824
		Total	**500000**	**107456**	**107456**	**107456**	**107456**	**929824**

Networking (NW)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total

1 .	Networking	The Institute is equipped NKN MTNL 1 Gbps speed network, however for smooth functioning of the system additional high speed internet will be required. Additionally as the data generated from the motion analysis system is large files, additional cloud storage and internal connectivity will be required to connect the different systems within the Centre.	116228	116228	0	116228	116228	464912
2 .	Networking	TThe Institute is equipped NKN MTNL 1 Gbps speed network, however for smooth functioning of the system additional high speed internet will be required. Additionally as the data generated from the motion analysis system is large files, additional cloud storage and internal connectivity will be required to connect the different systems within the Centre.	0	0	116228	0	0	116228
		Total	**116228**	**116228**	**116228**	**116228**	**116228**	**581140**

Industrial R&D Support (IRD)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Industrial R & D	: Indigenous technology pertinent to application of rehabilitation in movement disorders which will and develop as a part of research and innovation activity at MGM CHMS will be linked to the industry for fine tuning development of the device. Such a link with the industry will ensure that the device developed is ready to be launched in market for the end user	0	40000	40000	40000	40000	160000
2 .	Industrial R & D	Indigenous technology pertinent to application of rehabilitation in movement disorders which will and develop as a part of research and innovation activity at MGM CHMS will be linked to the industry for fine tuning development of the device. Such a link with the industry will ensure that the device developed is ready to be launched in market for the end user	40000	0	0	0	0	40000
		Total	**40000**	**40000**	**40000**	**40000**	**40000**	**200000**

Scientific Social Responsibility Activities (SSR)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Scientific Social Responsibility	The vision and mission of MGMCHMS is to extend the services to the society at affordable cost and to execute the mission. The Centre continues to undertake the activities of Social responsibilities to translate the findings of scientific research for the wellbeing of the underprivileged section of the society and to address the unmet needs of rehabilitation in the society overall	20000	20000	20000	20000	20000	100000
		Total	**20000**	**20000**	**20000**	**20000**	**20000**	**100000**

Maintenance (M)

S.	Description	Justification	1 Year	2 Year	3 Year	4 Year	5 Year	Total
1 .	Maintenance	The high end system demonstrate gradual wear and tear that occurs steadily but continuously. Therefore, they warrant continuous and timely maintenance to avoid unforeseen sudden disruption of functioning of system. Therefore, maintenance is essential expense to avoid uninterrupted completion of the defined tasks of project in 5 years.	232456	232456	232456	232456	232456	1162280
		Total	**232456**	**232456**	**232456**	**232456**	**232456**	**1162280**

Budget Head Summary in (INR)

Budget Head	Year-1	Year-2	Year-3	Year-4	Year-5	Total

1- Non-Recurring						
Equipment	11622800	0	0	0	0	**11622800**
Site Preparation/ Lab Facilities (IF)	500000	107456	107456	107456	107456	**929824**
Networking (NW)	116228	116228	116228	116228	116228	**581140**
Subtotal (Capital)	12239028	223684	223684	223684	223684	**13133764**
2- Recurring						
Industrial R&D Support (IRD)	40000	40000	40000	40000	40000	**200000**
Scientific Social Responsibility Activities (SSR)	20000	20000	20000	20000	20000	**100000**
Maintenance (M)	232456	232456	232456	232456	232456	**1162280**
Subtotal (General Items)	292456	292456	292456	292456	292456	**1462280**
Total Project Cost (Capital + General)	**12531484**	**516140**	**516140**	**516140**	**516140**	**14596044**

Part 4: PFMS Details

PFMS Unique Code Available: Yes

PFMS Unique Code : MGMIHSDPTP

Current Ongoing Project: NA

List of Uploaded Documents:-

1. Complete Project proposal
2. Certificate from PI
3. Conflict of interest
4. Endorsement from head of Institute
5. Quotation for Equipments

PRESCRIBED FORMAT for PG Colleges

FIST – 2021

Application for PG Colleges at Level – 0

1.

a	Name of the College & Year of Establishment	:	MGM School of Physiotherapy, Navi Mumbai 2008
b	Name of the post-graduate Departments & Year of Commencement of PG Program		• Musculoskeletal Physiotherapy -2008 • Neuro Physiotherapy -2008 • Cardio-vascular & Respiratory Physiotherapy-2008 • Community Physiotherapy - 2008 • Sport Physiotherapy -2017
c	Address for correspondence including Telephone, Telegram, FAX, e-mail etc		MGM School of Physiotherapy Plot No. 1& 2, Sector -1, Kamothe, Navi Mumbai 410 209. Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
d	Year of Commencement of PG Program in the Department & its Financial Status (General/Self-financed)		2008 – Self Financed

2. Status of the College (scan and upload supporting documents along with the proposal

	a) Academic Status [Affiliated College/ Autonomous College/ Constituent College]		Constituent Unit of MGM Institute of Health Sciences (Deemed to be University u/s 3 of UGC Act 1956)
	b) Financial Status [Govt. (Central and State Govt.) / Govt. aided / Private Colleges] i) Upload the copy of 2f and 12B Certificate issued by UGC along with the online submitted proposal;		Private College

3. Whether the College is accredited by NAAC/ NBA or any other relevant agency. If so, please specify the Grading or Rating by those Agencies:

Name of Accreditation Agency	**Rank/ Grading/ Rating**	**Year of Accreditation**
National Institutional Ranking Framework (NIRF)	Overall 101-150	2020
National Assessment and Accreditation Council (NAAC)	Grade A	2014

4. Department-wise Number of Faculty Members with Qualifications:

Name of UG and PG Departments	**Number of Faculty Members**	**Qualifications**
UG Department	**17**	**3PhD qualified faculty members + 14 MPT qualified faculty members**
Electrotherapy & Electrodiagnosis	01	Master of Physiotherapy (MPT)
Kinesiotherapy & Physical Diagnosis	02	Master of Physiotherapy (MPT)
Musculoskeletal Physiotherapy	04	PhD =2 Master of Physiotherapy 2
Neuro Physiotherapy	03	Master of Physiotherapy 3
Community Physiotherapy	02	Master of Physiotherapy 1 Pursuing PhD 1
Cardiovascular Respiratory Physiotherapy	05	PhD=1 Master of Physiotherapy 4
PG Department	**05**	**3 PhD qualified faculty members + 1 (MPT qualified, pursuing PhD) +1 MPT**
Musculoskeletal Physiotherapy	02	PhD =2
Neuro Physiotherapy	01	Master of Physiotherapy 1
Sports Physiotherapy	01	Pursuing PhD 1
Cardiovascular Respiratory Physiotherapy	01	PhD=1

5. Department-wise Number of Students during last three years admitted and passed:

Name of PG Department	**Admitted**			**Passed (Jan –Dec)**		
	2018	**2019**	**2020**	**2018**	**2019**	**2020**
Musculoskeletal Physiotherapy	4	2	3	6	6	4
Neuro Physiotherapy	2	3	3	1	5	2
Cardio-vascular & Respiratory Physiotherapy	-	1	2		1	-
Sports Physiotherapy	2	3	2		7	2
Total	**8**	**9**	**10**	**7**	**19**	**8**

6. Department-wise percentage Cut-off Marks of students admitted during last three years: (MGMCET Data)

Name of PG Department	**%-Cut-off Marks in UG Level Admission**			**%-Cut-off Marks in PG Level Admission**		
	2018	**2019**	**2020**	**2018**	**2019**	**2020**
Musculoskeletal Physiotherapy	-	-	-	50	50	50
Neuro Physiotherapy	-	-	-	50	50	50
Cardio-vascular & Respiratory Physiotherapy	-	-	-	-	50	50
Sport Physiotherapy	-	-	-	50	50	50

7. University Rank of Students at UG and PG Level University Examinations:

UG and PG Programs	**University Ranks during last 3 years**		
	2018	**2019**	**2020**
Bachelor of Physiotherapy	1. Ms. Pandey Pooja Ashok 2. Mr. Iyer Lakshman Chandrashekhar 3. Mr. Sarvaiya Viral Vijay	1. Ms. Jayati Sampat 2. Ms. Khushi Thakkar 3. Ms. Rucha Dalvi	1. Ms. Sardeshmukh Sharvari Vivek 2. Mr Mudhaliar Prabhat Sukumar 3. Ms. Mohammed Zoya Abdul Shaffi
Master of Physiotherapy	1. Ms. Kanjirathingal Jinny Paul 2. Ms. Gulati Anisha Devinder 3. Shaikh Zubeda Firdos Salahuddin	1) Ms. Apoorva Dighe 2) Ms. Heena Bhanushali 3) Ms. Richa Dharod	1. Mr. Vaidya Sumedh Subodh 2. Ms. Neha Sudhir Raorane 3. Ms. Badani Hiloni Rakesh

8. Number of Students qualified NET/GATE/INSPIRE or any other qualifying examination during last 3 years

UG and PG Programs	**No. of Students qualify NET/GATE/INSPIRE etc during last 3 years**		
	2018	**2019**	**2020**
Master Program	32	19	8

- Admission of students is not based on NET/GATE/ Inspire. Selection criterion is based on merit list of MGM Common Entrance Examination.

9. Name of the Departments supported already in the College under FIST Program:**Nil**

10. Indicate the development grant received from UGC/AICTE during the Twelfth and Thirteenth Plan.-**Nil**

	12th Plan	***13th Plan***
Building		
Equipment		

11. Has the College received any major infrastructure research grant during the last five years from S&T agencies including UGC/AICTE? If yes, details.

Heads		***Name of Agency/ Scheme with year and amount***		
Building		Nil		
Equipment:		**Name of Agency**	**Scheme with year**	**Amount**
8 Channel Bagnoli wired surface Electromyography system; Delsys Inc Ltd		Department of Biotechnology, Government of India, New Delhi	Science and Engineering Research Board, Year 2016 -2017	INR 13.69,000.00 for the equipment. Total funding: INR 30,33,050.00
Books		Nil		
Supplies and Materials		Nil		
Computing & Networking: Development of mobile based application for tele-rehabilitation		Department of Science and Technology, Government of India, New Delhi (approved for sanction by DST)	Women Scientist scheme (B) 2021	INR 9,05,000.00 Total funding: INR 24,15008.00
Facilities		Nil		

12. Details of research grant received from different agencies during the last five years:

Name of the Investigator	**Project No.**	**Title of the project and duration**	**Amount sanctioned**	**Funding Agency**
Dr Rajani Mullerpatan	A copy of MoU is attached for reference	Establishment of MGM Centre of Human Movement Science Centre (2015)	INR 70,72,064.00*	International Society of Biomechanics
Dr Rajani Mullerpatan	BT/PR14641/ MED/32/465/ 2015	Development of a Powered Trans-tibial Prosthesis	INR 30,33,050.00	Ministry of Science & Technology, Dept of Biotechnology, New Delhi
Dr Rajani Mullerpatan		The effects of labour and birth positioning on pelvic dimensions: gaining further insight to improve birth experience (2016 – 2018)	INR 1,12,000.00	Indo-Canadian Shastri Institute, Canada
Dr. Poonam Rajesh Desai (PT-PhD Scholar)	DST/WOS-B/HN-37/2021/2769	Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study 3 Years	INR 2415008.00 (Approved for sanction)	Department of Science and Technology (Women Scientist Scheme-B)

*Please note that International Society of Biomechanics donated equipment worth the amount mentioned above to support establishment of biomechanics research and training facility at MGM Centre of Human Movement Science of MGM School of Physiotherapy, Navi Mumbai.

13. Indicate the research activities of the faculty members as per the following pro-forma

Name and Designation of Faculty	**Major areas of Research**	**Number of Ph. Ds produced (in last 5 years)**
Dr. Rajani Mullerpatan Professor Director	1. Biomechanical exploration of Yogasanas and its application in healthcare. 2. Biomechanical exploration of traditional Indian sports. 3. Biomechanical exploration of Indian traditional dance forms. 4. Health of health care workers: A mobile based virtual platform to ensure a functioning health system to fight COVID 19 pandemic. 5. Development of a virtual platform for assessment and rehabilitation and monitoring of patients with neuro-musculoskeletal impairments. 6.Development and validation of plantar tissues stiffness measurement device for early detection of diabetic neuropathy 7. Development of passive spring loaded exoskeleton for reducing muscle activity of erector spine muscles in Mathadi workers	2 students were awarded PhD in last 5 years
Dr. Bela Agarwal Professor	1. Effect of squatting on knee articular cartilage in healthy adults 2. Biomechanical exploration of Yogasanas and its application in healthcare. 3. Biomechanical exploration of traditional Indian sports.	Awarded PhD in 2021. Will be recognized by MGM Institute of Health Sciences to be a PhD Supervisor shortly.
Dr. Triveni Shetty (PT) Associate Professor	1. Long term monitoring of functional outcome of multi-level of orthopedic surgeries in children and adolescents with cerebral palsy 2. Development of mobile technology (Detect, REhabilitate and Monitor (DREaM): Empowerment of primary caretakers of children with Cerebral palsy 3. Biomechanical exploration of Yogasanas and its application in healthcare. 4. Biomechanical exploration of traditional Indian sports.	Pursuing PhD
Dr. Shrutika Parab (PT) Assistant Professor	1. Rehabilitation of patients with Stroke, cerebral palsy and Down's syndrome	
Dr Mamta Shetty (PT) Assistant Professor	1. Rehabilitation of patients with musculoskeletal disorders	Registered for full-time PhD program for academic year 2021-22

14. **a) List of Research Publications in SCI Journals coming from the College during the last five years. Format E.g.**

(*Ramstrom O, Bunyapaiboonsri T, Lohmann S, Lehn JM. 2002. Chemical biology of dynamic combinatorial libraries. BiochimBiophysActa. 1572(2–3):178–186.*)

1. Pahade AJ, Wani SK, Mullerpatan RP, Elizabeth Roach K. Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis. Hong Kong Physiotherapy Journal. 2021;41(02):139-46.2.
2. Agarwal BM, van Deursen R, Mullerpatan RP. Electromyographic evaluation of spine and lower extremity muscles during repeated and sustained bodyweight deep-squat. Trends in Sport Sciences, 2021, 28(1): 19-27.
3. Haldeman S, Nordin M, Tavares P, Mullerpatan R, Kopansky-Giles D, Setlhare V, Chou R, Hurwitz E, Treanor C, Hartvigsen J, Schneider M. Distance management of spinal disorders during the COVID-19 pandemic and beyond: Evidence-based patient and clinician guides from the global spine care initiative. JMIR public health and surveillance. 2021;7(2): e25484.5.
4. Kanjirathingal JP, Mullerpatan RP, Nehete G, Raghuram N. Effect of yogasana intervention on standing balance performance among people with diabetic peripheral neuropathy: A pilot study. International Journal of Yoga. 2021;14(1):60.6.
5. Mullerpatan R, Shetty T, Singh Y, Agarwal B. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork and Movement Therapies. 2021; 26:1-6.
6. Sawant N, Bose M, Parab S. Dexteria app. therapy versus conventional hand therapy in stroke. Journal of Enabling Technologies. 2020;14(4):221-231.
7. Dharod R, Shetty T, Shete R, Mullerpatan R. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020; 32(3).
8. Swaminathan N, Jiandani M, Surendran PJ, Jacob P, Bhise A, Baxi G, Devani P, Agarwal B, Kumar VS, Pinto NM, Damke U. Beyond COVID-19: Evidence-Based Consensus Statement on the Role of Physiotherapy in Pulmonary Rehabilitation in the Indian Context. The Journal of the Association of Physicians of India. 2020;68(12):82-89.
9. Jiandani MP, Agarwal B, Baxi G, Kale S, Pol T, Bhise A, Pandit U, Shetye JV, Diwate A, Damke U, Ravindra S. Evidence-based National Consensus: Recommendations for Physiotherapy Management in COVID-19 in Acute Care Indian Setup. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2020;24(10):905-913.
10. Mullerpatan R, Nahar S, Singh Y, Cote P, Nordin M. Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India. European Spine Journal. 2020;30(4):1004-1010.

12. Mohanty T, Mehta D, Mullerpatan R, Agarwal B. Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in Children and Adolescents with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(2):75-83.
13. Mullerpatan RP, Agarwal BM, Shetty TV. Exploration of muscle activity using surface electromyography while performing suryanamaskar. International Journal of Yoga. 2020 ;13(2):137-143.
14. Bharnuke JK, Mullerpatan RP, Hiller C. Evaluation of Standing Balance Performance in Indian Classical Dancers. Journal of Dance Medicine & Science. 2020;24(1):19-23.
15. Dighe A, Bose M, Parab S. Influence of Variations in Seat Surface Inclination on Trunk Muscle Recruitment and Reaching Ability in Children with Spastic Cerebral Palsy: Systematic Review. Website: www. ijpot. com. 2019;13(3):22.
16. Bose M, Parab SD, Patil SM, Pandey NA, Pednekar GV, Saini SS. Exploring spinal muscular atrophy and its impact on functional status: Indian scenario. Indian journal of public health. 2019;63(3):254-257.
17. Mullerpatan R, Kamath M. Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life. Critical Reviews in Physical and Rehabilitation Medicine. 2019;31(4): v-vi.
18. Shetty M, Balasundaran S, Mullerpatan R. Grip and pinch strength: reference values for children and adolescents from India. Journal of pediatric rehabilitation medicine. 2019;12(3):255-262.
19. Parab S, Bose M, Shayer S, Saini RK, Salvi M, Ravi P, Sawant P. Effect of Bharatnatyam-based Dance Therapy in Children and Adolescents with Down Syndrome. Clinical Kinesiology (Online). 2019;73(3):15-20.
20. Mullerpatan R, Shetty T, Ganesan S, Johari A. Review of lower extremity function following SEMLS in children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2):157-171.
21. Mullerpatan R, Girdhar P, Singh Y, Salgotra KR, Wilkey A, Nordin M. Evidence-Based Rehabilitation of Spine-Pain Disorders among Underserved Individuals in Navi Mumbai, India: A Two-Year– Observational Report. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2):185-195.
22. Mullerpatan R, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B. Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries. Crit Rev PhysRehabil Med. 2019;31(2):173-183.
23. Shah T, Shetty M, Bose M, Mullerpatan R. A Study of Fine and Manual Hand Dexterity in People with Parkinson's Disease. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):93-100.
24. Mullerpatan R, Bharnuke J, Hiller C. Gait kinematics of Bharatanatyam dancers with and without low back pain. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):1-10.

25. Agarwal B, Advani M, van Deursen R, Mullerpatan R. Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):11-22.
26. Nair S, Agarwal B, Chatla J, Mullerpatan R. Health-related physical fitness of people with type 2 diabetes mellitus. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):23-33.
27. Naryanan G, Bose M, Parab S, Agarwal B, Mullerpatan R. Energy expenditure using three different walking techniques in individuals with spinal cord Injury. Crit Rev Phys Rehab Med. 2019;31(1):35-41.
28. Amberkar O, Agarwal B, Singh Y, Shete R, Mullerpatan R. Level of sports participation and performance among people with spinal cord injury. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):43-51.
29. Shetty T, Johari A, Ganesan S, Mullerpatan R. Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):53-62.
30. Mullerpatan R, Thanawala M, Agarwal B, Ganesan S. Development of the Deep Squat Milestone in Typically Developing Children. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):63-73.
31. Shetty T, Parab S, Ganesan S, Agarwal B, Mullerpatan R. Lower extremity muscle strength and endurance in ambulatory children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):75-84.
32. Iyer P, Shetty T, Ganesan S, Nair S, Rao N, Mullerpatan R. Exploration of sports participation in children with mild intellectual disability. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):85-92.
33. Agarwal B, Advani M, van Deursen R, Mullerpatan R. Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1):11-22.
34. Pisal A, Agarwal B, Mullerpatan R. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018;30(3):207-218
35. Johnson CD, Haldeman S, Nordin M, Chou R, Côté P, Hurwitz EL, Green BN, Kopansky-Giles D, Randhawa K, Cedraschi C, Ameis A. The Global Spine Care Initiative: methodology, contributors, and disclosures. European Spine Journal. 2018;27(6):786-795.
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classification system for spine-related concerns. European Spine Journal. 2018;27(6):889-900.

38. Haldeman S, Johnson CD, Chou R, Nordin M, Côté P, Hurwitz EL, Green BN, Cedraschi C, Acaroğlu E, Kopansky-Giles D, Ameis A. The Global Spine Care Initiative: care pathway for people with spine-related concerns. European Spine Journal. 2018;27(6):901-914.
39. Kopansky-Giles D, Johnson CD, Haldeman S, Chou R, Côté P, Green BN, Nordin M, Acaroğlu E, Ameis A, Cedraschi C, Hurwitz EL. The Global Spine Care Initiative: resources to implement a spine care program. European Spine Journal. 2018;27(6):915-924.
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41. Parab S, Bose M, Ganesan S. Influence of Random and Blocked Practice Schedules on Motor Learning in Children Aged 6–12 Years. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018;30(3):239-254
42. Bose M, Bellare B, Parmar L. Effect of Motor-Cognitive Dual Task Training on Dexterity and Function in People with Parkinson's Disease (Pwp) Using 9 Hole Peg Test (9hpt). International Journal of Recent Scientific Research.2018; 9(4):26090-26094.
43. Bose M, Chhibber S, Parab S. Electrophysiological Study to Evaluate Cross Education in Lower Extremity Using Mirror Movements in Stroke. International Journal of Health Sciences and Research. 2018;8(5):156-61.
44. Wani SK, Mullerpatan R. Prevalence of shoulder dysfunction among Indian people with type II diabetes. International Journal of Diabetes in Developing Countries. 2015;35(3):386
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b) List of Publications in Conference Proceedings during last five years. Format E.g.

1. Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan, Evaluation of Joint Angles and Net Joint Moments In Rope Jumping, XXVI Congress Of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.

2. Bela Agarwal, Robert van Deursen,RajaniMullerpatan, Influence Of Daily Squatting Exposure On Kinematics Of Deep Squat, XXVI Congress Of The International Society of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.

3. RajaniMullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN, Spine and Lower Extremity Kinematics Of Suryanamaskar, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,| Australia.

4. Rajani Mullerpatan, Juhi Bharnuke, Gait Kinematics of Indian Classical Bharatnatyam Dancers, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane, Australia.

5. Pradnya Girdhar, Physical Examination of Spine, Prevention, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach Proceedings Of Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

6. Rajani Mullerpatan, Biomechanics of Spine In Traditional Indian Movements, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach. Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

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8. Rajani Mullerpatan, The MGM-WSC Clinic For Underserved Population, Early Detection And Management Of Spine Disability A Patient-Centric Integrated Approach. Conference Proceedings: "Prevention, Early Detection and Management of Spine Disability: A Patient-centric Integrated Approach", Navi Mumbai, India ISBN: 978-93-89396-31-7, CBS Publishers. First Edition; 2020.

9. Dr. Rajani Mullerpatan. Enhancing physical activity for overall development in children using traditional Indian Movement Science Conference on communicating Ancient Indian Knowledge system for the Holistic development of the School students for their physical, mental and spiritual well- being, May 7-8th 2019, National Institute of Advance Studies , Bengaluru.
10. Agarwal B, Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. Conference proceedings HWWE 2015 Mumbai, India. ISBN 978-93-5258-836-7.
11. RajaniMullerpatan, Yuvraj Singh, Stacey Pinto, Anila Paul, Amit Maurya, Robert VanDeursen. Foot characteristics of Indian rural school children. Proceedings of XXV Congress of the International Society of Biomechanics. PO-0086. 1523-1524,12th – 16th July 2015, Glasgow, UK.
12. Parab S, Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. WCNR 2018 Poster Abstracts. (2018). Neurorehabilitation and Neural Repair, 32(4–5), 363–538. https://doi.org/10.1177/1545968318765498
13. Parab S, Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. Indian Journal Cerebral Palsy [serial online] 2016 [cited 2019 Jun 8]; 2:105-25.

c) List of scientific/ technical Books written by Faculty Members in the College.

- Rajani Mullerpatan (2021). 'Biomechanics of Indigenous Postures' in Margareta Nordin, Victor H Frankel (5 th ed.). Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer. 469-490.
- Bela Agarwal, Expert Consensus for Covid -19 Management in Indian Setup-Booklet, Medworld Asia International Publications, Dotphi. 2020; ISBN 978-81-946111-3-4.
- RajaniKanade (Dr. Mullerpatan's maiden surname was Kanade) (2000). 'Principles of Rehabilitation in Plastic Surgery'. In Pramod Kumar (ed.). Plastic Surgery Basic Principles and Techniques. Paras Publishing. 265-292.
- Book chapter on wrist, hand and elbow injuries and rehabilitation in textbook "Principles and practice of Physical Rehabilitation Jaypee publication in the year 2020.
- **Tejashree A**. Dabholkar A, Bhakti Meghraj and Sujata Yardi, Effect of Fatigue on Hand Dexterity and Reaction Time, (2014)chapter 34,page 205-209.Textbook name :**Biomechanics**:978-93-82332-86-2.
- **Tejashree A**. Dabholkar, PradnyaSawant and Sujata Yardi. Correlation of Muscle Work with Hand dexterity & reaction time in dental professionals, (2014). Chapter 30, page 181-184. Textbook name: **Biomechanics**:978-93-82332-86-2.
- **Dabholkar T.A**., Shroff R., Dabholkar A., Yardi S. (2018) Effect of Fatigue on Hand Function in Dental Profession. In: Ray G., Iqbal R., Ganguli A., Khanzode V. (eds) Ergonomics in Caring for People. **Springer**, Singapore.978-981-10-4980-4

- AkhilaKrishnakumar, **Dabholkar T.A**., Dabholkar A. (2018) Assessment of Scapular Stability in Postpartum Females: A Longitudinal Study. In: Ray G., Iqbal R., Ganguli A., Khanzode V. (eds) Ergonomics in Caring for People. **Springer, Singapore**.978-981-10-4980-4.
- **Dabholkar T.A.,** Sujata Yardi, Dabholkar A. (2018) Assessment of Forearm Muscle Work in Various Dental Activities. In: Ray G., Iqbal R., Ganguli A., Khanzode V. (eds) Ergonomics in Caring for People. **Springer, Singapore**.978-981-10-4980-4.

15. **Give a list of Equipment, which are available and functional in the College costing Rs.5 lakhs and above.**

Name of Equipment	Year of Purchase	Status	Remarks
EMED Pressure Platform (Pedobarography Platform System)	2013	Working	Purchased
Biofeedback Unit with MYOSCAN sensors	2014	Working	Purchased
COSMED & Treadmill CPET system	2015	Working	Purchased
Three Force platform system with accessories	2015	Working	Donated
Twelve Bonita 10 and 2 VGA Optical Camera	2015	Working	
Vicon Bonita Motion Analysis System	2015	Working	
Bagnoli 8- channel Wired sEMG system	2018	Working	Funded on DBT project
Delsys EMG works 8 channel wireless system	2018	Working	Donated

16. **Library facilities – List the Journals received in your College library in the concerned discipline.**

2021	
Sr. No.	**Name of Journal**
1.	Archives of Physical Medicine and Rehabilitation
2.	Clinical Biomechanics
3.	Journal of Orthopedic and Sports Physical Therapy (JOSPT)
4.	Journal of Physical Activity and Health
5.	Neurorehabilitation and Neural Repair

17. Details of Post-Graduate Teaching and Research Profile & Plans of the College for next 5 years.

Post graduate teaching

MGM School of Physiotherapy Navi Mumbai, is one of the four pioneering Institutes in India to offer Choice Based Credit System curriculum in Bachelor of Physiotherapy (BPT) program and four Post Graduate Master programs (MPT) in Physiotherapy education.

The exclusive elective courses in each Master's program (Musculoskeletal Physiotherapy-15, Neuro Physiotherapy-16, Cardiovascular and Respiratory Physiotherapy- 17, Sports Physiotherapy-14) are communicated to AIU for inclusion in the National Academic Credit Bank which was proposed by UGC in 2020. Some of the exclusive courses offered are Vestibular rehabilitation, Movement analysis and assistive technology, Clinical Biomechanics, Exercise Physiology, Mind and Body techniques, Sports for Fitness, Applications of Yoga in Physiotherapy, Kinanthropometry.

Movement is at the core of Physiotherapy. Hence Human Movement Science is fundamental to education, training and patient care. Therefore, MGM School of Physiotherapy, Navi Mumbai established MGM Centre of Human Movement Science in 2015 with intra-mural support from MGM Institute of Health Sciences (MGMIHS) and extra-mural support from International Society of Biomechanics, USA and BETIC, IIT Bombay.

In addition to curricular training, MGM Centre of Human Science regularly offers value added courses in 3D Gait Analysis (6 courses conducted successfully) as a part of Post graduate training.

In past 5 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 11 training courses. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1200 students from Physiotherapy (including BPT & MPT), Prosthetics & Orthotics(BPO) and Orthopedics(MS) benefitted from biomechanics training.

Furthermore, the Centre has delivered the Course in 3D Gait Analysis and Clinical Biomechanics to post-graduate students and research scholars outside MGMIHS. These courses are well received by researchers and postgraduate students in health care professions and engineering from various government and non-government institutes across various states of India.

Such inter-disciplinary post graduate training workshops presented a unique platform to postgraduate students of health and engineering disciplines across the country to come together and learn biomechanics and address unmet healthcare needs in India and countries with similar socioeconomic background.

As a part of post graduate teaching, the Centre offers state-of-art advanced facilities in Human Movement Science for training and research in order to understand its application in rehabilitation of musculoskeletal, neurological and cardio-vascular and pulmonary conditions, sports biomechanics, health promotion and fitness and technology design and validation.

Research Profile

MGM Centre of Human Science (MGMCHMS) has established a robust research profile in fundamental biomechanics and clinical application of human movement science in rehabilitation, since its inception in 2015.

Research activities designed for biomechanical exploration of indigenous movements and postures practiced in India, namely: Yoga, indigenous daily life postures, traditional sports and Indian classical dance forms (11) and clinical rehabilitation (6) have yielded 17 original scientific papers in peer reviewed Scopus/PubMed indexed journals. The Centre was invited to publish research findings in a special volume of Journal of Critical Reviews™ in Physical and Rehabilitation Medicine (Volume 31, 2019 Issue 1: indexed in Scopus), with a theme 'Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in MiddleIncome Countries'.

Original fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted.

The Centre has provided robust facilities for fundamental biomechanics research to scientists from BARC, Mumbai; IIT Bombay, etc.

Two patents are filed jointly with IIT Bombay for design of technology pertinent to rehabilitation. Inter-disciplinary collaborative research between Department of Mechanical Engineering, IIT Bombay and MGM School of Physiotherapy, Navi Mumbai resulted in development of a powered trans-tibial prosthesis for people with below knee amputation which was funded by Department of Biotechnology.

An external, self-wearable, low-cost, spring loaded passive exoskeleton was designed to reduce trunk muscle fatigue in manual laborers. The device was tested on healthy people and Mathadi workers with and without low back pain and results revealed 25% reduction in onset of fatigue. A proposal is shortlisted by Early Translation Accelerator (ETA) (established at BETIC, IIT Bombay), supported by BIRAC, New Delhi, to support its further development in a commercially viable product and license it to an industry partner.

Pilot work is in process for clinical testing of a device for early detection of risk to ulceration among people with diabetic neuropathy.

Our efforts continue to explore-i) the value of squat, a traditionally practiced Indian movement for maintenance of lower extremity muscle strength, joint motion, mobility and walking capacity among people with knee osteoarthritis; ii) to help children with cerebral palsy undergoing single event multiple level surgery, a tool is being developed for home based monitoring of function; iii) biomechanics and energy cost of two modifications of traditional Suryanamaskar for application in elderly people (a collaborative project with Sancheti College of Physiotherapy, Pune).

Nearly 500 patients (traumatic sports/dance or mechanical injury, cerebral palsy, stroke, Parkinson's disease, amputations, diabetic neuropathy, osteoarthritis, joint replacement) have benefitted from robust evaluation for gait analysis (at one-third of prevailing cost), balance assessment,foot geometry and pressure evaluation at markedly subsidized cost. Quantified objective reports helped surgeons, physiotherapists and prosthetics and orthoticians to plan targeted surgical interventions and therapy to optimize function after trauma/disorder.

In addition to patient care, the Centre has supported individual innovators and organizations to validate 9 ingeniously designed devices against gold standard to address unmet needs in clinical rehabilitation of patients with poliomyelitis (1), lower extremity amputations (3), diabetes (1), backache (1), health promotion (1), athletic performance (1) and gait (1). Amongst these 9 devices, 'Diabetic Foot Screening Device' and 'Mechanical Actuated Stance Control Knee Ankle Foot Orthosis' for people with polio' attracted funding from BIRAC for small-scale production and commercialization. Individual innovators ranged from entrepreneurs to our youngest listed innovator who was a standard X school student, who bagged Grand Prize at the Initiative for Research and Innovation in Science (IRIS) National Fair 2016 (New Delhi) and qualified to represent India at the Intel International Science and Engineering Fair 2017 held in Los Angeles, USA. efforts to validate indigenously designed innovative, robust and competent technology and health care solutions designed by clinicians and engineers across various higher academic institutes

(IIT Madras, IIT Guwahati, IIT Bombay, etc.) in India support the 'Make in India', 'Innovate India' and 'Start-up India' initiatives of Government of India.

The dedicated team of 5 Physiotherapy faculty members and 1 Research Associate complemented by mechanical Engineers from IIT Bombay, Queen's University, Canada; Human movement scientists from Cardiff University, UK along with 4 Ph.D. scholars, 14 MPT scholars, 7 M.Tech scholars and 24 BPT Scholars contributed to the growth of MGMCHMS in the past 5 years. A cohesive inter-disciplinary effort between healthcare professionals and engineers is a highlight of the team work at MGMCHMS resulting in translational healthcare research. It provides a unique platform for interdisciplinary research, which is ignited at the level of Master's program in health and engineering i.e. namely M.Tech and MPT programs.

Overall, the Centre is geared to be recognized as the Centre of Excellence in Human Movement Science at national level. Additionally, it is equipped with expertise, skill and resources to assume position of a National Centre for validation of technology in the area of rehabilitation of movement disorders.

The research profile of MGM Centre of Human Movement Science is of national and international merit and has received credibility through scientific publications in Scopus and Pubmed indexed journals, registered copyrights, and filed patents. The association of the Centre with International Society of Biomechanics and collaborative research projects with Universities abroad, namely Cardiff University, UK; Queens University, Canada and University of Sydney, Australia are a testimony to robust competent research conducted at the Centre.

Future 5-year plan:

The science of Biomechanics i.e. Human Movement Science has developed in the western world over the past half century. The impact of this science is visible in improved health care and sports performance and indigenous development of technology. Applications of movement related technology are wide for e.g. artificial intelligence, joint implants, artificial limbs, orthoses, external and internal prostheses, etc. However, we cannot pick up these devices off the shelf, which are developed in the west; because the needs in India are diverse and exclusive with respect to daily living. Therefore, we need to develop this science in India. Currently, in India, the science of Biomechanics is evolving in silos in premier engineering institutes and a few health institutes. An interdisciplinary approach to biomechanics is an urgent need of the hour to address our pertinent unmet needs in healthcare, sports performance and technology design and validation. Hence, we need to train and develop an interdisciplinary taskforce in biomechanics throughout the country to develop such indigenous health care solutions and technology for rehabilitation of people and sports performance enhancement.

Therefore, MGM Centre of Human Movement Science was established 5 years ago with a vision of developing such an interdisciplinary taskforce to develop applications of clinical biomechanics in sports and clinical rehabilitation. Building on its groundwork in the past 5 years, MGMCHMS has planned future initiatives in training, research, patient care and technology design and validation to boost 'Make in India', 'Innovate India' and 'Start-up India' initiatives launched by Government of India.

Training:

The MGMCHMS is scaling its existing efforts to bridge the gap in integrated biomechanics knowledge of health and engineering graduates, by offering a credit choice based module on Clinical Biomechanics to graduates and research scholars in a blended mode environment, which is in tune with the objectives of new Education Policy 2020. Findings of biomechanics research are compiled in one Chapter titled 'Biomechanics of Indigenous Postures' in Margareta Nordin, Victor H Frankel (5 th ed.). Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer (2021) 469-490 which is circulated globally in five languages. The Team at MGMCHMS is compiling a Textbook of Biomechanics of Indigenous Movements; which will serve as a resource material to inform this science to students, researchers, clinicians and engineers working in provision of healthcare and design of movement pertinent technology. Yogasanas research findings are been summarized in lay language in a Yogasanas evidence based brochure

for easy reference of clinicians, Yoga practitioners and grass root level healthcare workers to execute evidence based Yoga practice.

Equipped with state-of-the art facilities, faculty expertise and full-time scholars of Masters program, MGMCHMS is geared to make exclusive contribution in sports biomechanics training for performance enhancement and injury prevention and management in sports, which is aligned with Mission of SAI for health promotion of athletes targeting Olympics 2025.

We have initiated exchange programs with international institutes of repute to facilitate student mobility and widen horizons of post graduate students and develop MGM Centre of Human Movement Science as a Centre of Excellence in interdisciplinary Biomechanics training in India and Asia.

Research:

The thrust areas of research at MGMCHMS are fundamental integrated biomechanics, rehabilitation of people with neuro-musculo-skeletal disorders to maximize their capacity for independent living using artificial intelligence; sports performance enhancement for able bodied and specially-abled children and adults, understanding Yogasanas biomechanics, dance performance enhancement and movement pertinent technology design and validation.

Fundamental integrated biomechanics: The Centre is geared to integrate biomechanics with biochemical components and neural connections of human body. Pilot work is already performed in the area of knee biomechanics to explore the effect of commonly performed daily activity of deep squat on articular cartilage of knee joints and its implications for knee osteoarthritis.

Artificial intelligence for maximal performance of human movement: Based on existing vast clinical information on profile of movement in healthy people and people with movement disorders the Team has developed clinical algorithms which can be used to connect artificial intelligence for maximal performance of human movement. Pilot work is in process for early detection, measurement, function monitoring and rehabilitation of children with cerebral palsy and elderly people.

Sports Performance for able-bodied people: MGMCHMS has the capacity for providing a DNA print of the body profile of sportsperson at the beginning of sports career, identifying a human body shape for a specific sport, guiding performance enhancement, identification of risk of injury, prevention of injury and rehabilitation of injury through robust scientific measures.

Sports promotion for specially-abled people: MGMCHMS can contribute towards sports biomechanics for Paralympic sports by identifying available functional capacity of specially-abled people, guiding training of specially abled people to enhance collateral functional abilities and performance enhancement, identification of risk of injury, prevention of injury and rehabilitation of injury.

MGMCHMS has the exclusive capacity to contribute to talent Scouting at micro level & nurturing talent towards excellence, support training with scientific & sports equipment and scientific personnel and monitor and enhance performance with a scientific evaluation system & to implement various schemes of the MYAS e.g. Khelo India, Assistance to NSF, TOPS, FIT India.

COVID 19: COVID 19 pandemic has awakened us to notice our negligible investment in public health. In order to strengthen our efforts to adopt movement as a therapeutic device for health promotion and reduction of burden of non-communicable diseases and delay disability caused by movement disorders, we have planned to scale the collaborative interdisciplinary research model. Successful outcome of interdisciplinary research model engaging health and engineering research scholars of Masters and PhD programs has motivated us to plan larger number of interdisciplinary research projects to achieve the goal of applied translational research to enhance function of people with movement disorders and reduce disability.

Technology design and validation: e-Hackathons in rehabilitation technology are in the planning for designing innovative technology for enhancement of movement performance and reduction of disability

caused by movement disorders. The Centre has reached out to engineering institutes across India (through AICTE) and Innovation Centers across India to inform them of availability of robust, gold-standard technology available for validation of technology pertinent to rehabilitation.

In addition to the training and research activities planned for the next 5 years, MGM Centre of Human Movement Science is taking a lead in forming a vibrant National Society of Human Movement Science for health and wellness in order to develop this science in India and represent internationally as an affiliate Society of International Society of Biomechanics.

The MGMCHMS has successfully established an interdisciplinary ecosystem for development of Biomechanics to innovate indigenous solutions for health and wellness. In order to boost the activities and initiatives in this field and make a remarkable and meaningful contribution, we look forward to support from DST in order to make India an Atmanirbhar Bharat in health, which will be better equipped to cope with any unforeseen future disasters.

18. Has the College received support under the FIST Program in previous years at Level '0'? If so, indicate: **Nil**

    i) Project No.
    ii) Amount Received and Expenditure (Rs in lakh)
    iii) Impact of that support in College's profile & growth (as per **Annexure – 1**).

Details of funds requested for 5 years:

Grant Head		Budget Heads	Total	Year 1	Year 2	Year 3	Year 4	Year 5
			Total INR Cost					
A Capital (C)	**A1**	**Equipment**						
		Force Plate(40x60cm)	11,00,000.00	11,00,000.00				
		4 Cameras	35,00,000.00	35,00,000.00				
		In Shoe plantar pressure system(2 pairs of insoles)	30,00,000.00	30,00,000.00				
		Pliance sensor						
		K5 metabolic cart	2600000.00	2600000.00				
		Laptop with hard disk (2 units)	300000.00	200000.00				
		Wall mounted Dynamometer	900000.00	900000.00				
		Weighing scale for wheel chair bound people	50000.00	50000.00				
		Real time step activity monitor (2 units)	100000.00	100000.00				
		Portable Doppler	72,800.00	72,800.00				
		Total for A1	**11622800.00**	**11622800.00**				
	A2 (Fixed %)	Infrastructure Max. @ 8% of Equipment cost (Capital)	929824.00	500000.00	107456.00	107456.00	107456.00	107456.00
	A3 (Fixed % and Level)	Networking Max. @ 5% of Project cost (Capital)	581140.00	116228.00	116228.00	116228.00	116228.00	116228.00
B General (G)	B1 (Fixed @ Project cost)	Industrial R&D support * [@Rs.1.0 L (Project cost$ ≤ Rs 100.0 L)] [@Rs.2.0 L (Project cost$>Rs 100.0 L)]	200000.00	40000.00	40000.00	40000.00	40000.00	40000.00
	B2 (Fixed)	SSR Activities$# (@Rs. 1.0 L)	100000.00	20000.00	20000.00	20000.00	20000.00	20000.00
	B3 (Fixed % @ Project cost)	Maintenance [@10% Project cost]	1162280.00	232456.00	232456.00	232456.00	232456.00	232456.00
TOTAL: [A (Capital) + B (General)]			**14596044.00**					

***** Incentive grants for extending utilization of FIST facilities for the industries/ MSMEs/ Start-ups etc.

[#] Incentive grants for carrying out activities pertaining to the Scientific Social Responsibility (SSR)

[$]Exclusive of Maintenance cost

19. Details of each Budget Heads with full justifications for each item as given at **Sr. No. 19** including details of similar support from any other sources.-

Justification:

MGM School of Physiotherapy has invested heavily in infrastructure, full-time faculty members and equipment to develop the science of biomechanics for application in health and wellness. The School covers the cost for salary and maintenance of all equipment. We seek support to step up this facility to generate a task force within the country to undertake research and conduct integrated raining for healthcare professionals and engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable diseases and enhance sports performance.

1. **Force Plate(40x60cm):** Currently, MGMCHMS has 3 force plates. The fourth force plate will enable us to undertake interdisciplinary collaborative research with mechanical engineers to develop finite element models for commonly performed postures of daily living for e.g. cross-legged sitting, kneel sitting, etc. Kinetic analysis of such postures requires an assembly of 4 force plates to record 4 points of contact. Additionally, this is a portable force-plate, therefore can be taken outdoors for kinetic analysis of various sports.

The 4-force plate assembly will find application for design and validation of technology for risk of fall assessment in the elderly, which is a huge need posed by ever-increasing ageing population in India and worldwide.

The 4 force plate assembly will also allow biomechanical analysis of various traditional sports such as Kabaddi, Kho-Kho, etc. which are not explored in the western world and common sports like running. Additionally, it will provide a kinetic platform for analysis of Yogasanas and various dance forms.

2. **Optical Infrared Cameras:** MGMCHMS is equipped with 12 Bonita Cameras. Four Vantage V5 cameras are portable cameras that serve dual purpose of indoor and outdoor kinematic data capture. Hence they can be outdoors for real time motion analysis of outdoor sports activity. Compatibility with the existing system makes it suitable for indoor usage as well, as more infra-red cameras will reduce these gaps and. The data from 3D cameras provide robust data necessary for finite element modelling

Development of finite element modelling will be the stepping stone for technology design of joint implants, which will allow our patients to sit cross-legged, kneel etc. after hip and knee joint replacement surgeries and live a full life of all daily activities. In addition to technology design, it will also help validation of wide range of indigenously designed technology pertinent to movement.

3. **In-Shoe plantar pressure system (2 units):** The MGM Centre of Human Movement Science is equipped with a pressure platform, which provides detailed evaluation of foot geometry and plantar pressure distribution during static and dynamic activities such as walking and running. However, the system is robust for analysis in barefoot condition only. Therefore, an in-shoe plantar pressure system is necessary for measurement of dynamic plantar pressure distribution which can inform the clinicians, sports coaches and trainers and athletes about the appropriate footwear necessary to enhance performance and reduce the risk of injuries. The manufacturers are providing a common base station and software for the in-shoe system pliance wheelchair pressure system, therefore a combined quotation is provided for the two and system systems, this will reduce the overall cost.

India is the second capital of diabetes in the world. In-shoe pressure system is a huge need to evaluate and prescribe appropriate foot-wear to people with diabetic neuropathy and adults and children with various foot disorders. In addition to clinical decision making, findings of foot geometry and plantar pressure distribution will inform innovators to design appropriate foot orthotics and footwear. Footwear and orthotic design is a huge opportunity for innovation in India because our culture and environment demands exclusive footwear designs.
It also has a huge application in validation of indigenously developed foot prosthetics to address exclusive environment and cultural demands of our population.

5. **K5 metabolic cart:** MGM Centre of Human Movement science is currently equipped with Fitmate Med (COSMED, Italy) metabolic cart which assesses resting metabolism, cardiorespiratory fitness (VO2max) and basic spirometry. It is used to understand energy cost of novel devices such as newly designed prosthesis in patients with amputation. Energy cost of activity has also been explored to provide novel health care solutions using indigenous postures and physical activity forms.
However, the limitation of the above system is lack of CO_2 analysis.
The K5 metabolic cart will enable estimation of metabolic cost of sport activities and rehabilitation exercises to train athletes and people with musculoskeletal disorders. Information on carbon-dioxide production will assist fatigue studies with applications in industrial health, sports and ergonomics of activities in health care and industrial sector.

6. **Laptops:** The existing 3 laptops are used to their maximum capacity for data storage and software applications. Two additional laptops will provide required e-space for additional software and on-field outdoor data collection for sports applications.

7. **Pliance sensor:** The equipment offers pressure distribution measurement between hard, soft and curved surfaces. The system consists of a flexible and elastic measuring sensor mat, a multi-channel analyser, a calibration device and a software package for the computer. The pliance analyser allows individual calibration curves for each sensor, individual dynamic amplification control and crosstalk suppression, resulting in accurate and reproducible pressure values of the seated localized pressure locations of patients in wheelchairs. The knowledge will assist in selecting the appropriate cushions and correct adjustments of the wheelchair to fit the individual patient with spinal cord injuries, chronic neurological conditions and in geriatric patients. It will also help in ergonomic applications for seating design in the industry and at home in addition to Paralympic sports.
The system shares the base station with in shoe system will use the same base station

8. **Wall mounted dynamometer:** The existing dynamometer at the Centre provides an objective instrument for assessing isometric and concentric strength and muscular endurance of the extensors and flexors of the lumbar and thoracic spine. However, objective evaluation of muscles of the upper and lower extremity is deficient. A wall mounted dynamometer will provide objective evaluation of muscle strength for applications in sports rehabilitation, musculoskeletal disorders and neurological disorders.

9. **Weighing scale for wheel chair bound people:** Our work in rehabilitation of patients with spinal cord injury, sports participation in wheel-chair bound individuals and Paralympic athletes for prescription of novel health care programs requires analysis of factors influencing response to training. Objective measurement of body composition of these patients will be useful for prescription and monitoring of rehab programs.

10. **Real time step activity monitor (5 units):** Currently, 3 ankle worn Step Activity Monitors (SAM) are used for real-time accurate ambulatory activity monitoring. The step activity monitor works with a docking station and software that handles set-up, downloading, display, analysis, and many other functions. It detects steps walked in wide variety of normal and abnormal gait disorders and cadence ranging from a slow shuffle to a fast run. It has a capacity to monitor and store data for a month. Additional units of the Step Activity Monitor are necessary to assess benefits of hospital based conservative or surgical care, rehabilitation programs and other interventions is actually translated to daily life by real time monitoring of walk activity. It is also a precious device to monitor real-time walking to validate technology designed to assist ambulation.

11. Portable Doppler: The Ankle Brachial Index is a measure of severity of arterial diseases. With high prevalence of diabetes in India, early intervention following objective evaluation of Ankle Brachial Index

would enable early intervention and potential prevention of foot ulcerations, amputations and increase disability free life years. The Centre is a large catchment area for urban and rural villages in and around Navi Mumbai and Raigad district.

At the time of establishment of MGMCHMS, 2 AMTI force plates and 10 Bonita cameras were donated by International Society of Biomechanics (value of INR 70,72,064.00) to set up the basic facility for 3D motion capture and analysis of human walking. Thereafter, BETIC, IIT Bombay loaned 1 force plate and 2 Bonita infra-red cameras (INR 40,29,407) to complete the system for analysis of Yogasanas and complex postures for analysis and validation of technology. However, an assembly of 3 force plates is an asymmetrical assembly which is yet inadequate for biomechanical analysis of complex dynamic postures.

MGM School of Physiotherapy purchased pressure platform for analysis of foot geometry and dynamic plantar pressure distribution. However, an in-shoe system is necessary for in-shoe applications in diabetic neuropathy, sports and foot disorders for appropriate prescription of footwear and design and validation of footwear and foot orthotics and prosthetics.

Installation & repairs: Installation of purchased equipment by system experts is essential expense to ensure smooth functioning of the system. The team of MGM CHMS in the past 5 years is trained by team of Engineers for trouble shooting of the equipment. The team is gained rich experience in handling the equipment's. However, to avoid sudden unforeseen repairs, team of experts experienced in handling the equipment's will be required to avoid disruption of work.

Networking: The Institute is equipped NKN MTNL 1 Gbps speed network, however for smooth functioning of the system additional high speed internet will be required. Additionally as the data generated from the motion analysis system is large files, additional cloud storage and internal connectivity will be required to connect the different systems within the Centre.

Industrial R & D support: Indigenous technology pertinent to application of rehabilitation in movement disorders which will and develop as a part of research and innovation activity at MGM CHMS will be linked to the industry for fine tuning development of the device.

Such a link with the industry will ensure that the device developed is ready to be launched in market for the end user

SSR: The vision and mission of MGMCHMS is to extend the services to the society at affordable cost and to execute the mission. The Centre continues to undertake the activities of Social responsibilities to translate the findings of scientific research for the wellbeing of the underprivileged section of the society and to address the unmet needs of rehabilitation in the society overall

Maintenance: The high end system demonstrate gradual wear and tear that occurs steadily but continuously. Therefore, they warrant continuous and timely maintenance to avoid unforeseen sudden disruption of functioning of system. Therefore, maintenance is essential expense to avoid uninterrupted completion of the defined tasks of project in 5 years.

Information submitted as above are true and correct.

Signature of the

MGM School of Physiotherapy NAVI MUMBAI

Principal/ Director of College/ Institute

National Institutional Ranking Framework
Ministry of Human Resource Development
Government of India

India Rankings 2020: University (Rank-band: 101-150)

Institution list in alphabetical order

Name	City	State
Amity University	Jaipur	Rajasthan
Amity University	Gurugram, Haryana	Haryana
Annamalai University	Annamalainagar	Tamil Nadu
Assam University	Silchar	Assam
Avinashilingam Institute for Home Science & Higher Education for Women	Coimbatore	Tamil Nadu
Babasheb Bhimrao Ambedkar University	Lucknow	Uttar Pradesh
Central University of Kerala	Kasaragod	Kerala
Central University of Rajasthan	Kishangarh	Rajasthan
Central University of Tamil Nadu	Tiruvarur	Tamil Nadu
Charotar University of Science & Technology	Changa	Gujarat
D. Y. Patil Educational Society	Kolhapur	Maharashtra
Dharmsinh Desai University	Nadiad	Gujarat
Dhirubhai Ambani Institute of Information and Communication Technology	Gandhinagar	Gujarat
Dr. B.R. Ambedkar University Delhi	Delhi	Delhi
English & Foreign Languages University	Hyderabad	Telangana
Indraprastha Institute of Information Technology Delhi	New Delhi	Delhi
Jawaharlal Nehru Technological University	Anantapur	Andhra Pradesh
Jaypee Institute of Information Technology	Noida	Uttar Pradesh
Jaypee University of Information Technology	Solan	Himachal Pradesh
Karunya Institute of Technology and Sciences	Coimbatore	Tamil Nadu
KLE Technological University	Dharwad	Karnataka
M. G. R. Educational and Research Institute	Chennai	Tamil Nadu
Maharaja Sayajirao University of Baroda	Vadodara	Gujarat
Mangalore University	Mangalore	Karnataka
Manipur University	Imphal	Manipur
Meenakshi Academy of Higher Education and Research	Chennai	Tamil Nadu
MGM Institute of Health Sciences	Navi Mumbai	Maharashtra
Nagaland University	Zunheboto	Nagaland
Nirma University	Ahmedabad	Gujarat
PES University	Bengaluru	Karnataka
Pravara Institute of Medical Sciences	Ahmednagar	Maharashtra
Presidency University	Kolkata	West Bengal
Pt. Ravishankar Shukla University	Raipur	Chhattisgarh
Rajiv Gandhi University	Itanagar	Arunachal Pradesh
Rastriya Sanskrit Vidyapeeth	Tirupati	Andhra Pradesh
Sambalpur University	Sambalpur	Odisha
Shivaji University	Kolhapur	Maharashtra
Shoolini University of Biotechnology and Management Sciences	Solan	Himachal Pradesh
Shri Mata Vaishno Devi University	Katra	Jammu and Kashmir
Sikkim Manipal University	Gangtok	Sikkim

Name	City	State
Sikkim University	Gangtok	Sikkim
Sri Devraj Urs Academy of Higher Education and Research	Kolar	Karnataka
Sri Krishnadevaraya University	Anantapur	Andhra Pradesh
Sri Venkateswara Institute of Medical Sciences	Tirupati	Andhra Pradesh
Sumandeep Vidyapeeth	Vadodara	Gujarat
Tumkur University	Tumkur	Karnataka
Veer Surendra Sai University of Technology	Burla	Odisha
Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology	Chennai	Tamil Nadu
Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Chennai	Tamil Nadu
Vinayaka Mission's Research Foundation	Salem	Tamil Nadu

National Institutional Ranking Framework
Ministry of Human Resource Development
Government of India

India Rankings 2020: University (Rank-band: 101-150)

Institutions not in alphabetical order

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Ashoka University	Sonipat, Haryana	Haryana
Annamalai University	Annamalainagar	Tamil Nadu
Assam University	Silchar	Assam
Avinashilingam Institute for Home Science & Higher Education for Women	Coimbatore	Tamil Nadu
Babasaheb Bhimrao Ambedkar University	Lucknow	Uttar Pradesh
Central University of Kerala	Kasaragod	Kerala
Central University of Rajasthan	Kishangarh	Rajasthan
Central University of Tamil Nadu	Thiruvarur	Tamil Nadu
Charotar University of Science & Technology	Changa	Gujarat
D. Y. Patil Educational Society	Kolhapur	Maharashtra
Dharmsinh Desai University	Nadiad	Gujarat
Dhirubhai Ambani Institute of Information and Communication Technology	Gandhinagar	Gujarat
Dr. B.R. Ambedkar University Delhi	Delhi	Delhi
English & Foreign Languages University	Hyderabad	Telangana
Indraprastha Institute of Information Technology Delhi	New Delhi	Delhi
Jawaharlal Nehru Technological University	Anantapur	Andhra Pradesh
Jaypee Institute of Information Technology	Noida	Uttar Pradesh
Jiyaji University of Information Technology	Satna	Madhya Pradesh
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Maharaja Sayajirao University of Baroda	Vadodara	Gujarat
Mangalore University	Mangalore	Karnataka
Manipur University	Imphal	Manipur
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MGM Institute of Health Sciences	Navi Mumbai	Maharashtra
Nagaland University	Zunheboto	Nagaland
Nirma University	Ahmedabad	Gujarat
PES University	Bengaluru	Karnataka
Poona College of Medical Sciences	Aurangabad	Maharashtra
Presidency University	Kolkata	West Bengal
Rajiv Gandhi University	Itanagar	Arunachal Pradesh
Rashtrasant Tukadoji Maharaj Nagpur University	Nagpur	Maharashtra
Sambalpur University	Burla	Odisha
Sathyabama Institute of Science and Technology	Chennai	Tamil Nadu
Shoolini University of Biotechnology and Management Sciences	Solan	Himachal Pradesh
Shri Mata Vaishno Devi University	Katra	Jammu and Kashmir
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Sri Krishnadevaraya University	Anantapur	Andhra Pradesh
Sri Venkateswara Institute of Medical Sciences	Tirupati	Andhra Pradesh
Sumandeep Vidyapeeth	Vadodara	Gujarat
Tumkur University	Tumkur	Karnataka
Veer Surendra Sai University of Technology	Burla	Odisha
Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology	Chennai	Tamil Nadu
Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Chennai	Tamil Nadu
Vinayaka Mission's Research Foundation	Salem	Tamil Nadu

राष्ट्रीय मूल्यांकन एवं प्रत्यायन परिषद

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

An Autonomous Institution of the University Grants Commission

Certificate of Accreditation

The Executive Committee of the
National Assessment and Accreditation Council
on the recommendation of the duly appointed
Peer Team is pleased to declare the
M. G. M. Institute of Health Sciences
(Deemed to be University u/s 3 of the UGC Act 1956)
Kamothe, Navi Mumbai, Maharashtra as
Accredited
with CGPA of 3.07 on four point scale
at A grade
valid up to February 20, 2019

Date : February 21, 2014

Director

EC/66/A&A/003

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410 209

Tel 022-27432471, 022-27432994, Fax 022 - 27431094

E-mail : registrar@mgmuhs.com | Website : www.mgmuhs.com

Amended Memorandum of Association (MoA)/Rules

[As per UGC (Institutions Deemed to be Universities) Regulations, 2019]

(Approved as per BOM-63/2021 dated 17/02/2021)

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector-1, Kamothe, Navi Mumbai - 410209
Tel. No. 022-27432471, 022-27432994, Fax No. 022 - 27431094
E-mail : registrar@mgmuhs.com ; Website : www.mgmuhs.com

Amended Memorandum of Association (MoA)/Rules

[As per UGC (Institutions Deemed to be Universities) Regulations, 2019]

Memorandum of Association (MoA)

1. NAME, ADDRESS AND REGISTRATION DETAILS OF THE TRUST/SOCIETY REGISTERED FOR THE DEEMED TO BE UNIVERSITY:

Name: MGM Institute of Health Sciences, Navi Mumbai

Address:

MGM Educational Campus
Sector 1, Kamothe, Navi Mumbai, Pin – 410209
Dist: Raigad, State: Maharashtra
Phone Number : (022)27432471/27432994
E-Mail: registrar@mgmuhs.com
Website: www.mgmuhs.com

Registration Details:

1. Society Registration Act 1860, vide Registration No. MAHARASHTRA 177/06 (Raigad) dated 31/03/2006 and
2. Bombay Public Trust Act, 1950 vide Registration No. F-5466 (Raigad) dated 02/05/2006

2. NAME OF THE INSTITUTION DEEMED TO BE UNIVERSITY ALONG WITH ITS APPROVED CONSTITUENT UNITS/OFF-CAMPUSES/OFF-SHORE CAMPUSES:

(i) Name of the Institution Deemed to be University:
MGM Institute of Health Sciences, Navi Mumbai

(ii) Constituent Units:

At Navi Mumbai Campus:

a. MGM Medical College
b. MGM School of Biomedical Sciences
c. MGM School of Physiotherapy
d. MGM New Bombay College of Nursing
e. MGM Institute's University Department of Prosthetics and Orthotics

At Aurangabad Campus:

f. MGM Medical College
g. MGM School of Biomedical Sciences
h. MGM School of Physiotherapy
i. MGM College of Nursing

3. APPROVED CONSTITUENT UNITS / OFF-CAMPUSES / OFF-SHORE CAMPUSES WITH UGC LETTER/ MHRD NOTIFICATION AND DATES

i. MGM Medical College, Navi Mumbai
ii. MGM Medical College, Aurangabad

MHRD Notification Number: F. 9-21/2005-U.3 (A) dated 30/08/2006

4. DEFINITIONS

i. "Act" means the University Grants Commission Act, 1956 [Act 3 of 1956].

ii. "Campus" means campus of MGM Institute of Health Sciences (Institution Deemed to be University) at its Headquarter at Navi Mumbai and at Aurangabad, wherein its major facilities, faculty, staff, students and its Academic Departments are located at both these places.

xi. Where, an Institution Deemed to be University wishes to surrender its status of 'Institution Deemed to be University', it may do so with the prior permission of the Government; and similarly, withdrawal of any Constituent Unit(s) of the Institution Deemed to be University from the purview of an Institution Deemed to be University, shall require the Sponsoring body to take the prior permission of the Government.

Provided that such surrender or withdrawal, as the case may be, shall take effect only after the last batch of students on the rolls of the Institution Deemed to be University or its Constituent Unit(s), as the case may be, have been accorded opportunity to qualify for the completion of the programme of study and award of degree.

xii. In the event of conflict of opinion with regard to interpretation of these Regulations, the opinion of the Commission shall be final.

49. LEGAL PROCEEDINGS

i. For the purpose of Section 6 of the Societies Registration Act, 1860, the person in whose name the Institution Deemed to be University may sue or be sued shall be the Registrar, who shall have the power to enter into agreements, sign documents and authenticate records on behalf of the Institution Deemed to be University, and shall exercise such powers and perform such duties, as may be prescribed by these Regulations.

ii. No suit or legal proceedings shall lie against the Government, or the Commission, or the Institution Deemed to be University, or an Officer of the Institution Deemed to be University, or a member of the authority of the Institution Deemed to be University, in respect of anything done or purported or intended to be done in pursuance of any of these Regulations.

50. REMOVAL OF DIFFICULTY

UGC reserves the right to remove difficulty/ies in the course of implementation of UGC (Institutions Deemed to be Universities) Regulations, 2019 in consultation with the Government of India, Ministry of Human Resource Development.

*****

Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act 1956)
Navi Mumbai- 410 209

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

(TO BE PUBLISHED IN THE GAZETTE OF INDIA PART-I SECTION-1)

No. F. 9-21/2005-U.3 (A)
Government of India
Ministry of Human Resource Development
Department of Higher Education
******

Shastri Bhawan, New Delhi,
30 August 2006

NOTIFICATION

In exercise of the powers conferred by Section 3 of the University Grants Commission Act, 1956, the Central Government, on the advice of the University Grants Commission, hereby declare the MGM Institute of Health Sciences, Navi Mumbai consisting of two constituent medical colleges i. e. i) Mahatma Gandhi Mission's Medical College, Navi Mumbai (Maharashtra) and ii) Mahatma Gandhi Mission's Medical College, Aurangabad (Maharashtra) as Deemed to be University for the purpose of the aforesaid Act, provisionally, for a period of five years, from the date MGM Institute of Health Sciences, Navi Mumbai disaffiliates its Mahatma Gandhi Mission's Medical College, Navi Mumbai from Maharashtra University of Health Sciences, Nasik for its under graduate courses and from University of Mumbai for its post graduate courses and disaffiliates its Mahatma Gandhi Mission's Medical College, Aurangabad (Maharashtra) from Maharashtra University of Health Sciences, Nasik for its under graduate courses and from Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad for its post graduate courses and subject to conditions mentioned at S. No. 7 of the endorsement of this notification. This declaration is also subject to review by a Review Committee to be appointed by the University Grants Commission (UGC).

2. Government of India or the University Grants Commission will not provide any Plan or Non Plan grants to the MGM Institute of Health Sciences, Navi Mumbai or any of its constituent institutions.

30.08.2006

(Sunil Kumar)
Joint Secretary to the Government of India

The Manager,
Government of India Press,
Faridabad (Haryana).

Copy forwarded for information to: -

1. The Secretary, University Grants Commission, New Delhi.

Contd... 2/-

Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

2. The Member Secretary, Medical Council of India (MCI), New Delhi.

3. Director, Distance Education Council, Indira Gandhi National Open University, Maidan Garhi, New Delhi.

4. Vice Chancellor, University of Mumbai, Mumbai (Maharashtra).

5. Vice Chancellor, Maharashtra University of Health Sciences, Nasik (Maharashtra)

6. Vice Chancellor, Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad (Maharashtra).

7. Director, MGM Institute of Health Sciences, Navi Mumbai (Maharashtra);

(i) MGM Institute of Health Sciences, Navi Mumbai will continue to abide by the norms and guidelines laid down by the UGC for institutions notified as Deemed to be Universities.

(ii) The affiliating State Universities i.e. University of Mumbai, Mumbai, Maharashtra University of Health Sciences, Nasik, and Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad are to agree to examine and grant the degrees to those students of MGM Institute of Health Sciences, Navi Mumbai, who are already enrolled with them prior to the date of this notification, on successful completion of courses / programmes they are pursuing at present with the two constituent colleges of MGM Institute of Health Sciences, Navi Mumbai, namely i) Mahatma Gandhi Mission's Medical College, Navi Mumbai and ii) Mahatma Gandhi Mission's Medical College, Aurangabad.

(iii) All norms of MCI will continue to be in force and complied with.

8. Principal Secretary (Technical &Higher Education), Government of Maharashtra, Mantralaya, Mumbai.

9. All Ministries/Departments of the Government of India.

10. All State Governments and Union Territories.

11. Registrars of all Universities & Deemed Universities.

12. Press Information Bureau, Shastri Bhawan, New Delhi-110001

13. The Secretary-General, Association of Indian Universities, A.I.U. House, 16 Kotla Marg, New Delhi - 110002.

14. Guard file / Notification file/ National Informatics Centre.

15. File No. F. 9-31/2005-U.3 (A).

Vice Chancellor
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

Madhukar Sinha 30-08-06
(Madhukar Sinha)
Director

THE UNIVERSITY GRANTS COMMISSION ACT, 1956

(3 of 1956)

[3rd March, 1956]

An Act to make provision for the co-ordination and determination of standards in Universities and for that purpose, to establish a University Grants Commission.

Be it enacted by Parliament in the Seventh Year of the Republic of India as follows:-

CHAPTER I

PRELIMINARY

Short title and commencement

1. (1) This Act may be called the University Grants Commission Act, 1956.

(2) It shall come into force [on such date][1] as the Central Government may, by notification in the Official Gazette, appoint.

Definitions

2. In this Act, unless the context otherwise requires-

(a) "Commission" means the University Grants Commission established under section 4;

(b) "executive authority" in relation to a University, means the chief executive authority of the University (by whatever name called) in which the general administration of the University is vested;

(c) "Fund" means the Fund of the University Grants Commission constituted under section 16;

(d) "member" means a member of the University Grants Commission and includes the Chairman[2] [and Vice-Chairman];

(e) "prescribed" means prescribed by rules made under this Act;

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1. 5th November 1956, vide notification No. S.R.O. 2605, dated the 1st November, 1956, see Gazette of India, 1956, Pt. II, Sec. 3, p. 1882.
This Act has been extended to Pondicherry by Act 26 of 1965, s. 3 and Sch. I.
2. Ins. by Act 33 of 1972, s. 2 (w.e.f. 17-3-1972).

(f) "University" means a University established or incorporated by or under a Central Act, a Provincial Act or a State Act, and includes any such institution as may, in consultation with the University concerned, be recognised by the Commission in accordance with the regulations made in this behalf under this Act.

Application of Act to institutions for higher studies other than Universities

3. The Central Government may, on the advice of the Commission, declare by notification in the Official Gazette, that any institution for higher education, other than a University, shall be deemed to be a University for the purposes of this Act, and on such a declaration being made, all the provisions of this Act shall apply to such institution as if it were a University within the meaning of clause (f) of section 2.

CHAPTER II

ESTABLISHMENT OF THE COMMISSION

Establishment of the Commission

4. (1) With effect from such date as the Central Government may, by notification in the Official Gazette, appoint, there shall be established a Commission by the name of the University Grants Commission.

(2) The said Commission shall be a body corporate having perpetual succession and a common seal, and shall by the said name sue and be sued.

Composition of the Commission

[5. (1) The Commission shall consist of –

(i) a Chairman,

(ii) a Vice-Chairman, and

(iii) ten other members,

to be appointed by the Central Government.

(2) The Chairman shall be chosen from among persons who are not officers of the Central Government or of any State Government.

(3) Of the other members referred to in clause (iii) of sub-section (1) –

(a) two shall be chosen from among the officers of the Central Government, to represent that Government;

1. Subs. by Act 38 of 1972, s. 3, for s. 5 (w.e.f. 17-8-1972).

ISB

Economically Developing Countries (EDC) Project

Memorandum of Understanding

Please note this document contains guidelines and examples to assist you when filling in each section. The instructions (highlighted in blue italics) should be deleted when completing this application form.

Declaration by the International Society of Biomechanics (ISB):

The ISB is dedicated to supporting international initiatives that will promote research, education, and the provision of healthcare in the field of biomechanics. The objectives of the ISB, with regards to the advocacy of projects in EDC regions, include the following:

- To make the Society truly international.
- To help develop skills of, and/or opportunities for, clinicians and researchers in EDC who do not have the resources available to do so on their own.
- To provide collaborative learning opportunities for students and researchers in developed countries to help them understand the challenges faced in the developing world.
- To enable donating organizations to do something beneficial with equipment that is no longer needed by them.
- To help provide a sustainable initiative that will allow biomechanics skills and knowledge to flourish in developing regions.
- To enable clinicians and researchers in developing countries to solve biomechanics-related problems specific to their own region.

The ISB would like to ensure the long-term sustainability and overall success of all EDC projects. As such, all participants must be clear on the objectives of the EDC participating organization(s) and the supporting organization(s), in addition to the outcomes each party wishes to achieve. This Memorandum of Understanding is intended to help clarify this for all participants. It is also the framework by which the ISB will evaluate the success of the project in the short and long-term and to find out whether the expected outcomes have been achieved, thereby enabling improvement of this process for future projects.

Participants:

Please list all organizations involved in this project (include those that are supporting the EDC participant by way of equipment donations, technical or financial support, or other resources) and their primary contacts.

	Name of Organization	EDC Participant	Supporting Organization	Primary Contact(s)	ISB Member Number*	E-mail
1.	*MGM School of Physiotherapy*	☒	☐	*Dr. Rajani Mullerpatan*	5043	rajani.kunade@gmail.com
2.	*Indian Institute of Technology, Mumbai*	☐	☒	*Prof. B. Ravi* *Mr. Rupesh Ghyar*	*N/A* *In progress*	b.ravi@iitb.ac.in
3.	*Cardiff University*	☐	☒	*Prof. Robert van Deursen*	1974	vandeursenr@cardiff.ac.uk
4.	*International Society of Biomechanics (ISB)*	☐	☒	*John Challis*	1192	jhc10@psu.edu

* A minimum of one primary contact from each organization must be a member of the ISB.

Project Proposal:

To be completed by the EDC participant:

1. **What is the overall mission of your organization** *(e.g. to improve the independence and wellbeing of physically disabled people…)* **and how does this project help to support it?**

The overall mission of MGMIHS is to provide healthcare services, research and higher education particularly in the area of medicine, nursing, physiotherapy and health management. Within physiotherapy/rehabilitation, training and research in the area of Biomechanics is essential to help maximize functional independence of people with physical impairments resulting from a wide spectrum of conditions i.e. repetitive stress, congenital, developmental and degenerative conditions precipitated by traumatic, vascular and pathologic origin. Precise and complete kinesiological assessment of such conditions will guide clinical decision making for accurate conservative, surgical, prosthetic/orthotic and ergonomic management for maximal functional outcome.

2. **What is the primary strategic objective(s) of this project? [Please specify details about one or more of the areas listed below. In formulating your objectives, consider specific results you would like to achieve.]**

   a. **Teaching/educational programs:**

   - To design and seek approval for a postgraduate degree course in Biomechanics designed at a level of global merit (to enable qualified postgraduates to participate in projects conducted worldwide) and local value to meet specific functional needs of our population emerging from a lifestyle influenced by exclusive Indian culture far different from Western lifestyle.
   - Establish training for students from various disciplines such as Physiotherapy, Bio engineering, Mechanical engineering, Prosthetics - Orthotics and Orthopaedics at graduate, postgraduate and PhD level.
   - Enhance skills in clinical biomechanics of faculty members of MGMSOP

   b. **Research programs:**

   - Produce high end research in the area of human movement science related to clinical questions; to offer health care solutions global in nature and specific to the Indian population.

   c. **Clinical assessment – diagnosis and treatment:**

   - Provide precise and complete kinesiological assessment of congenital, developmental and degenerative conditions precipitated by traumatic, vascular and pathologic origin which will guide clinical decision making for accurate conservative, surgical, prosthetic/orthotic and ergonomic management.

   d. **Other (please specify):**

   (include additional lines if necessary)

3. **What initiatives/actions (project design and/or management strategies) will be implemented to achieve the results outlined in Question 2?**

a) Teaching/Educational programs:

- Curriculum for postgraduate course in Biomechanics will be designed and sought approval from MGMIHS and IIT Mumbai.

- A circular will be sent to Bio-engineering, Mechanical Engineering, Prosthetics and Orthotics and Orthopedics departments within the above mentioned institutes to inform students from respective disciplines training schedule in biomechanics.
- Training will be imparted to faculty members in form of continuing professional development.

b) Research programs:

- Collaborative research projects between the 3 organizations will be developed to produce high end research studies encompassing fundamental and clinical biomechanics. PhD students will be appointed on appropriate research projects. Broad areas of research are-
  i. Barefoot walking and the risk of plantar ulceration (in collaboration with IIT Mumbai, Cardiff University)
  ii. Foot and knee instability and the development of OA (in collaboration with Cardiff University and the University of Sydney)
  iii. Yoga postures and their effect on the musculoskeletal system (in collaboration with IIT Mumbai and Cardiff University)

c) Clinical assessment –

- Diagnosis and treatment: Information pertaining to available clinical biomechanical evaluation tools will be circulated to various departments within and outside the hospital within Mumbai and Navi Mumbai. Referred patients will be assessed using biomechanical tools to arrive at precise measurement of impairments. Income generated through such services will be used for financial viability of the center. Expenses incurred for annual maintenance of laboratory equipment will be covered partly from the income generated by the center and partly from the funding acquired for research projects.

4. Who will benefit from this project? *(e.g. Students, patients, etc)*

- Undergraduate and postgraduate students from Physiotherapy, Bio- engineering, Mechanical Engineering, Prosthetics and Orthotics and Orthopedics department will benefit from training. Training will be imparted to students within India and across continents. Every effort will be made to enroll students from within India and countries abroad.
- Faculty members from MGMIHS will benefit from skill development in clinical biomechanics.
- A Biomechanics Centre with expert input from biomechanics specialists worldwide operated in India will offer global merit training at subsidized cost thereby making it affordable for students from several developing countries.
- Patients with congenital, developmental and degenerative conditions of traumatic, vascular and pathologic origin will benefit from biomechanical evaluation.

5. **What are the expected benefits for each group listed in Question 4?** *(e.g. Exposure to state-of-the-art methods of...)*

- **Students will be exposed to globally used state-of-the-art valid and reliable methods used for biomechanical studiesuch as quantitative movement analysis and plantar pressure measurement. They will receive hands-on training and have opportunities to use various biomechanical tools to conduct research in biomechanics. Such training of global merit will be available at affordable cost to students from developing countries.**
- **Patients will benefit from precise and complete kinesiological assessment which will guide clinical decision making for accurate conservative, surgical, prosthetic/orthotic and ergonomic management.**
- **Faculty members will benefit from acquiring skills for biomechanical evaluation which will be applied in both clinical practice and student training.**
- **The biomechanics center will benefit from financial viability through the above mentioned expected benefits.**

6. **Please list proposed milestones – associated with the actions, individuals, and benefits given in Questions 3, 4, and 5, respectively – together with a timeline of events. Milestones should include specific outcomes that the collaborators wish to achieve.**

Key Milestones	Time period
1. Establish BiomechAnics Center: installation of equipment and pilot start	*December 2013*
2. Collaborative research projects	*Already started. Ongoing*
3. Design the curriculum for Masters degree course in Biomechanics and seek approval from the above mentioned contributing organizations	*September 2014*
4. Commence the course in clinical biomechanics	*January 2015*
5. Commencement of clinical service to patients	*March 2014 onwards*

7. **What other authority/administrative body, such as government or college administration officials, must approve this initiative to ensure resources are allocated to the intended recipients? Has approval already been sought** ***(please provide evidence of any approvals)?***

- **Administrative/competent authorities of 3 above mentioned institutes have approved development of the research activities proposed at MGM Center for Biomechanics.**
- **Additionally, approval will be sought for curriculum for Masters Course in Biomechanics by University Grant Commission, India and Academic Council of MGMIHS.**
- **The opportunity to develop and approve transnational education in association with Cardiff University will be investigated.**

8. **What commitments will your organization make to ensure:**
   a. **Recognition of contributions provided by supporting organizations?** *(e.g. Website acknowledgment, progress reports)*

- **Publications and patents arising out of collaborative projects with Cardiff University and IIT Bombay will be shared by all 3 above mentioned organizations.**
- **MGMIHS will acknowledge the support and contribution provided by IIT**

Mumbai and Cardiff University on its website.

- Technical support provided by IIT Bombay will be acknowledged in relevant presentations and publications.
- Secondly, IIT Bombay will have an opportunity to conduct clinical trials at MGM Center for Biomechanics in collaboration with host organization which will be acknowledged in related reports.
- MGMIHS will acknowledge the support and contribution provided by IIT Mumbai, Cardiff University, ISB and AMTI on its website and in relevant publications.
- MGMIHS will provide agreed upon [to be decided] educational materials to ISB to further share with ISB members in support to the EDC educational program.
- MGMIHS will provide a brief "Project History" for the ISB website

b. Long-term sustainability of the project [including personnel required to ensure continuation of project into the future]? *(e.g. staff training, technical support, security and maintenance, etc)*

- The host organization i.e. MGM Center for Biomechanics will provide ongoing security and maintenance of equipment.
- Technical guidance for equipment selection and experimental data analysis will be provided by IIT Bombay. The equipment maintenance will be sought via annual maintenance contract from the respective vendors.
- Staff training will continue as an ongoing process which will be partially supported by MGM Center for Biomechanics.
- Any agreed joint transnational education programs would facilitate staff development.
- Income generated through clinical services will aid financial viability of MGM Center for Biomechanics. For e.g. annual maintenance of equipment and expenses incurred towards consumables.
- Income generated through tuition fees for Masters Course in Biomechanics and PhD program will partially support salary of some staff members.
- Income generated through any agreed joint initiatives would be negotiated as appropriate.
- PhD students will be recruited as research assistants on certain projects.

Supporting Organizations – Commitments and Anticipated Benefits:

What contributions will be made by the supporting organizations? Please list all support that each participant has agreed to provide *(e.g. financial, in-kind, training, etc)*, the period over which they have committed this support, estimated costs for the organization, and how they will benefit *(e.g. publicity)*.

Organization	Commitments	Duration	Estimated Costs	Objectives/Benefits
MGMHS	Allotted infrastructure for Biomechanics Center	Ongoing	Approx 1 million USD	Supports objectives outlined on pg 1.
	Allotted one competent Professor	Ongoing	Salary is paid by MGMSDP (15,000 USD)	
	Will recruit one research assistant & one laboratory technician	Ongoing	Salary will be paid by MGMHS (9000 USD)	
	Already purchased some equipment such as sweat pressure platform, activity monitoring system, Silicon mask etc.			
	Staff training	2 weeks		
Cardiff University	Send Prof. van Deursen for 4 visits	4 visits: Nov 2013 May 2014 Nov 2014 May 2015	Covered by ISB	Collaborative Research projects. Biomechanics lab design, installation of equipment. Provide expertise in curriculum design related to clinical biomechanics.
IIT Bombay	Technical guidance and collaborative research projects	ongoing		Using the MGMHS Biomechanics lab for purpose of clinical testing of the products which are developed by IIT Bombay
ISB	Financial support to send Prof. van Deursen to MGMHS	4 visits	7,500 USD	Supports objectives outlined on pg 1; acknowledgment in appropriate media; support for development of EDC educational material.
	Coordinate donation of two second-hand, re-calibrated force platforms from AMTI with technical support for 5 years	As soon as available	Approx 10,000 USD	AMTI acknowledgment in appropriate. MGMHS and ISB media will strengthen relationship with AMTI.

Budget

Before any project can be endorsed by the ISB, a detailed budget for all costs involved for each participating organization must be approved by the ISB President, IDC Project Officer, and ISB Treasurer. In the budget, please consider monetary costs involved in establishing/initiating the project plus ongoing costs to ensure the project is sustainable. Please include the budget as a separate document.

Signatures of primary contact from each participating organization:

Dr. Rajani Mullerpatan		25 July 2013
Name (please print)	Signature	Date
Prof. B. Ravi		1 August 2013
Name (please print)	Signature	Date
Prof. Robert van Deursen		9 August 2013
Name (please print)	Signature	Date
Prof. John Challis		22nd Oct. 2013
Name (please print)	Signature	Date

(Include additional lines if necessary)

(4)

AGREEMENT

IIT & MGM — Equipment — 7/8/15 - 7/8/17
Renewal — ?

This agreement is being entered into by and between Indian Institute of Technology Bombay located at Powai, Mumbai-400076 (hereafter, 'IITB') and MGM Institute of Health Sciences, located at MGM Educational Campus, Sector 1, Kamothe, Navi Mumbai-410209 (hereafter, 'MGMIHS').

1. PREAMBLE

1.1 MGMIHS have established a Centre for Human Movement Science (hereafter 'CHMS') in Vashi for gait and bio-mechanical studies of patients as well as healthy individuals, research and training purposes, for which they have received support from the International Society of Biomechanics, USA in the form of eight (8) Vicon cameras and two (2) AMTI force plates.

1.2 IITB is establishing a Biomechanical Engineering and Technology Incubation Centre (hereafter, 'BETiC'), funded by Rajiv Gandhi Science & Technology Commission, Government of Maharashtra, in which a gait lab is to be set up, for which similar equipment [four (4) Vicon cameras and one (1) AMTI force plate] have been procured.

1.3 CHMS of MGMIHS is planning to study Yoga, traditional dance postures and sports activities for therapeutic purposes, for which additional cameras and force plate are required in CHMS.

1.4 IITB is interested in generating clinical data from biomechanical studies and testing of medical devices under development at BETiC.

1.5 MGMIHS and IITB have been collaborating in developing innovative medical devices for diagnostic, treatment and rehabilitation purposes.

1.6 IITB and MGMIHS wish to collaborate in the field of gait analysis by sharing the respective facilities mentioned above, and agree to enter into this agreement as per the following terms and conditions:

2. LOAN AND USE OF EQUIPMENT

2.1 IITB will loan the equipment specified in Annexure 1 to MGMIHS for a period of two (2) years from the date of signing this agreement.

2.2 The equipment will be installed in CHMS (complementing similar equipment already installed there), for purposes as mentioned in section 1.1 above.

2.3 MGMIHS will acknowledge the contribution by displaying a plaque at a mutually agreed prominent location in CHMS premises, indicating that the said equipment is provided by BETiC, IIT Bombay.

2.4 MGMIHS will be responsible for proper use of the said equipment; and all statutory/ regulatory compliances including obtaining proper consent from subjects undergoing the studies. In case of human subjects, all requisite medical, governmental, statutory or any other applicable regulatory or legal compliances, rules, permissions, approvals shall be complied with during the subsistence hereof.

2.5 The day to day costs of running the CHMS, including salaries of personal, consumables, etc. will be covered by MGMIHS.

2.6 The cost of maintenance and any repair of IITB equipment provided to MGMIHS, that is not covered by warranty or AMC, will be equally shared by both parties.

2.7 MGMIHS will be responsible for ongoing security and protection of the equipment, including insurance to cover against fire, theft and any other like or similar eventuality or contingency.

2.8 MGMIHS will return the equipment in its original usable condition to IITB at the end of two (2) years from the date of this agreement, or procurement of similar equipment from other sources, whichever is earlier.

2.9 The term of this agreement is for a period of two years from the date of signing of the agreement by both parties. MGMIHS and IITB may extend this agreement for further period under mutually agreed to terms.

This agreement may be amended by both parties subject to such amendment being agreed to mutually and reduced to writing.

3. ACCESS FOR RESEARCHERS

3.1 MGMIHS will create a BETiC Cell or Desk in or near CHMS, to facilitate collaboration activities with IITB.

3.2 IITB researchers will, on a mutually agreed basis, visit MGMIHS from time to time, to work on collaborative projects, including bio-mechanical studies, development and testing of medical devices, and attending or conducting relevant meetings and training programmes. The cost of such local travel of IITB researchers will be covered by BETiC project.

3.3 CHMS will provide the gait data generated in collaborative projects mentioned above, to IITB for further analysis, joint publications and other uses.

4. CONFIDENTIALITY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

4.1 Both IITB and MGMIHS agree to maintain confidentiality of any confidential information belonging to the other party, and will not share the same with any other third party, except with the express prior written consent of the disclosing party or in the event it is required to be disclosed by operation of law or regulation.

4.2 No new IPR is expected to be generated during the use of the abovementioned equipment.

4.3 IPR (if any) related to the development of any novel medical devices or software by collaboration between MGMIHS and IITB will be covered by separate agreements.

4.4 MGMIHS will acknowledge and give due accreditation to the contribution of IITB in their publications, and relevant publicity materials.

5. LIMITATIONS, SEVERABILITY AND REMEDIES

5.1 MGMIHS will use IITB equipment for research, clinical studies and training purposes only. Any other use will be based on explicit written consent of IITB.

5.2 MGMIHS will not give IITB equipment to any third party. The IITB equipment will not be moved or relocated to any other location or premises other than as stipulated herein or permitted by IITB in its sole determination.

5.3 IITB will not be responsible or liable for any losses arising out of the use, non-use or misuse of the equipment loaned to MGMIHS. MGMIHS acknowledges that the equipment provided herein is on an "AS IS WHERE IS BASIS". Any and all warranties of any kind or nature whatsoever with regards to the equipment itself or its use, storage or handling/logistics or any results therefrom (expected or otherwise) are expressly excluded.

5.4 The successors of CHMS at MGMIHS and BETiC at IITB will honour this agreement till the subsistence of this agreement.

5.5 In the event of any disagreement between the two parties or in the event IITB determines in its sole discretion, it will have the right to terminate this agreement in addition to recalling its loaned equipment, and MGMIHS will return the same in good condition within three (3) months of such request provided by IITB in writing.

5.6 The validity, interpretation, enforceability, and performance of this Agreement shall be governed by and construed in accordance with the Central and relevant State Laws of India. Venue for all disputes hereunder shall be in Mumbai.

In witness thereof, both parties have signed this Agreement by affixing an official seal:-

Date: August 7th 2015
Place: Mumbai

For CHMS, MGMIHS

(Dr. Rajani Mullerpatan)
Professor-Director
MGM School of Physiotherapy
MGM Institute of Health Sciences
Vashi, Navi Mumbai

Professor - Director
Physiotherapy Education
MGM Trust
Navi Mumbai

For, IIT Bombay

7/8/15

Dean Research and Development

IIT Bombay
Powai, Mumbai

Witness 1:

Witness 2:

Dr. Jyoti Chatla (PT)

Pro Vice Chancellor (Research)
MGM Institute of Health Sciences
Navi Mumbai

ANNEXURE-1

List of Equipment for Loan from BETIC, IIT Bombay to CHMS, MGMIHS, Navi Mumbai

Sl.	Item and Description	OEM Vendor	Quantity	Value
1	Bonita 10 VGA Optical Camera, 240 fps with 4-12 mm varifocal lens and NIR strobe	Vicon Motion Systems Ltd., Oxford, UK	4	GBP 14,000
2	Bonita 720c Video Camera, 120 fps with 4-12 mm lens	Vicon Motion Systems Ltd., Oxford, UK	2	GBP 5,600
3	Snag-less cable to connect the camera to Giganet unit -25 m	Same as above	6	GBP 1140
4	Dual Video PC – Dell Precision Tower 5810 CTO	Dell	1	GBP 3400
5	Monitor 21.5" Dell	Dell	1	GBP 250
6	Single Force Platform system (BP600900-2000)	AMTI	1	USD 21,200
7	Cable to connect force sensor with D-type connectors (9615-030-6-6) 9 m	AMTI	3	USD 510
8	Mounting rail for force plate	AMTI	1	GBP 1500
9	Resin kit for mounting plate to floor	AMTI	450 ml	GBP 300
10	Strain Gage Signal Conditioner / Amplifier for force plate outputs, 6-channel	AMTI	1	USD 3800

(4)

भारतीय गैर न्यायिक

एक सौ रुपये Rs. 100

रु. 100 ONE HUNDRED RUPEES

भारत INDIA

INDIA NON JUDICIAL

महाराष्ट्र MAHARASHTRA ● 2015 ● MY 378332

18 FEB 2016

MEMORANDUM OF AGREEMENT

This MEMORANDUM OF AGREEMENT is made on this Twenty Eight day of March of Two thousand and sixteen BY AND BETWEEN President of India, acting through Secretary, Department of Biotechnology, Ministry of Science and Technology, Government of India, New Delhi, hereinafter referred to as the 'DBT' (which expression unless excluded by or repugnant to the subject shall mean and include its successor-in-office and assigns) of the ONE PART;

AND

MGM Institute of Health Sciences, Navi Mumbai a society under the Societies Registration Act – 1860, having its registered office at Sector 1, Kamothe, Navi Mumbai, Pin: 410209, hereinafter referred to as UDPT, MGM Institute (which expression shall

28-03-2016

where the context so admits include its successors and permitted assigns) of the OTHER PART;

WHEREAS DBT being desirous of Bioengineering development decided to support a project submitted by Dr. Abhishek Gupta, IITB & Dr. Rajani P Mullerpatan, UDPT, MGM Institute for the attainment of the objectives, hereinafter described in the Annexure I (detailed project proposal) annexed hereto;

This Memorandum of Agreement (MoA) defines the role and responsibilities of the participating agencies, monitoring and other matters related to the 'Development of Powered Transtibial Prosthesis'.

NOW THE PARTIES HERETO AGREE AS FOLLOWS:-

1.0 . ROLE OF DEPARTMENT OF BIOTECHNOLOGY, NEW DELHI

To provide funds to the extent of INR 3033,050=00 over a period of 3 years from the date of sanction of the project, to UDPT, MGM Institute for undertaking activities as detailed in Annexure I(detailed project proposal). Details of the funds to be provided are given in Annexure II.

2.0. ROLE OF MGMIHS

2.1. To provide their contribution in terms of infrastructure, facilities and expertise of UDPT, MGM Institute for 3 years from date of sanction of the project as detailed in Annexure – II. (Refer to pages 21 & 22 of project proposal annexed).

2.2. To provide existing facilities as mentioned in the project document (Refer to pages 21 & 22 of project proposal annexed).

2.3. To be responsible for accomplishing objectives identified and activities listed (refer to page 8 of project proposal annexed).

2.4. To allow the Scientists authorized by DBT to work with the Research & Development team of the center in all stages of process development and production.

2.5. To recruit all scientific and non-scientific staff as sanctioned by DBT (purely on contractual basis for this particular project; their contract will be in co-existence with this project).

2.6. To prepare and submit all periodical reports and other documents that would be required by DBT.

2.7. To maintain a separate audit head of account/bank account for the grants received from DBT for the project.

2.8. To submit an annual audited statement of expenditure incurred under the project.

2.9. To ensure effective utilization of the grant given by DBT for the purpose for which it was granted and to ensure timely progress of project work.

2.10. The manpower, both scientific and non-scientific, recruited shall be purely on contractual terms & conditions such that the contract for engagement of the manpower shall run concurrently with the said project period only.

3.0 DURATION OF PROJECT

3.1 Duration of project shall be 3 years from the date the Project has been sanctioned by DBT.

4.0 RIGHTS OF OWNERSHIP/TECHNOLOGY TRANSFER AND UTILIZATION

4.1 The know-how generated from the project by UDPT, MGM Institute will be the joint property of UDPT, MGM Institute and DBT, Government of India. It shall be the responsibility of UDPT, MGM Institute to take necessary action for protection of the intellectual property arising out of the PROJECT through proper instruments, such as, patents, copy rights, etc.

4.2 The know-how developed may be transferred to other entrepreneurs on a non-exclusive basis on such terms and conditions as may be determined by DBT.

4.3 All the assets provided and created under this funding will be the property of DBT and shall not be utilized for purposes other than those for which the grant has been sanctioned. The rights of UDPT, MGM Institute under this MoA shall not be transferred to any other party without prior approval in writing of DBT.

4.4 It shall be the responsibility of UDPT, MGM Institute to ensure that support of DBT is suitably acknowledged in the publications (papers, reports, etc.) arising out of the PROJECT.

5. SECRECY

It is hereby agreed that the participating agencies shall keep information and data collected completely secret provided that the right to transfer the technology shall rest with the DBT.

6. MONITORING

6.1 The progress of implementation of the project and proper utilization of grant shall be reviewed by the DBT and by the Monitoring Committee set up by DBT.

6.2 The periodic progress of physical achievements and the utilization of funds, statement of expenditure shall be evaluated by the Monitoring Committee.

6.3 The Comptroller and Auditor General of India, at his discretion shall have the right of access to the books and accounts of UDPT, MGM Institute for the grants received from DBT for this project.

6.4 The DBT may terminate the grant at any stage if it is convinced that the grant has not been properly utilized or appropriate progress has not been made. In the event, DBT terminates the grant, UDPT, MGM Institute shall hand over all documents including technical details and equipment purchased related to the project.

7.0 DURATION OF MEMORANDUM OF AGREEMENT

This MoA will remain inforce for the duration of the project and until all claims are settled between DBT and UDPT, MGM Institute.

8.0 ARBITRATION

In the event of any question, dispute or difference whatsoever arising between the parties to this Agreement out of or relating to the construction, meaning, scope, operation or effect of this Agreement or the validity of the breach thereof shall be referred to an Arbitrator to be appointed by mutual consent of both the parties herein. If the parties cannot agree on the appointment of the Arbitrator within a period of one month from the notification by one party to the other of existence of such dispute, then the Arbitrator shall be nominated by the Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. The provisions of the Arbitration and Conciliation Act, 1996 will be applicable and the award made thereunder shall be final and binding upon the parties

hereto, subject to legal remedies available under the law. Such differences shall be deemed to be a submission to arbitration under the Indian Arbitration and Conciliation Act, 1996, or of any modifications or reenactments thereof.

9.0. GOVERNING LAW

This Contract shall be governed by the Law of India for the time being in force.

IN WITNESS WHEREOF the parties hereto have signed, sealed and delivered this Agreement on the day, month and year first above written in presence of:

Witnesses:

1.

2.

Signed by ----------

(Designation)

For and on behalf of The President of India

Witnesses:

1. Dr. [illegible]

2. Mr. MUKESH DEORE

Signed by ----------

(Designation)

Prof. Z. G. Bedade
Registrar,
MGM Institute of Health Sciences
Kamothe, Navi Mumbai-401209

For and on behalf of

University Department of Physiotherapy

MGM Institute of Health Sciences, Navi Mumbai

Annexure - I

Detailed Project Activities

Details of the activities to be undertaken by University Department of Physiotherapy, MGM Institute of Health Sciences, Sector No1, Plot No 1 & 2, Kamothe, Navi Mumbai 410209 under the project entitled **"Development of Powered Transtibial Prosthesis".**

Please find enclosed a detailed copy of the project proposal submitted to DBT for reference. Refer to pages 21 & 22.

Objectives:

1. Gait analysis of adults with transtibial amputation

Annexure – II

Details of Funds

PI's NAME AND ADDRESS

Dr. Rajesi P Mullerpatan, University Department of Physiotherapy, MGM Institute of Health Sciences, Sector No1, Plot No 1 & 2, Kamothe, Navi Mumbai 410209

Items	*I year*	*II year*	*III year*	Total
Non-recurring	22500 USD @68.58 INR= 1543,050=00			1543,050=00
Manpower	480,000	480,000	480,000	1440000=00
Consumables				30000=00
Travel				As per DBT norms
Contingencies				
Overhead				
Total				**3033,050=00**

TERMS & CONDITIONS OF THE GRANT

(To be signed and enclosed with concern filled proforma)

1. Approval of the Research proposal and the grant released would be for the specific project mentioned in paras I to V of this proposal and grant should be exclusively spent on the project for which it has been sanctioned within the stipulated time. The Institute is not permitted to seek or utilise funds from any other organisation (Government, Semi Government, Autonomous or Private) for this research project. Any unspent part of amount would be surrendered to the Govt. of India through an account payee demand draft drawn in favour of the "Drawing and Disbursing Officer, Department of Biotechnology, New Delhi", and carry forward of funds of the next financial year for utilization for the same project may be considered only with the specific approval of the Department of Biotechnology (DBT).

2. For permanent/semi-permanent assets acquired solely or mainly out of the grant, an audited record in the form of a register in the prescribed proforma (enclosed at Appendix-'A') shall be maintained by the Institute. The term "assets" means (I) immovable property and (II) movable property of a capital nature, where the value exceeds Rs. 1000/- The grant will not be utilised for construction of any immovable property. Full facilities by way of accommodation, etc. for the project will be given by the Institute.

3. All the assets acquired from the grant will be the property of Govt. of India and should not without the prior sanction of the Deptt. of Biotechnology, be disposed of, or encumbered or utilised for purpose other than those for which the grant has been sanctioned.

4. At the conclusion of the project, the Govt. of India will be free to sell or otherwise dispose of assets which are the property of the Government. The Institute shall render to Govt. necessary facilities for arranging the sale / disposal of these assets. The Government may, however, consider the request of host institutions to retain the assets created under a project for carrying out similar work for the promotion of science.

5. The implementing Institute/PI will furnish progress report of work on the project every six months. The progress of the project will also be reviewed / monitored at least once a year by the concerned Task Force/Project Monitoring Committee, etc. In addition the DBT shall designate Scientists/Specialists to visit the Institute periodically for reviewing the progress of work and for suggesting such measures as to ensure early realization of the objectives of the project. On completion of the project five copies of a consolidated report of the work done on the subject would be submitted to the Department of Biotechnology.

6. The Institute is required to send to DBT a list of assets referred to at Sl. No. 2 above at the end of each financial year as well as at the time of seeking further instalments of the grant.

7. The Institute would furnish to the Deptt. of Biotechnology a Utilization Certificate (Copy enclosed at Appendix – 'B') and an audited statement of expenditure (Copy enclosed at Appendix - 'C') duly signed by the P.I., the Head of the

Institute and the Head of the Finance wing, pertaining to the grant at the end of each financial year as well as a consolidated statement of expenditure at the end of the completion of the project.

8. A stamped receipt be sent to the Deptt. of Biotechnology on receipt of the Cheque/ Demand draft towards each release.

9. The Comptroller and Auditor-General of India at his discretion shall have the right of access to the books and accounts of the Institute for the grant received from the Government.

10. The Institute would maintain seperate audited accounts for the project. If it is found expedient to keep a part or whole of the grant in a bank account earning interest,the interest thus earned should be reported to the Deptt. of Biotechnology.

11. Sale proceeds, if any, as a result of the development of the project arising directly from funds granted by the Deptt. of Biotechnology shall be reported to the Govt. of India. The Govt. of India may at its discretion allow a portion of such receipt to be retained by the Institute for its utilisation for the project activities.

12. Investigators/Institutes wishing to publish papers based on the research work done under Deptt. of Biotechnology projects should acknowledge the financial support received from the Deptt. of Biotechnology.

13. Investigators/Institutes may utilize various resources such as the Bioinformatics resources, experimental materials, reagents, cell lines, animals, etc. from the National facilities/Institutes/Centres established by this Department as per the terms of transactions followed by them. More information may be obtained about such facility from DBT websites: www.dbtindia.org / www.dbtindia.nic.in, www.btinet.nic.in.

14. Investigators / Institutes shall follow the detailed instructions on technology transfer and Intellectual Property Rights (IPR) as given at Annexure - V.

15. Investigators / Institutes may file patents with the help of the Biotechnology Patents Facilitating Cell (BPFC) established at DBT on priority bases. The format for filing the patents may be seen at Annexure –VI.

16. The Govt. of India (Dept. of Biotechnology) will have the right to call for drawings, specifications and other data necessary to enable the transfer of know-how to other parties and the Institute shall supply all the needed information at the request of the Department of Biotechnology which will ensure confidentiality. The information required for commercializing Biotechnologies may be furnished to this Deptt. as per the format enclosed at Annexure – VII.

17. The Institute may not entrust the implementation of the work for which the grant is being sanctioned to another institution and to divert the grant receipts as assistance to the latter institution. However, in such situations the express permission of DBT may be obtained. In case the grantee is not in a position to execute or complete the project, it may be required to refund forthwith to the Govt. of India (Department of Biotechnology) the entire amount of grant received by it.

18. The human resources that may be engaged for the project by the Institute are not to be treated as employees of the Govt. of India and the deployment of such human resource at the time of completion or termination of project will not be the concern/responsibility of the Govt. of India. The Organization may make reservations for Scheduled Castes, Schedule Tribes etc. in the human resource to be engaged for the project in accordance with the instruction issued by the Govt. of India from time to time.

19. The Deptt. of Biotechnology reserves the right to terminate the grant at any stage and also to recover the amounts already paid if it is convinced that the grant has not been properly utilized or the work on the project has been suspended for any unduly long period or appropriate progress is not being made.

20. The project will become operative with effect from the date of release of the first installment for the project.

21. If the Investigator to whom a grant for a project has been sanctioned leaves the institution where the project is being implemented, he shall submit five copies of complete and detailed report of the work done by him on the project and the money spent till the date of his/her release and shall also arrange to refund the unspent balance, if any.

22. The organisation should maintain subsidiary accounts of the Govt. of India grant and furnish it to the Audit Officer as and when the recurring and non-recurring expenditure exceeds the limits of Rs. 5.00 lakhs.

Signature of Project Coordinator (applicable only for multi-institutional projects)
Not applicable

Signature of Executive Authority of Institute/ University With seal

Date : 28-3-2016

Prof. Z. G. Badade
Registrar,
Nerul Institute of Health Sciences
Kamothe, Navi Mumbai-401209

Signature of Principal Investigator

Dr. Rajani P Mullerpatan

Date : 28-3-2016

Signature of Co-Investigator

Dr. Swagatika Mishra

Mrs. SWAGATIKA MISHRA
RCI. Regd. No. A66691
INCHARGE PROSTHETIC & ORTHOTIC WORKSHOP

Date : 28-3-2016

AMTI
FORCE AND MOTION

PACKING LIST

Advanced Mechanical Technology, Inc.
176 Waltham Street
Watertown, MA 02472
Tel: (617) 926-6700
Fax: (617) 926-5045

Shipping Number: 0017545
Ship Date: 12/16/2014

Order Number: 0016847
Order Date: 12/10/2014
Salesperson: FBA
Customer Number: V1001

Sold To:
Vicon Motion Systems Ltd.
14 Minns Business Park
West Way
Oxford, OX2 0JBUnited Kingdom

Ship To:
Vicon Motion Systems Ltd.
14 Minns Business Park
West Way
Oxford, OX2 0JB United Kingdom

Confirm To:	Phone No:	Fax No:	Email:
A/ A. Surdock	+44 1865 261859	+44 1865 240527	Adele.Burdock@vicon.com

Customer P. O.	Terms	F. O. B.	Ship VIA	Number of Packages: 7
N/A	Net 30 Days	Ex-Works (EXW)	NNR LOGISTICS	Weight of Shipment: 00240

Item Number	Unit	Ordered	Shipped	Backordered
OR6-7-1K-DEMO DEMO EQUIPMENT - Biomechanics Force Platform (464x508x82.5 mm), 1000 lbs. capacity **Serial Number:**4389M **Serial Number:**4390M	EACH	2.00	2.00	0.00
A-CAL-CD ACCY ITEM: Calibration CD with serial number	EACH	1.00	1.00	0.00
A-NETF-MAN ACCY ITEM: Manual, NetForce Software, v3.05.00	EACH	1.00	1.00	0.00
A-NETF-SW ACCY ITEM: Software, NetForce, v3.5.2.	EACH	2.00	2.00	0.00
GEN5 Six Channel strain gage signal conditioner/amplifier with analog and digital (USB) outputs **Serial Number:**0358 **Serial Number:**0359	EACH	2.00	2.00	0.00
14N-B-32365 Z-foot, GEN5 Amplifier	EACH	1.00	1.00	0.00
A-DRIVER-CD Driver CDs for GEN5 - two (2) CD's - 32-bit and 64-bit, 1 CD for each version.	EACH	1.00	1.00	0.00
A-GEN5-MAN Product Manual, GEN5 Amplifier	EACH	1.00	1.00	0.00
A-GEN5-SW ACCY ITEM: Software, GEN5 Amplifier, Version 1.1.0, dated 2/24/12	EACH	2.00	2.00	0.00
A-HEX18 ACCY ITEM: Hex Key, 1/8" wide Hex (Used for Z-foot screws)	EACH	2.00	2.00	0.00
E2101-00003 Connector, DB25, solder cups, AMP 747912-2				

Contin

PACKING LIST

Advanced Mechanical Technology, Inc.
176 Waltham Street
Watertown, MA 02472
Tel: (617) 926-6700
Fax: (617) 926-5045

Shipping Number: 0017545
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Salesperson: FBA
Customer Number: V1001

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14 Minns Business Park
West Way
Oxford, OX2 0JBUnited Kingdom

Ship To:

Vicon Motion Systems Ltd.
14 Minns Business Park
West Way
Oxford, OX2 0JB United Kingdom

Confirm To:	Phone No:	Fax No:	Email:
Adele Burdock	+44 1865 261859	+44 1865 240527	Adele.Burdock@vicon.com

Customer P. O.	Terms	F. O. B.	Ship VIA	Number of Packages: 7
N/A	Net 30 Days	Ex-Works (EXW)	NNR LOGISTICS	Weight of Shipment: 90240

Item Number	Unit	Ordered	Shipped	Backordered
E2102-00004	EACH	2.00	2.00	0.00
Hood, 25-pin conn, max .335" OD Cable, MFG P/N: A33667-ND				
E2501-00001	EACH	8.00	8.00	0.00
Feet, vinyl, for GEN5, adhesive backing, McM 9572K87				
E4001-00006	EACH	2.00	2.00	0.00
Power Supply, Globtek WB9QG400CCP-N-MED(R)				
E6001-00020	EACH	2.00	2.00	0.00
Cable, USB2.0 A-B, 3 ft., Black, for use with GEN5 QS61-ND				
E6001-00023	EACH	1.00	1.00	0.00
USB Hub, Industrial version with European adapter				
E6002-00013	EACH	2.00	2.00	0.00
Input Adapter, Q-UK(R) for the UK				
9613J030-2R-2	EACH	2.00	2.00	0.00
Cable, 30 feet (9m) long, force sensor to amplifier, right angle connector on sensor end exiting to the left and standard connectors on amplifier end. connector pins "b" and "c" connected at both ends, blue heat shrink added.				
SMF-1R	EACH	2.00	2.00	0.00
Mounting Fixture for OR6 Force Platforms with Epoxy Adhesive.				
A-GLOVE	EACH	4.00	4.00	0.00
ACCY ITEM: Set of Latex gloves				
A-HEX316	EACH	2.00	2.00	0.00
ACCY ITEM: Hex Key, 3/16" wide Hex				
	EACH	1.00	1.00	0.00
ACCY ITEM: Resin Use Instructions for MR Installation				
	EACH	2.00	2.00	0.00
ACCY ITEM: Mixing Wand, Proset 300-MW				

Continue

VICON

14 Minns Business Park,
West Way, Oxford OX2 0JB
United Kingdom

PACKING LIST

CONSIGNEE:	SHIP TO:
The Dean Mahatma Gandhi Mission Medical College Plot No. 1 & 2 ,Sector – 18 Kamothe Navi Mumbai-410 209 India	The Dean Mahatma Gandhi Mission Medical College Plot No. 1 & 2 ,Sector – 18 Kamothe Navi Mumbai-410 209 India

Invoice No.	Invoice Date	Customer	Tax ID	Shipment Method
INV9952AM		MGM PT		NMR CIF Mumbai

Contact	Order Date	Payment Terms	
		NOT APPLICABLE	
Purchase Order		Sales Person	Page
CHARITY DONATION		AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs

Total No. of Pkgs : 1

Country of Origin : UK

Manufactured by Vicon Motion Systems Ltd.

AMTI BFA SYSTEMS	AMTI BIOMECHANICS FORCE PLATE ANALYSIS SYSTEM	3SET	110Kgs	108Kgs

Total no. of Pkgs : 7

Country of Origin : USA

Manufactured by AMTI

Vicon Motion Systems Ltd
14 Minns Business Park
West Way
Oxford OX2 0JB
United Kingdom
Tel: +44(0) 1865 261800
Fax: +44(0) 1865 240527

Total number of packages for this shipment : 8

Package 1 contains Vicon Bonita Motion Analysis System with Standard Accessories
Package 2 contains AMTI Biomechanics Force Plate Analysis System
Package 3 contains AMTI Biomechanics Force Plate Analysis System
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Invoice No.	Invoice Date	Customer	Tax ID	Shipment Method
INV9952AM		MGM PT		HNR CIF Mumbai

Contact	Order Date	Payment Terms	
		NOT APPLICABLE	
Purchase Order		Sales Person	Page
CHARITY DONATION		AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs

Total No. of Pkgs : 1

Country of Origin : UK

Manufactured by Vicon Motion Systems Ltd.

AMTI BFA SYSTEMS	AMTI BIOMECHANICS FORCE PLATE ANALYSIS SYSTEM	2SET	110Kgs	108Kgs

Total no. of Pkgs : 7

Country of Origin : USA

Manufactured by AMTI

Vicon Motion Systems Ltd
14 Minns Business Park
West Way
Oxford OX2 0JB
United Kingdom
Tel +44(0) 1865 261800
Fax +44(0) 1865 240527

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Invoice No.	Invoice Date	Customer	Tax ID	Shipment Method
INV9952AM		MGM PT		NNR OF Mumbai

Contact	Order Date	Payment Terms	
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Purchase Order		Sales Person	Page
CHARITY DONATION		AR-LFS	1/1

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Invoice No.	Invoice Date	Customer	Tax ID	Shipment Method
INV9952AM		MGM PT		NMR CIF Mumbai

Contact	Order Date	Payment Terms
		NOT APPLICABLE

Purchase Order	Sales Person	Page
CHARITY DONATION	AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs

Total No. of Pkgs : 1

Country of Origin : UK

Manufactured by Vicon Motion Systems Ltd.

AMTI BFA SYSTEMS	AMTI BIOMECHANICS FORCE PLATE ANALYSIS SYSTEM	2SET	110Kgs	106Kgs

Total no. of Pkgs : 7

Country of Origin : USA

Manufactured by AMTI

Vicon Motion Systems Ltd
14 Minns Business Park
West Way
Oxford OX2 0JB
England
Tel: +44(0) 1865 261800
Fax: +44(0) 1865 240527

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INV9952AM		MGM PT		NNR CIF Mumbai

Contact	Order Date	Payment Terms
		NOT APPLICABLE

Purchase Order	Sales Permit	Page
CHARITY DONATION	AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs

Total No. of Pkgs : 1

Country of Origin : UK

Manufactured by Vicon Motion Systems Ltd.

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Total no. of Pkgs : 7

Country of Origin : USA

Manufactured by AMTI

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INV9952AM		MGM PT		NHR CIF Mumbai

Contact	Order Date	Payment Terms	
		NOT APPLICABLE	
Purchase Order		Sales Person	Page
CHARITY DONATION		AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs
Total No. of Pkgs : 1 Country of Origin : UK Manufactured by Vicon Motion Systems Ltd.				
AMTI BFA SYSTEMS	AMTI BIOMECHANICS FORCE PLATE ANALYSIS SYSTEM	2SET	110Kgs	108Kgs
Total no. of Pkgs : 7 Country of Origin : USA Manufactured by AMTI				

Vicon Motion Systems Ltd
14 Minns Business Park
West Way
Oxford OX2 0JB
United Kingdom
Tel: +44(0) 1865 261800
Fax: +44(0) 1865 240527

Total number of packages for this shipment : 8

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Purchase Order		Sales Person	Page
CHARITY DONATION		AR-LFS	1/1

Marks & Nos.	Material Description		Gross Wt.	Net Wt.
VBMA SYSTEMS	VICON BONITA MOTION ANALYSIS SYSTEMS (ALONG WITH STANDARD ACCESSORIES)	1EA	32kgs	30kgs

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INTEGRAL PART OF PACKING LIST DATED JUNE 11, 201

Item Number	Unit	Ordered	Shipped	Backordered
BP600900-2K	EACH	1.00	1.00	
Biomechanics Force Platform (600x900x101.6mm), 2K lb capacity.				
Serial Number:982204				
A-CAL-CD	EACH	1.00	1.00	
ACCY ITEM: Calibration CD with serial number		1.00	1.00	
A-NETF-MAN	EACH			
ACCY ITEM: Manual, NetForce Software, v3.05.00		1.00	1.00	
A-NETF-SW	EACH			
ACCY ITEM: Software, NetForce, v3.5.3		3.00	3.00	
9615-030-6-6	EACH			
Cable, 30 feet (9m) long, force sensor to USB amplifier. High Density D-type connector on both ends. AMTI Logo molded into cable connector. MFG # SP6S324 HD26M/F # 26 SH TF				
NLD LD00 30'	EACH	1.00	1.00	
BP600900-MR	EACH	2.00	2.00	
Mounting Rail, BP600900 Force Platform				
A-GLOVE	EACH	1.00	1.00	
ACCY ITEM: Set of Latex gloves				
A-HEX316	EACH	1.00	1.00	
ACCY ITEM: Hex Key, 5/16" wide flats				
ACCY ITEM: Mixing Wand, Permit 300-MW	EACH	4.00	4.00	
A-N38	EACH	4.00	4.00	
ACCY ITEM: Nuts (3/8-16)				
A-S38	EACH	4.00	4.00	
ACCY ITEM: Studs (3/8-16) Double-Ended				
A-SET3816	EACH	4.00	4.00	
ACCY ITEM: Setscrew, 3/8-16 thread, 1" long				
A-UBWW38				
ACCY ITEM: UBW Washers (3/8)				

AND INTEGRAL PART OF PACKING LIST DTED JNE 11, 2015

Item Number	Unit	Ordered	Shipped	Backordered
MOUNTING-RESIN	EACH	1.00	1.00	0
Epoxy / Resin, 450 mL, for Installing Mounting Rails and Systems, without Dispensing Device				
GEN5	EACH	1.00	1.00	0
Six Channel strain gage signal conditioner/amplifier with analog and digital (USB) outputs **Serial Number:**2735				
14N-B-32365	EACH	1.00	1.00	0
Z-foot, GEN5 Amplifier				
A-DRIVER-CD	EACH	1.00	1.00	0
Driver CDs for GEN5 - two (2) CDs - 32-bit and 64-bit, 1 CD for each version				
A-GEN5-MAN	EACH	1.00	1.00	0
Product Manual, GEN5 Amplifier				
A-GEN5-S/W	EACH	1.00	1.00	0
ACCY ITEM: Software, GEN5 Amplifier, Version 1.1.0, dated 2/24/12				
A-HEX18	EACH	1.00	1.00	0
ACCY ITEM: Hex Key, 1/8" wide Hex (Used for Z-foot screws)				
E2101-00003	EACH	1.00	1.00	0
Connector, DB25, solder cups, AMP 747912-2				
E2102-00004	EACH	1.00	1.00	0
Hood, 25-pin conn, max .335" OD Cable, MFG P/N A33687-ND				
E2501-00002	EACH	4.00	4.00	0
Feet, vinyl, for GEN5, adhesive backing, McM #9723SRT				
E4001-00006	EACH	1.00	1.00	0
Power Supply, Globtek WR9QG40ICCP-N-MED(R)				
E6001-00019	EACH	1.00	1.00	0
Cable, USB2.0 A-B, 6 ft., Black, for use with GEN5				

PART OF PACKING LIST DATED JUNE 11, 201

	Unit	Ordered	Shipped	Backorde
[illegible]	EACH	1.00	1.00	
for the UK				
MBCIT				
[illegible], for Installing Mounting Rails and Systems, with Dispensing Device	EACH	1.00	1.00	
S-GLOVE				
ACCY ITEM: Set of Latex gloves	EACH	2.00	2.00	
ACCY ITEM: Resin Use Instructions for MR Installation	EACH	1.00	1.00	
ACCY ITEM: Mixing Wand, Power Mix-MW	EACH	1.00	1.00	
ACCY ITEM: Epoxy Dispensing Device M-300 LV	EACH	1.00	1.00	
CASTING-RESIN				
Epoxy Resin, 450 mL, for Installing Mounting Rails and Systems, without Dispensing Device	EACH	1.00	1.00	

Ref. Quote: Q-39261
End User: Indian Institute of Technology - Bombay, Materials Management Division, India
HS Code for the System Listed above: 9018 90 8090
Advanced Mechanical Technology, Inc.
Acct. #: 824-7268677
With: TD BANK N.A.
105 Second Ave
Waltham, MA 02451
ABA / Routing #: 031101266
SB Code #: NOTHUS33XXX
Fed Tax ID #: 04-2591151

ADVANCED MECHANICAL TECHNOLOGY, INC.
[illegible]
Waltham, MA 02472
Tel: [illegible] Fax: (617) 926-5946
(800) 422-2684

PLEASE READ

Shipment Terms: Unpack and inspect immediately. All claims for damaged / discrepant shipments must be made

World Spine Care

"Improving lives in underserved communities through sustainable, integrated, evidence based, spine care."

Dr Rajani Mullerpatan
MGM School of Physiotherapy, Navi Mumbai
MGM Institute of Health Sciences
Navi Mumbai
Maharashtra
India

09 July 2020

Dear Rajani,

Thank you for your recent correspondence regarding the PhD student. I can confirm that World Spine Care Europe will provide a scholarship for one PhD student commencing in the summer/autumn of 2020 for a period of 3 years. The scholarship amount is for 5000 Euros per year for tuition and living cost. The scholarship is for study within Spine Care.

As a charity we are accountable to our members and those who assist in the funding provision for such ventures. Therefore, we would ask that annual updates are provided by the student and the MGM School of Physiotherapy, Navi Mumbai,
so that we are able report progress to our membership and Board of Trustees.

I would like to thank you for providing the opportunity for the Doctoral Fellowship to be implemented at the MGM School of Physiotherapy, Navi Mumbai, a Constituent Unit of MGMIHS. We are excited about the prospects of furthering our understanding of Spine Care in India and look forward to hearing from you regarding the candidates and the theme of the PhD studies.

Yours sincerely,

Adam Wilkey
President World Spine Care Europe

World Spine Care
[illegible]

World Spine Care Canada
[illegible]

World Spine Care Europe
[illegible]

MGM

MGMSOP NM <

Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)

Rajani Kanade

To: MGMSOP NM <

PLEASE PRINT EMAIL AND ATTACHMENTS

---------- Forwarded message ---------
From: **Rajani Kanade**
Date: Wed, 31 Mar 2021 at 11:16
Subject: Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)
To: CHMS MGM

PLEASE PRINT

---------- Forwarded message ---------
From: **Poonam Desai**
Date: Wed, 31 Mar 2021 at 11:16
Subject: Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)
To: Dr. Rajani Mullerpatan

---------- Forwarded message ---------
From: **Pawan Kumar**
Date: Wed, Mar 31, 2021, 10:51
Subject: Approval Letter-(DST/WOS-B/HN-37/2021)
To:

Dear Ms. Poonam,

This with reference to your presentation made in the Subject Expert Committee (SEC) meeting of Health Care and Nutrition (HCN) area and revising the proposal in consultation with Dr. AJ Singh, SEC Member, your project proposal is recommended for support under WOS-B component of KIRAN Division of DST.

In this regard, you are requested to submit documents to start process of sanctioning of recommended project proposals at this end. list of documents is attached herewith. For some documents, format has been prescribed. Please submit these documents as per the enclosed format only. Documents may be submitted in soft copy as **single PDF file.**

noted

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एमजीएम /०१/प्र/४१/२०१९/३८४ दिनांक: १८/०९/२०१९

प्रति,
श्री. दि. र. शिंदे
प्रबंधक, महाराष्ट्र राज्य व्यवसायोपचार आणि भौतिकोपचार परिषद,
मुंबई

विषय: महाराष्ट्र शासन निर्णय (GR) : एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस, नवी मुंबई (अभिमत विद्यापीठ) अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरेपी, नवी मुंबई येथे पदव्युत्तर अभ्यासक्रमास (MPT) मान्यता मिळाल्या बाबत.

संदर्भ: १. आपले जा.क्र. ओटीपीटी/परिषद/१७४/१९ दि. ०४.०७.२०१९
२. आपले जा.क्र. ओटीपीटी/परिषद/१७८/१९ दि. ०४.०७.२०१९
३. आपले जा.क्र. ओटीपीटी/परिषद/१०१३/१९ दि. १८.०७.२०१९
४. शासन निर्णय, क्रमांक एमईडी-२०१९/प्र.क्र.२०७/१९/शिक्षण-२ दिनांक १६ सप्टेंबर, २०१९

महोदय,

वरील संदर्भीय विषयास अनुसरून आपणास कळविण्यात येते की, एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस, नवी मुंबई, हा उच्च शिक्षण मानव संसाधन विकास मंत्रालय, भारत सरकार, नवी दिल्ली यांचे अधिसूचना क्रमांक. एफ.९१/२००५-यु-३ (अ) दि. ३०.०८.२००६ नुसार अभिमत विद्यापीठ म्हणून मान्यता मिळाली, आणि त्यानुसार ते कार्यरत आहे.

एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई, अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरेपी, नवी मुंबई शैक्षणिक वर्ष २०१९-२० [एमपीटी- प्रवेश क्षमता प्रत्येकी ०३] अभ्यासक्रमासाठी आवश्यकता प्रमाणपत्र मिळण्यासाठी मा. सचिव, वैद्यकिय शिक्षण आणि औषधी द्रव्ये विभाग, मंत्रालय, मुंबई यांच्याकडे दि. ०८.०७.२०१९ रोजी प्रस्ताव सादर केलेला होता.

एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरेपी, नवी मुंबई येथे पदव्युत्तर अभ्यासक्रम [एमपीटी- प्रत्येकी ०३] Cardio Vascular and Respiratory Physiotherapy, Neuro Physiotherapy, Musculoskeletal Physiotherapy and Sports Physiotherapy शैक्षणिक वर्ष २०१९-२० साठी महाराष्ट्र शासनाची मान्यता प्राप्त झाली आहे.

एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरेपी, नवी मुंबई येथे शैक्षणिक वर्ष २०१९-२० पासून पदव्युत्तर अभ्यासक्रम [एमपीटी- प्रत्येकी ०३] Cardio Vascular and Respiratory Physiotherapy, Neuro Physiotherapy, Musculoskeletal Physiotherapy and Sports Physiotherapy विद्यार्थ्यांचे प्रवेश घेण्याची कार्यवाही सुरु करण्यात येत आहे.

करीता माहितीस्तव सादर.

आपला विश्वासू,

कुलसचिव
Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed to be University u/s 3 of UGC Act, 1956)
Navi Mumbai - 410 209

सोबत: महाराष्ट्र शासन निर्णय (GR) क्रमांक एमईडी-२०१९/प्र.क्र.२०७/१९/शिक्षण-२ दिनांक १६ सप्टेंबर, २०१९

प्रत:
१) प्राचार्य, एम जी एम स्कूल ऑफ फिजिओथेरेपी, नवी मुंबई
२) प्रवेश प्रक्रिया विभाग, एम जी एम इन्स्टीट्युट ऑफ हेल्थ सायन्सेस, नवी मुंबई

एम.जी.एम.चे इन्स्टिटयुट ऑफ फिजिओथेरपी, नवी मुंबई. फिजीओथेरेपी पदव्युत्तर अभ्यासक्रम सुरु करण्यास मान्यता देणेबाबत.

महाराष्ट्र शासन

वैद्यकीय शिक्षण व औषधिद्रव्ये विभाग,

मो.ते.कन्यालयाची नवीन इमारत, ६ वा मजला, मो.ते. कन्यालय मंत्रालय,

लोकमान्य टिळक मार्ग, मुंबई ४०० ००१

शासन निर्णय क्रमांक एमईडी-१०१९/प्र.क्र.२०५/१९/शिक्षण-२

दिनांक: १६ सप्टेंबर, २०१९

वाचा:- संचालक,वैद्यकीय शिक्षण व संशोधन, मुंबई यांचे पत्र क्र. संवैशिक्षण/ एमपीटीएच/ नवीन/एमजीएमपीटीएचनयु/पीजी-१४/२०१९/५-अ, दिनांक ०३.०९.२०१९.

प्रस्तावना:- एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ) अंतर्गत इन्स्टिटयुट ऑफ फिजिओथेरपी, नवी मुंबई या महाविद्यालयात Cardio Vascular and Respiratory Physiotherapy, Neuro Physiotherapy, Musculoskeletal Physiotherapy आणि Sports Physiotherapy हे पदव्युत्तर पदवी अभ्यासक्रम सुरु करण्याच्यासंदर्भात संचालक वैद्यकीय शिक्षण व संशोधन, मुंबई यांनी सक्षमता तपासणी करुन सदर्भाधीन पत्रान्वये अहवाल शासनास सादर केला आहे. महाराष्ट्र आरोग्य विज्ञान विद्यापीठ, नाशिक यांनी फिजिओथेरपी अभ्यासक्रमाबाबत विहीत केलेले निकषांना अनुसरुन संचालक, वैद्यकीय शिक्षण व संशोधन, मुंबई यांनी शासनास सादर केलेला सक्षमता तपासणी अहवाल विचारात घेऊन शासन पुढीलप्रमाणे निर्णय घेत आहे.

शासन निर्णय:- एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ) अंतर्गत इन्स्टिटयुट ऑफ फिजिओथेरपी, नवी मुंबई या महाविद्यालयात सन २०१९-२० या शैक्षणिक वर्षापासून Cardio Vascular and Respiratory Physiotherapy,Neuro Physiotherapy, Musculoskeletal Physiotherapy आणि Sports Physiotherapy हे पदव्युत्तर पदवी अभ्यासक्रम प्रत्येकी ०३ विद्यार्थी प्रवेशक्षमतेसह सुरु करण्यास खालील अटी व शर्तीस अधीन राहून मान्यता देण्यात येत आहे :-

२. अटी व शर्ती:-

१) सदरहू फिजीओथेरेपी महाविद्यालयातील Cardio Vascular and Respiratory Physiotherapy,Neuro Physiotherapy, Musculoskeletal Physiotherapy आणि Sports Physiotherapy या पदव्युत्तर पदवी अभ्यासक्रमांची प्रवेश क्षमता शासनाने निर्धारित केल्यानुसार प्रत्येकी ०३ विद्यार्थी एवढी राहील.

२) केंद्र शासन/ राज्य शासन/मा.सर्वोच्च न्यायालय आणि मा. उच्च न्यायालय यांनी वेळोवेळी दिलेल्या आदेशानुसार सदर अभ्यासक्रमाच्या प्रवेशाकरीता लिपिबध्द करण्यात आलेली कार्यपद्धती अवलंबिण्यात यावी.

३) शासकीय नियम/ करावा या सर्वोच्च व मा.उच्च न्यायालय यांनी वेळोवेळी दिलेल्या निर्णयानुसार शैक्षणिक शुल्कासाठी जी कार्यवाही अनुसरणे वेळोवेळी प्राप्त होईल, त्याप्रमाणे शैक्षणिक शुल्क निश्चित करण्यात यावे.

४) महाराष्ट्र एज्युकेशनल इन्स्टिट्यूशन्स (प्रोहिबिशन ऑफ कॅपिटेशन फी) ॲक्ट, १९८७ (महाराष्ट्र ॲक्ट १९८८ चा ६) मधील तरतुदींचे संस्थेने काटेकोरपणे पालन करणे आवश्यक आहे.

५) सदरहू संस्थेस कायम विना अनुदान तत्वावर मान्यता देण्यात आली आहे. त्यामुळे कोणत्याही आवर्ती/ अनावर्ती स्वरूपाच्या खर्चासाठी अनुदानाची मागणी शासनाकडे करण्यात नाही.

६) शासकीय किंवा शासन महाविद्यालयातील कोणत्याही अध्यापकास तो सेवानिवृत्त होईपर्यंत किंवा नियत वयोमानानुसार सेवानिवृत्त होईपर्यंत संस्थेमध्ये नोकरी देता येणार नाही किंवा त्यांच्या सेवा [illegible] वापरता येणार नाहीत.

७) संस्थेने कोणत्याही परिस्थितीत शासनाने मान्य केलेल्या विद्यार्थी प्रवेश क्षमतेपेक्षा जास्त विद्यार्थी प्रवेशीत करू नये.

८) एम.जी.एम. इन्स्टिट्यूट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ) या विद्यापीठाचे संलग्नीकरण प्राप्त झाल्याशिवाय सदर जागांवर प्रवेश करण्यात येऊ नयेत.

सदर आदेश महाराष्ट्र आरोग्य विज्ञान विद्यापीठ अधिनियम, १९९८ मधील कलम ६४(१) नुसार शासनास प्रदत्त असलेल्या अधिकाराचा वापर करून निर्गमित करण्यात येत आहेत.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

(अजित सासुलकर)
अवर सचिव, महाराष्ट्र शासन

प्रत,
मा. राज्यपालांचे सचिव, राजभवन, मलबार हिल, मुंबई
मा. मुख्यमंत्र्यांचे प्रधान सचिव, मंत्रालय, मुंबई
मा. मंत्री (वै.शि.) यांचे विशेष कार्य अधिकारी, मंत्रालय, मुंबई.
मा. राज्यमंत्री (वै.शि.) यांचे विशेष कार्य अधिकारी, मंत्रालय, मुंबई.
संचालक, वैद्यकीय शिक्षण व संशोधन, मुंबई
प्राचार्य, इन्स्टिट्यूट ऑफ फिजिओथेरपी, नवी मुंबई.
निवडनस्ती (वैशि-२).

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E-mail : registrar@mgmuhs.com | Website : www.mgmuhs.com

दिनांक: १८/०९/२०१९

एमजीएम /०६/प्र/४१/२०१९/963

प्रति,
श्री. वि. र. शिंदे
प्रशासक, महाराष्ट्र राज्य व्यवसायोपचार आणि भौतिकोपचार परिषद,
मुंबई

विषय: महाराष्ट्र शासन निर्णय (GR) : एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस, नवी मुंबई (अभिमत विद्यापीठ) अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरपी, नवी मुंबई येथे भौतिकोपचार अभ्यासक्रमास (BPT) मान्यता मिळाल्या बाबत.

संदर्भ: १. आपले जा.क्र. ओटीपीटी/परिषद/१३०८/१९ दि. ०४.०७.२०१९
२. आपले जा.क्र. ओटीपीटी/परिषद/१४८८/१९ दि. ०४.०७.२०१९
३. आपले जा.क्र. ओटीपीटी/परिषद/१५१३/१९ दि. १८.०७.२०१९
४. शासन निर्णय, क्रमांक: पीएसओ-२०१९/प्र.क्र.११६/१९/शिक्षण १ दिनांक १३ सप्टेंबर, २०१९

महोदय,

वरील संदर्भांन्वये विषयास अनुसरून आपणास कळविण्यात येते की, एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस, नवी मुंबई, हा उच्च शिक्षण भारत सरकार, मानव संसाधन विकास मंत्रालय, भारत सरकार, नवी दिल्ली यांचे अधिसूचना क्रमांक: एफ.२१/२००५-यु-३ (अ) दि. १०.०८.२००६ नुसार अभिमत विद्यापीठ म्हणून मान्यता मिळाली, आणि त्यानुसार ते कार्यरत आहे.

एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई, अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरपी, नवी मुंबई शैक्षणिक वर्ष २०१९-२० (बीपीटी- प्रवेश क्षमता १००) अभ्यासक्रमासाठी आवश्यकता प्रमाणपत्र मिळण्यासाठी मा. सचिव, वैद्यकिय शिक्षण आणि औषधी द्रव्ये विभाग, मंत्रालय, मुंबई यांच्याकडे दि. ०८.०७.२०१९ रोजी प्रस्ताव सादर केलेला होता.

एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरपी, नवी मुंबई येथे भौतिकोपचार अभ्यासक्रम (बीपीटी- प्रवेश क्षमता १००) शैक्षणिक वर्ष २०१९-२० साठी महाराष्ट्र शासनाची मान्यता प्राप्त झाली आहे.

एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई अंतर्गत एम जी एम स्कूल ऑफ फिजिओथेरपी, नवी मुंबई येथे शैक्षणिक वर्ष २०१९-२० पासून भौतिकोपचार अभ्यासक्रम बीपीटी साठी १०० विद्यार्थ्यांचे प्रवेश देण्याची कार्यवाही सुरू करण्यात येत आहे.

करीता माहितीस्तव सादर.

आपला विश्वासू,

कुलसचिव
Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act, 1956)
Navi Mumbai - 410 209

सोबत: महाराष्ट्र शासन निर्णय (GR) क्रमांक पीएसओ-२०१९/प्र.क्र.११६/१९/शिक्षण १ दिनांक १३ सप्टेंबर, २०१९

प्रत
१) प्राचार्य एम जी एम स्कूल ऑफ फिजिओथेरपी, नवी मुंबई
२) प्रभारी अधिकारी [illegible], एम जी एम इन्स्टीट्यूट ऑफ हेल्थ सायन्सेस, नवी मुंबई

भौतिकोपचार महाविद्यालयाला मान्यता देण्याबाबत.

एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायसेन्स (अभिमत विद्यापीठ), नवी मुंबई संचलित एम.जी.एम. स्कुल ऑफ फिजिओथेरपी, नवी मुंबई.

महाराष्ट्र शासन

वैद्यकीय शिक्षण व औषधी द्रव्ये विभाग,

शासन निर्णय, क्रमांक: पीएसओ-२०१९/प्र.क्र.१९६/१९/शिक्षण-१,

९ वा मजला, गो.ते.रुग्णालय संकुल, लोकमान्य टिळक मार्ग, मुंबई ४०० ००१.

दिनांक : १६ सप्टेंबर, २०१९.

वाचा : १. कुलसचिव, एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायसेन्स (अभिमत विद्यापीठ), नवी मुंबई यांचे क्र.एमजीएम/०१/प्र/४५/२०१९/१३०, दिनांक ०८.०३.२०१९ रोजीचे पत्र.

२. संचालक,वैद्यकीय शिक्षण व संशोधन, मुंबई यांचे पत्र क्र.संवैशिसं/बीपीटीएच/प्रवेश क्षमता वाढ/एमजीएमपीटी४/युजी-०४/२०१९/१-अ, दिनांक ०३.०९.२०१९.

प्रस्तावना:

एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायसेन्स (अभिमत विद्यापीठ), नवी मुंबई संचलित एम.जी.एम. स्कुल ऑफ फिजिओथेरपी, नवी मुंबई या संस्थेचा भौतिकोपचार पदवी अभ्यासक्रम सुरु करण्याबाबतचा प्रस्ताव संदर्भ क्र.(१) च्या पत्रान्वये कुलसचिव, एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायसेन्स (अभिमत विद्यापीठ), नवी मुंबई यांच्याकडून शासनास प्राप्त झाला होता. त्यानुसार सदर संस्थेची संचालक, वैद्यकीय शिक्षण व संशोधन, मुंबई यांचेमार्फत सक्षमता तपासणी करण्यात आली. संचालक, वैद्यकीय शिक्षण यांनी सक्षमता तपासणीचा अहवाल संदर्भ क्र.(२) येथील पत्रान्वये शासनास सादर केला असून त्यांनी उक्त संस्थेतील भौतिकोपचार पदवी अभ्यासक्रमाला परवानगी देण्याबाबत शिफारस केली आहे. सादर शिफारस विचारात घेऊन उक्त महाविद्यालयातील भौतिकोपचार अभ्यासक्रमाला शैक्षणिक वर्ष २०१९-२० साठी १०० विद्यार्थी प्रवेश क्षमतेसह परवानगी देण्याची बाब शासनाच्या विचाराधीन होती.

शासन निर्णय :

संचालक, वैद्यकीय शिक्षण व संशोधन, मुंबई यांनी संदर्भ क्र. (२) अन्वये केलेली शिफारस विचारात घेऊन, शासन एम.जी.एम. इन्स्टिटयुट ऑफ हेल्थ सायसेन्स (अभिमत विद्यापीठ), नवी मुंबई संचलित एम.जी.एम. स्कुल ऑफ फिजिओथेरपी, नवी मुंबई या संस्थेतील भौतिकोपचार पदवी अभ्यासक्रमाला शैक्षणिक वर्ष २०१९-२० पासून १०० विद्यार्थी प्रवेश क्षमतेसह सुरु करण्यास खालील अटी व शर्तींच्या अधीन राहून याद्वारे मान्यता देत आहे:-

१) या महाविद्यालयातील भौतिकोपचार पदवी अभ्यासक्रमाच्या १०० (शंभर) इतक्या प्रवेश क्षमतेस मंजूरी देण्यात येत आहे.

२) राज्य शासनाने भौतिकोपचार अभ्यासक्रमाच्या महाविद्यालयांबाबत वेळोवेळी विहित केलेल्या नियमांचे व मानकांचे पालन करणे संस्थेवर बंधनकारक राहील.

३) महाराष्ट्र एज्युकेशन इन्स्टिट्यूशन्स (प्रोहिबिशन ऑफ कॅपिटेशन फी) ॲक्ट, १९८७ (महाराष्ट्र ॲक्ट क्र.VI १९८८) मधील तरतुदींचे संस्थेने काटेकोरपणे पालन करणे आवश्यक राहील.

४) सदरहू संस्थेस कायम विना अनुदान तत्वावर मान्यता देण्यात आली आहे. त्यामुळे संस्था आवर्ती/ अनावर्ती वा अन्य स्वरूपाच्या कोणत्याही खर्चासाठी शासनाकडे अनुदानाची मागणी करणार नाही असे लेखी अभिवचन संस्थेने दिले पाहिजे.

५) शासकीय वैद्यकीय किंवा तत्सम महाविद्यालयातील कोणत्याही अध्यापकास तो सेवानिवृत्त होईपर्यंत किंवा नियतवयोमानानुसार सेवानिवृत्त होईपर्यंत सदरहू संस्थेमध्ये नोकरी देता येणार नाही किंवा त्याच्या सेवा संस्थेस वापरण्यात येणार नाहीत.

६) संचालक, संचालनालय, वैद्यकीय शिक्षण व संशोधन, महाराष्ट्र राज्य, मुंबई यांनी दिलेल्या शिफारशीच्या आधारे सदर परवानगी देण्यात आलेली आहे.

७) राज्य शासन/मा. सर्वोच्च न्यायालय/मा. उच्च न्यायालय यांनी वेळोवेळी दिलेल्या निर्देशानुसार प्रवेश व शुल्कनिश्चितीबाबत कार्यवाही करणे संस्थेला बंधनकारक राहील.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

(डॉ.श्रीनिवास कोतवाल)
अवर सचिव, महाराष्ट्र शासन

प्रति,

१. मा.राज्यपाल यांचे सचिव, राजभवन, मलबार हिल, मुंबई.
२. मा.मुख्यमंत्र्यांचे सचिव, मंत्रालय, मुंबई.
३. मा. मंत्री (वै.शि.) यांचे खाजगी सचिव, मंत्रालय, मुंबई.
४. मा. राज्यमंत्री (वै.शि.) यांचे खाजगी सचिव, मंत्रालय, मुंबई.
५. संचालक, वैद्यकीय शिक्षण व संशोधन, मुंबई.
६. प्रबंधक, महाराष्ट्र राज्य व्यवसायोपचार व भौतिकोपचार परिषद, मुंबई.
७. अध्यक्ष/सचिव, एम.जी.एम. इन्स्टिट्यूट ऑफ हेल्थ सायन्सेस (अभिमत विद्यापीठ), नवी मुंबई, सेक्टर-०१, कामोठे, नवी मुंबई-४१०२०९.
८. अवर सचिव (शिक्षण-२), वै.शि. व औ.द्र. विभाग, मंत्रालय, मुंबई.
९. निवडनस्ती (शिक्षण-१).

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)
Accredited by NAAC with 'A' Grade
Sector-01, Kamothe, Navi Mumbai - 410 209
Tel 022-27432471, 022-27432994, Fax 022 - 27431094
E-mail : registrar@mgmuhs.com , Website : www.mgmuhs.com

No MGM/01/AC-26/2019/347 June 25, 2019

To,
The Principal
MGM School of Physiotherapy
Navi Mumbai – 410 209

Subject : Recognition as a UG Teacher

Madam,

I am directed to inform you that on recomondation of UG/PG Teacher Approval Committee meeting held on 29/03/2019 and further receiving approval from Academic Council (AC-33/2019) meeting held on 16/04/2019, Board of Management is pleased to grant/extend recognition as Under-Graduate (UG) Teacher to the following Teachers of your College for three years (ie. From Academic Year 2019-20 to Academic Year 2021-22).

Sr.No	Name of Faculty
1	Dr. Triveni Shetty (PT)
2	Dr. Mamta S Shetty (PT)
3	Dr. Juhi Bhamuke (PT)
4	Dr. Pradnya Girdhar (PT)
5	Dr. Rucha Pradhan (PT)
6	Dr. Shrutika Parab (PT)
7	Dr. Pooja Dogra (PT)
8	Dr. Hiranmayee Bagwe (PT)
9	Dr. Payal Murkudkar (PT)
10	Dr. Ruturaj Shete (PT)

This recognition is granted on the basis of the information furnished by you in the application submitted to the University for the purpose. University reserves the right to withdraw this recognition, if considered necessary to do so for specific reasons later on. You are requested to convey this decision to the respective teacher at your level.

Yours sincerely,

Registrar
Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act, 1956)
Navi Mumbai- 410 209

Copies to: 1) Chairperson, UG /PG Teachers Approval Committee, MGMIHS
2) Academic Section (1), MGMIHS

To file in person

(6)

MGM INSTITUTE OF HEALTH SCIENCES

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E-mail : registrar@mgmuhs.com ; Website : www.mgmuhs.com

MGM/01/AC-26/2017/ 429 2nd January 2017

To
Dr. Rajani Mullerpatan
Professor-Director
MGM School of Physiotherapy,
Navi Mumbai

Sub: PG Teacher approval – reg..

Madam,

As per your letter dated 16th November 2016, the UG/PG Teacher Approval Committee of the University in its meeting held on 09th December, 2016 considered the proposal and subsequently the said proposal has been duly approved by the Academic Council (AC-25/2016) of MGM Institute of Health Sciences at its meeting held on 29th December, 2016.

Therefore, following teachers of MGM School of Physiotherapy, Navi Mumbai have been accorded "PG Teachers approval /continuation of PG Teacher" for next three years with effect from Academic Year 2017-18.

Sr. No.	Name of Faculty	Designation	Specialty	Approved PG Teacher Since
1.	Dr. Rajani Mullerpatan	Professor	Musculoskeletal Physiotherapy	01/07/2008
2.	Dr. Bela Agarwal	Professor	Cardio Pulmonary Physiotherapy	09/04/2012
3.	Dr. Meruna Bose	Associate Professor	Neuro Physiotherapy	01/01/2010
4.	Dr. Yuvraj Singh	Assistant Professor	Musculoskeletal Physiotherapy	01/06/2016
5.	Dr. Shruti Nair	Assistant Professor	Cardio Pulmonary Physiotherapy	01/08/2016

Kindly note that the PG Teacher approval is subject to MGMIHS Rules and Regulations.
You are requested to convey this decision to the respective teacher at your level.

With regards,

Registrar
Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act, 1956)
Navi Mumbai-410 209

Copies to:
1. Chairperson, UG /PG Teacher Approval Committee
2. MGMIHS – Academic Section

Department of Musculoskeletal Physiotherapy

Sr. No.	Invention Title	Name of Inventors	Copyright Registration Number	Date of Approval
1	Reference Values for Spatiotemporal Variables of Gait in Healthy Indian Adults	Rajani Mullerpatan, Triveni Shetty	L-92919/2020	17-07-2020
2	Comparison of palmar abduction in three wrist positions among health adults using conventional finger goniometer	Rajani Mullerpatan, Anisha Gulati	L-97865/2020	21-12-2020
3	Reference values for hand grip and pinch strength for healthy Indian Adolescents	Rajani Mullerpatan, Mamta Shetty	L-97877/2020	21-12-2020
4	MGM Ground Level Activity Exposure Questionnaire	Bela Agarwal and Rajani Mullerpatan	L-76907/2018	27-07-2018
5	Translated and validated marathi version of Shoulder Pain And Disability Index (SPADI)questionnaire	Apeksha Pahade, Surendra Wani, Rajani Mullerpatan	L-97633/2020	12-11-2020
6	3 Dimensional Gait Report for children: 6-9 years	Rajani Mullerpatan	L-105701/2021	21-12-2020
7	Reference values for hand grip and pinch strength for healthy Indian adults	Rajani Mullerpatan, Mamta Shetty	L-100130/2021	06-03-2021
8	MGM Reference values for Centre of pressure (CoP) trajectory in quiet stance among healthy Indian people aged 7-65 years.	Rajani Mullerpatan, Triveni Ranga Shetty	L-103788/2021	27-05-2021
9	MGM Reference values for Gait Kinematic variables in Healthy Indian Adults	Rajani Mullerpatan, Triveni Shetty, Bela Agarwal	L-103652/2021	25-05-2021
10	MGM Measurements Among Individuals Ages 5-65 Years 5-65 Years	Rajani Mullerpatan, Triveni Shetty, Bela Agarwal	L-105704/2021	23-07-2021
11	MGM Reference Values for Kinematics and Muscle Activity During Suryanamaskar	Rajani Mullerpatan, Triveni Shetty, Bela Agarwal	L-105719/2021	23/07/2021
12	MGM Reference Values for Foot Geometry And Pressure Distribution of Indian Classical Bharatanatyam Dancers			23-07-2021

Neurophysiotherapy Department

Sr. No.	Invention Title	Name of Inventors	Copyright Registration Number	Date of Approval
1	3 Dimensional Gait Report for Children : 9 to 12 years	Rajani Mullerpatan, Triveni Shetty	L-93922/2020	8/21/2020

Department of Cardiovascular and respiratory Physiotherapy

Sr. No.	Invention Title	Name of Inventors	Copyright Registration Number	Date of Approval
1	Physiotherapy Management of Covid-19 in Indian Set-up	Maria Jiandani, Bela Agarwal et.al.	L-95459/2020	06-10-2020

Sports Physiotherapy

Sr. No.	Invention Title	Name of Inventors	Copyright Registration Number	Date of Approval
1	Paediatric fitness report females 13-18 years	Bela Agarwal, Rajani Mullerpatan	L-91340/2020	21-05-2020
2	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 years and Adolescents: 13-17 years	Bela Agarwal, Rajani Mullerpatan	L-92917/2020	17-07-2020
3	MGM Paediatric Fitness Testing Report: Males 13-18 Years	Bela Agarwal, Rajani Mullerpatan	L-93923/2020	8/21/2020
4	Pediatric Fitness testing Report: Males 6-12 Years	Bela Agarwal, Bhoomika Sawant, Rajani Mullerpatan	L-97874/2020	21-12-2020

6. Evidence of research in 4 PG departments of MGM School of Physiotherapy.

Department of Musculoskeletal Physiotherapy

1. Pahade AJ, Wani SK, Mullerpatan RP, Elizabeth Roach K. Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis. Hong Kong Physiotherapy Journal. 2021 Dec 19;41(02):139-46.
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MGM School of Physiotherapy

MGM Institute of Health Sciences, Navi Mumbai

MGM Centre of Human Movement Science

Report: 2015-2020

Contents

Preamble

Human movement science has grown rapidly over the last half a century in the western countries. Scientists from a wide spectrum of healthcare fields (physiotherapy, surgery, prosthetics-orthotics, anatomy, etc.) and engineering (mechanical, biomedical, aeronautical, etc.) have contributed with robust research to evolve this field. Applications of human movement science range from health promotion, clinical rehabilitation, sports and dance injury, orthotic and prosthetic design, medical device innovations, etc.

In India, the science of human movement is growing gradually. Health and Engineering Institutes like IITs (mechanical, biomedical and aeronautical engineering departments), IISc, Bangalore; BARC; DRDO, NITIE, SRASSC, Manipal Academy, Physiotherapy Institutes, SAI etc. are pursuing academic and research activities in human movement science. However, each institute is working in isolation within a specific mandate of funded projects; resulting in scattered growth of biomechanics throughout India. High-end fundamental research and elite applied clinical work is going on at a few health and engineering institutes, in addition to focused efforts towards indigenous development of robust and affordable prosthesis. However, a need for concerted, cohesive inter-disciplinary effort to develop appropriate healthcare solutions is still perceived.

Engineers and healthcare professionals need to work together to achieve this goal. Medical device innovation has already gained momentum in India with dedicated Centre's like BETiC, TCS Innovation Labs, etc. which seek complementary support from MGM Centre of Human Movement Science. An exemplary partnership between MGM Centre of Human Movement Science and BETiC, IITB is trying to address an urgent need of integrating clinical biomechanics in healthcare for past 5 years.

MGM Centre of Human Movement Science is committed to develop this science in India, disseminate fundamental knowledge and study applications of movement science in health promotion and rehabilitation, to address unmet local and global needs of people from across all economic strata of society. The Team of enthusiastic Physiotherapists, Human movement scientists and Mechanical engineers is working towards creating indigenous simple bold healthcare solutions; designed to engage the mechanical marvel of human body itself to keep people mobile and functionally independent. The philosophy is driven by the fact that technology cannot afford to reach every part of the world, which is challenged by health problems caused by movement disorders. Hence, we explore movement to promote it as a therapeutic device for health promotion and clinical rehabilitation.

On the other hand, The Centre is engaged in applying knowledge of human movement science in design and validation of technology for health promotion, early detection and rehabilitation of people living with movement impairments. Collaboration with national and international health and engineering institutes with high research repute strengthens our multidisciplinary approach to develop relevant movement science applications.

Our 5 year report encompasses the progress of MGM Centre of Human Movement Science since 2015. We present this report to students, researchers and professionals from health care and engineering fields with an aim of engaging them in the goal of generating a multi-disciplinary task force within the country for undertaking research and developing movement science further in India.

Dr. Rajani Mullerpatan & Team of MGM Centre of Human Movement Scienc

Preface

Dr. Anil Kakodkar
Chairman, Rajiv Gandhi Science and Technology Commission

"I have participated in most of your annual meetings if not all of them. Every time I have been watching progress and new things. Today I get a sense that the Centre has got an existence of its own. The Centre is growing with its collaborative work not just with Indian Institutes but across various nodes even abroad. I am extremely delighted to be a part of this discussion. I want to make a few suggestions and comments for your consideration. Healthcare program that we have around is essentially a sick care program and not a healthcare program. Healthcare program should have preventive part which is currently missing. We can look at the program as human wellness program which can include biomechanics, human movement science, traditional Indian and art such as classical Indian dance forms. The field is quiet broad and everything can't be brought under this umbrella on day 1. But things can be started off in this direction. For example, at one centre there was a research conducted on postures of Suryanamaskar by an orthopaedic surgeon who suggested addition of relevant poses for better joint mobility in existing 12-pose Suryanamaskar cycle and named it as Samarthanamaskar as he was a devotee of Swami Samartha Ramdas. Several people complain of knee problems and the Indian habit of squatting and how it becomes difficult after total knee arthroplasty. I have seen surgeons performing hemi-replacements of knee joint and patients are able to perform squatting post-operatively. I think these are some of the benefits of understanding human movement science. The Centre that you have created has a huge potential in developing human movement science. The ecosystem that you have built around the Centre with several partner institutions in various areas of specialization and different disciplines, gives us a great opportunity to move forward in that direction. In that context, I want to endorse what Dr. Ravi said earlier. You have within MGM campus, various institutions such as engineering colleges, medical colleges and you are a University in itself and I think you must leverage your autonomy by creating academic, research, research translation and industry engagement programmes where human movement science can be looked at in a very holistic way. Centre is already conducting activities for academic training, research, technology and device validation. The Centre has already started research on traditional sports, classical dance and day to day ground level activities. While talking about the overall subject of human wellness, we should also integrate biomechanics, biochemical aspects and neural connection of human body. There is a great connection between artificial intelligence to human health. Creating facilities for supporting human wellness for people who are differently-abled rather than apparently mechanical looking gadgets incorporating human intelligence with artificial intelligence technology. Relationship between human brain and external computer can work in coordination. These can be some powerful tools for development. In terms of Human

movement science, there can be human neurological control or artificial control. Since you are an inter-disciplinary team, people doing PhD and Masters level projects in a joint mode i.e. medical fraternity and engineering fraternity working together is an area you might like to carry forward. The last point that I wish to make is more general. You have come this far and if I had to ask you what's your strength. Your strength is the great ecosystem that you have built around. The point is that suppose it was Dr. Rajani, faculty member in Physiotherapy Department of MGM doing a regular job, clearly all this was not possible. Suppose Dr. Rajani had interest in research in the area of biomechanics and you would have decided to do the possible research in your department then you would have not come this far. The main reason for success of this Centre is the ecosystem that you have built. For Indian Science and technology to go forward, the so called "Atmanirbhar Bharat" will not be possible by creating slogans. Atmanirbhar Bharat will only be possible by creating such ecosystems. All complimentary elements which are required for translation of technology/information from lab to market, all of them should be a part of that ecosystem. And you have successfully created a fairly good ecosystem. If you are broadening your vision, you probably need to expand your ecosystem around you. You have come this far by yourself with your excellent work. You are on a jumping board now. So you can jump very high and I wish you all the very best for your success. Last year we championed saying let's take this society forward, take it along with everybody who is involved. If there is difficulty in making that happen then I suggest you change the name of the society Biomechanics to a broader version Human Wellness or Human wellness or science and create a new initiative. Let the old thing remain where it is and create a new Centre because sometimes the old becomes a bottle neck and a hurdle. So you have given enough opportunity to take everybody along. If you see a quick success then you go along with it. If you don't see that happening, then broaden the horizon and create a new society by its own name."

Dr. Anil Kakodkar
Chairman, Rajiv Gandhi Science and Technology Commission

An Indian nuclear physicist and mechanical engineer awarded Padma Shri (1998), Padma Bhushan (1999), Padma Vibhushan (2009).

Former Chairman, Atomic Energy Commission of India
Former Secretary to the Government of India
Former Director of Bhabha Atomic Research Centre
Former Chairman, Board of Governors of the Indian Institute of Technology, Bombay

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Executive Summary

MGM Centre of Human Movement Science (MGMCHMS) has accomplished 5 successful years since its establishment in 2015. It was established by MGM School of Physiotherapy, a Constituent Unit of MGM Institute of Health Sciences, Navi Mumbai on 5th Oct 2015. The Centre was funded by International Society of Biomechanics and BETiC, IIT-Bombay to address an urgent need to integrate clinical biomechanics in Indian healthcare.

The vision is to generate a task force within the country to undertake research and develop human movement science in India, by conducting integrated training for clinicians and engineers. The Centre assumes uniqueness in India, by conducting four major activities under one roof in parallel, namely: training, research, clinical service and technology design and validation.

In past 5 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 11 training courses. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1200 students from Physiotherapy (including BPT & MPT), Prosthetics & Orthotics(BPO) and Orthopedics(MS) benefitted from biomechanics training.

Research activities designed for biomechanical exploration of indigenous movements and postures practiced in India, namely: Yoga, indigenous daily life postures, traditional sports and Indian classical dance forms (11) and clinical rehabilitation (6) have yielded 17 original scientific papers in peer reviewed Scopus/PubMed indexed journals. The Centre was invited to publish research findings in a special volume of Journal of Critical Reviews™ in Physical and Rehabilitation Medicine (Volume 31, 2019 Issue 1: indexed in Scopus), with a theme 'Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in Middle-Income Countries'. Furthermore, the research output is compiled into a chapter titled 'Biomechanics of Indigenous Postures' in the Textbook of Basic Biomechanics of the Musculoskeletal System, 5ed, Publishers: Wolters Kluwer which is due for publication in Jan 2021.

Original fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted. Two patents are filed for design of technology pertinent to rehabilitation.

Inter-disciplinary collaborative research between Department of Mechanical Engineering, IIT Bombay and MGM School of Physiotherapy, Navi Mumbai resulted in development of a powered trans-tibial prosthesis for people with below knee amputation which was funded by Department of Biotechnology.

An external, self-wearable, low-cost, spring loaded passive exoskeleton was designed to reduce trunk muscle fatigue in manual laborers. The device was tested on healthy people and Mathadi workers with and without low back pain and results revealed 25% reduction in onset of fatigue. A proposal is shortlisted by Early Translation Accelerator (ETA) (established at BETIC, IIT Bombay), supported by BIRAC, New Delhi, to support its further development in a commercially viable product and license it to an industry partner. Pilot work is in process for clinical testing of a device for early detection of risk to ulceration among people with diabetic neuropathy.

Our efforts continue to explore-i) the value of squat, a traditionally practiced Indian movement for maintenance of lower extremity muscle strength, joint motion, mobility and walking capacity among people with knee osteoarthritis; ii) to help children with cerebral palsy undergoing single event multiple level surgery, a tool is being developed for home based monitoring of function; iii) biomechanics and energy cost of two modifications of traditional Suryanamaskar for application in elderly people (a collaborative project with Sancheti College of Physiotherapy, Pune).

Nearly 500 patients (traumatic sports/dance or mechanical injury, cerebral palsy, stroke, Parkinson's disease, amputations, diabetic neuropathy, osteoarthritis, joint replacement) have benefitted from robust evaluation for gait analysis (at one-third of prevailing cost), balance assessment,foot geometry and pressure evaluation at markedly subsidized cost. Quantified objective reports helped surgeons, physiotherapists and prostheticians and orthoticians to plan targeted surgical interventions and therapy to optimize function after trauma/disorder.

In addition to patient care, the Centre has supported individual innovators and organizations to validate 9 ingeniously designed devices against gold standard to address unmet needs in clinical rehabilitation of patients with poliomyelitis (1), lower extremity amputations (3), diabetes (1), backache (1), health promotion (1), athletic performance (1) and gait (1). Amongst these 9 devices, 'Diabetic Foot Screening Device' and 'Mechanical Actuated Stance Control Knee Ankle Foot Orthosis' for people with polio' attracted funding from BIRAC for small-scale production and commercialization. Individual innovators ranged from entrepreneurs to our youngest listed innovator who was a standard X school student, who bagged Grand Prize at the Initiative for Research and Innovation in Science (IRIS) National Fair 2016 (New Delhi) and qualified to represent India at the Intel International Science and Engineering Fair 2017 held in Los Angeles, USA.

The dedicated team of 4 Physiotherapy faculty members and 1 Research Associate complemented by mechanical Engineers from IIT Bombay, Queen's University, Canada; Human movement scientists from Cardiff University, UK along with 4 Ph.D. scholars, 14 MPT scholars, 7 M. Tech scholars and 24 BPT Scholars contributed to the growth of MGMCHMS in the past 5 years. A cohesive inter-disciplinary effort between healthcare professionals and engineers is a highlight of the team work at MGMCHMS resulting in translational healthcare research.

Presently it is geared to be recognized as the Centre of Excellence in Human Movement Science at national level. Additionally, it is equipped with expertise, skill and resources to assume position of a National Centre for validation of technology in the area of rehabilitation of movement disorders.

In the future, we envisage scaling our efforts for training and research to promote movement as a therapeutic device for health promotion and rehabilitation of people through a culturally palatable approach.

Dr. Rajani Mullerpatan

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MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

MGM CENTRE OF HUMAN MOVEMENT SCIENCE

Sector-30, Plot 46, Vashi, Navi Mumbai

MGM SCHOOL OF PHYSIOTHERAPY
Sector-1, Kamothe, Navi Mumbai

VISION

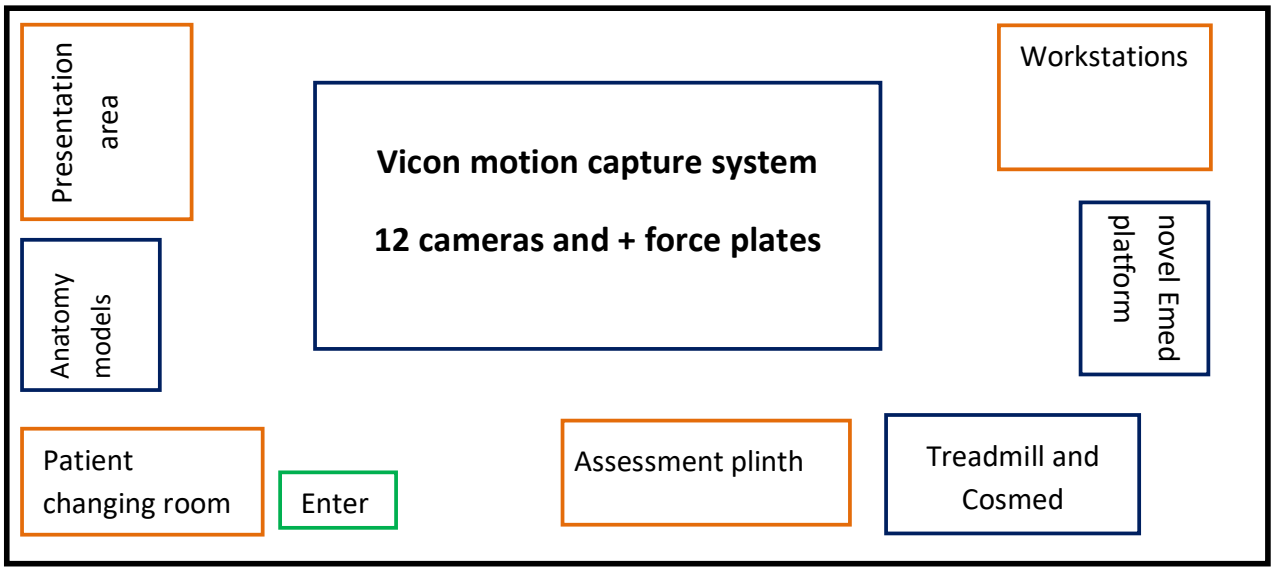
The aim is to generate a task force within the country to undertake research & conduct integrated training for health care professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders

MISSION

The mission is to provide people with robust & comprehensive movement-analysis facilities following injury/disorder at an affordable cost for precise clinical-decision-making.

Facilities

MGM CHMS is spread over 2116 sq. feet area, equipped with robust state of art technology for comprehensive evaluation of human motion. MGM CHMS is located on the first floor of MGM super specialty hospital in Vashi, Navi Mumbai. The lab is 92 ft. long x 23 ft. wide x 13 ft. high.



Layout of MGM Centre of Human Movement Science

❖ Vicon motion capture system and AMTI force plates:

MGM CHMS motion analysis system is a robust gold standard equipment which includes- 12 [Bonita] 240 fps optical cameras (VICON, UK), 2 VGA video camera and three force platforms (AMTI, USA).

VICON motion analysis system has the potential to offer objective and unbiased gait information that can assist clinical decision-making. In addition, motion analysis can be used to influence decision making for orthopedic surgery and assess post treatment progress. AMTI biomechanics force platforms are designed to measure forces, moments and are sensitive to accelerations. Force plates can be used individually or as a walkway to record multiple footfalls.

VICON along with AMTI force plates is a state of art system for comprehensive motion analysis and allows reliable assessment of kinematics and kinetics of human movement. The system is extensively used in research setting for evaluation of motion in all three planes.

The MGMCHMS is also equipped with Vicon Polygon reporting software. This is an integrated visualization and report editing tool that enables quick and easy creation of a gait report. Polygon analyzes trial data that has been created with Vicon motion capture and processing software. Though the software contains modeled data generated by Vicon biomechanical modeling software (such as Plug-in gait, bodybuilder and OLGA); MGM CHMS has generated custom based template for gait analysis with reference values generated from Indian population, thus providing a better understanding of the deviations pertaining to our population.

❖ Novel e-med system for plantar pressure analysis:

E-med® Pedography platform at MGM Centre of Human Movement Science is gold standard system for foot geometry and plantar pressure distribution (Novel e-med, Germany). E-med ® Pedobarography platform (frequency 100Hz, resolution: 4 sensors/cm 2, sensor area: 574x320mm) is an accurate electronic system for recording and evaluating foot geometry and plantar pressure distribution under static and dynamic conditions. It consists of calibrated capacitive sensors that provide robust, objective and reliable information on foot function.
The Emed platform is extensively used for scientific research on foot geometry and pressure distribution. The system provides maximum and average plantar pressure over total foot as well as regional pressure distribution over forefoot, midfoot, hindfoot, hallux and toes. Apart from measurement of foot geometry, important measures such as arch index, hallux angle, coefficient of spreading etc can also be computed which are unavailable from traditional foot print system. Pedobarography measurement has significant applications in footwear design, sports biomechanics to correct altered landing pattern.

❖ Electromyography system:

Delsys Bagnoli EMG System: Delsys Bagnoli EMG DSY-DS-B03 is a 8 channel wire-less device which can be connected to VICON software so that it is helpful in various range of biomechanical research activity such as muscle activity in gait cycle, sports biomechanics.

The ProComp Infiniti: The ProComp Infiniti SA7500 encoder is an eight (8) channel, multi-modality device for real-time computerized biofeedback and data acquisition. It has 8 protected pin sensor inputs with two channels sampled at 2048 s/s and six channels sampled at 256 s/s. The ProComp Infiniti encoder is able to render a wide and comprehensive range of objective physiological signs used in clinical observation and biofeedback. All sensors are completely noninvasive and require little or no preparation for use.

❖ Step Activity Monitor:

The Step Activity Monitor (SAM) by Orthocare Innovations is a highly accurate ankle worn ambulatory activity monitor, the size of a small pager. The StepWatch works with a docking station and software that handles stet-up, downloading, display, analysis, and many other functions. It detects steps for a wide variety of normal and abnormal gait style and cadence ranging from a slow shuffle to a fast run. It has a capacity to monitor and store data for a month.

❖ Trunk Leg Dynamometer:

The Trunk leg dynamometer is an objective instrument for assessing trunk and leg strength. Due to its design, it provides an accurate and safe way to take measurements. A trunk dynamometer measures isometric and concentric strength and muscular endurance of the extensors and flexors of the lumbar and thoracic spine. The oversized body includes a solid base for safety as well as cushion handgrips for comfort. Chain adjusts for height differences or to vary the point of force application. Strength indicator remains at subject's maximum reading until reset. The scale measures to 660 lbs. or 300kg

❖ Vibrothesiometer:

Digital Vibrothesiometer is a robust objective non-invasive tool to detect neuropathy. The vibrometer helps to detect the loss of vibration perception threshold (VPT) accurately. This device is equipped with an electronic tuning fork which has vibration strength that slowly increases till the patient faces the vibration sensation. The digital vibrometer is integrated with a software system that enables storage of data and multiple reports of various patients.

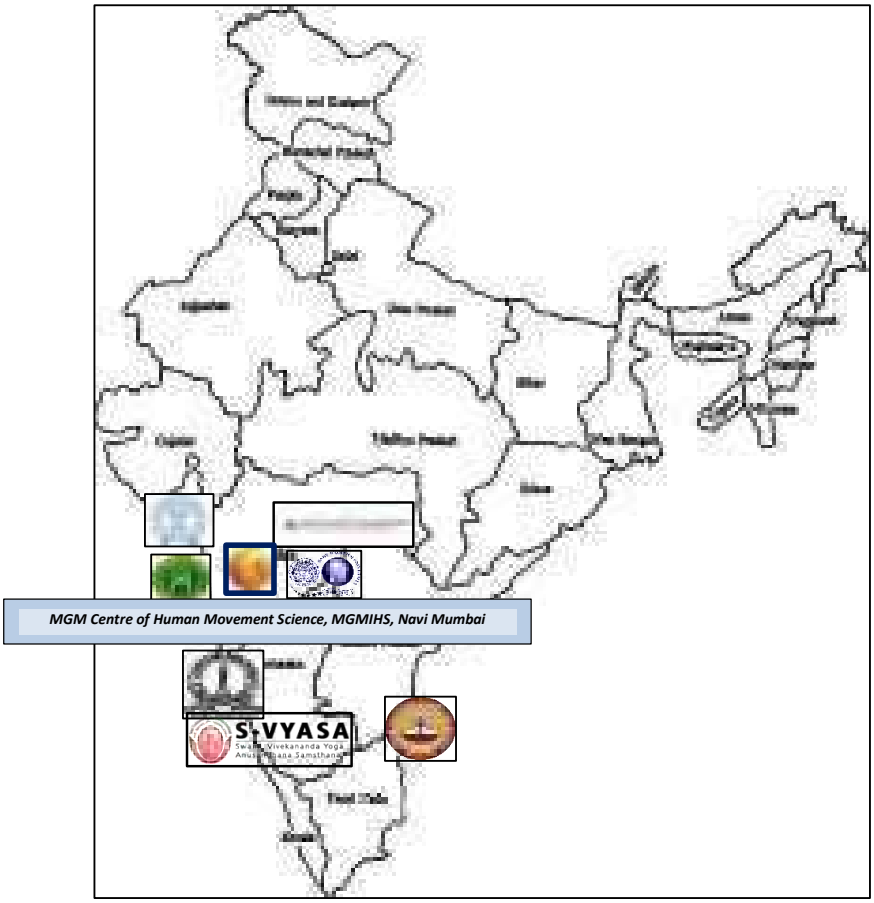
❖ Body Composition Analyser(A202 Tanita):

Tanita is the standard and market leader for body composition analyzers. A Tanita body composition monitor provides valuable measurements regarding body fat, skeletal muscle mass and water content. These measurements indicate body fat, muscles metabolism, bone structure and body water. The equipment provides a quick non- invasive method to assess body composition, an important component of physical fitness.

❖ Oxygen Consumption Analyzer (Fitmate Med, COSMED):

Fitmate Med by COSMED, Italy is an electronic device developed for assessing resting metabolism, cardio-respiratory fitness (VO2max) and basic spirometry (FVC, SVC, MVV). It allows personalized weight management programs and exercise prescriptions according to the ACSM's latest recommendations. It is sensitive equipment that provides accurate respiratory gas analysis and real time oxygen consumption. Energy expenditure of activity is computed and comprehensive analysis of cardio-respiratory and metabolic systems allows for monitoring treatment outcomes and prescription of evidence based activity. This non–invasive, indirect measure permits evaluation of sub-maximal and maximal exercise performance. It involves measurements of gas exchange, primarily oxygen uptake i.e. VO_2, minute ventilation, heart rate, respiratory frequency and energy expenditure. VO2 at maximal exercise (peak VO2) is considered the best index of aerobic capacity and cardio-respiratory function. It is a sensitive measure which can be used to understand cardio-respiratory function in health and disease.

National collaborations & Linkages



BETiC, IIT B– Prof. Ravi, Institute Chair Prof., Founder-BETiC IIT Bombay b.ravi@iitb.ac.in

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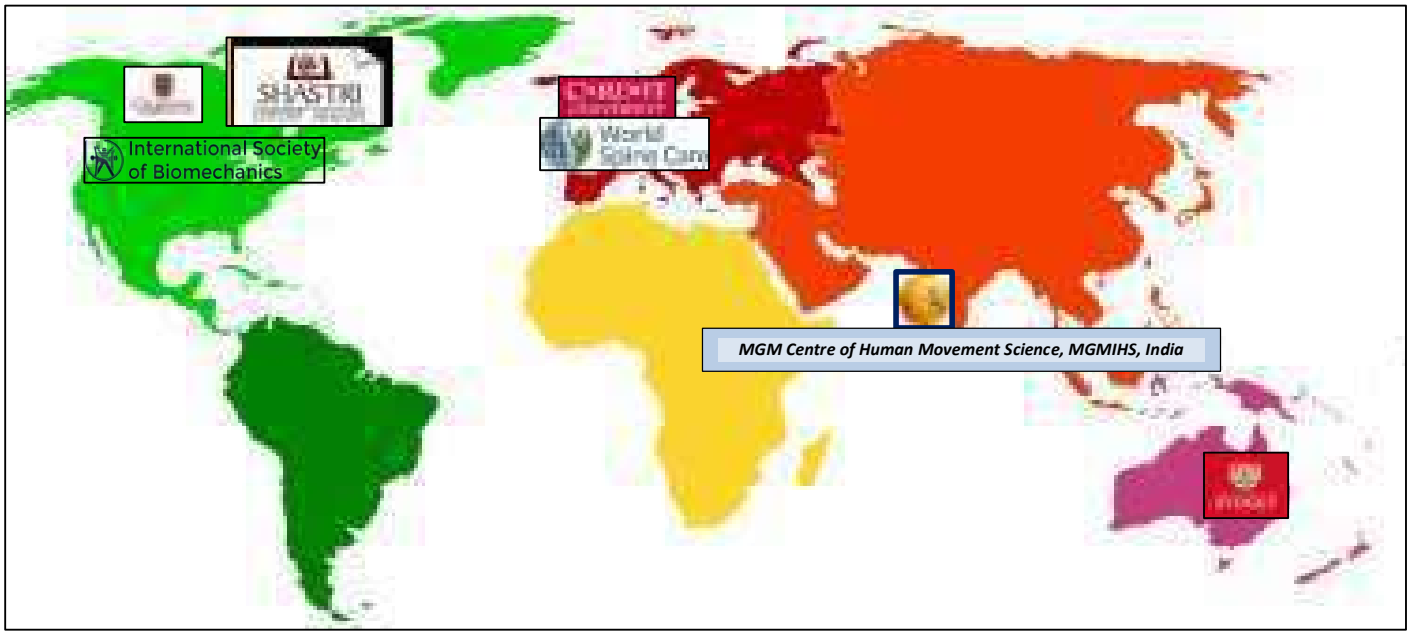
SNDT Women's University, Mumbai, Nancy Fernandes, nancy.fernandes@ltnursingsndt.ac.in

International collaborations



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Prof. Margareta Nordin, World Spine Care, Europe-dmn2@nyu.edu

Dr. Prachi Kaul, Director, Shastri Indo-Canadian Institute, Canada
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Dr. Andrea Hemmerich, Professor, Department of Mechanical Engineering, Queens University, Canada a.hemmerich@alumni.utoronto.ca

Knowledge Dissemination

In past 5 years, the Centre gained recognition for its work in training clinicians and engineers across various states of India in clinical biomechanics and commonly adopted applications of biomechanics such as human gait. Guided tours to higher secondary school and junior college students and short-term demonstrations are regularly conducted to spread awareness and disseminate knowledge of biomechanics within Maharashtra and outside, among clinicians, students and faculty members of health care and engineering.

The Centre has trained several clinicians and engineers in clinical biomechanics across Maharashtra, Gujarat, Karnataka, Kerala & Delhi through 11 training courses. Participants reported an excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Additionally, over 1200 students from Physiotherapy (including BPT & MPT), Prosthetics & Orthotics(BPO) and MS(Orthopedics) benefitted from biomechanics training.

Curricular training

IV BPT students being trained on 3D gait analysis for healthy and patient population

Designing protocol for data capture with Physiotherapy Master Scholars

Master Scholars and Interns practicing 2 D analysis of movement.

Demonstration of 3D motion capture system to MS Ortho residents (II & III year), MGM Medical College, MGM IHS, Navi Mumbai

CME for Physiotherapy Master Scholars on Musculoskeletal modelling by Prof. Marcus Pandey, Chair of Mechanical & Biomedical Eng., University of Sydney

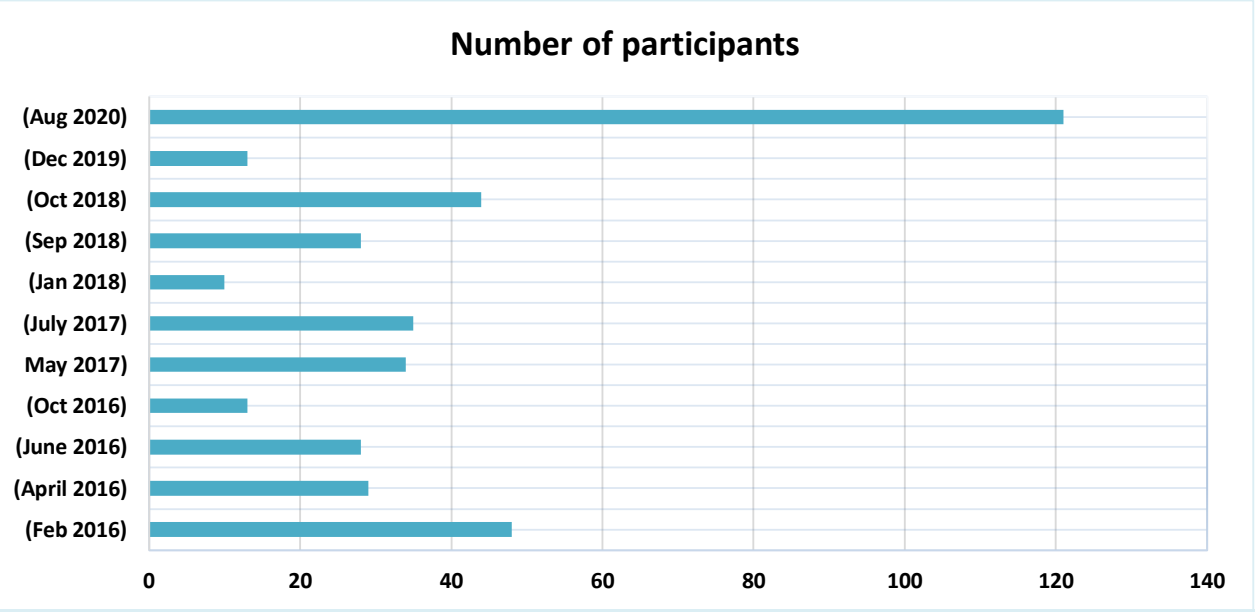
Workshop on strength and conditioning for Physiotherapy Master Scholars by Mr. Shailesh Shetty (Trainer)and Dr. Ruchita Tendolkar (Sports Physiotherapist)

Workshops

In the last 5 years, MGM CHMS conducted 11 training programs to train students, faculty members and clinicians from engineering and healthcare fields.

- **Three workshops in 'Course in Clinical biomechanics'**
  (Feb & April 2016, May 2017)

- **Eight workshops in 'Basics of Gait Analysis (2D/3D)'**
  (June 2016, Oct 2016, July 2017, January 2018, September 2018, Oct 2018, December 2019, Aug 2020)



Graph presents number of participants in the workshops conducted at MGMCHMS from 2016-2020

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Workshop in Clinical Biomechanics


Workshop in Clinical Biomechanics in April 2016


Workshop in Clinical Biomechanics in April 2016 & May 2017

Advanced Workshop in Clinical Biomechanics in May 2017

Basics of 2D & 3D Gait Analysis

Basic 3D Gait Analysis workshop in Feb 2016

Basic 3D Gait Analysis workshop in October 2016

Basic 3D gait analysis workshop conducted in collaboration with Private Practitioners Group Mumbai and Bombay branch of IAP in July 2017 (seated left to right: Dr. Roshan Vania, Dr. D H Dastoor, Dr. Asha Chitnis, Dr. Deepak Kachalia)

Research

The Centre conducts research in 4 major thrust areas: i) biomechanical exploration of traditional ground level activities and its scientific application; ii) biomechanical exploration of Yoga (Suryanamaskar) and its scientific application in healthcare; iii) biomechanical exploration of traditional sports and its scientific application in healthcare and iv) biomechanical exploration of traditional dance form (Bharatanatyam) and its scientific application in healthcare. Research activities in these areas have yielded 17 original scientific papers in peer reviewed Scopus/PubMed indexed journals. Complete research output is compiled into a chapter titled 'Biomechanics of Indigenous Postures' in the Textbook of Basic Biomechanics of the Musculoskeletal System, 5ed, Publ: Wolters Kluwer which is due for publication in Jan 2021.

Fundamental and applied research was conducted to study over 3000 healthy volunteers to generate normative reference values for Indian population (of all age groups ranging from pediatric to geriatric), which are copyrighted, have huge potential for application in future research and design of healthcare solutions including therapy and tool kits for rehabilitation, sports, education and daily personal care. Three patents are filed for design of technology pertinent to rehabilitation. In past 5 years, MHMCHMS has evaluated 308 participants for various research activity and its clinical implementation in the area of cerebral palsy, women's health, diabetes mellitus, spine pain, lower limb amputations, dancer's health as well as development of indigenous medical assistive devices through various intramural, extramural and collaborative funded research projects.

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Research Thrust Area

Biomechanical Exploration of Yogasana and its Scientific Application

MGM Centre of Human Movement Science has undertaken much needed robust biomechanical exploration of Yogasana, which is necessary for its safe prescription in health promotion and prevention, and management of neuro-musculo-skeletal disorders. Research studies are largely funded intramural by MGM Institute of Health Sciences, Navi Mumbai. The highlights of research findings include- kinematics, kinetics, postural control and muscle control during Suryanamaskar and its application in management of low back pain. Additionally, influence of Yoga intervention on cricket bowling performance, balance performance of people with diabetic neuropathy and shoulder function in people with frozen shoulder presenting with diabetes mellitus was studied.

Thoppukaranam was studied to explore its physical and neuro-psychological benefits in University students. Brief summary of research work completed in this thrust area is presented in this section.

❖ To study the neuro-musculoskeletal, cardiopulmonary, cognitive and psychological effects of "Thoppukaranam" in healthy adults (*manuscript submitted*)

Heena Bhanushali, Bela Agarwal, Rakesh Ghildiyal, Sudhir Kadam, Rajani Mullerpatan

"Thoppukaranam" is known as Super Brain Yoga which is being widely practiced in US, there is only a single study on Thoppukaranam till date, which has been done to study its effects on selective attention and psychological states. Current research study aimed to investigate, the neuro-musculoskeletal, cardiopulmonary, cognitive and psychological effects of "Thoppukaranam" to provide evidence-based practice of the same among healthy as well as affected individuals. A total of 30 university students (mean age 21.2±1.5) participated in a 12week intervention program of Thoppukaranam. Following intervention, performance during Chair-Stand test, Calf-Raise test, 30-second Deep-Squat test and 6-minute-walk test improved by 27%, 14%, 28% and 3% respectively($p<0.001$). Reduction in timed limb co-ordination test was observed. ($p<0.001$). Total score on d2 attention test improved by 11%, with reduction in error-rate by 43%($p<0.001$). Further, 42% reduction in anxiety, 18% reduction in academic stress and 34% improvement in Concentration and selective attention among university students.

A typical Yogasana session conducted for patients with Diabetic neuropathy

❖ Effect of Yoga on Bowling Performance and Physical Fitness in Cricket Bowlers

(*manuscript in pipeline*)

Sumedh Vaidya, Bela Agarwal

Cricket, as a sport, derives its thrill from the battle between bat and ball. Limited information is available on factors that contribute to proficient fast bowling performance. Yoga has a distinct emphasis on physical postures(asanas),respiration techniques (pranayama), deep relaxation that cultivate awareness and improve attention. A total 30 non- elite cricketers aged 13-25 years were recruited for a 12week Yoga intervention program. A 12-week intervention of Yoga demonstrated significant improvement in bowling speed (p = <o.oo1), accuracy (p = <o.oo1). upper limb strength (p = <o.oo1), lower limb strength, power and flexibility (p = <o.oo1), back muscles strength (p = <o.oo1), and cardiovascular endurance (p = <o.oo1). Bowling speed and accuracy was marginally better in Yoga intervention group compared to control group. Speed improved by 6.52% in the Yoga group, whereas Control group demonstrated improvement of 5.18%. The bowling accuracy improved in the Yoga group by 35.4% while control group demonstrated an improvement of 31.29%.

❖ Influence of Suryanamaskar on Pain intensity, Muscle strength, Function, Psychosocial factors and Trunk Muscle activity in people with non-specific chronic low back pain: A S-EMG Study

(*manuscript in pipeline*)

Rajani Mullerpatan, Triveni Shetty, Anuja Surve, Anisha Gulat

Bowlers being tested for bowling accuracy

Non-specific low back pain is a common, potentially disabling condition usually treated with self-care and non-prescription medication. Suryanamaskar is a part of yoga program which is known to have positive effects on muscle endurance, obesity, flexibility and fitness. The objective of the current study was to investigate the spinal muscle activation patterns during Suryanamaskar in patients with chronic mechanical low back pain and study its potential as a therapeutic exercise for management of chronic mechanical low back pain. Twenty-four participants with chronic nonspecific low back pain were recruited for 12 weeks for Suryanamaskar training program. Twelve week Suryanamaskar intervention

demonstrated reduction pain intensity and disability (p= 0.00) while an improvement in torso, leg and floor lift strength (p=0.00) and physiological domain of Back PAQ score. Symmetry in muscle recruitment pattern of Erector spinae and multifidus during the 12 pose sequence was observed post 12-week Suryanamaskar intervention. The participants also demonstrated reduced over activity of back extensor muscles with activation comparable to healthy adults at the end of 12 -week intervention.

❖ Biomechanical analysis and energy expenditure of traditional, chair and wall Suryanamaskar (*manuscript in pipeline*)

Apurva Shimpi, Riddhi Goradia, Asha Shaikh, Rajani Mullerpatan, Bela Agarwal

Suryanamaskar (SN), a yogic technique is composed of twelve postures of dynamic muscular movements synchronized with deep breathing. Traditionally, Suryanamaskar, is performed on floor. Hence modifications of Suryanamaskar like wall Suryanamaskar and chair Suryanamaskar have been devised for elderly who are unable to perform traditional variant. It was important to understand the application of these modified SNs in healthy population first so that they can then be prescribed to people with musculoskeletal disorders. Kinematics and kinetics all 3 types of Suryanamaskar (traditional and 2 modified types) was collected using 12-camera motion analysis system (Vicon, UK) Energy expenditure was assessed by using indirect calorimetry via metabolic cart Fitmate Med (Cosmed ,Italy). Highest energy expenditure was noted while performing traditional Suryanamaskar followed by chair and wall Suryanamaskar. Thus, recommending modified version of Suryanamaskar for patients and elderly population.

Research Thrust Area

Biomechanical exploration of Traditional dance forms

India is the land of origin of various magnificent forms of classical and folk dances. Dance as a graceful form of movement has huge potential to maintain and enhance balance, co-ordination, muscle strength, gait and daily activity. Yet negligible scientific information is available to understand potential of Indian classical dance forms in healthcare application. Therefore, MGM Centre of Human Movement Science has undertaken biomechanical exploration of traditional Indian dance forms to unfold its potential as a therapeutic device for health promotion and rehabilitation of movement disorders among children and adults and serve as a conduit for cultural heritage restoration. Secondly, survey findings reporting musculoskeletal injuries among dancers in India prompted research in this thrust area. Preliminary work conducted to explore biomechanical demands of the most commonly performed Indian classical dance form i.e. Bharatanatyam, is presented in this section.

❖ Biomechanical exploration of Aramandi: A fundamental Bharatanatyam dance posture (*manuscript in pipeline*)

Juhi Bharnuke, Rajani Mullerpatan

Aramandi is a fundamental dance pose adopted in Bharatanatyam. Prolonged exposure in sustaining *Aramandi* is speculated to cause alteration in kinematics of spine, pelvis and lower extremity, which may reflect in the dancer's daily life movements. Hence a cross-sectional study was conducted on Bharatanatyam dancers(n=10) using 3 D motion capture system to understand kinematics of major joints of lower extremity during *Aramandi.* Dancers reported an average of 12 years dance experience with a mean exposure of 5.5 hours per week. Balance performance was 25% better during *Aramandi* compared to static bipedal stance. Dancers attained an average of 30°spine extension, 28°anterior pelvic tilt, 55 °hip flexion, 34°hip abduction, 82°knee flexion and 43°ankle dorsiflexion while adopting *Aramandi* stance. 3D kinematic evaluation of *Aramandi* pose revealed quantification of joint angles at spine and pelvis along with hip, knee and ankle joints bilaterally. Present findings will provide insight in clinical evaluation and management of musculo-skeletal impairments reported at low back and knee joint.

3D stick figure on motion analysis system of traditional Bharatanatyam posture- Aramandi

❖ Musculoskeletal Foot adaptations in Bharatanatyam dancers (*manuscript submitted*)

Rajani Mullerpatan, Juhi Bharnuke

In the most commonly practiced Indian classical dance form i.e. Bharatanatyam, rhythmic tapping performed barefeet at varying speeds (*laya*) is speculated to influence height of medial longitudinal arch causing structural alteration of ankle-foot complex. Present study explored musculoskeletal foot adaptations in trained Bharatanatyam dancers. Twenty-one trained Bharatanatyam dancers and 21 age-matched healthy non-dancers participated. During walking, dancers presented 21% higher arch index arch, 15% wider forefoot, 44% wider midfoot. Total plantar pressure distribution was 37% higher among dancers. Current findings will inform clinicians and Bharatanatyam dancers on dancer's foot function and guide strategies for prevention of foot pain and rehabilitation

Research Thrust Area

Exploration of traditional sports for healthcare application

Sports Science has evolved in the last century to understand mind and body demands to play a sport, address health problems of sports people and its application in health promotion. However, a few sports have received the glamour and attention in competition and science. Whereas traditional sports remain neglected. Hence at MGM Centre of Human Movement Science, attempts are made to explore biomechanical and cardio-pulmonary demands of traditional sports such as skipping, Mallakhamb, Kabaddi etc. to expand boundaries of existing sports science field with emerging knowledge. It is foreseen that scientific exploration of traditional sports will not only add to the knowledge of sports science but also revive and popularize them among children and adults of generations to follow.

❖ An Investigation into Foot Structure and Function of Indian Mallakhamb Players (*manuscript in pipeline*)

Payal Pawar, Rajani Mullerpatan, Yuvraj Singh

Biomechanics of Mallakhamb, a traditional Indian gymnastic sport remains unexplored. Present study compared structure and function of ankle-foot complex of Mallakhamb players (n=37) with age-matched controls (group A; n=17). Mallakhamb players were categorized on duration of training. i.e. players with ≤ 3 yrs formed group B (n=22) and players with > 3 yrs formed group C (n=15). Foot function measured was significantly different between the three groups ($p<0.001$). Foot structure measured in terms of response to static loading in standing using Chippaux-Smirak Index (CSI) showed significant difference between 3 groups ($p<0.001$) and a significant decline from group A to group C ($p<0.001$). Ankle-foot complex of Mallakhamb players demonstrated greater muscle function compared to age-matched controls.

❖ Effect of Plyometric training on explosive power, agility, balance and aerobic performance of young adult male Kabaddi players (*manuscript accepted for publication*)

Richa Dharod, Triveni Shetty, Ruturaj Shete, Rajani Mullerpatan

Kabaddi is a team contact sport demanding higher level of endurance, explosive power, strength, agility, reaction time, spatial awareness and speed. Present study hypothesized that plyometric training integrated with conventional Kabaddi training would sports specific fitness among male Kabaddi players. Sixty-one sub-elite Kabaddi players (18-35 years) were allotted to plyometric training group (n=31) and control group(n=30). Kabaddi players trained with plyometric exercises demonstrated significant improvement in physical fitness components of explosive power ($p< 0.05$), lower extremity flexibility ($p= 0.00$), skeletal muscle mass ($p= 0.00$), balance ($p< 0.05$) agility ($p= 0.00$) and aerobic capacity ($p= 0.00$) compared to conventional training group. This improvement is speculated to cast a positive impact on raiding and defense performance of Kabaddi players. Hence, it is recommended that plyometric training could be integrated along with conventional training regime to enhance sports performance of Kabaddi player.

❖ Lower extremity joint loading during Bounce rope skip in comparison to run and walk (*manuscript submitted*)

Rajani Mullerpatan, Triveni Shetty, Yuvraj Singh, Bela Agarwal

Bounce rope-skip holds immense scope for physical activity in space and time constrained urban setting, wherein compliance to commonly performed weight-bearing, aerobic activities like walking and running is a challenge. Thus, present study aimed to explore kinematics and lower-extremity joint loading during rope-skipping compared to walking and running. Following ethical approval, 3D motion analysis of bounce rope-skip, walk and run was captured from 22 healthy female participants aged 18-25yr. In one bounce rope-skip cycle, hip motion ranged between 13.4°-35.3°flexion; knee between13.6 °-67.9° flexion and ankle between 34.5°dorsiflexion to-13.4°plantarflexion. In coronal plane, peak hip and knee adductor moment during rope-skip were lower compared to run and higher than walk ($p<0.001$). Bounce

rope- skip caused low loading on hip, knee and ankle joints compared to run ; supporting its prescription as hip and knee joint-protective exercise for health promotion in young adults.

❖ Effect of 12 weeks of barefoot exercises on lower extremity functional fitness tests and running performance in sub-elite marathon runners (*manuscript in pipeline*)

Neha Raorane, Bela Agarwal, Pravin Gaikwad, Juhi Bharnuke, Rajani Mullerpatan

Running places substantial repetitive loading on the foot. Running related foot injuries are often related to poor intrinsic muscle strength and balance of foot. Improved proprioception and balance due to barefoot running has been reported. The current study explored the effect of barefoot exercise intervention on foot structure, function and dynamic balance performance insub-elite marathon runners**.** All participants were evaluated with the pre-intervention tests which included-power, flexibility, lower limb strength testing, agility, balance test, performance test, intrinsic muscle strength (E-med). Barefoot exercise intervention was beneficial in reducing arch index during running which is indicative of increase in intrinsic muscle strength. Reduced forefoot loading was observed in barefoot exercisers during running. Greater improvement in dynamic balance support prescription of bare-foot exercises in

Runners practising barefoot exercises

❖ Level of Sports Participation and Performance among People with Spinal Cord Injury (published)

Oshin Amberkar, Bela Agarwal, Yuvraj Singh, Ruturaj Shete & Rajani Mullerpatan

Foot pressure analysis of sub-elite Marathon Runner

Sports participation in people with spinal cord injury leads to enhanced functional capacity, increased muscle strength, greater flexibility, and increased optimism. It is important to encourage people with spinal cord injury to participate in sports and understand facilitators of and barriers to it. Sports participation in people with physical disabilities including spinal cord injury is lower compared with people without them. Sports participation among the physically disabled in high-income countries like the United States and the Netherlands is 44% and 37%, respectively, whereas among people with spinal cord injury in Australia and Switzerland it is 44.6% and 59.8%, respectively. Limited information is available on sports participation of people with spinal cord injury in low- to middle-income countries. The present study aimed to explore sports participation among adults with spinal cord injury in Mumbai, India. Following ethical approval, 102 subjects (mean age 40.41 years; 88 males and 14 females) with spinal cord injury from four paraplegic rehabilitation center were interviewed. Sports participation was 60% in people with spinal cord injury (n = 61/102). Strong family support, financial security, and institutional support in the form of motivation and training facilities were the top facilitators. Barriers faced during participation in sports were difficulty in reaching the sports ground, lack of disabled-friendly toilets, and accommodation. Reasons for not participating in sports were lack of self-motivation, poor fitness level, and low confidence attributed to disability.

Research Thrust Area

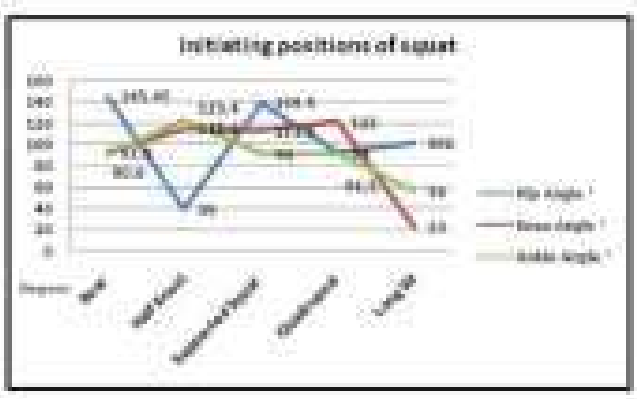
Exploration of traditional ground level activities for healthcare application

Changing lifestyle has brought about a phenomenal reduction in physical activity profiles of people, globally. Deleterious effects of sedentary lifestyle such as decrease in joint mobility, low muscle strength and loss of function, are gaining attention. The World Health Organization recommends 150 min/week of regular engagement in moderate-vigorous physical activity. Various researchers have demonstrated benefits of accumulating activity in any form to meet this net total score. Although, people now recognize the need for engaging in exercises to improve cardiorespiratory fitness, activities of daily living that contributed to non-exercise activity thermogenesis (NEAT) are becoming extinct. People have given up high flexion activities such as squatting, sitting down cross leg on the floor and kneeling. Ability to sit down on the floor and get up without support is now recognized as a prognostic marker predicting longevity. Hence, we are exploring the influence of regular engagement in ground-level activities on muscle activation, joint mobility, postural control and participation and health related quality of life among healthy people and patients with knee osteoarthritis.

❖ Development of the Deep Squat Milestone in Typically Developing Children

(*manuscript published*)

Rajani Mullerpatan, Meera Thanawala, Bela Agarwal & Sailakshmi Ganesan



Deep squat is a functional activity recruiting multiple muscle groups in a single manoeuvre with huge potential value in paediatric rehabilitation following neuro-musculoskeletal dysfunction. Current study was designed to explore development of the deep squat milestone, patterns of movement adopted for attainment, and lower-limb joint motion during deep squat in typically developing children. Following ethical approval and parental consent, data were recorded from 12 normally developing children, aged 6–13 months, using video cameras in the natural environment of each child every consecutive month. Hip, knee, and ankle joint angles were computed using Silicon Coach software. Descent of squat was attained first, followed by ascent from squat one month later. The average age at which typically developing children initiated supported/ unsupported descent to deep squat was 11 months; supported ascent from squat was initiated at 12 months. Ascent from deep squat to upright posture was broadly noted from three initiating postures: bear followed by half kneeling and then supported squat. Timing of ascent from squat was observed to be one month after reported attainment of pull-to-stand reported at 11 months.

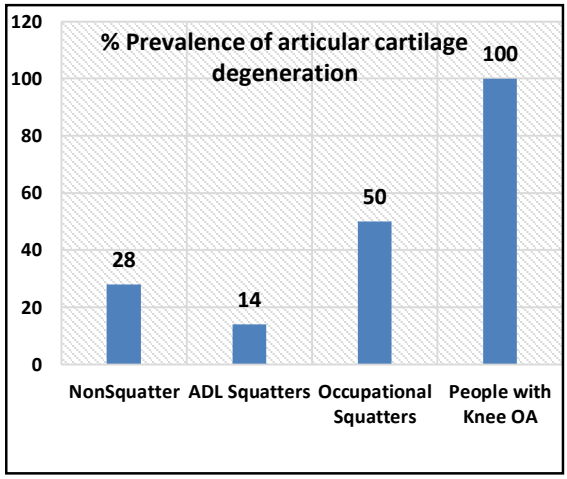
❖ Birthing experience of women who have undergone normal deliver in a selected community of India. (*manuscript published*)

Nancy Fernandes Pereira, Shobha Gaikwad, Andrea Hemmerich,
Rajani P Mullerpatan and Bela Agarwal

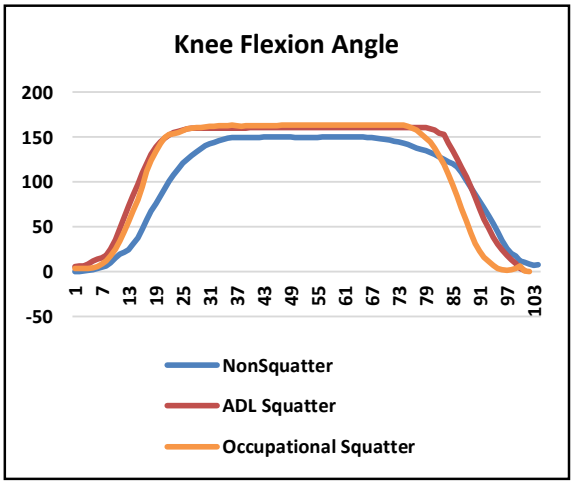
A study was conducted on "Birthing experience of women who have undergone normal deliver in a selected community of India". The purpose of the study was to provide support & comfortable position to women during birthing process. A qualitative research approach was used to analyze the interview & content analysis was done. Finding of the study revealed that work experience of ANM (Auxiliary Nurse Midwifes) & ASHA workers, was important because with increase in number of cases they felt skillful & confident. In terms of facilities for delivery it was identified that there was no special arrangement of rooms available, they had to conduct delivery single handedly, and the position for delivery commonly used was the traditional position supine position with legs flexed & drawn towards the abdomen. Findings related to the mother evolved over their experience because all the mothers wanted a pleasant experience of delivery. The study concluded that squatting position which is adopted in daily activities of life among Indians which increased the pelvic dimension is not used during child birth.

❖ Effect of squatting on knee articular cartilage in healthy adults (*manuscript in pipeline*)

Bela Agarwal, Robert van Deursen, Nikhil Bhuskute, Vishal Singh, Raman P Yadav, Rajani Mullerpatan, Preeti Kapoor, Lt. Gen. K. L. Salgotra, Rajani Mullerpatan



Partial squatting activity as an intervention has been studied in established cases of OA. Insufficient literature on biomechanical, structural and biochemical adaptations to varying magnitude of squatting exposure in asymptomatic adults makes it necessary to analyse whether this self-loading activity can be used as a predictive and rehabilitative tool for early identification and early intervention directed towards delaying articular cartilage damage. Following ethical approval 150 healthy adults (Non squatters, ADL squatters and occupational squatters) in the age group 30-45 years and 30 people with knee OA were recruited for the study. Squat exposure was quantified using a validated tool- MGM Ground Level Activity Questionnaire. Longer exposure to deep squatting activities appears to result in increased knee flexion, and ability to maintain squat with posterior pelvis tilt and spine extension. With respect to structural changes on knee MRI, prevalence of early signs of articular cartilage damage was 28% in non-squatters, 14% in ADL squatters and 50% in occupational squatters. People with knee OA who squatted habitually (30 ± 36 min) maintained greater knee ROM compared topeople with knee OA who had given up squatting . Further, a deep-squat intervention in healthy people led to increase in lower extremity muscle strength. Moderate squat exposure (up to 30 min) appears to exert a protective effect on knee articular cartilage in healthy people as indicated by the confluence between microcellular structures (knee articular cartilage MOAKS score), biomechanical indicators (Knee Adductor Moment) and biochemical indicators (uCTxII and PLA2).



❖ Comparison of knee mobility, muscle activity, balance and quality of life among non-squatters and habitual squatters with knee Osteoarthritis (*manuscript in pipeline*)

Bela Agrawal, Rajani Mullerpatan

Knee osteoarthritis is one of the leading causes of disability that leads to significant functional modifications and activity limitations. Many people perform deep squat as a component of habitual activities of daily living whereas others completely refrain from squatting. We explored knee mobility, lower extremity muscle strength, balance and quality of life among 24 habitual squatters and non-squatters with knee osteoarthritis. Habitual squatters reported a moderate squat exposure of 30-40 min/day. Active as well as passive knee flexion was significantly greater in habitual squatters (133.9^0, 143.9^0 respectively) compared to non-squatters (110.5^0, 117.5^0 respectively). Lower extremity muscle strength was greater in habitual squatters. Functional performance was similar in both groups. Our findings suggest a beneficial effect of low-moderate daily exposure to squat activities on knee mobility and muscle strength. A key observation was thatlack of squat exposure in people with knee OA resulted in reducedknee mobility and lower extremity muscle strength.

❖ Influence of squatting on back muscles, pelvic motion, and labor outcomes in pregnant women (*manuscript in pipeline*)

Rajal Savla, Sushil Kumar, Bela Agarwal, Rajani Mullerpatan

Pregnancy is a major life event in a woman's life where she undergoes enormous physical, emotional, and hormonal changes throughout 40 weeks of her gestation. Squatting is considered as one of the best birthing positions. There is paucity of literature that studies the influence of ADL (activity of daily living) squatting in pregnant women during labor. Nine ADL squatters were recruited using convenient sampling technique, and data was collected once in their second trimester (13-24 weeks) and once in third trimester (25-36 weeks). There was a significant positive correlation observed between average daily squat exposure (MGMGLAEQ) and endurance of back muscles in ADL squatters. It can be concluded that ADL squatting has a positive influence on back muscles, pelvic motion and labor outcomes when compared with non-squatters. ADL squatters had better back muscle endurance, reduced back pain, increased lumbopelvic motion, and lower limb endurance as compared to non-squatters. Also, the duration of second stage of labor and incidence of LSCS was comparatively lowerin ADL squatters.

❖ Influence of pelvic segment definition using landmarks palpated in a high flexion posture on joint angles and moments (*published*)

Andrea Hemmerich, Rajani Mullerpatan, Tara Diesbourg, Bela Agarwal, Emily Geens, Triveni Shetty, Geneviève Dumas

Several studies have demonstrated presence of motion artifact during high impact activities such as running, however the quantum of motion artefact during high flexion activities remains unquantified. We compared joint angles at the hip and lumbo-sacral joint using palpated and digitized anatomical

markers in squat posture to angles measured using routine 3D motion capture technique where markers are placed in standing posture. We observed that hip flexion angles were lower whereas lumbo-sacral angles were higher for palpated pelvis model compared to skin marker model which may be due to a caudal shift of the PSIS marker during squat. Moments were not influenced by marker models which may be due to relatively consistent position of center of mass and inertial properties of the pelvis.

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Research Thrust Area

Clinical Rehabilitation

Biomechanical exploration of impairments of children and adults with neuro-musculoskeletal conditions such as cerebral palsy, Parkinson's disease, lower extremity amputation, knee osteoarthritis, sports injuries, dance injuries, etc. has unraveled exclusive clinical features of Indian patient population at various stages of involvement and socio-cultural specific needs for clinical rehabilitation.

❖ Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment (published)

Triveni Shetty, Rajani Mullerpatan, Ashok Johari

The gait deviation index (GDI) is a comprehensive tool derived from three dimensional gait analysis providing averaged kinematic data from the pelvis, hip, knee, ankle, and foot. Lack of information on the GDI of children with severe gait impairment characterized by high crouch angle (> 20°) motivated our group to explore GDI at different levels of the gross motor function classification system (GMFCS). Forty-seven ambulatory children (5–18 years) with cerebral palsy (CP) (28 males; 19 females) with a mean crouch angle 20.15° were compared with 45 normally developing healthy children. The GDI of children with CP was 25% lower than that of age-matched healthy children and 13%–27% lower than that of children with less severe crouch angle (2.2°–18.9°) at similar functional levels reported in the literature. Significant linear decline was observed in GDI across GMFCS I (70), GMFCS II (65.42), and GMFCS III (44.6). Out of nine kinematic variables computed to calculate GDI, minimum knee flexion in stance was three times greater (6.9°) among children at GMFCS I and two times greater (16.1° and 37.39°, respectively) among children at GMFCS II and III compared with children at similar GMFCS levels reported in the literature.

❖ Lower Extremity Muscle Strength and Endurance in Ambulatory Children with Cerebral Palsy (published)

Triveni Shetty, Sailaxmi Ganesan, Rajani Mullerpatan

Muscle weakness in children with cerebral palsy (CP) results in inability to produce isolated maximum voluntary muscle contraction from individual muscles results in stereotypical movements, consequently, early fatigue during ambulation causing further deterioration in muscle endurance. Limited information on lower extremity muscle strength and muscle endurance based on functional tests drove the present study with a purpose to inform clinician variation in lower extremity muscle strength and endurance in children with CP. Thirty children with CP (15 males, 15 females, GMFCS level I–II) and 30 age-matched healthy children were evaluated for muscle strength and endurance

using functional tests such as 30-second chair stand test, step-up test, timed up and go test, timed floor to stand test, 30-meter walk test, calf-raise test, and 14 stair climb test. Performance of children with CP was 54–73% lower on all tests compared to healthy children. In conclusion, markedly lower strength and endurance of all major lower extremity muscle groups, namely, hip flexors, hip extensors, hip abductors, knee extensors, and ankle plantar flexors, reiterates a strong need for objective functional evaluation and targeted training to improve ambulatory performance in children with CP. Gender and GMFCS level did not influence strength-endurance evaluation.

❖ Gross motor function profile of children with cerebral palsy from low resource setting (manuscript in pipeline)

The gross motor outcome of children with cerebral palsy in low resource settings with fewer resources to support their child's development, cultural differences in parental interaction style, and lower/ delayed access to health services remains unclear. Thus, the current study aimed to explore the gross motor outcome based on GMFM score among children and adolescent with cerebral palsy at various GMFCS level in a low resource setting in India to plan comprehensive and optimal rehabilitation goals. Seventy-one ambulatory children (5-18yr) with spastic cerebral palsy (61%males) with mean crouch angle 22.2^0 physically and cognitively able to complete a three-dimensional gait analysis (3DGA) were included after obtaining signed informed consent from parents and assent from children above 12 years. The total GMFM score in GMFCS I was 91.26 %, in GMFCS II was 75.42 %, in GMFCS III was 53.58% and in GMFCS IV was 45.92%. Significant linear decline was noted in mean GMFM score from GMFCS I to GMFCS IV (p=0.00). The children from low resource settings were more affected than children from high resource setting (from literature) at similar GMFCS level.

❖ Evaluation of Daily Walking Activity in Patients with Parkinson Disease (published)

Akanksha Pisal, Bela Agarwal, Rajani Mullerpatan

Parkinson disease limits walking, and little is known about the performance of walking and factors that influence the quantum of walking in active, city-dwelling patients with mild to moderate Parkinson disease in an environment characterized by extended family support but limited access to public spaces. An exploratory study was performed to evaluate daily walking performance and the influence of an intrinsic factor—namely, balance during standing—and the extrinsic factors habitual physical activity and health-related quality of life in people with Parkinson disease. Daily walking activity was recorded with a step activity monitor for 8 consecutive days in 15 patients with Parkinson disease (Hoehn and Yahr scale score, 1–3). Patients with Parkinson disease demonstrated 17% lower engagement in long-duration activity and a 47% lower score on the physical activity domain of the World Health Organization Quality of Life BREF instrument. A moderate positive correlation was observed between balance during tandem stance and mean number of daily steps.

- **A Study of Fine and Manual Hand Dexterity among People with Parkinson's Disease** (published)

  Tosha Shah, Mamta Shetty, Meruna Bose, Rajani Mullerpatan

  Dexterity evaluation is pivotal in assessment of hand function during rehabilitation of people with Parkinson's disease. Scarce information on hand dexterity in Parkinson's disease (PD) using standard tools, prompted present study, aimed to evaluate fine and manual hand dexterity using Minnesota Manual Dexterity Test (MMDT) and Nine Hole Peg Test(NHPT). A purposive sample of 54 people with PD and convenient sample of 54 healthy age and gender matched adults were studied using standard protocol. Average value of manual dexterity in people with PD was116.8sec and of fine dexterity was 39.5sec (left hand) and 36sec (right hand). No significant difference was noted in fine dexterity between right and left hand. The study revealed moderate positive correlation($r=0.63;p=0.00$) between manual dexterity and motor function on MDSUPDRS. Low positive correlation ($r=0.44$; $p=0.001$) was found between fine dexterity and motor function on MDSUPDRS.

- **Exploration of upper extremity functions among people with shoulder dysfunction with and without Diabetes mellitus and the effect of Gomukhasana on shoulder functions** (manuscript in pipeline)

  Hiloni Badani, Rajani Mullerpatan, Surendra Wani

  Shoulder dysfunction is most common in upper limb with a prevalence of 29.61% in patients with diabetes. Poor compliance to routine to exercises due to time constraints is a major challenge. Thus, it is deemed essential to explore one comprehensive asana-Gomukhasana and its effect on muscle activity, joint mobility and regulation of diabetes for management and prevention of shoulder complication in Diabetes. Twenty individuals with shoulder dysfunction (10 with and 10 without diabetes) in the age group of 45-65 years were included in this study. Patients who received Gomukhasana intervention demonstrated a significant increase in flexion, extension, internal rotation and external rotation range of motion and 30% increased shoulder abductor muscle strength among people with diabetes mellitus.

- **Comparison of effects of Yoga intervention and balance exercises on standing balance in people with diabetic peripheral neuropathy** (manuscript submitted)

  Jinny Kanjirathingal, Rajani Mullerpatan, Girish Nehete, Nagaratna Rao

  Diabetic peripheral neuropathy (DPN)is known to cause impaired balance and eventually increase risk of fall. Yogasanas, hold potential for training balance control. Therefore, the current study aimed to evaluate the effect of structured Yogasana intervention on static and dynamic balance performance among people with diabetic neuropathy. Thirty- five people with diabetic peripheral neuropathy aged 42-70 years were recruited, to Yogasana intervention group following ethical approval. Balance performance and lower extremity strength demonstrated improvement among Yogasana intervention group ($p\leq0.05$) post 12-week intervention. Post hoc comparison revealed that Yogasana intervention was marginally more effective to improve static and dynamic balance performance compared to conventional balance exercises in all variables of standing balance performance($p\leq0.025$).

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Research Publications

Sr. No	Title	Authors	Journal	Year	Database Indexing
	Exploration of Yoga				
1.	Exploration of muscle activity using surface electromyography while performing Suryanamaskar	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty	International Journal of Yoga	2020	PubMed
2.	Kinematics of Suryanamaskar using three-dimensional motion capture	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Girish Nehete, S.N. Omkar	International Journal of Yoga	2019	PubMed
	Dance Biomechanics				
3.	Evaluation of Standing Balance Performance in Indian Classical Dancers	Juhi Bharnuke, Rajani Mullerpatan	Journal of Dance, Medicine and Science	2020	PubMed
4.	Gait Kinematics in Bharatanatyam dancers with and without low back pain	Rajani Mullerpatan, Juhi Bharnuke, Claire Hiller	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
5.	Survey of Musculoskeletal Disorders among Indian dancers in Mumbai and Mangalore	Shruti Nair, Shruti Kotian, Rajani Mullerpatan	Journal of Dance, Medicine and Science	2018	PubMed
	Clinical Rehabilitation Cerebral Palsy				
6.	Review of lower extremity function following SEMLS in children with cerebral palsy	Rajani Mullerpatan, Triveni Shetty, Sailakshmi Ganesan, Ashok Johari	Critical Reviews™ in Physical and Rehabilitation Medicine	2019	Scopus
7.	Exploration of Gait Deviation Index in children with cerebral palsy with severe gait impairment	Triveni Shetty, Ashok Johari, Sailakshmi Ganesan, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
8.	Exploration of sports participation in children with mild intellectual disability	Priyanka Iyer, Triveni Shetty, Sailakshmi Ganesan, Shruti Nair, Nagmani Rao, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus

Research Publications

Sr. No	Title	Authors	Journal	Year	Database Indexing
		Amputation/Disability			
9.	Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries	Rajani Mullerpatan, Megha Sonkhia, Blessy Thomas, Swagatika Mishra, Abhishek Gupta, Bela Agarwal	Critical Reviews™ in Physical and Rehabilitation Medicine	2019	Scopus
		Women's Health			
10.	Birthing experience of women who have undergone normal delivery in selected community of India	Nancy Fernandes, Shobha Gaikwad, Andrea Hemmerich, Rajani Mullerpatan, Bela Agarwal	International Journal of Innovative, Knowledge Concepts	2018	EBSCO, Index Copernicus
		Parkinson Disease			
11.	Evaluation of Daily Walking Activity in Patients with Parkinson Disease	Akanksha Pisal, Bela Agarwal, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
12.	A Study of Fine and Manual Hand Dexterity among People with Parkinson's Disease	Tosha Shah, Mamta Shetty, Meruna Bose, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
		Sports			
13.	Level of Sports Participation and Performance among People with Spinal Cord Injury	Oshin Amberkar, Bela Agarwal, Ruturaj Shete, Yuvraj Singh, Rajanu Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
		Ground level Activity: Squat			
14.	Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis	Bela Agarwal, Manisha Advani, Robert Van Deursen, Rajani Mullerpatan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus
15.	Influence of habitual deep squatting on kinematics of lower extremity, pelvis and trunk	Bela Agarwal, Robert Van Deursen, Rajani Mullerpatan	International Journal of Health and Rehabilitation Science	2018	Index Copernicus
16.	Comparison of Muscle Activity and Energy Cost between Various Bodyweight Squat Positions	Shreya S. Sahasrabudhe, MPT, Bela M. Agarwal, Rajani P. Mullerpatan,	Clinical Kinesiology	2017	Scopus
17.	Development of the Deep Squat Milestone in Typically Developing Children	Rajani Mullerpatan, Meera Thanawala, Bela Agarwal, Sailakshmi Ganesan	Critical Reviews™ in Physical and Rehabilitation, Medicine	2019	Scopus

Technology Validation

MGM Centre of Human Movement Science is equipped with robust gold-standard technology and expertise necessary to validate technology designed for health promotion and rehabilitation of people with movement disorders. The Centre has successfully validated 8 indigenous devices designed by innovators from School (Ambani School, Mumbai), academic and research institutes of technology (IITB, IITM), Technology incubation Centre's (BETiC) and Industry (Actofit, Navi Mumbai). Successful illustration of technology validation in past 5 years is attracting major industry innovators for this purpose.

Validation of Devices

❖ Testing of Wearable Motion Sensing Device (Actofit)

Actofit band is fitness tracker that automates comprehensive workout tracking & provides actionable insight. Using machine learning algorithms Actofit team approached MGM CHMS to test their device against Vicon Motion Analysis system. Six routinely performed gym exercises were analyzed for number of repetitions, peak velocity and peak force. Raw data acquired from gyroscope sensor was denoised using discrete wavelet transform to accurately identify start and end point of each exercise repetition. Linear velocity in m/s was calculated from angular velocity in degree/sec. Velocity calculated from wrist worn device comprising IMU sensor was further compared with Motion data captured from VICON for validation purpose. Results showed a high correlation between the Vicon and wearable device mean and peak values. It was observed that velocity calculated from IMU sensor on the wearable device matched with one calculated from VICON setup.

❖ Testing of device to detect posture in cyclists (Cyclos)

The device was developed by Mast. Kunj Dedhia, a X standard student from Dhirubhai Ambani International School, Mumbai. This innovation has won the Grand Prize at the Initiative for Research and Innovation in *Science (IRIS) National Fair 2016 and has qualified to represent India at the Intel International Science and Engineering Fair 2017 to be held in Los Angeles, USA.*

❖ Testing of Mechanical Actuated Stance Control Knee Ankle Foot Orthosis for Polio patients

Conventional KAFOs provide stability by locking the knee joint in a fully extended position during both stance and swing phases. This results in excessive energy consumption and induces abnormal gait events such as circumduction, hip hiking, and vaulting during gait. Walking with conventional KAFOs can also lead to premature exhaustion during ambulation, as well as limited mobility, pain, and a decreased range of motion (ROM) in lower limb joints. An indigenous Mechanical Actuated Stance Control Knee Ankle Foot Orthosis was developed by Aumeesh Tech Pvt. Ltd(Society of Innovation and Entrepreneurship) an SINE -IITB and BETiC incubated healthcare startup in the field of assistive devices and rehabilitation healthcare. The design was validated on 3D motion analysis system and the results were presented for a BiRAC, DST, Govt of India grant. Results revealed that the new design provided 135^0 of flexion and reduced the energy expenditure of gait. The design was awarded the BiRAC grant of 10,00,000 lacs. The new Mechanical Actuated Stance Control Knee Ankle Foot Orthosis was better alternative to the existing orthotic callipers by automatic locking and unlocking of the knee joint according to the stance and swing phase of the user to provide lower limb stability, mechanical stability, light weight, less force use, footwear compatibility

❖ Validation of wearable inertial sensors based gait analysis system for estimation of spatiotemporal parameters and joint kinematics in the sagittal plane

Gunjan Patel, Rajani Mullerpatan, Sujatha Srinivasan

Wearable inertial sensor-based (i-Sens) systems can be considered an alternative to standard camera-based motion capture system for estimation of joint angle and gait parameters. Owing to its miniaturized size and wireless data transmission the setup finds its usefulness in indoor and outdoor environments.

Gait Analysis at self-selected speed was performed on healthy adults in in-door(n=15) and outdoor(n=8) environments. Two i-Sens units (for indoor and outdoor study) were placed at level of knee and hip respectively along with passive markers (for indoor study only) of Vicon system for simultaneous data recording. Low RMSE and strong positive correlation was observed between the two systems in terms of hip and knee joint angles (Indoor: hip 3.98 ± 1.03°, knee 6.48 ±1.91°, Outdoor: hip 3.94 ± 0.78°, knee 5.52 ± 0.99°) respectively. The MAPE (E%) in both environments was good and excellent for stride length, sufficient and good for stride time, cadence, walking speed. Results demonstrated that i-Sens system had potential to become an alternative modality for gait analysis. Further clinical trials using i-Sens system are warranted on normal as well as pathological conditions.

Design and Validation of Devices

❖ Comparison of erector spinae muscle activity in healthy adults and Mathadi workers with mechanical low back pain with and without spring loaded passive exoskeleton.

Sneha Kirve, Rajani Mullerpatan

High risk and prevalence of occupational low back pain due to manual material handling like dynamic lifting and prolonged stooped postures and associated injuries has raised research interest in novel orthotic solutions over past two decades. Wearable back support exoskeleton promises to support and improve the ergonomics by reducing the trunk muscle activity and thereby muscle fatigue. The urging financial need of Mathadi workers to continue daily manual labor work without receiving paid time off-work, motivated development of a novel spring loaded passive exoskeleton to reduce trunk muscle activity and prolong muscle fatigability. Twenty Mathadi workers participated after signed informed consent. Low back muscle surface electromyography (SEMG) of the left and right lumbar erector spinae (LES), left and right thoracic erector spinae (TES) were compared in Sorensen's trunk holding test for one minute under two conditions: with and without exoskeleton. The exoskeleton significantly reduced the median frequency by 49% and 33%, for left and right LES respectively. This result indicates reduced muscle fatigue caused by biomechanical alteration. The spring loaded passive exoskeleton help to reduce the burden of excessive muscle activity and thereby reduce muscle fatigue during the dynamic

Sorensen's test with spring exoskeleton

❖ Development of a Powered Transtibial Prosthesis

Abhishek Gupta, Rajani Mullerpatan, Deepshika Raut

A collaborative project between IIT Bombay and MGM Institute of Health Sciences, Navi Mumbai aimed towards developing a powered trans-tibial prosthesis for people with below knee amputation; funded by Department of Biotechnology, Government of India. Dr. Abhishek Gupta, Department of Mechanical Engineering, IITB and Dr Rajani Mullerpatan, MGM School of Physiotherapy, MGMIHS are the principal investigators working on the project and Dr. Swagatika Mishra, Department of Orthotics & Prosthetics, MGMIHS as a co-investigator.

The proposed study incorporated a bi-articular actuator, in addition to one that is conventionally used in powered trans-tibial prosthesis, to apply torque to knee joint. This actuator mimicked behavior of gastrocnemius and soleus muscles in an intact leg and is expected to improve synergy between the patient's joints & prosthesis. It is expected to lead to a more symmetric and closer to natural gait thus reducing excessive joint forces experienced by trans-tibial amputees and effectively reduce energy cost of walking with artificial limb.

The preliminary objective of designing a bi-articular actuation mechanism has been completed. The concept of this actuator finds reference to the unpowered ankle exoskeleton which was developed to reduce metabolic cost of walking by Collins S.H. et published in Nature, 2015 (doi:10.1038/nature14288). In comparison to a uni-articular unpowered device, our proposed

actuator is bi-articular. The bi-articular actuation mechanism forms the core component of the proposed designed. Design included selection of actuators and sensors, placement of actuators, and design of mechanical linkages to transfer power to the ankle. One of the actuators was mounted on the shank of the prosthesis, whereas the other attached to a knee brace worn by the user. Position sensors used to measure the angular position of the ankle during walking.
The second objective of designing an energy storage and return foot has been completed as the readymade foot will be used. Design of the knee brace has been completed and some modifications in designing are near completion.

❖ Validation of an indigenously developed device for measuring stiffness of plantar tissue in people with Type II diabetes

Prof. Ravi B, Rajani Mullerpatan, Dr Paritosh Baghel

India faces a gigantic challenge of diabetes which is growing rapidly over the last few years. Changing lifestyle and improved capacity for detection can explain this rampant growth. Out of these 29.6 % to 60 % present with diabetic neuropathy. In the last two-three decades, rise in diabetic foot complications has led to increase in search for valid, sensitive and reliable tools for early identification of diabetic neuropathy. Diabetic neuropathy leads to hardening of the plantar surface which can lead to changes in plantar cutaneous sensory thresholds and tissue stiffness. Currently there is no tool to measure plantar tissue stiffness as an indicator of tissue breakdown. Hence a tissue stiffness measurement device was developed and is in the process of being patented. Validity the device needs to be determined prior to wide scale application for identification of diabetic foot complications. Output from the study will generate a reference data base from healthy non-diabetic adults for plantar tissue stiffness, sensory, vibration threshold, temperature and plantar pressure.

Long term Impact:

- Build awareness and education of diabetic foot complications
- Early detection of foot deformities and risk of plantar ulceration in the survey population
- Save an estimated 15 % of diabetic population that develop diabetic foot ulcer atleast once in lifetime.
- Develop a sustainable model for early detection of diabetic neuropathy and prevention of foot complications.

Platform for engaging engineers

MGM Centre of Human Movement Science was conceived with an intention of engaging engineers and clinicians together for development of meaningful applications in clinical biomechanics for Indian healthcare needs. Exemplary model of inter-disciplinary collaborative research projects engaging healthcare and engineering research scholars is evident from the following projects conducted at MGMCHMS.

Effect of squatting on knee articular cartilage in healthy adults

Kinematics and kinetics of lower limb have been studied extensively for activities such as level walking. However, lacuna in biomechanical exploration of high flexion postures like deep squat which are integral to activities of daily living in many eastern and Asian cultures is deemed necessary in order to prescribe this activity which is proved to be beneficial for maintaining mobility. Thus the aim was to develop a marker model for study of kinetics and kinematics of deep squat and compute muscle forces developed during squat activity

PhD Researcher Scholar: Dr. Bela MGM School of Physiotherapy, MGM Centre of Human Movement Sciences, MGM Institute of Health Sciences

Mechanical Engineer Researcher Scholar: Mechanical Engineer Researcher Scholar Mr. Ajinkya Patil, Department of Mechanical Engineering VJTI Bombay

Role of Physiotherapist

- Capture and process kinetics and kinematics of deep squat activity using 12 camera Vicon system and 2 AMTI force plates to inform marker trajectories, velocity, acceleration, joint angles, force and moment.
- Capture and process muscle activity data via surface EMG using 6 channel Bioinfinity from bilateral rectus femoris, gluteus maximus and gastrocnemius muscles.
- Comparison of net joint moments in people with varying squat exposure and BMI

Role of Mechanical Engineer

- Converting c3d files generated in Vicon Nexus to .trc and .mot files with the help of Matlab script 'c3d2opensim'.Scalling of model and importing dynamic squat trial data to Opensim 3.3to obtain joint angles and moments using Inverse Kinematics and Inverse dynamics tool.
- Validating marker model developed for Opensim to analyze squat.
- Determined muscle forces for squatting activity in Opensim software with the help of computed muscle control (CMC) tool for comparison with actual muscle forces obtained from EMG system

Need: Bone on bone forces for squatting have been estimated previously however thigh-calf contact force occurring during deep squat are known to alter the net joint moments acting on the knee articular cartilage. Effect of thigh-calf contact force on muscle force and bone on bone force needs to be estimated to compute net joint moment which can be incorporated separately in the finite element model to accurately determine the stresses and strains developed during squatting thus enabling evidence based prescription of squat activity.

Role of Mechanical Engineer

- To develop a computational model for estimating net joint moments during deep squat activity.
- Validating marker model developed for Opensim to analyze deep squat with incorporation of thigh calf contact force.
- Determined net joint moments for squatting activity in Opensim software with the help of computed muscle control (CMC) tool.

Comparison of erector spinae muscle activity in healthy adults and Mathadi workers with mechanical low back pain with and without spring loaded passive exoskeleton

Need: As the low back pain is the leading cause of activity limitation and work absence throughout the world, due to increased fatigability and decrease function of the muscle. Thereby some external force is required to enhance the muscle capability and increased performance which will be done by Spring loaded passive exoskeleton

MPT Researcher Scholar, Master of Physiotherapy, MGM School of Physiotherapy

MGM Centre of Human Movement Sciences, MGM Institute of Health Sciences

Mechanical Engineer Researcher Scholar, Senior Project Technical Assistant, Department of Mechanical Engineering, IIT Bombay, Powai

Role of Physiotherapists

- The main aim was to reduce the erector spinae muscle fatigue using a loaded spring
- To mimic mechanical properties of as the muscle.
- 3D motion capture and superficial electromyography of spinal muscles was captured in 2 conditions - in healthy adults and Mathadi workers, with and without spring loaded passive exoskeleton.

- Significant alteration in erector spinae activity was observed in spring loaded condition.

Role of Mechanical Engineer

- Design/selection of brace for spring attachment so as to minimize the relative motion between the body and spring attachment points
- Study of the prior art related to the subject to set clear approach and implementation
- Determination of optimum value of spring constant by the approach set forth
- Construction of setup and ensuring desired force transfer on muscle

Comparison of plantar cutaneous sensory thresholds in bare foot and shod adults

Need: It is important to understand changes as there are implications related to safe guarding foot health of numerous urban and tribal Indians who still walk predominantly bare foot. To study seasonal changes in plantar cutaneous sensory thresholds in bare foot walkers.

MPT Researcher Scholar, Master of Physiotherapy, MGM School of Physiotherapy

MGM Centre of Human Movement Sciences, MGM Institute of Health Sciences

Mechanical Engineer Researcher Scholar, Senior Project Research Assistant BETIC Lab

Department of Mechanical Engineering, IIT Bombay, Powai

Role of Physiotherapist

- The main aim was to evaluate plantar cutaneous sensory threshold in bare foot and shod adults and to identify changes in foot structure and muscle strength that could influence vibration thresholds.
- Plantar tissue stiffness, sensations and pressure distribution on foot was evaluated in adults in shod and barefoot conditions. People with diabetes and non-diabetic participants from rural and urban areas were evaluated.
-

Role of Mechanical Engineer

- Design and development of one of a kind plantar tissue stiffness measurement device.
- Selection of components like actuator and force sensor, with proper indentation rate and force sensitivity

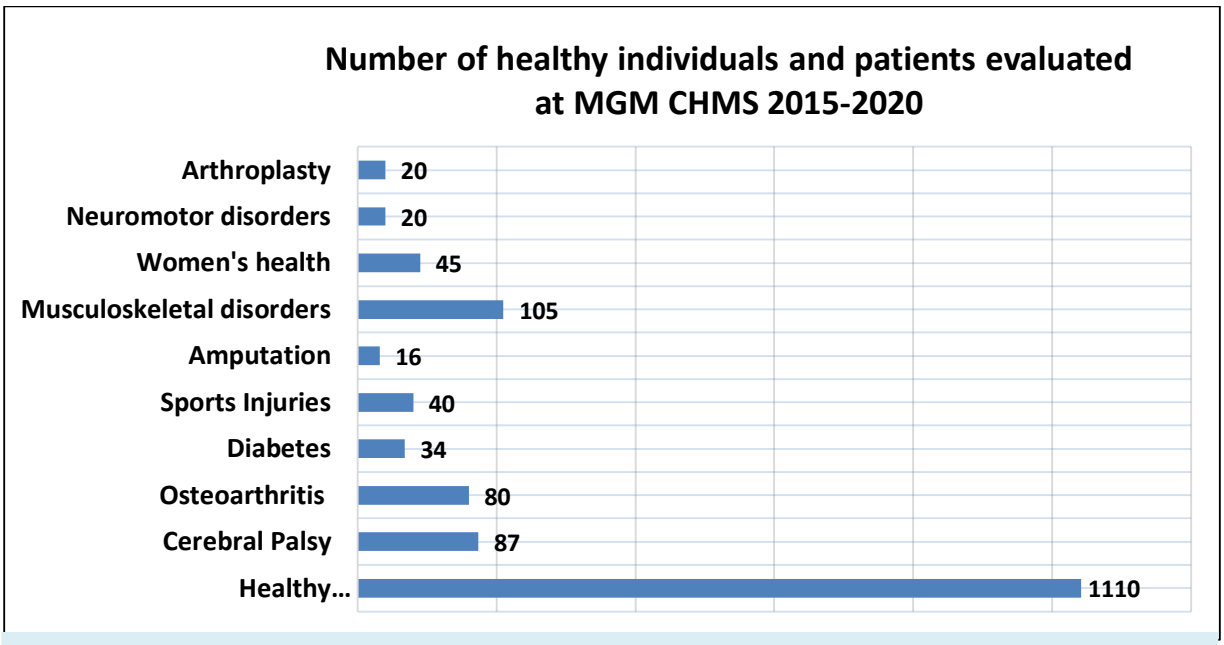
- Testing of prototypes with volunteer an taking feedback from volunteers and doctors for improvements
- Troubleshooting and conducting trails with doctors and data collection.

Patient care

MGM Centre of Human Movement Science is committed to develop Biomechanics in India in all 3 domains i.e. academic, research and clinical. MGM Centre of Human Movement Science teams did the tremendous work in all three domains. 1110 consented healthy participants (aged between 5-75 yr) were analyzed to generate normative reference data for Indian population and this is still ongoing. Total 447 patients have been tested for gait evaluation, balance testing and foot pressure analysis.

Our efforts continue to explore-i) the value of squat, a traditionally practiced Indian movement for maintenance of lower extremity muscle strength, joint motion, mobility and walking capacity among people with knee osteoarthritis; ii) in order to help children with cerebral palsy undergoing single event multiple level surgery, a tool is being developed for home based monitoring of function; iii) biomechanics and energy cost of two modifications of traditional Suryanamaskar for application in elderly people (a collaborative project with Sancheti College of Physiotherapy, Pune).

Nearly 500 patients (traumatic sports/dance or mechanical injury or disorders such as cerebral palsy, stroke, Parkinson ’s disease, amputations, diabetic foot complications, osteoarthritis, joint replacement) have benefitted from robust evaluation for gait analysis (at one-third of prevailing cost), balance assessment and foot geometry and pressure at markedly subsidized cost. Quantified objective reports helped surgeons, physiotherapists and prostheticians and orthoticians to plan targeted surgical interventions and therapy to optimize function after trauma/disorder.



Graphs presents number of patients and healthy participants evaluated at MGM CHMS 2015-2020

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Review and Summary

Past, present and future activities of MGM Centre of Human Movement Science in four domains namely- training, research, patient care and technology design and validation were reviewed in a meeting on 5th Oct 2020, which was witnessed by collaborators from pertinent disciplines of health and engineering from across various states of India. Keen and active participation of researchers, academicians and clinicians from government and self-funded higher academic health and engineering institutes generated constructive feedback to plan a roadmap for future initiatives synched with national health priorities and global healthcare needs.

All collaborators from health and engineering institutes and invitees from state and central government funding agencies unanimously applauded the progress of MGM Centre of Human Movement Science in all four domains of training, research, patient care and technology design and validation in last 5 years. The interdisciplinary ecosystem created at MGMCHMS from collaborations between government and self-funded higher academic health and engineering institutes at national and international level emerged as an exclusive hallmark feature of the Centre.

Maximal utilization of facilities at the Centre to offer training in human movement science to students and research scholars of Masters and PhD programs in health and engineering disciplines across the country was appreciated. Original scientific contribution made by the Centre to build knowledge base in form of a Chapter on biomechanics of indigenous movements to a fundamental Textbook of Basic Biomechanics was highly commended. Opportunities were identified to introduce these credit based training modules to students from various health and engineering institutes who will benefit from the new Education Policy 2020.

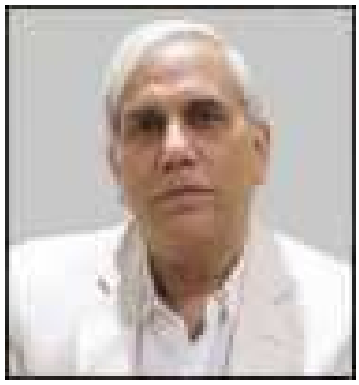
Participants also praised attempts of the Centre to provide high- end investigation technology at most subsidized rates to patients with movement disorders to assist clinicians to plan targeted interventions for effective treatment.

Scientific exploration of Indian traditional movements adopted in daily life, Yoga, sports and classical dance forms to promote human movement as a therapeutic device; received special attention because it also serves as a conduit for restoration of heritage. Robust biomechanical exploration of Yoga in the land of origin of Yoga was commended.

Researchers acknowledged access to the state of art gold standard technology facilities available at MGMCHMS necessary for design and validation of innovative devices in the field of rehabilitation; because robust validation added value to the devices which were awarded by BIRAC, (Department of Science and Technology).

The immense value of contribution of work conducted at MGMCHMS to the wider perspective of health promotion and technology design and validation was echoed. Based on valuable, critical suggestions offered by visionaries in health and engineering, the Centre has planned future initiatives.

Dr. M. C. Mishra
Former Director-All India Institute of Medical Sciences



"At the very first outset, I would like to congratulate Dr. Rajani Mullerpatan on 5 years completion of MGM Centre of Human Movement Sciences. I visited the Centre 3 years ago, progress there on has been immense, very significant and very encouraging for me. It definitely depicts and conveys your passion towards this specialty and what relief it can bring to the users after your interventions. You are saying that with your interventions Knee Replacement can be delayed by 10 years, I would rather say in some of them Knee Replacement may not be even needed after your intervention which should be our exact goal when we are dealing with such mechanisms and non-operative interventions by investigating motion science in these patients.

So, I have no doubt that you are doing excellent and outstanding work in India which is unparallel work, I haven't seen it anywhere with this passion. I am now in Sharada University in Greater Noida; I am going to ask people who are working in this area to get in touch with you and get some inspiration from you to establish something similar here. Keep going with this passion and keep raising your bar. Soon there will be no boundaries to it.

What I would look forward in future would be modern prosthesis for upper limbs and lower limbs (as we seen in developed countries) at an affordable cost because India is still limited in fine, light and affordable prosthesis needed for amputees. It is a huge area which still needs to be worked upon. There are few charitable Institutes working on it such as one in Rajasthan named Mahavir Sansthan. They are doing a wonderful job by providing this prosthesis, similarly there is an Artificial Limb Centre in Pune for armed forces. Particularly for individuals who cannot afford expensive prosthesis, it serves as a limiting factor for them. If you can depute someone with interest in this area that would be remarkable and is much needed in our country. Low-income groups suffer the most. I discussed with you when I visited the Centre that disability adjusted life year lose due to injuries exceeds more than Heart Diseases and Cancer according to WHO data. Injury may keep occurring in the future. There is a drop noticed in the accident rate in this pandemic but after the lockdown it has come back to original numbers.

Thank you for inviting me. I could know what you have accomplished so beautifully and effectively. My request to you is to continue with this passion and raise your bars. Develop certain groups amongst your team and choose those who can take up the different areas in this field. What you are doing is a humongous work. I hope to get more insights of your work in future. Thank you to MGMIHS for exposing me to this field at your Centre. I look forward for more information from you in this area. I request you to share the link of this meeting with me so that I can forward it to the Dean of Paramedical Sciences here and ask him to get in touch with you. Thank You

MGM Centre of Human Movement Science,
Annual Meeting: Monday, 5th October 2020
Past, Present and Future

Time: 9.00 a.m. – 1.30 p.m. **Mode:** Online Zoom platform **Attendees: 35**

Host: Dr. Rajani Mullerpatan, MGM Centre of Human Movement Science, MGM Institute of Health Sciences Navi Mumbai

- **Graced the occasion**

Chairman

1. Dr. Anil Kakodkar, Chairman, Rajiv Gandhi Science and Technology Commission, Mumbai

Dignitaries

2. Shri. Kamalkishore Kadam, Chancellor, MGM Institute of Health Sciences, Navi Mumbai
3. Prof. Shashank Dalvi, Vice Chancellor, MGM Institute of Health Sciences, Navi Mumbai
4. Dr. Nitin Kadam, Pro Vice Chancellor, MGM Institute of Health Sciences, Navi Mumbai
5. Dr. Sabita Ram, Research Director, MGM Institute of Health Sciences, Navi Mumbai
6. Dr. Chander Puri, Former ProVC Research, MGM Institute of Health Sciences, Navi Mumbai
7. Dr. Raman Yadav, Director, MGM Innovation Cell, MGM IHS, Navi Mumbai
8. Dr. Sanjay Mishra, Department of Science and Technology(DST), Government of India
9. Dr. Sai Baba M, National Institute of Advanced Studies (NIAS), Bangalore
10. Dr. Mahesh Mishra, Former Director, All India Institute of Medical Sciences, New Delhi
11. Dr. Rita Khadkikar, Internal Quality Assurance Cell head, MGM Institute of Health Sciences
12. Dr. Arun Sapre, Rajiv Gandhi Science and Technology Commission
13. Dr. Raju Parasher, President, Society of Indian Physiotherapists (SIP)
14. Dr. T.M Srinivasan, Swami Vivekananda Yoga Anusandhana Samsthana, Banglore
15. Dr. Geeta Lathkar, Director, MGM College of Engineering, Nanded
16. Dr. Prashant Mullerpatan, S L Raheja Hospital and Research Centre, Mumbai
17. Dr. Sona S, Sancheti College of Physiotherapy, Pune
18. Dr. Rinki Gupta, AMITY University, Noida

Collaborators

19. Prof. Ravi Bhallamudi, PI/Founder, BETiC, IIT-Bombay
20. Dr. Subodh Tiwari, Director, Kaivalyadhama Yoga Institute, Lonavala
21. Dr. Ashok Johari, World President, International Society of Orthoepdics and Traumatology
22. Dr. Ramesh Lekurwale, K J Somaiya College of Engineering, Mumbai
23. Mr. Girish Nehete, Yoga Practitioner
24. Shastri Indo-Canadian Institute, New Delhi
25. Dr. S.N. Omkar, IISc Banglore,
26. Dr. Kanagaraj, IIT-Guwahati, Assam
27. Dr. Sujatha Srinivasan, IIT-Madras
28. Dr. Rohan, IIT-Guwahati, Assam

Faculty & Students

29. Dr. Vanitha Shenoy, Dean, MGM Dental College, Navi Mumbai
30. Dr. Srivalli Shrikanth, MGM Dental College, Navi Mumbai
31. Dr. Vrushali Panhale, Principal, MGM College of Physiotherapy
32. Dr. Mansee Thakur, Director, MGM School of Biomedical Sciences, Navi Mumbai
33. Dr. Triveni Shetty (PT), Core Team, MGM Centre of Human Movement Science
34. Dr. Juhi Bharnuke (PT), Core Team, MGM Centre of Human Movement Science
35. Dr. Poonam Desai (PT), PhD Scholar, MGM CHMS, MGM School of Physiotherapy, Navi Mumbai.

Future Initiatives

MGM Centre of Human Movement Science has planned future initiatives in training, research, patient care and technology design and validation based on its experience in last 5 years.

Training: In an attempt to bridge the gap in integrated biomechanics knowledge of health and engineering graduates, the Centre plans to scale its existing efforts nationwide; to offer a credit choice based module on Clinical Biomechanics to graduates and research scholars in a blended mode environment, which is in tune with the objectives of new Education Policy 2020. The Team at MGMCHMS is compiling a Textbook of Biomechanics of Indigenous Movements; which will serve as a resource material to inform this science to students, researchers, clinicians and engineers working in provision of healthcare and design of pertinent technology. A Yogasana evidence based brochure is in the making for easy reference of clinicians, Yoga practitioners and grass root level healthcare workers to execute evidence based Yoga practice.

Research: Covid 19 pandemic has awakened us to notice our negligible investment in public health. In order to strengthen our efforts to adopt movement as a therapeutic device for health promotion and reduction of burden of non-communicable diseases and delay disability caused by movement disorders, we have planned to scale the collaborative interdisciplinary research model. Successful outcome of interdisciplinary research model engaging health and engineering research scholars of Masters and PhD programs has motivated us to plan larger number of interdisciplinary research projects to achieve the goal of applied translational research to enhance function of people with movement disorders and reduce disability.

Patient-care: Lack of e-evaluation tools for early detection, measurement, function monitoring and rehabilitation based on appropriate clinical algorithms prompted the Team at MGMCHMS to develop mobile-based technology to promote movement as a therapeutic device for people with musculo-skeletal, neurological & cardio-respiratory disorders, amputation, etc.

Technology design and validation: e-Hackathons in rehabilitation technology are in the planning for designing innovative technology for enhancement of movement performance and reduction of disability caused by movement disorders. The Centre has planned to reach out to various Innovation Centres across India to inform them of availability of robust, gold-standard technology available for validation of technology pertinent to rehabilitation.

Enthused response from dynamic researchers in the field of human movement science has initiated the activity of forming a vibrant National Society of Biomechanics/Human Movement Science for development of this science in India and represent internationally as an affiliate Society of International Society of Biomechanics.

Team, MGM Centre of Human Movement Science

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How to reach us:

Address: MGM Centre of Human Movement Science, 1 st floor, MGM Super specialty Hospital, Sector 30A, Plot 46, Opposite Sanpada Railway Station, Navi Mumbai, Maharashtra 400705
Website: https://www.mgmsopnm.edu.in/humanMovementSciences.html

e-mail ID: chmsmgm@gmail.com OR mgmchms@mgmsopnm.edu.in
Contact Number: 022 2743-7866

MGM

MGMSOP NM <[illegible]@mgmsopm.edu.in>

Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)

1 message

Rajani Kanade <[illegible]@gmail.com>
To: MGMSOP NM <[illegible]@mgmsopm.edu.in> — Wed, Mar 31, 2021 at [illegible]

PLEASE PRINT EMAIL AND ATTACHMENTS

---------- Forwarded message ---------
From: **Rajani Kanade** <[illegible]@gmail.com>
Date: Wed, 31 Mar 2021 at 11:19
Subject: Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)
To: CHMS MGM <[illegible]@gmail.com>

PLEASE PRINT
---------- Forwarded message ---------
From: **Poonam Desai** <[illegible]@gmail.com>
Date: Wed, 31 Mar 2021 at 11:16
Subject: Fwd: Approval Letter-(DST/WOS-B/HN-37/2021)
To: Dr. Rajani Mullerpatan <[illegible]@gmail.com>

---------- Forwarded message ---------
From: **Pawan Kumar** <[illegible]>
Date: Wed, Mar 31, 2021, 10:51
Subject: Approval Letter-(DST/WOS-B/HN-37/2021)
To: <[illegible]@gmail.com>

Dear Ms. Poonam,

This with reference to your presentation made in the Subject Expert Committee (SEC) meeting of Health Care and Nutrition (HCN) area and revising the proposal in consultation with Dr. AJ Singh, SEC Member, your project proposal is recommended for support under WOS-B component of KIRAN Division of DST.

In this regard, you are requested to submit documents to start process of sanctioning of recommended project proposals at this end. list of documents is attached herewith. For some documents, format has been prescribed. Please submit these documents as per the enclosed format only. Documents may be submitted in soft copy as **single PDF file.**

आदर के साथ / With Kind Regards

पवन कुमार / Pawan Kumar

वैज्ञानिक 'सी' / Scientist 'C'

किरण प्रभाग / KIRAN Division

विज्ञान और प्रौद्योगिकी विभाग

Department of Science & Technology

भारत सरकार / Govt. Of India

noted

[signature]

World Spine Care

"Improving lives in underserved communities through sustainable, integrated, evidence based, spine care."

Dr Rajani Mullerpatan
MGM School of Physiotherapy, Navi Mumbai
MGM Institute of Health Sciences
Navi Mumbai
Maharashtra
India

09 July 2020

Dear Rajani,

Thank you for your recent correspondence regarding the PhD student. I can confirm that World Spine Care Europe will provide a scholarship for one PhD student commencing in the summer/autumn of 2020 for a period of 3 years. The scholarship amount is for 5000 Euros per year for tuition and living cost. The scholarship is for study within Spine Care.

As a charity we are accountable to our members and those who assist in the funding provision for such ventures. Therefore, we would ask that annual updates are provided by the student and the MGM School of Physiotherapy, Navi Mumbai,
so that we are able report progress to our membership and Board of Trustees.

I would like to thank you for providing the opportunity for the Doctoral Fellowship to be implemented at the MGM School of Physiotherapy, Navi Mumbai, a Constituent Unit of MGMIHS. We are excited about the prospects of furthering our understanding of Spine Care in India and look forward to hearing from you regarding the candidates and the theme of the PhD studies.

Yours sincerely,

Adam Wilkey
President World Spine Care Europe

World Spine Care
[illegible]

World Spine Care Canada
[illegible]

World Spine Care Europe
[illegible]

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

At MGM School of Physiotherapy, Navi Mumbai PhD program commenced in 2010.

- Since then 6 full-time scholars are awarded PhD degree by MGM Institute of Health Sciences.
- Two PhD scholars are pursuing full-time PhD program.
- Four PhD scholars have registered for full-time PhD program in the Academic year 2021-22
- Out of the 2 scholars pursuing PhD currently, Ms. Poonam Desai is awarded fellowship by WOS_B Scheme of DST 2021 (Women Scientist B) and Ms. Triveni Shetty was shortlisted for presentation at the Women Scientist Conclave in Kolkata 2019.

List of PhD scholars awarded PhD degree by MGM Institute of Health Sciences

Sr. No.	Name of scholars	Name of Project	Year of Registration	Year of award of PhD Degree
1	Dr. Surendra Wani	A comprehensive analysis of shoulder muscles among Indian people with diabetes	June '2010	27.01.2019
2	Dr. Sibi Daniel	Reasoning based therapeutic approach in chronic neck pain: A pragmatic study.	June '2010	14.01.2018
3	Dr. Meruna Bose	The effect of dual task oriented training on functional outcome and the health related quality of life in Parkinson's disease	June '2011	27.01.2019
4	Dr. Vrushali Panhale	The integration of training of evidence based practice in physiotherapy education	June '2012	11.06.2019
5	Dr. Sreeraj S.R.	Influence of various media on modes of therapeutic ultrasound in phonophoresis	June '2012	31.07.2018
6	Dr. Bela Agarwal	Effect of squatting on knee articular cartilage in healthy adults	June' 2014	29.08.2021

List of PhD students pursing fulltime PhD program				
1.	Dr. Poonam Desai (PT)	Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study	August 2019	Ongoing
2.	Dr. Triveni Shetty (PT)	Long term monitoring of functional outcome of multi-level of orthopedic surgeries in children and adolescents with cerebral palsy	September 2016	Ongoing

List of PhD registered for fulltime PhD program in the Academic year 2021-22

Sr. No.	Name of Candidates
1.	Dr. Mamta Shetty (PT)
2.	Dr. Bhoomika Sawant (PT)
3.	Dr. Sona Sarma (PT)
4.	Dr. Tejal Pardeshi (PT)

PROJECT IMPLEMENTATION GROUP

The Project Implementation Group (PIG) is constituted with the following faculty members who will be responsible and accountable for the smooth implementation of the DST FIST Project at the Department/ Centre/ School/ PG College.

S. No.	Name of Faculty Member	Designation, Affiliation, Phone, email id
1	Dr. Rajani Mullerpatan (Principal Investigator)	Professor- Director, MGM School of Physiotherapy, Department of Musculoskeletal Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
2	Dr. Bela Agarwal (Co-Investigator)	Professor-, MGM School of Physiotherapy, MGM Institute of Health Sciences, Department of Cardiovascular and Respiratory Science Physiotherapy Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
3	Dr Triveni Shetty (PT) (Member of PIG)	Associate Professor, MGM School of Physiotherapy, Department of Neuroscience, Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
4	Dr. Shrutika Parab (PT) (Member of PIG)	Assistant Professor, MGM School of Physiotherapy, Department of Neuroscience Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in
5	Dr. Mamta Shetty (PT) (Member of PIG)	Assistant Professor, MGM School of Physiotherapy, Department of Musculoskeletal Physiotherapy,MGM Institute of Health Sciences, Navi Mumbai Contact number: 022-27437866 Email mgmschoolofphysiotherapy@mgmsopnm.edu.in

Signature of the
Head of the Department/ Principal of the College

Resume of Principal Investigator

Professor-Director
MGM Institute's University Department of Physiotherapy
MGM Institute of Health Sciences
Navi Mumbai 410 209, India

Telephone : +91 99200 48476 Email. : rajani.kanade@gmail.com

Date of Birth: May 24, 1972 **Nationality: Indian**

PROFESSIONAL QUALIFICATIONS :

PhD **:** Cardiff University, UK, March 2007
Diploma in Research Methods & Medical Statistics, Cardiff University. 2005

MSc (PT) University of Mumbai, India, May 1995

BSc (PT) University of Mumbai, India, November 1992

Awards / Recognitions/ Memberships:
(a) International (list):

- Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme on the development of the Package of Interventions for Rehabilitation
- Honorary Research Associate, Cardiff University, UK (2011-2013)
- Dr. PN Berry Scholarship Award, High Commission of India, London, UK, 2002-2003
- Executive Council Member, International Society of Biomechanics (2017-2019)
- Awarded International Certificate on Principles of Bioethics and Human Rights from UNESCO chair in Bioethics
- Ex-Member of Europe Didactic Foot Study Group

(b) National (list):

- Indian Association of Physiotherapists Award, 2010.

(c)Membership of Scientific/Societies/other Professional bodies:

- Lifetime Member of Society of Indian Physiotherapist
- Grant Committee Member of Society of Indian Physiotherapist
- Executive Council Member, International Society of Biomechanics (2017-2019)
- Ex-Member of European Diabetic Foot Study Group

PROFESSIONAL EXPERIENCE:

Previous Appointments

Professor-Director **Present -since 2008**
MGM School of Physiotherapy, Navi Mumbai

Lecturer July 2006-June 2008
School of Medical Sciences, University of Nottingham, UK
Academic, Research and administrative

Full Time Researcher PhD April 2003-June 2006
Research Centre for Clinical Kinesiology, Cardiff University,
UK Human Movement analysis:
Full-time Research & academic

Dr. P N Berry Scholarship, July 2002- Mar 2003
High Commission of India, London, UK
Various NHS Trust hospitals and Institutes within UK
Overview of Physiotherapy practice and research in UK and National survey of burns care and rehabilitation within UK

Lecturer Sep 2000 – June 2002
Topiwala National Medical College, Mumbai,
India Academic, Clinical & Administrative

Head of Dept & Assistant Professor May 1999 – May 2000
Kasturba Medical College, Manipal Academy of Higher Education, India
Administrative, Academic & Clinical

Assistant Professor Sep 1996 – April 1999
Kasturba Medical College,
Manipal Academy of Higher Education,
India Academic, Administrative & Clinical

List of Research Publications:

1. Scott Haldeman, Margareta Nordin, Patricia Tavares, **Rajani Mullerpatan** et al. Distance Management of Spinal Disorders During the COVID-19 Pandemic and Beyond: Evidence-Based Patient and Clinician Guides from the Global Spine Care Initiative. JMIR Public Health Surveill. 2021 Feb 17;7(2): 25484. doi: 10.2196/25484.
2. Jinny P Kanjirathingal, **Rajani P Mullerpatan**, Girish Nehete, Nagarathna Raghuram. Effect of Yogasana intervention on standing balance performance among people with diabetic peripheral neuropathy: A pilot study. 2021; 14 (1) 60-70.
3. **Rajani Mullerpatan**, Triveni Shetty, Yuvraj Singh, Bela Agarwal. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies. 26 (2021) 1-6.
4. Dharod R, Shetty T, Shete R**, Mullerpatan R**. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(3).
5. **Rajani P Mullerpatan**, Bela M Agarwal, Triveni V Shetty. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga; 2020 13 (2): 137-143.

6. **Mullerpatan R**, Nahar S, Singh Y, Cote P, Nordin M. Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India. European Spine Journal. 2020 Sep 10:1-7\
7. Mohanty T, Mehta D, **Mullerpatan R**, Agarwal B. Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in Children and Adolescents with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(2)
8. Bharnuke JK, **Mullerpatan RP**, Hiller C. Evaluation of Standing Balance Performance in Indian Classical Dancers. Journal of Dance Medicine & Science. 2020 Mar 15;24(1):19-23.
9. Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life. Mullerpatan R, Kamath MV. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(4).
10. Shetty M, Balasundaran S, **Mullerpatan R.** Grip and pinch strength: Reference values for children and adolescents from India. Journal of pediatric rehabilitation medicine. 2019 Jan 1;12(3):255-62
11. **Mullerpatan R**, Shetty T, Ganesan S, Johari A. Review of lower extremity function following SEMLS in children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2)
12. **Mullerpatan R**, Girdhar P, Singh Y, Salgotra KR, Wilkey A, Nordin M. Evidence-Based Rehabilitation of Spine-Pain Disorders among Underserved Individuals in Navi Mumbai, India: A Two-Year− Observational Report. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2)
13. **Mullerpatan R**, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B. Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries. Crit Rev PhysRehabil Med. 2019;31(2)
14. Shah T, Shetty M, Bose M, **Mullerpatan R**. A Study of Fine and Manual Hand Dexterity in People with Parkinson's disease. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
15. **Mullerpatan R**, Bharnuke J, Hiller C. Gait kinematics of Bharatanatyam dancers with and without low back pain. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
16. Agarwal B, Advani M, van Deursen R, **Mullerpatan R.** Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
17. Nair S, Agarwal B, Chatla J, **Mullerpatan R**. Health-related physical fitness of people with type 2 diabetes mellitus. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
18. Naryanan G, Bose M, Parab S, Agarwal B, **Mullerpatan R**. Energy expenditure using three different walking techniques in individuals with spinal cord Injury. Crit Rev Phys Rehab Med. 2019;31(1):35-41
19. Amberkar O, Agarwal B, Singh Y, Shete R, **Mullerpatan R.** Level of sports participation and performance among people with spinal cord injury. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
20. Shetty T, Johari A, Ganesan S, **Mullerpatan R.** Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
21. **Mullerpatan R**, Thanawala M, Agarwal B, Ganesan S. Development of the Deep Squat Milestone in Typically Developing Children. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
22. Shetty T, Parab S, Ganesan S, Agarwal B, **Mullerpatan R**. Lower extremity muscle strength and endurance in ambulatory children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
23. Iyer P, Shetty T, Ganesan S, Nair S, Rao N, **Mullerpatan R.** Exploration of sports participation in children with mild intellectual disability. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
24. Agarwal B, Advani M, van Deursen R, **Mullerpatan R**. Influence of varying squat exposure on knee pain and function among people with knee osteoarthritis. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1)
25. Pisal A, Agarwal B, **Mullerpatan R**. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018;30(3)
26. Johnson CD, Haldeman S, Nordin M, Chou R, Côté P, Hurwitz EL, Green BN, Kopansky-Giles D, Randhawa K, Cedraschi C, Ameis A, **Mullerpatan R**. The Global Spine Care Initiative: methodology, contributors, and disclosures. European Spine Journal. 2018 Sep 1;27(6):786-95
27. Nordin M, Randhawa K, Torres P, Yu H, Haldeman S, Côté P, Torres C, Modic M, **Mullerpatan R**, Cedraschi C, Chou R. The Global Spine Care Initiative: a systematic review for the assessment of spine-related complaints in populations with limited resources and in low-and middle-income communities. European Spine Journal. 2018 Sep 1;27(6):816-27
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Text Book Chapters:

- Rajani Mullerpatan (2021). 'Biomechanics of Indigenous Postures' in Margareta Nordin, Victor H Frankel (5 th ed.). Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer. 469-490.
- Rajani Kanade (Dr. Mullerpatan's maiden surname was Kanade) (2000). 'Principles of Rehabilitation in Plastic Surgery'. In Pramod Kumar (ed.). Plastic Surgery Basic Principles and Techniques. Paras Publishing. 265-292.

List of Patents/ Copyrights
Copyrights/ Patents:

Patent Applications					
Sr.No.	**Name/(s) of the Patenter**	**Patent Number**	**Title of Patent**	**Date of Application**	**Published/Applied**
1	**RajaniMullerpatan,** Amit Maurya, Bhallamudi Ravi, Ghyar Rupesh	1431/MUM/2015	A device for measurement of properties of a body part	7/4/2017	Applied
2	Nishant Kathpal, Ghyar Rupesh, Chetan Pakhare, Yash Gupte, Bhallamudi Ravi, **Mullerpatan Rajani**	20182100 5692	A device for screening of a diabetic foot	15/02/2018	Applied

Registered copyrights				
Sr. No.	**Copyright work Title**	**Name of Authors**	**Copyright Registration Number**	**Date of Registration**
1.	MGM Reference values for Centre of pressure (CoP) trajectory in quiet stance among healthy Indian people aged 7-65 years.	Rajani Mullerpatan, Triveni Ranga Shetty	L-103788/2021	27/05/21
2.	MGM Reference Values for Foot Geometry And Pressure Distribution of Indian Classical Bharatanatyam Dancers	Rajani Mullerpatan	L-105701/2021	23/07/2021
3.	MGM Reference Values For Kinematics And Muscle Activity During Suryanamaskar	Rajani Mullerpatan, Triveni Shetty Bela Agarwal	L-105719/2021	23/07/2021
4.	MGM Reference Values for Anthropometric Measurements Among Individuals Ages 5-65 Years	Rajani Mullerpatan, Triveni Shetty	L-105704/2021	23/07/2021
5.	MGM Reference Values for Gait Kinematic Variables In Healthy Indian Adults	Rajani Mullerpatan, Triveni Shetty Bela Agarwal	L-103652/2021	25/05/2021

6.	Reference values for hand grip and pinch strength for healthy Indian adults	**Rajani Mullerpatan**, Mamta Shetty	L-100130/2021	06/03/2021
7.	3 Dimensional Gait Report for children: 6-9 years	**Rajani Mullerpatan** Triveni Shetty	L-97873/2020	21/12/20
8.	Translated and validated marathi version of Shoulder Pain And Disability Index (SPADI)questionnaire	Apeksha Pahade, Surendra Wani, **Rajani Mullerpatan**	L-97633/2020	12/11/20
9.	Paediatric fitness report females 13-18 years	Bela Agarwal, **Rajani Mullerpatan**	L-91340/2020	21/05/2020
10.	Reference Values for Spatiotemporal Variables of Gait in Healthy Indian Adults	**Rajani Mullerpatan**, Triveni Shetty	L-92919/2020	17/07/2020
11.	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 years and Adolescents: 13-17 years	Bela Agarwal, **Rajani Mullerpatan**	L-92917/2020	17/07/2020
12.	3 Dimensional Gait Report for Children : 9 to 12 years	**Rajani Mullerpatan,** Triveni Shetty	L-93922/2020	8/21/2020
13.	MGM Paediatric Fitness Testing Report: Males 13-18 Years	Bela Agarwal, **Rajani Mullerpatan**	L-93923/2020	8/21/2020
14.	Pediatric Fitness testing Report: Males 6-12 Years	Bela Agarwal, Bhoomika Sawant, **Rajani Mullerpatan**	L-97874/2020	21/12/2020
15.	Comparison of palmar abduction in three wrist positions among health adults using conventional finger goniometer	**Rajani Mullerpatan,** Anisha Gulati	L-97865/2020	21/12/2020
16.	Reference values for hand grip and pinch strength for healthy Indian Adolescents	**Rajani Mullerpatan,** Mamta Shetty	L-97877/2020	21/12/2020
13	MGM Ground Level Activity Exposure Questionnaire	Bela Agarwal and **Rajani Mullerpatan**	L-76907/2018	27/07/18

Mentorship provided (Students guided, teaching etc.):

Sr. No	Title	Principle Investigator	Supervisor	Research Scholars/Fellow (Year)
PhD Scholar Projects Supervised by Dr.R P Mullerpatan				
1	Comprehensive analysis of shoulder muscles among people with type II diabetes (2010-2018)			In-service PhD Scholar
2	Effect of squatting on knee articular cartilage in healthy adults (2014 - till date) – Dr. Bela A (PT)			In-service PhD Scholar
3	Long term monitoring of functional outcome following multi-level orthopedic surgeries in children with cerebral palsy (2016 - till date) – Dr. Triveni S (PT)			In-service PhD Scholar
4	Level of functional outcome in geriatric people from urban and rural setting (2019 - till date) – Dr. Poonam D (PT)			Full time PhD scholar
Master's (MPT) Scholar Projects				
1	Effect of Yoga on Low Back Pain, Physical and Psychological (Anxiety, Depression and Quality of Life) Function in Postpartum Women			2018-2020
2	Exploration of Upper extremity function among people with shoulder dysfunction with Diabetes Mellitus and effect of Gomukhasana on shoulder function			2018-2020
3	The effect of Yoga on neck Pain, Muscle Strength, Function and Psychosocial Factor in Sedentary Workers with chronic Mechanical Neck			2018-2020
4	Comparison of Plantar Cutaneous Sensory Thresholds in Bare Foot and Shod Adults			2017-2019
5	Evaluation of Performance Based and Patient Reported Outcomes After Total Hip Replacement and Total Knee Replacement in India			2017-2019
6	Comparison of Erector Spinae Muscle Activity in Healthy Adults and Mathadi Workers with Mechanical Low Back Pain with and Without Spring Loaded Passive Exoskeleton			2017-2019
7	Comparison between the Effectiveness of Suryanamaskar and Exercises on Pain, Strength, Function and Psychosocial Factors in Patients with Chronic Non-Specific Low Back Pain			2017-2019

8	Comparison of effects of Yoga intervention and balance exercises on standing balance in people with diabetic peripheral neuropathy	2016-2018
9	Functional Performance in People with Hip pain	2016-2018
10	Evaluation of Palmar Abduction In Three Wrist Positions Among Healthy Adults	2016-2018
11	Survey of Spinal Pain in Indian Rural Population	2015-2017
12	Evaluation of Balance in Indian Classical Dancers and Age- Matched Controls : A Comparative Study	2015-2017
13	Survey of Spinal Pain in Indian Rural Population	2015-2017
14	Squatting Milestone in Children and Measurement of Its Development	2015-2017
15	Evaluation of Daily Walking Activity in People with Parkinson's Disease	2014-2016
16	Evaluation of Medial Longitudinal Arch in Urban And Rural Children	2014-2016
17	Normative Data of Grip and Pinch Strength for Healthy Indian Pediatric Population	2013-2015
18	Effect of Osteoarthritis on Health Related Fitness	2013-2015
19	A Study of Fine and Manual Hand Dexterity Among People with Parkinson's Disease	2013-2014
20	Functional Outcome In People with Lower Limb Amputation in Urban And Rural	2013-2014
21	Evaluation of Cardio-Pulmonary Function and Lower Limb Muscle Activity in Different Squat Positions	2013-2014
22	Foot Structure and Function in Mallakhamb Gymnasts	2012-2013
23	Evaluation of Long Term Functional Outcome in People With Unilateral Below knee Amputation	2012-2013
24	Manual Hand Dexterity : Normative Data for Healthy Indian Adults	2012-2013
25	Effect of Mulligan Bent Leg Raise Maneuver on Back Extensor Performance During Bending Activity in Patients with Non-Specific Low Back Pain : A Quantitative E.M.G	2011-2012
26	Effect of Foot Postures on activity of Tibialis Anterior, in Single Limb Stance using Surface EMG	2010-2011

Technologies Developed/Transferred:

(a) Number of Technologies developed:

1. A device for measurement of tissue stiffness of a body part was developed for early detection of tissues, at risk of breakdown; for e.g. plantar tissue of feet in people with diabetic neuropathy. The device has potential for application in various other clinical conditions.This device was designed in in collaboration with Bio Engineering Incubation Centre at IIT Bombay.

2. 'STIMU' : device was designed for measurement of plantar tissue stiffness for screening diabetic foot by early detection of diabetic neuropathy named: in collaboration with Bio Engineering Incubation Centre at IIT Bombay. The device is in stage of clinical trials.

3. A powered transtibial prosthesis was developed for people with below knee amputation incorporating a bi-articular actuator. The study was funded by Department of Biotechnology, Government of India. The patent application for the same is in process.

4. I-sens gait analysis wearable inertial sensor-based system developed by IIT- Madras: Biomechanical input was provided for validation of the gait analysis system with the gold-standard 3D system for motion analysis.

5. A novel spring- loaded passive exoskeleton was designed and developed for reducing muscle activity of trunk muscles (erector spinae group of muscle) in Mathadi workers. The patent application for the same is in process.

(b) Number of Technologies transferred to industry

1. One device was designed in collaboration with Bio Engineering Incubation Centre at IIT Bombay for validation of plantar tissue stiffness for early detection of diabetic neuropathy named: 'STIMU'. The device was commercialized through a Start-up named- Ayati Devices Private Limited, a Medical Device Designer & Manufacturer (Dec 2018).

Significant research contributions made in his/her area of research:

Dr. Rajani Mullerpatan has made significant original contribution to science to explore promotion of human movement as a therapeutic device in health promotion, prevention/reduction of disability, optimization of function and attenuation of burden of non-communicable diseases. While pursuing this research endeavor, she has focused on scientific exploration of indigenous movements for collateral restoration of heritage of traditional Indian movement forms of daily living, Yoga, sports and classical dance forms. In parallel, she has utilized this knowledge for design of movement- pertinent technology for enhancement of human movement performance and rehabilitation of people with movement disorders; which is useful for the masses in rural and urban sector to address unmet needs in healthcare- through interdisciplinary collaborative research with engineers at national and international level. The DNA of Dr. Mullerpatan's research work is marked by interdisciplinary, translational and sustainable innovations, underpinned by original scientific knowledge of traditional India human movement forms engaging the biomechanical marvel of human body, to address unmet needs in healthcare of people with disposal income and low disposal income, to create a scalable societal and economic impact.

Dr. Mullerpatan's efforts to conduct research in human movement science began with first establishing a facility to conduct research in this area in India. She established MGM Centre of Human Movement Science at MGM School of Physiotherapy, MGM Institute of Health Science in 2015. She garnered financial support from MGM Institute of Health Sciences, International Society of Biomechanics and BETIC, IIT-Bombay to create an exclusive facility for inter-disciplinary research, training, patient care and technology design and validation under one roof for health professionals and engineers. Creating such an exclusive facility in a self-funded private Higher Academic Institute in India in 2015 was a huge challenge because of a thin line of mega divide, which exists between Government Institutes and private Institutes in India. Thereafter, she developed an interdisciplinary ecosystem constituted by researchers and innovators from Government and Private Higher Academic Institutes across India, UK, Canada and Australia necessary to embark on the mission of exploring human movement science applications for health promotion, early detection, prevention and rehabilitation of disability.

She commenced this mission by filling the huge knowledge gap identified in scientific literature on the level and profile of function of healthy Indian people because India is the second most populous country, which presents its own exclusive culture, and it would not be appropriate to pick the data off the shelf, which is generated from other population groups. Therefore, it was essential to generate the reference values for Indian population to plan efficient culturally palatable rehabilitation programs. Key sub-areas of work included spine care, upper extremity function, health related fitness in diabetes, evidence-based model of care, biomechanical exploration of-traditional daily life postures namely squat; Suryanamaskar; classical dance forms namely Bharatanatyam; Parkinson's disease and cerebral palsy.

Reference ranges for Indian population in human movement performance: Exploration of human movement science at MGM Centre of Human Movement Science began with generation of reference ranges for-fundamental human postures among healthy Indian people in all biological age groups. She studied kinematic and kinetic characteristics of gait of 547 healthy people (5-73 yr) to understand the profile of healthy people's gait (part of original data are copyrighted; whereas part of the data are in the process of being copyright. The manuscript is in pipeline for publication). Findings of gait profile will be useful for various clinical, research, training and gait-technology design and validation purposes. Alongside, she explored foot geometry and plantar pressure distribution of 447 children studied to create a foot profile of Indian children (original data are in the process of being copyright. The manuscript is in pipeline for publication); which will be valuable in research, clinical, training and footwear design. In parallel, hand grip and pinch strength was studied in 1289 healthy people, aged 5-89 yr because hand grip strength is a vital clinical sign of frailty (part of original data are copyrighted and published; whereas part of the data are in the process of being copyright and publication). In addition to hand grip strength, comprehensive evaluation of health related physical fitness was conducted over 2000 healthy people aged 6-60yr(The manuscript is in pipeline for publication) to draw a comprehensive profile of health related physical fitness.

After generation of reference values for critical markers of the function matrix of healthy Indian people, Dr.Mullerpatan conducted original research projects designed for biomechanical exploration of various Indian traditional and ancient movement forms such as daily life postures-for e.g. squatting, Yogasanas, classical dance form namely Bharatanatyam and traditional sports such as Mallakhamb, Kabaddi and bounce rope skipping.

Structural, biomechanical and biochemical exploration of widely adopted common daily life posture: Squat: Exploration of traditional daily life postures began with development of a tool named 'MGM Ground level Activity Exposure Questionnaire' for quantification of exposure to high flexion ground level postures and record deterioration or improvement in function among people with knee osteoarthritis. This novel, reliable and valid tool is published and copyrighted and is available to researchers in public domain free of cost.

Clinical studies adopting this tool reported that -although there is an on-going quandary of magnitude of permissible squatting activity in people with knee OA, longer exposure to deep squatting activities confers greater knee range of motion and lower extremity muscle strength. People with knee OA with moderate squat exposure for ADL (30 ± 36 min) present with greater knee ROM compared to people with knee OA who had given up squatting.

It was found that squatting activates all prime movers of spine namely erector spinae-rectus abdominis and lower extremity muscles such as vastus-lateralis, biceps-femoris, gluteus-maximus, gluteus-medius and gastrocnemius. Dynamic squatting results in greater activation of muscles compared to sustained-squat indicating that engagement in dynamic body-weight squat training may be useful for both people with no squat exposure as well as habitual squatters resulting in greater activation of knee stabilizers, which may be beneficial in maintaining sound musculoskeletal health.

Positive associations between structural changes, biomechanical variables at macro-level and biochemical markers at micro-level were noted while studying squat exposure. People with moderate squat exposure demonstrated lowest prevalence of early structural changes of knee osteoarthritis. High body mass, increase in urinary cartilage proteins, anti-oxidant activity and knee adductor moment may serve as non-invasive biomarkers for identification of early knee osteoarthritis and degeneration of articular cartilage. A rise in inflammatory activity in sweat from knee in healthy people may serve as a novel biomarker to identify early inflammatory changes in the knee joint at a stage where cartilage damage may not be sufficiently high.

Thus, early identification of risk factors using non-invasive methods and institution of early preventive therapeutic measures such as maintenance of ideal body mass, engaging in moderate level of activities that optimally load the knee joint such as squatting, enhancing anti-oxidant status of the body through physical activity, may delay onset of symptomatic knee OA.

Biomechanical and physiological exploration of Yogasanas: Dr.Mullerpatan passionately and robustly explored the biomechanics of Yogasanas in the land of origin of Yoga, because although Yoga is practiced worldwide for health benefits, there are gaps in knowledge for safe prescription of Yoga. The most widely practiced Yogasana-namely Suryanamaskar was explored to unfold its kinematics (motion) of spine, lower extremity and upper extremity joints, kinetics (forces to indicate weight bearing) on upper extremity and lower extremity joints and energy cost.

Suryanamaskar, a composite Yogasana producing a balance between flexion and extension is known to have positive health benefits for obesity and physical fitness management, upper limb muscle endurance, and body flexibility. Kinematic exploration of Suryanamaskar demonstrated that the spine moved through a range of 58° flexion to 44° extension, which is near full range of motion. Hence, Suryanamaskar holds potential to increase the mobility of almost all body joints, with stretch on anterior and posterior soft tissues and challenge postural balance mechanisms through a varying base of support. A study conducted to explore of muscle activity using Surface EMG while performing Suryanamaskar revealed that Suryanamaskar elicited high-to-moderate muscle activation of major postural muscles of the trunk and lower extremity during alternating flexion-extension movements of the spine. Erector spinae demonstrated the highest muscle activation in Hastapadasana.
Findings of these series of studies are being synthesized to draft a brochure, which will provide evidence based information to Yoga practitioners and clinicians for safe prescription of Suryanamaskar. Research studies continue to explore other commonly practiced Yogasanas and kriyas.

Negligible scientific information on rich heritage of Indian classical dance forms motivated Dr.Mullerpatan to explore indigenous postures of Indian classical dance forms with an objective of using the knowledge for scientific application in health promotion, rehabilitation of movement disorders and promotion of dancer's health. Indian classical dance has earned recognition across the globe; however, health of the dancers carrying forth this heritage has not received any attention. Survey of musculoskeletal disorders among Indian dancers in Mumbai and Mangalore revealed common sites of injury, commonly perceived causes of injury and factors influencing injury. Original research studies conducted to explore biomechanics of classical dance forms revealed how training in Indian classical dance forms results in greater standing balance performance because of the engagement of three prime systems in neuronal circuitry which are responsible for balance performance i.e. visual system (during Bhavang), vestibular system (Chakkars/spins) and proprioceptive system (tatkara or footwork). Further work revealed the influence of typical postures of Bharatanatyam dance form spilled over in motion of spine, pelvis and hip joints during daily-performed activity such as- gait.

In the sports arena, as much glamour is captured by Cricket, Football, etc; in India, traditional sports such as Mallakhamb, Kabaddi and Skipping have remained in silo for many years not only on the sports field; but also in sports science and research. As, Kabaddi is now gaining recognition as a competitive sport on national and international forum, research was conducted to explore ways to enhance performance of Kabaddi players and it was found that plyometric training can be integrated along with conventional training regime to enhance sports performance of Kabaddi players. Traditionally played

Mallakhamb (pole gymnast) poses huge challenges to the architecture and function of ankle foot complex because the gymnast is expected to pivot the body with ankle foot complex around the pole. Findings on biomechanical adaptations caused by practice of Mallakhamb provide useful considerations to Coaches and Clinicians for training and rehabilitation. Comparison of lower extremity joint loading during bounce rope skipping, running and walking revealed that skipping causes low loading on hip, knee and ankle joints compared to run which supports its prescription as joint protective exercise for health promotion in young adults and helps to clear myths about loading caused by skipping. Such a series of studies continue to unravel the biomechanical demands of daily traditional ground level activities, Yogasanas, traditional sports and classical dance forms.

Multilateral efforts of Dr.Mullerpatan continued to engage in researching sustainable, effective, evidence-based patient-care models for the underserved. Spine pain is one of the most common cause for disability. Hence she researched factors pertinent to spine care and reported the burden of spine pain among rural and tribal population of six villages (n=2323) in Raigad district of Maharashtra State of India through point prevalence of neck and low back pain. Additionally, attitudes and beliefs of rural people towards spine pain and disability caused by spine pain were researched because this information was valuable in designing culturally palatable rehabilitation program for spine pain.
While researching the local situation, she contributed to the spine care model developed by Global Spine Care Initiative, which is published and referred globally by clinicians from various health disciplines. Further, pilot studies were conducted to study the effectiveness of Yoga and Suryanamaskar in management of chronic mechanical neck and low back pain. Promising results of these studies will contribute hugely to the rehabilitation toolbox, by providing an alternate form of mind and body exercise because patients suffering from chronic ailments such as back pain find one form of exercise monotonous, leading to non-compliance to exercise (manuscripts are in pipeline for publication).

The lens of rehabilitation was also focused on neurological disorders resulting in life-long functional limitations like Cerebral palsy because much-needed biomechanical exploration of impairments among children with cerebral palsy residing in low resource settings like India provided deeper insight on exclusive clinical features at various stages of involvement and socio-cultural specific needs for clinical rehabilitation. In childhood, cerebral palsy is the most common cause of physical disability. Cerebral palsy impacts functioning, inclusive of body structures (e.g., limbs), body functions (e.g., strength), activities (e.g., walking), and participation (e.g., playing a sport), which in turn may cause disabilities affecting health-related quality of life. Gait reflects the overall status of sensory motor function in children with cerebral palsy. Severity in motor disability reflects on the walking pattern of the child. Hence robust instrumented 3D gait analysis was conducted among children with severe walking impairment, which illustrated detailed gait characteristics of children walking with higher crouch angle. Further studies were conducted to inform researchers and clinicians lower extremity muscle strength and endurance of Indian children with cerebral palsy with greater impairments, which is crucial for planning of treatment and monitoring treatment outcome.
Parallel attempts were made to review functioning of children following surgical interventions. Among the various interventions available for children with cerebral palsy, single event multi-level surgery is the preferred method to treat musculoskeletal deformities in cerebral palsy and has proven to be the most effective. Therefore lower extremity function was reviewed following single-event multiple level surgery in children with cerebral palsy to understand the value of surgical intervention in restoration of function. Over and above research efforts to maximize function, Dr.Mullerpatan dreams of an inclusive environment in India for children with cerebral palsy in education and sport. In an attempt to introduce and enhance sports participation among children with cerebral palsy in India, she explored level (district and national) and nature of participation in sports and barriers to sports participation among children with mild intellectual disability.
Taking cognizance of challenges faced by parents/caregivers to travel with a child with cerebral palsy in our country, which has limited accessible environment, a mobile-based application is in the process of development to monitor functioning of children with cerebral palsy in between visits for early detection of markers indicating deterioration in human movement performance.

Dr.Mullerpatan continues to integrate knowledge generated from robust, comprehensive 3D exploration of human movement performance into design and development of valid, reliable surrogate measures/devices, which can be widely used in routine clinical settings to address unmet needs.

Major R&D projects/programmes implemented during the last 5 years:

No	Project Title	Principal Investigator	Funding Agency/ Institutes	Total Fund Received (INR)	Research Fellow	Objectives
Completed Projects						
1.	Development of powered transtibial prosthesis (2015 – till date)	Dr. Rajani Mullerpatan	Department of Biotechnology DBT, New Delhi, India	33,00,000	1 Research fellow for 3 years	Design Bi-articular actuation mechanism with energy storage and return foot and knee brace for transtibial prosthesis
2.	The effects of labour and birth positioning on pelvic dimensions: gaining further insight to improve birth experience (2016 – 2018)	Dr. Rajani Mullerpatan	Indo-Canadian Shastri Institute, Canada	1,12,000	1 Research fellow 1 Research Associate 1 Field visit coordinator for 12 months	Use motion capture device to investigate the effects of birthing positions on pelvic dimensions in a group of non-pregnant Indian subjects. Better understand rural Indian women's current experiences and aspirations around childbirth.
3.	Biomechanical exploration of 3 types of Suryanamaskar (2017-19)	Dr. Rajani Mullerpatan	Sancheti College of Physiotherapy, Pune, India	1,72,000		Evaluate kinematics, kinetics of traditional, Chair and Wall Suryanamaskar using 3D motion analysis system Compare kinematics, kinetics, energy expenditure, quality of life, muscle activity between 3 types of Suryanamaskar
4.	Gait Analysis using i-sens wearable system and 3 D motion analysis (2017-19)	Dr. Rajani Mullerpatan	IIT Madras, Chennai, India	75,000		Compare gait kinematics and kinetics using a new wearable inertia sensors (i-Sens) system that has been developed at IIT Madras with the 3D multi-camera motion capture system in healthy adults
5.	Establishment of MGM Centre of Human Movement Science (2014 – 2015	Dr.Rajani Mullerpatan	International Society of Biomechanics, IIT Bombay, Mumbai, India	99,05,830		Generate a task force within the country to undertake research & conduct integrated training for health care professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders
Ongoing project						
6.	Validation of an indigenously developed device for measuring stiffness of plantar tissue in people with Type II diabetes (2019 – till date)	Dr. Rajani Mullerpatan	IIT Bombay, MGM IHS, Mumbai, India	1,70,519(IITB) + 1,50,000(MGM)	1 Research Fellow appointed for 6 months	Early detection of diabetic neuropathy and prevention of consequent foot complications.

Declaration:
I hereby declare that the information furnished above by me is true to the best of my knowledge.

Date:

Rajani Mullerpatan

Dr. Rajani Mullerpatan
Professor – Director
MGM School of Physiotherapy
MGM Institute of Health Sciences

Dr. Bela Agrawal (PT)
PhD, M.Sc(PT) (Cardiovascular and Respiratory Sciences)
Professor
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Contact Details:
MGM School of Physiotherapy,
MGM Institute of Health Sciences,
Sector 1, Kamothe, Navi Mumbai
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Educational qualification:

- Completed Bachelors in Physiotherapy- BSc (PT) from Seth G.S. Medical College, Mumbai affiliated to the University of Bombay in Nov1992
- Masters in Cardiovascular and Pulmonary Physiotherapy- MSc (PT) from L.T.M.M. College, Mumbai affiliated to the University of Bombay in May1995.
- Currently, pursuing PhD at MGM Institute of Health Sciences, Navi Mumbai.

Professional Organization Membership:

- Life member of Indian Association of Physiotherapists- Membership Number- 2219
- Member of Maharashtra State OTPT Council, Membership Number - 2010/04/PT/000296
- Member of Society of Indian Physiotherapists, Membership Number – 0213

Academic Experience:

- Working in the profession for 28 years in various setups which include hospitals, teaching institutes and private clinics
- More than 15 years of teaching experience which included teaching graduate, post graduate students as
- Assistant Professor at Seth G.S. Medical College, Physiotherapy Department, Mumbai from 2.09.1996 to 14.02.1997
- Assistant Professor at T.N. Medical College, Physiotherapy Department from 15.02.1997- 30.04.1997
- Assistant Professor at L.T.M.M. College, Physiotherapy Department from 5.10.2000 to 6.12.2006
- Associate Professor at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai from 9.04.2012 till 29.07.2019.
- Professor at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai from 30.07.2019 till date
- Principal in-charge at MGM School of Physiotherapy from April 2014 to May 2019.

Clinical Experience:

- Junior Physiotherapist at L.T.M.M. College and Hospital, Physiotherapy Department from 6.12.1993-28.01.1997; 27.06.117-30.09.2000
- Consultant Physiotherapist at Sai Kripa Hospital, Mumbai from 01.12. 2009- 30.12. 2010
- Consultant Physiotherapist at Deep Ganga Holistic Healing Center, Mumbai from 01.01. 2011- 30.03. 2012

Research Interest:

- The current focus of research is developing assessment tools for specially-abled people and exploring newer methods of enhancing cardiopulmonary endurance fitness.
- Exploration of biomechanical aspects of traditional Indian movement forms.
- We are in the process of developing a fitness battery which will be applicable to all age groups and relevant to the Indian lifestyle.
- Application of fitness testing in patients suffering from chronic ailments like musculoskeletal problems, neurological diseases and cardiopulmonary is a part of our teams ongoing projects.
- Exploring respiratory muscle strengthening and energy cost of activity in neurologically affected people like Parkinson's patients.

Intellectual Property - Copyrights	
1	MGM Ground Level Activity Exposure Questionnaire. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L-76907/2018 dated 27.07.2018
2	Pediatric Fitness Testing Report Females 13-18 years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L-91340/2020 dated 21.05.2020
3	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 Years and Adolescents: 13-17 Years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L- L-92917/2020 dated 17.07.2020
4	MGM Pediatric Fitness Testing Report: Males 13-18 Years. **Bela Agarwal** and Rajani Mullerpatan. Registration Number L- L-93923/2020 dated 21.08.2020
5	Physiotherapy Management of Covid-19 in Indian Setup. Mariya P Jiandani, **Bela Agarwal**, Gaurang Baxi, Sudeep Kale, Jaimala Shetye, Abhijit Diwate, Umanjali Damke, Savita Ravindra, Titiksha Pol, Anjali Bhise, Unnati Pandit, Prajakta Patil, Razia Nagarwala, Pratibha Gaikwad. L-95459/2020 dated 06/10/2020
6	Pediatric Fitness testing Report: Males 6-12 Years. **Bela Agarwal**, Bhoomika Sawant, Rajani Mullerpatan. L-97874/2020 dated 21/12/2020
7	MGM Reference values for Gait Kinematic variables in Healthy Indian Adults. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-103652/2021 dated 25/05/2021
8	MGM Measurements Among Individuals Ages 5-65 Years 5-65 Years. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-105704/2021 dated 23/07/2021
9	MGM Reference Values for Kinematics and Muscle Activity During Suryanamaskar. Rajani Mullerpatan, Triveni Shetty, **Bela Agarwal.** L-105719/2021 dated

	23/07/2021

Publications	
1	**Bela Manish Agarwal**, Robert Van Deursen, Rajani Prashant Mullerpatan. Electromyographic evaluation of spine and lower extremity muscles during repeated and sustained bodyweight deep-squat. Trends in Sport Sciences.2021; 28(1): 19-27.DOI: 10.23829/TSS.2021.28.1-3.
2	Rajani Mullerpatan, Triveni Shetty, Yuvraj Singh, **Bela Agarwal**. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies 26 (2021) 1e6.
3	Narassimman Swaminathan, Mariya Jiandani, Praveen J Surendran, Prasob Jacob, Anjali Bhise, Gaurang Baxi, Poorvi Devani, **Bela Agarwal**, V Sunder Kumar, Nicole MariaPinto, Umanjali Damke, Prahlad Prabhudesai. **Beyond COVID 19: Evidence-Based Consensus on post covid pulmonary rehabilitation in the Indian context**. J Assoc Physicians India. 2020 Dec;68(12):82-89.
4	Jiandani MP, **Agarwal B**, Baxi G, Kale S, Pol T, Bhise A, Pandit U, Shetye JV, Diwate A, Damke U, Ravindra S, Patil P, Nagarwala RM, Gaikwad P, Agarwal S, Madan K, Jacob P, Surendran PJ, Swaminathan N. Evidence-Based National Consensus: Recommendations for Physiotherapy Management in COVID-19 in Acute Care Indian Setup. Indian J Crit Care Med 020;24(10):905–913
5	Expert Consensus and Recommendation for Physiotherapy Management of COVID 19 in Indian setup. Mariya P Jiandani, **Bela Agarwal**, Gaurang Baxi, Sudeep Kale, Jaimala Shetye, Abhijit Diwate, Umanjali Damke, Savita Ravindra, Titiksha Pol, Anjali Bhise, Unnati Pandit, Prajakta Patil, Razia Nagarwala, Pratibha Gaikwad. ISBN: 978-81-946111-3-4, Medworld Asia International Publications, 1st Edition June2020
6	Tanochni Mohanty, Dhruv Mehta, Rajani Mullerpatan, & **Bela Agarwal**. Cardiorespiratory Endurance, Flexibility and Lower-Extremity Muscle Strength in Children and Adolescents with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation Medicine, 32(1):75–83 (2020)
7	Mullerpatan RP, **Agarwal BM**, Shetty TV. Exploration of muscle activity using surface electromyography while performing Surya Namaskar. Int J Yoga 2020;13:137-43.
8	Nair S, **Agarwal B**, Chatla J, Mullerpatan R . Health-Related Physical Fitness of People With Type 2 Diabetes Mellitus. Critical Reviews™ in Physical and Rehabilitation, Medicine. 2019; 31 (1); 11-21
9	Mullerpatan R, Sonkhia M, Thomas B, Mishra S, Gupta A, **Agarwal B**. Review of Contextual Factors Influencing Function Following Lower Extremity Amputation in Low to Middle Income Countries. Crit Rev Phys Rehabil Med. 2019;31(2)
10	Shetty T, Parab S, Ganesan S; **Agarwal B**, Mullerpatan R. Lower Extremity Muscle Strength and Endurance in Ambulatory Children With Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 1-10
11	**Agarwal B**, Advani M, Deursen RV, Mullerpatan R. Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis;; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31(1):23-34
12	Mullerpatan RP, **Agarwal BM**, Shetty T, Nehete GR, Narasipura OS. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. Int J Yoga. 2019 May-Aug;12(2):124-131.
13	Rajani Mullerpatan, Meera Thanawala, **Bela Agarwal**, Sailakshmi Ganesan.

	Development of deep-squat milestone in typically developing children. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 62-67
14	Oshin Amberkar, **Bela Agarwal**, Yuvraj Singh, Ruturaj Shete, Rajani Mullerpatan. Level of sports participation and performance among people with spinal cord injury. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 49-55
15	Gayathri Naryanan, Meruna Bose, Shrutika Parab, **Bela Agarwal**, Rajani Mullerpatan. Energy expenditure using three different walking techniques in individuals with spinal cord Injury. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 32-39
16	Pisal A, **Agarwal B**, Mullerpatan R. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Critical Reviews™ in Physical and Rehabilitation, Medicine; 2018; 30 (3):207-218.
17	**Bela M. Agarwal**, Robert van Deursen, Rajani P. Mullerpatan. Influence of habitual deep squatting on kinematics of lower extremity, pelvis and trunk International Journal of Health and Rehabilitation Sciences, March 2018;7(1):1-19.
18	Nancy Fernandes Pereira, Shobha Gaikwad , Andrea Hemmerich , Rajani P Mullerpatan and **Bela Agarwal**. Birthing experience of women who have undergone normal deliver in a selected community of India. International Journal of Innovative Knowledge Concepts, February 2018; 6(2):120-125.
19	**Agarwal B**, Mukri A, Shah M et al. Effect of Inspiratory muscle training in individuals with Parkinson's disorder. Int J Health Sci Res. 2017; 7(6):178-185.
20	Sahasrabudhe SS, **Agarwal BM**, Mullerpatan RP. Comparison of Muscle Activity and Energy Cost between Various Bodyweight Squat Positions. Clinical Kinesiology,2017; 71(2):19-24
21	Shruti P Nair, **Bela Agarwal**, Monal Shah, Shradha Sawant, Nikita Sinha, Vijayendra Rajguru, Rajani Mullerpatan Level of physical exercise capacity, respiratory muscle strength and peak expiratory flow rate in healthy adolescents -. MGM Journal of Medical Sciences 2016, April-June,3(2):66-71.
22	**Bela Agarwal**, Monal Shah, Nilesh Andhare and Rajani Mullerpatan-Incremental Shuttle walk test: reference values and predictive equation for healthy adult Indians . Lung India, 2016, IP: 14.139.125.214
23	**Agarwal B**, Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. ISBN 978-93-5258-836-7 Conference proceedings HWWE 2015
24	**Bela Agarwal**, Meghana Chowdhry, Rajani Mullerpatan - Effect of movement therapy on academic stress in physiotherapy students. MGM Journal of Medical Sciences Oct-Dec 2014 Vol 1 number 4;189-192
25	Bela Garg - Physiotherapy in respiratory conditions – NAPCON Journal 2001
26	Jaimala Shetye and Bela Garg - Objective Assessment of improvement following pulmonary rehabilitation –The Journal of IAP 1999-2000;Vol1 , 13-16
27	Bela Garg, Maria Mascarenus and Surekha Pol -Cardiac Rehabilitation – Physical Therapy Rehabilitation 1996

Book Chapters	
1	Bela Agarwal, Expert Consensus for Covid -19 Management in Indian Setup-Booklet, Medworld Asia International Publications, Dotphi. 2020; ISBN 978-81-946111-3-4.

Conference Proceedings	
1	Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan, Evaluation of Joint Angles And Net Joint Moments In Rope Jumping, XXVI Congress Of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.
2	Bela Agarwal, Robert van Deursen And Rajani Mullerpatan, Influence Of Daily Squatting Exposure On Kinematics Of Deep Squat, XXVI Congress Of The International Society of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,Australia.
3	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN, Spine and Lower Extremity Kinematics Of Suryanamaskar, XXVI Congress of The International Society Of Biomechanics 23 -27 July 2017 Brisbane Convention & Exhibition Centre Brisbane,| Australia.
4	Agarwal B , Sinha N , Khadye C , Kaku J , Joshi S , Katalkar S , Khan A. Effect of Health Education and Monitoring Of Physical Fitness on Level of Physical Activity in Class III Hospital Workers. Conference proceedings HWWE 2015 Mumbai, India. ISBN 978-93-5258-836-7.

Co-Investigator in Funded Research Projects

Sr. No	Title	Project type	Year	Co-Investigator	Principal Investigator	Institution	Status
1	The effects of labor and birth positioning on pelvic dimensions: gaining further insight to improve the birth experience	Extramural project	2016-2017	Bela Agarwal, Triveni Shetty	Andrea Hemmerich Genevieve Dumas, Dr. Rajani Mullerpatan	Queen's University, MGM CHMS	Completed
2	Development of a Powered Trans-tibial Prosthesis	Extramural projects	2016	Bela Agarwal, Megha Bandawade	Abhishek Gupta, Dr. Rajani Mullerpatan	IIT-B, MGM CHMS	Ongoing
3	Effect of squatting on knee articular cartilage in healthy people	PhD	2014	Bela Agarwal	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Ongoing
7	Experimental	M Tech	2015-	Ajinkya	Dr. Rajani	IIT-B,	Comp

	biomechanics of human squatting		2016	Patil, Bela Agarwal	Mullerpatan	MGM CHMS	leted
12	Comparison of functional performance among people with unilateral/bilateral total knee replacement and conservatively managed osteoarthritis of knee	MPT	2015-2017	Shruti Rane	Dr. Bela Agarwal	MGM School of Physiotherapy, MGM CHMS	Completed
14	Spine and Lower extremity Kinematics of Suryanamaskar	Inhouse	2017	Triveni Shetty ,Bela Agarwal	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Ongoing
15	Evaluation of joint angles and net joint moments in rope jumping	Inhouse	2017	Triveni Shetty,Bela Agarwal, Yuvraj Singh	Dr. Rajani Mullerpatan	MGM School of Physiotherapy, MGM CHMS	Completed
16	Exploring biomechanics of Yogasana	In house		Bela Agarwal, Triveni Shetty	Rajani Mullerpatan	MGM CHMS	Ongoing

CME / Workshops Conducted		
Sr. No.	**Topic / Theme**	**Date**
1	Delivered a talk titled 'Neurological and systemic sequelae in patients with COVID' in a webinar on Post COVID Rehabilitation	18th September 2020
2	Physiotherapy in Intensive Care Unit (ICU)	6-8th December 2018
3	Pulmonary rehabilitation	9th September2017
4	Hands on workshop of "Cardiopulmonary Assessment & Exercise Training"	21st & 22nd March 2014
5.	'Respiratory Physiotherapy' at The XIII National conference of "Growth Development and Behavioural Pediatrics Academy GDBPCON XIII	5-7th December 2014

6	Clinical Biomechanics at MGM Center of Human Movement Sciences, MGM Super Specialty Hospital, Navi Mumbai	1-3rd April 2016
7	Cardio Pulmonary Assessment and Exercise Training MGM New Bombay Hospital, Navi Mumbai	21st - 22nd March 2014
8	Cardiopulmonary and Neurologic Physiotherapy treatment techniques Monitoring physical fitness in children and adolescents GDBCON conference organized by MGM Department of Pediatrics, MGM Institute of Health Sciences, Navi Mumbai	5 – 7th Dec 2014
9	Physiotherapy in the ICU at MGM New Bombay Hospital, Navi Mumbai	5-6th April 2013
10	Physiotherapy in the ICU at LTMM College and LTMG Hospital ,Mumbai	On 6 occasions from 2000-2006
11	Physiotherapy in the ICU at Sancheti College of Physiotherapy, Pune	2004
12	Participated as faculty in "Pulmonary Critical Care " NAPCON at LTMM College and LTMG Hospital ,Mumbai	2001
13	Participated as Faculty in "Update in Cardiothoracic nursing "for nurses at Leelabai College of Nursing SNDT University ,Mumbai	2000,2001
14	Participated as Faculty in "Paediatric Intensive Care Management " Maharashtra State IAP conference at Seth G.S. Medical College, KEM Hospital ,Mumbai	1996
15	Conducted Cardiac Rehabilitation workshop for Physiotherapists at Amar Jyoti Rehabilitation Center, New Delhi	1996

Courses, workshops and webinars attended		
Title	**Date**	**Venue**
Webinar on ''Mission Fit India'	12th Feb2021	MGM Institute of Health Sciences, Navi Mumbai
Online Teaching Learning and Evaluation with Moodle and MOOC Platform	13-14th July 2020	Virtual Training by Education Promotion Society of India, New Delhi
Certificate Course in Research Methodology	Jan 2017-March 2017	Online Course conducted by Alexis Foundation
Basics in Clinical Biomechanics	26-28th February 2016	MGM Center of human Movement Sciences ,MGM Super Specialty Hospital ,Navi Mumbai
"Workshop on Global Perspectives on Medical Education and its relevance to India"	6 Jan 2015	MGM Medical College ,Navi Mumbai
Understanding gait in Cerebral	18-19th April 2015	Jupiter Gaitlab , Thane

Palsy		

Conference Presentations	
1	Bela Agarwal, Rajani Mullerpatan. Prevalence of musculoskeletal pain among people with varying squat exposure; at Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
2	Bela Agarwal, Robert van Deursen, Rajani Mullerpatan. Effect of varying squat exposure on muscle strength and endurance; at 5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
3	Bela Agarwal, Kishore Raut, Rajani Mullerpatan. Development of MGM Ground Level Activity Questionnaire; at 5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
4	Bela Agarwal, Robert Van Deursen and Rajani Mullerpatan. Influence of Daily Squatting Exposure 0n Kinematics of Deep Squat. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.
5	Rajani Mullerpatan, Bela Agarwal, Triveni Shetty, Omkar SN. Spine and Lower extremity Kinematics of Suryanamaskar . Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.
6	Triveni Shetty, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan. Evaluation Of Joint Angles And Net Joint Moments In Rope Jumping. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.
Conferences Attended	
1	British Indian Orthopedic Society Virtual Meeting on 2nd -3rd July 2021, Cardiff , UK. Accredited by Royal College of Surgeons of England
2	Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
3	Society of Indian Physiotherapists SIP-e-Con, 17th Jan 2021 held at Amar Jyoti Institute of Physiotherapy, Delhi
4	5th Annual Conference of Society of Indian Physiotherapists, Jan 10-12 2020, at Novotel Hotel, Juhu, Mumbai
5	MGM-World Spine Care Conference - Prevention, Early Detection and Management of Spinal Disability: A Patient-centric Integrated Approach on 18-19th January 2019 at MGM Institute of Health Sciences, Navi Mumbai
6	Chairperson at FootCon, GMC Gymkhana, Marine Drive, Mumbai on 16-17th Dec 2017
7	XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia, 23-27 July 2017.

Awards	
2nd prize in paper	"Prevalence of musculoskeletal pain among people with varying

presentation	squat exposure". Bela Agarwal, Rajani Mullerpatan, at Scientifica 2021, an International Research Conference, held Online on 27 and 28 March 2021, Organized by Sancheti College of Physiotherapy, In association with Maharashtra University of Health Sciences, Nashik.
2nd prize in poster presentation	'Effects of growth spurt on clinical outcome measures of pulmonary function and exercise capacity' at National GDBP Conference organized by Indian Association of Pediatrics-MGMIHS (Pediatric Department) held in MGM College on 6th December,2014.
University of Bombay Second Rank holder at MSc (PT) University of Bombay Third Rank holder at First year BSc (PT) University of Bombay Third Rank holder at Second year BSc (PT) University of Bombay Third Rank holder at Third year BSc (PT)	

Postgraduate Research Projects Supervised

S: No	Name of the candidate	Title of the topic	Academic Year
1	Damini Aglawe	Evaluation of physical activity in critically ill patients during ICU stay and post ICU discharge	2019-2021
2	Abhijeet Kanojia	A review on effect of Suryanamaskar on physical fitness in children	2019-2021
3	Mihir Mange	Effect of telemetric '3 S' intervention on physical fitness, psychological well-being and quality of Life in Healthy adults	2019-2021
4	Neha Raorane	Effect of 12 weeks of barefoot exercises on lower extremity functional fitness and running performance in sub-elite marathon runners	2018-2020
5	Sumedh Vaidya	Effect of yoga on bowling performance and physical fitness in cricket bowlers	2018-2020
6	Bhumika Sawant	Squatting intervention in people with chronic respiratory dysfunction	2017-19
7	Oshin Amberkar	Development and Evaluation of a Conceptual Model to Improve Sports Participation and Performance in People with Spinal Cord Injury	2017-19
8	Manisha Advani	Influence of sustained occupational postures on knee pain and functional performance	2016-18
9	Zubeda	Functional performance in people with hip pain	2016-18

10	Shruti Rane	Comparison of knee function in people with conservatively managed osteoarthritis of knee and people with unilateral TKA	2015-17
11	Deepak Tandel	Inter tester and Intra tester reliability of incremental wheelchair propulsion test	2015-17
12	Jones Stanley	Developing an incremental wheelchair propulsion test for evaluation of cardio respiratory endurance in people with spinal cord injury	2014-16
13	Mohanty Tanochni	Health related physical fitness in ambulatory children and adolescents with cerebral palsy	2014-16
14	Jadhav Sneha	Effect of Osteoarthritis on Health realted Fitness	2013-15
15	Andhare Nilesh	Normative values for inspiratory pressure & Maximum expiratory pressure in age group of 31-70 yrs	2012-14
16	Afrin Mukhri	To study effect of inspiratory muscle strength in Parkinson	2012-14
17	Monal Shah	Normative Values for Six Minute Walk Test, Incremental Shuttle Walk Test and Peak Expiratory Flow Rate: In Mumbai Population in the Age Group of 17-30 Years.	2011-13

Undergraduate Research Projects Supervised			
Sr. No.	**Title of Project**	**Name of student**	**Month / Year**
1	Physical activity profile in post tuberculosis patients – magnitude of problem(prevalence)	Khadija, Zehra, Ria, Reem	2016-17
2	Musculoskeletal problems in post tuberculosis patients – magnitude of problem(prevalence)	Shreya, Mitali, Nisha, Jacqlene	2016-17
3	Ground level activities in various occupations in urban & rural population	Maithili,Sejal, Aisha,Faiza, Pooja,Devika,Shruti, Sanchita	2016-17
4	Temporo-spatial variables in squatting	Ritu,Pooja, Mohsina, Rajal	2016-17
5	Six minute walk test in patients affected with stroke & back pain	Bhoomika, Shraddha, Hely, Dhvani	2016-17
6	Immediate effect of PNF and MFR along with conventional therapy on respiratory functions in patients with COPD	Samiksha, Mamta, Neha, Vishakha,	2016-17
7	Evaluation of Respiratory muscle strength in chronic neurological conditions in children	Interns Roll no. 31-36	2015-16
8	Comparison of VO2 peak in 6 min walk test, incremental shuttle walk test and modif amoung healthy individuals in the age group 20-60 years	Interns Casual Batch	2015-16
9	ISWT in children and adolescent (6-17years)	A Surabhi , Ancy Vincent, B Uttkarsha Bindhu C.C. , Birajdar Huda	2014-15
10	6 MWT in children (6-9 years): Rural versus Urban	Bobadi Snehal , Chandurkar Shrut, C Sayali, C Smirti, D Nabha	2014-15

11	Evaluation of fitness in people with Diabetes Mellitus	Doshi Priya, D Anthea, Elvino John, Gindra Pooja, Gill Harpreet	2014-15
12	Effect of self monitoring of physical fitness on physical activity levels	Joshi Sanchita, Kaku Jyoti, Katalkar Priyadarshani, K Chetali, Khan Aqsa	2014-15
13	Evaluation of ankle dysfunction in adults using CAITY	Mane Ankita, Mohanty Nancy, Nair Rajlakshmi, Nale Dhanashree, Nikam Prathamesh	2014-15
14	Evaluation of fitness in women at different critical milestones- Puberty, Pregnancy and menopause	Nivya Joseph,Panchal Riddhi Panmand Mohinee, Parab Shrutika Patel Dipiti	2014-15
15	Evaluation of fitness in thyroid dysfunction and metabolic syndrome	Patole Priyanka ,Penkar Ujal ,Rupika Gopinathan ,Sanghavi Rashi,Shah Dhavni	2014-15
16	Evaluation of fitness in physically elite population among children and adults	Shetty Sanjana ,Shruthi P,Siddiqui Samrin, Simi Mohanan, Sonawane Snehal	2014-15
17	Effect of practice sessions on ISWT	Talankar Reema ,Preeti Yadav	2013-14
18	Assessment of Physical fitness in the age group of 20-60 years using the test battery.	Manta Shetty, Poonam Desai, Saloni Thakkar, Tasmiya Shaikh, Pooja V	2013-14
20	Assessment of physical fitness in age group of 9-15 years using fitness test battery	Bilimoria Zarine E. Dand Darshita	2013-14
21	Assessment of physical fitness in age group of 9-15 years using fitness test battery	Sawant Abhishek A, Shete Ruturaj , Shetty Priyanka, Shinde Kashmira , Thanawala Meera, Tulsankar Gauri	2013-14

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Apercu

Pursuing PhD from MGM Institute of Health Sciences (since 2016) Post graduate in physiotherapy with specialization in Neurosciences with over 14 years of experience in clinical filed and 6 years academic and research experience. Strong theoretical knowledge and clinical exposure through work experience at medical college and allied roles.

Areas of Expertise

Neurorehabilitation
Clinical Biomechanics
Kinesiology / Movement Sciences
3D & 2D Motion analysis system
Vestibular Rehabilitation
General Management
Interpersonal Skills
Movement analysis of traditional movements

Key Achievements

- Eight papers published in International Indexed Journals and 3 copyrights registered.
- Best PhD paper Award from MGM Institute of Health Sciences for year 2019-2020
- Platform and poster presentations at national and international conferences including ISB, SIPCON, IFNR. Recently, one research project was shortlisted for poster presentation at India Science Festival organized by Government of India, DST Women Scientist Conclave.
- Under the guidance of Mentor Dr Rajani Mullerpatan, registered a copyright on Temporal-spatial parameters of gait and filed 4 more in gait analysis as co-author

Professional Experience

MGM School of Physiotherapy, MGM Institute of Health Sciences, NM — Aug-2015 till date

Associate Professor

- Undergraduate and post-graduate student training for neuro-physiotherapy, kinesiology, Kinesiotherapy and sports biomechanics and movement sciences. Duties involved assessment & treatment, discussions & bed-side teaching, case presentations.
- Co-ordination of all activities at MGM Centre of Human Science.
- Teaching experience includes for graduate/post graduate students as well as project/dissertation guidance
- Extension include: Initiation of MGM Cerebral palsy support group and reviving of stroke support group.
- Successfully trained students/ clinicians and academicians through 7 workshops in Clinical Biomechanics and Basics in 2D and 3D gait analysis

Academics

Professional Qualification

- Post-graduation (Neuroscience), TNMC College , Nair Hospital, MUHS
- Post-graduate Diploma in Rehabilitation, All India Physical Medicine & Rehabilitation, Haji Ali
- Graduation in Physiotherapy, Dr. D. Y Patil College of Physiotherapy, MUHS

Publications

1	Mullerpatan R, **Shetty T**, Ganesan S, Johari A. Review of lower extremity function following SEMLS in children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2).
2	**Shetty T**, Johari A, Ganesan S, Mullerpatan R. Gait Deviation Index of Children with Cerebral Palsy with Severe Gait Impairment. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1).
3	Iyer P, **Shetty T**, Ganesan S, Nair S, Rao N, Mullerpatan R. Exploration of sports participation in children with mild intellectual disability. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1).
4	**Shetty T**, Parab S, Ganesan S; Agarwal B, Mullerpatan R. Lower Extremity Muscle Strength and Endurance in Ambulatory Children with Cerebral Palsy. Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 1-10
5	Mullerpatan RP, Agarwal BM, **Shetty T**, Nehete GR, Narasipura OS. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. Int J Yoga. 2019 May-Aug;12(2):124-131.
6	Mullerpatan RP, Agarwal BM, **Shetty TV**. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga. 2020 May 1;13(2):137.
7	Dharod R, **Shetty T**, Shete R, Mullerpatan R. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(3).
8	Rajani Mullerpatan, **Triveni Shetty**, Yuvraj Singh, Bela Agarwal. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies. 26 (2021) 1-6.
9.	Rajani Mullerpatan, Bela Agarwal, **Triveni Shetty**, Omkar SN. Spine and Lower Extremity Kinematics of Suryanamaskar. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.
10.	**Triveni Shetty**, Bela Agarwal, Bindya Sharma, Rajani Mullerpatan. Evaluation of Joint Angles and Net Joint Moments in Rope Jumping. Conference Proceedings XXVI Congress of the International Society of Biomechanics 2017 (ISB2017) Brisbane, Australia,23-27 July 2017.

List of Copyrights registered

Copyright work Title	**Name of Authors**	**Copyright Registration Number**	**Date of Registration**
MGM Reference values for Centre of pressure (CoP) trajectory in quiet stance among healthy Indian people aged 7-65 years.	Rajani Mullerpatan, Triveni Ranga Shetty	L-103788/2021	27/05/21
MGM Reference Values For Kinematics And Muscle Activity During Suryanamaskar	Rajani Mullerpatan, Triveni Shetty Bela Agarwal	L-105719/2021	23/07/2021
MGM Reference Values for Anthropometric Measurements Among Individuals Ages 5-65 Years	Rajani Mullerpatan, Triveni Shetty	L-105704/2021	23/07/2021
MGM Reference Values for Gait Kinematic Variables In Healthy Indian Adults	Rajani Mullerpatan, Triveni Shetty Bela Agarwal	L-103652/2021	25/05/2021

3 Dimensional Gait Report for children: 6-9 years	**Rajani Mullerpatan** Triveni Shetty	L-97873/2020	21/12/20
Reference Values for Spatiotemporal Variables of Gait in Healthy Indian Adults	**Rajani Mullerpatan**, Triveni Shetty	L-92919/2020	17/07/2020
3 Dimensional Gait Report for Children : 9 to 12 years	**Rajani Mullerpatan,** Triveni Shetty	L-93922/2020	8/21/2020

Personal Information

Date of Birth – 11th March 1985

Nationality - India

Marital Status – Married

Email : tshetty@mgmsopnm.edu.in

Declaration:
I hereby declare that the information furnished above by me is true to the best of my knowledge.

Date: 6th September 2021

Dr. Triveni Shetty (PT)
Associate Professor
MGM School of Physiotherapy
MGM Institute of Health Sciences

Curriculum Vitae

Dr.Shrutika Dilip Parab (MPT- Neuro)

Current Designation : **Assistant Professor,** MGM School of Physiotherapy, MGM Institute of Health Sciences (*MGMIHS; Deemed to be University*), Navi Mumbai

MSOTPT Reg. no : 2016/04/PT/004668

Address : B2/204,Bhimashankar Chs, Sector-19A, Nerul Navi Mumbai

Email id : drshrutikaparab@gmail.com

Mobile No. : +91 9969402471

LinkedIn : https://www.linkedin.com/in/dr-shrutika-parab-b42643b7

Career Objective:

To succeed in an environment of growth and excellence and earn a job which provides me job satisfaction and help me achieve personal as well as organizational goals. Seeking quality environment where my knowledge can be shared and enriched.

Work Experience:

- Assistant Professor at MGM School of Physiotherapy, Navi Mumbai (Oct 2017- Present).
- Clinical Physiotherapist at Reliva Physiotherapy and Rehab (May 2015 - Oct 2017).
- Clinical Physiotherapist at Dr.Sonawane's Orthopedics Hospital, Seawoods (March -June 2015).

Educational Qualifications:

Sr. No.	Institute	Course	Year of Passing	Percentage
1.	St. Xavier's High School	S.S.C.	2008	81.3 %
2.	Tilak Junior College	H.S.C.	2010	69.6 %
3.	M.G.M. School Of Physiotherapy	I BPTh (Part-I)	2011	76.6 %
4.	M.G.M. School Of Physiotherapy	I BPTh (Part-II)	2012	74 %
5.	M.G.M. School Of Physiotherapy	II BPTh	2013	69.5 %
6.	M.G.M. School Of Physiotherapy	III BPTh	2014	70.5 %
7.	M.G.M University Department of Physiotherapy.	MPT (Neuro Physiotherapy)	2015-17	60%

Curriculum Vitae

Academic Projects:

- Effect of random and blocked practice schedules on motor learning in children (2016-17)
- Research Project on level of physical fitness in Geriatrics. (2014)
- Current trends of physical fitness in menopausal females (2015)

Awards and Recognition:

- Awarded as the **"Chancellor's Best Graduate Gold Medal"** BPTh. Batch 2010-14, Felicitated by Honorable Ex-Union minister Mr. Sharad Chandra Pawar.
- Certified Basic Life Support Provider (2018)

Research Profile:

Research Interest: Areas of research include focused studies on assessment; evidence based management and applied physiotherapeutics in adult and paediatric neurological conditions likeStroke, Parkinson's disease, Spinal Cord Injury, Cerebral Palsy, Down syndrome, Bell's Palsy etc

Project Supervisor/ Guide of projects of Department of Neuro Physiotherapy:

1. Ongoing Postgraduate projects 2019-2020 : **2**
2. Completed Postgraduate projects 2017-2020 : **3**
3. Completed Undergraduate projects 2017-2020 : **6**

Journal Reviewer:

1. Adapted Physical Exercise Quarterly

Publications/ Conference Proceedings:

1. **Parab S,** Bose M, Ganesan S. Influence of Random and Blocked Practice Schedules on Motor Learning in Children Aged 6–12 Years. Critical Reviews™ in Physical and Rehabilitation Medicine. 2018; 30 (3). **(Pubmed, Scopus)**
2. Bose M, Chhibber S, **Parab S.** Electrophysiological Study to Evaluate Cross Education in Lower Extremity Using Mirror Movements in Stroke. International Journal of Health Sciences & Research. 2018; 8 (5). **(Pubmed, Index Copernicus, Google Scholar)**

3. Shetty T, **Parab S,** Ganesan S, Agarwal B, Mullerpatan R. Lower extremity muscle strength and endurance in ambulatory children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31 (1). **(Pubmed,Scopus)**

4. Narayanan G, Bose M, **Parab S**, Agarwal B, Mullerpatan R. Energy expenditure using three different walking techniques in individuals with Spinal Cord Injury. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019. **(Pubmed,Scopus)**

5. Dighe A, Bose M, **Parab S**. Influence of Variations in Seat Surface Inclination on Trunk Muscle Recruitment and Reaching Ability in Children with Spastic Cerebral Palsy: Systematic Review. Indian Journal of Physiotherapy and Occupational Therapy; 2019, Vol. 13 (3). **(Pubmed,Scopus)**

6. Bose M, **Parab SD**, Patil SM, Pandey NA, Pednekar GV, Saini SS. Exploring spinal muscular atrophy and its impact on functional status: Indian scenario. Indian journal of public health. 2019 Jul 1;63(3):254. **(Pubmed, Scopus)**

7. **Parab S**, Bose M, Shayer S, Saini RK, Salvi M, Ravi P, Sawant P. Effect of Bharatnatyam-based Dance Therapy in Children and Adolescents with Down Syndrome. Clinical Kinesiology (Online). 2019 Oct 1;73(3):15-20. **(Scopus)**

8. Sawant N,Bose M, **Parab S.** Dexteria App. therapy versus conventional hand therapy in Stroke. Journal of Enabling Technology (Accepted for publication) 2020

9. **Parab S,** Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. WCNR 2018 Poster Abstracts. (2018). *Neurorehabilitation and Neural Repair*, *32*(4–5), 363–538. https://doi.org/10.1177/1545968318765498 **(Scopus, MEDLINE, CINAHL)**

10. **Parab S,** Bose M. Effect of Random and Blocked Practice Schedules on Motor Learning in Children. Indian Journal Cerebral Palsy [serial online] 2016 [cited 2019 Jun 8]; 2:105-25. **(Scopus, MEDLINE, CINAHL)**

Research Achievements:

- **Awarded for Best Research Paper** 2018-19 by MGM Institute of Health Sciences,Navi Mumbai
- **Oral paper presentation** National level at Indian academy of Cerebral palsy conference (IACPCON) 2016, Bangalore.
- **Poster Presentation, International** at 10th World Congress for Neurorehabilitation 2018, Mumbai.

- **Oral paper presentation at National** level at Indian Federation of Neuro-rehabilitation Conference 2019, Mumbai
- **E-Poster selected for presentation** at 11th World Congress for Neuro Rehabilitation jointly with 35th Congress of the French Society of Physical and Rehabilitation Medicine 2020

Workshops & Conferences Attended

- Attented online training on COVID-19: Operational Planning Guidelines and COVID-19 Partners Platform to support country preparedness and response, April 2020
- Delegate at National Conference Indian Federation of Neuro-rehabilitation Conference 2019, Mumbai.
- Organising Committee Member and Delegate at conference on 'Spine Care: Prevention, Early Detection & Management of Spine Disability: A patient-centric Integrated Approach' at MGM Institute of Health Sciences, Navi Mumbai on 18th and 19th of January 2019.
- Attended hands-on workshop on handling skills in "First year of life" (2018).
- Attended hands-on Workshop on Vestibular Rehabilitation (2018).
- Attended hands-on "Workshop on Qualitative Research Analysis" (2018).
- Attended conference on Revised Accreditation Framework of NAAC held at Deogiri College, Aurangabad (2018).
- Attended the 10th World Congress for Neurorehabilitation 2018, Mumbai.
- Attended the 11th Annual Conference of The Indian Academy of Cerebral Palsy at Bangalore (2016).
- Attended hands-on workshop on Sensory Integration.(2016)
- Attended hands-on workshop on Neurodevelopmental Therapy in Pediatrics.(2016)
- Attended Basic one-day Aquatic therapy workshop.(2017)
- Attended workshop on "Using the ball for therapeutic intervention for children with movement disorders" conducted by Barbara Hodge PT, C/NDT. (2016)
- Completed Basic and Advanced course in Clinical Biomechanics.(2016)
- Completed training in SPSS- For data analysis in medical profession.(2016)

Curriculum Vitae

- Attended seminar on diagnosis and management for back-ache conducted by Indian association of Physiotherapists, Mumbai branch.(2016)
- Attended hands-on workshop on Bobath and adult hemiplegia. (2015).
- Certified Kinesio Taping Therapist. Attended "Hands-on Kinesiological Taping Technique" Workshop Organized by Physical Therapy Research & Educational Foundation, India.(2015)
- Completed level 1 course of Dry Needling conducted by Indian Academy of Dry Needling.(2015)
- Attended the symposium on "Physiotherapy in Burns" at National Burns Centre, Airoli, Navi Mumbai.(2013)
- Participated as a delegate in CPD on "Clinical & Research update in Musculoskeletal Pain" at MGM School of Physiotherapy.(2013)
- Participated as a delegate at GDBPCON 2014.

Administrative Portfolios managed in current Institute:

- IQAC Co-ordinator
- In charge Criteria II NAAC
- Examination In-charge
- Mentorship In-charge
- In-charge of Grievance Redressal Cell
- Member of Academic Committee
- BLS Trainer for MGM School of Physiotherapy at MGM Skills Lab
- Environmental Studies -College Coordinator

Personal Details:

- Date of Birth: 02 August 1992
- Gender: Female
- Marital Status: Married
- Languages Known: English, Hindi and Marathi
- Nationality: Indian

Declaration: I hereby declare that the information furnished above by me is true to the best of my knowledge.

Dr.Shrutika Parab (PT)

Date:

RESUME

Dr. Mamta Shetty (MPT, Musculoskeletal Physiotherapy)

Permanent address : Building C-11 Flat no 12, Kendriya Vihar , Kharghar, Navi Mumbai-410210

Phone No. : 9930662506

Email id: mamtashetty51091@gmail.com

Personal Details –

Age : 29yrs

Sex : Female

Nationality : Indian

Date of Birth : 05/10/1991

Marital Status : Single

Languages known : Hindi, English, Marathi, Gujarati

Career Objective:

To be contributing asset in the field of Physiotherapy, this will provide me exciting opportunities to utilize my skills in an organization which rewards performance with responsibilities & challenging opportunities.

Academic Record :

COURSE	INSTITUTION	UNIVERSITY	YEAR OF PASSING	PERCENTAGE
M.P.Th (Musculoskeletal Physiotherapy)	Terna Physiotherapy College	Maharashtra University of Health Sciences	2017	66.6% (1st rank in college)
B.P.Th	MGM School of Physiotherapy	MGM University of Health Sciences	2014	61.87%
H.S.C	Mahatma School of Academics and sports and Junior College of Arts, Science and Commerce	Maharashtra State board	2009	68.50 %
S.S.C	Atomic Energy Central School No-5	CBSE	2007	72.80%

Publications:

1. Effectiveness of Dry Needling on pain and functions on Shoulder Impingement in population with upper quadrant dysfunction: A Randomized control trial, International Journal of Recent Scientific Research, Vol. 9, Issue 3(F), pp. 25072-25077, March 2018)
2. Grip and Pinch strength: Reference values for Children and adolescents from India – In process of publication in Journal of Pediatric Rehabilitation Medicine, Pubmed Indexed Journal
3. A study of Fine and Manual dexterity among People with Parkinson's disease, Critical Reviews in Physical and Rehabilitation Medicine, Vol. 31, 2019 Issue; DOI: 10.1615/CritRevPhysRehabilMed.2019030473, pages 93-100

Copyrights

1. Reference values for hand grip and pinch strength for Healthy Indian Adolescents; L-97877/2020; 21/12/2020
2. Reference values for hand grip and pinch strength for Healthy Indian Adults; L-100130/2021; 06/05/2021

Project Work

Following projects have been done-

1. **Internship**- assessment of physical fitness in age group 20-60years using fitness test battery.
2. **Final year**- Awareness of Antenatal Exercises in Pregnant Women
3. **MPT**- Effectiveness of Dry Needling on pain and functions on Shoulder Impingement in population with upper quadrant dysfunction: A Randomized control trial

Workshops Done :

Certified practitioner in the following-

1. Kinesio taping
2. Neurodynamic solutions (NDS - Shacklock)
3. Neuromuscular Dry Needling
4. Pilates

Conferences/ Seminars:

- Attended CME on "Updates in Cerebral Palsy: Holistic Approach" organized by MGM School of Physiotherapy in April 2011 in Navi Mumbai.
- Attended workshop on "Critical Thinking in Physical Therapy" organized by MGM School of Physiotherapy, Navi Mumbai.
- Attended seminar on "Disaster Management" by Prof. Ashokkumar V Patil.
- Attended symposium on "Physiotherapy in Burns" at National Burns Centre in November 2013.
- Attended seminar on "Burns Update" at National Burns Centre in September 2014.
- Attended Physio Accord 2014, National Physiotherapy Conference, Bangalore.
- Attended and presented a poster in SIPPHYSIO , Bangalore.
- Attended NCPT- National conference at Cidco Exhibition Centre, Vashi.
- Attended and presented at Medinspire- National conference, DY Patil University, Nerul, Navi Mumbai, January 2019

Extra Curricular Activities:

- Volunteered for "Medical Assessment Camp" organized by Nina Foundation at Welingkar Institute, Matunga.
- Volunteered for Walkathon on "World Heart Day" organized by MGM Hospital, Vashi.

Work Experience :

1. Currently working as Assistant Professor at MGM School of Physiotherapy, Kamothe, Navi Mumbai
2. 4 years experience as a consultant Physiotherapist at Physio Heal Physiotherapy Clinic, Under Guidance of Dr. Neera Chadha (Ex HOD BARC Hospital, Mumbai) Kharghar, Navi Mumbai.
3. 3 years' experience as a MPT student (Musculoskeletal Physiotherapy) at Terna Hospital and Research Centre, Nerul , Navi Mumbai.
4. 6 months Internship at MGM Hospital, Kamothe, Navi Mumbai (Musculoskeletal physiotherapy, Cardiopulmonary physiotherapy, Neuro-physiotherapy and physiotherapy in Community Based Rehabilitation).

Internship at MGM School of Physiotherapy (6 Months),

Clinical postings attended –

- Orthopedic Wards and OPD at MGM Hospital, Kamothe
- Orthopedic Wards and OPD at Mathadi Hospital, Koparkhairane
- Neuro Adult and Pediatric Wards ad OPD at MGM Hospital, Vashi
- Neuro Pediatrics OPD and ICU at MGM Baby Friendly Hospital, Kalamboli
- Neuro Pediatrics at Aashray School, Sanpada
- Neuro Adult and Pediatrics at Cheshire Home, Andheri
- Neuro Adult at "Sharan" Smt. Kamala Raheja Rehabilitation Centre for Paraplegics, Vashi
- Cardio-Respiratory, Medicine, Surgery and Burns Wards, CCU, ICU and OPD at MGM Hospital, Kamothe
- Cardio-Respiratory Wards, CCU and Cardiac Rehabilitation OPD at MGM Hospital, Vashi
- Community Postings at Yusuf Meher Ali Centre, Old Panvel
- Women's Health Wards and OPD at MGM Baby Friendly Hospital, Kalamboli

Maharashtra State OT PT Council:

Registration No. – 003981

Undertakings :

I am confident that I'll do justice to the job entrusted to me with great sense of professionalism and enthusiasm.

Declaration : The above statements are true to the best of my knowledge and belief.

Place: Kharghar, Navi Mumbai

Dr. Mamta Shetty (MPT, Musculoskeletal Physiotherapy)

MGM INSTITUTE OF HEALTH SCIENCES
(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
MGM SCHOOL OF PHYSIOTHERAPY
Sector-1, Kamothe, Navi Mumbai – 410209

CERTIFICATE FROM THE INVESTIGATOR

PROJECT TITLE: Foster Human Movement Science for excellence in Biomechanics training, research, services, technology design and validation for application in health, sport and wellness.
Running Title: FIST for MAST (Movement Applications in Science & Technology)

1. We agree to abide by the terms and conditions of the DST grant.
2. We did not submit this or a similar project proposal elsewhere for financial support.
3. We have explored and ensured that equipment and basic facilities will actually be available as and when required for the purpose of the project. We shall not request financial support under this project, for procurement of these items.
4. We undertake that spare time on permanent equipment will be made available to other users.
5. We have enclosed the following materials:

ITEMS		NUMBER OF COPIES
(a)	Endorsement from the Head of the Institution (on letter head)	One
(b)	Certificate from Investigator	One
(c)	Certificate from Investigator regarding conflict of interest	One
(d)	Name and address of experts/institution interested in the subject/ outcome of the project	One
(e)	Copies of the proposals	One hard Copy

Date : 6th September 2021
Place: Navi Mumbai

Name & Signature of Principal Investigator
Dr. Rajani Mullerpatan

Name & Signature Of Co-Investigator(s)
Dr Bela Agarwal

MGM School of Physiotherapy NAVI MUMBAI

MGM INSTITUTE OF HEALTH SCIENCES
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MGM SCHOOL OF PHYSIOTHERAPY
Sector-1, Kamothe, Navi Mumbai – 410209

Endorsement from PI and Summary Sheet for FIST-2021

Application for [please tick one] ✓Level O Level 1 Level 2 Level 3

- Subject Area (for Level 1, 2 and 3): **Not Applicable**
- Name of the Department (for Level 1, 2 and 3)/ College (for Level O):

  MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai
- Year of Establishment: **2008**
- Name of the University/ Institution (for Level 1, 2 and 3): **Not Applicable**
- Address for correspondence including Telephone, Telegram, FAX, e-mail etc.

  MGM School of Physiotherapy
  Plot No. 1& 2, Sector -1, Kamothe, Navi Mumbai 410 209.
  Contact number: 022-27437866
  Email mgmschoolofphysiotherapy@mgmsopnm.edu.in

- Status of the Institute/ University/ College (attach supporting documents)
  - Academic Status [College (Affiliated/ Autonomous/ Constituent) or Institute/University/ Deemed University]
    Constituent Unit of MGM Institute of Health Sciences
    (Deemed to be University u/s 3 of UGC Act 1956)
  - Financial Status [Government (Central or State Govt.)/ Govt. Aided / Private Colleges]
    Private College
- Total budget: INR 1.5 crore

Information as above is true and is correct.

6 Sep 2024

Signature of the
Head of the Department/ Principal of the College

MGM School of Physiotherapy NAVI MUMBAI

DEPARTMENT OF SCIENCE AND TECHNOLOGY
POLICY ON CONFLICT OF INTEREST

FOR REVIEWER & COMMITTEE MEMBER or APPLICANT or DST OFFICER ASSOCIATED/ DEALING WITH THE SCHEME/ PROGRAM OF DST

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics, are objective measures that is intended to protect the integrity of the decision making processes and minimize biasness. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence/ unprejudiced dealings, prior to, during and subsequent to the currency of the programme to be entered into with a view to enable public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to prevent corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. **Coverage of the Policy**:

a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable on all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in evaluation of proposals and subsequent decision making process.

b) This policy aims to minimize aspects that may constitute actual Conflict of Interests, apparent Conflict of Interests and potential Conflict of Interests in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflict of interests that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor etc.)

2. **Specifications as to what constitutes Conflict of Interest**.

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

(i) Due to any reason by which the Reviewer/Committee Member cannot deliver fair and objective assessment of the proposal.

18. The Comptroller and Auditor General of India, at his discretion, shall have the right to access to the book accounts for this support. **The Department shall open an interest earning Bank account for operation of funds being transferred by DST. The interest thus earned should be reflected appropriately in the Financial Statement of each year submitted to the Department of Science & Technology and the same need to be deposited back to Consolidated Fund of India by using the Non-Tax Receipt Portal (NTRP) i.e., www.Bharatkosh.gov.in**

19. Any unspent amount sanctioned/ interest accrued would be surrendered to the Government through the Bharatkosh site (www.Bharatkosh.gov.in) and the receipt of the same may be enclosed with financial documents. Any carry forward of funds to the next financial year may be considered only with the specific approval of the Department on receipt of proper financial documents/Interim progress report from the university.

20. The Grantee Institution is directed to use the Expenditure-Advance-Transfer (EAT) module of PFMS, and next release will be made only after mapping and following EAT modules by the grantee institutions.

21. Due acknowledgement of technical support / financial assistance resulting from FIST grant of Department of Science & Technology should mandatorily be highlighted by the grantee organization in bold letters in all publications/ thesis /Patents/Prototypes, Media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

22. To give visibility to the identified department, the department may be called as "DST-FIST Sponsored Department". **The Public Notice displaying the Logo of the FIST Program may be suitably displayed in this regard**.

Signed by

6th Sep 2021

Head of the Department/ Centre
or Principal of College

MGM School of Physiotherapy
NAVI MUMBAI

Signed by

Head of the University / Institute

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

6/9/2021

Registrar or Head of Finance

*Chairman of Trust/ Board/ Management

* *Only for Non-Govt. (including Private and Aided) Institutes/ Colleges/ Organizations supported under 50:50 mode as per the FIST Award Letter*

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector-01, Kamothe, Navi Mumbai - 410 209
Tel 022-27432471, 022-27432994, Fax 022 - 27431094
E-mail : research@mgmuhs.com | Website : www.mgmuhs.com

ENDORSEMENT FROM THE HEAD OF INSTITUTION

Project Title: Foster Human Movement Science for excellence in Biomechanics training, research, services, technology design and validation for application in health, sport and wellness.
Running Title: FIST for MAST (Movement Applications in Science & Technology)

1. Certified that the Institute welcomes participation of Dr. Rajani Mullerpatan as the Principal Investigator and Dr. Bela Agarwal as the Co-Investigator for the project and that in the unforeseen event of discontinuance by the Principal Investigator, the Co-Investigator will assume the responsibility for the fruitful completion of the project (after obtaining consent in advance from DST).

2. Certified that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant, will be extended to investigator (s) throughout the duration of the project.

3. Institute assures financial and other managerial responsibilities of the project.

4. Certified that the organization has never been blacklisted by any department of the State Government or Central Government.

Name and Signature of Head of Institution

Date: 6th September 2021

Place: Navi Mumbai

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

REMARKS: In regard to research proposals emanating from scientific institutions/laboratories under various scientific departments the Head of the institution is required to provide a justification indicating clearly whether the research proposals falls in line with the normal research activities of the institution or not and if not, the scientific reasons which merit its consideration by DST.

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector-01, Kamothe, Navi Mumbai - 410 209
Tel 022-27432471, 022-27432994, Fax 022 - 27431094
E-mail : research@mgmuhs.com | Website : www.mgmuhs.com

Endorsement Letter from the Registrar of the University/Head of the Institute/ Principal of the College

(Statement from Employer, on the Letter Head)

This is to certify that:

I. **Dr. Rajani Mullerpatan, Professor- Director** the Head or Coordinator of, **MGM School of Physiotherapy, MGM Institute of Health Sciences, NM** will assume full responsibility for implementing this project proposed under FIST Program of the Department of Science and Technology, New Delhi during year 2021- 2022

II. The date of starts of the Project from the date on which the University/Institute receives the bank draft/cheque/RTGS from the Department of Science & Technology.

III. The Head or Coordinator will be governed by the rules and regulations of the University/Institute and will be under administrative control of the University/ Institute for the duration of the FIST project.

IV. The grant-in-aid by the Department of Science & Technology will be used to meet the expenditure on the FIST project and for the period for which the project has been sanctioned as indicated in the sanction letter/ order.

V. No administrative or other liability will be attached to the Department of Science & Technology at the end of the FIST project.

VI. The University/ Institute will provide basic infrastructure and other required facilities to the investigator for implementing the FIST project.

VII. The University/ Institute will take into its books all assets received under this sanction and its disposal would be at the discretion of Department of Science & Technology.

VIII. Institute assumes to undertake the financial and other management responsibilities of the FIST project.

IX. Organizing institute will participate in the monitoring/ reviewing of the FIST Project whenever they were asked to do so.

Seal of University/Institute Signature
Registrar of University/Head of Institute/ Principal of the College

MGM INSTITUTE OF HEALTH SCIENCES Deemed University Navi Mumbai NAVI MUMBAI

Dr. Rajesh B. Goel
Registrar
MGM Institute of Health Sciences
(Deemed University u/s 3 of UGC Act, 1956)
Navi Mumbai- 410 209

PAMTRONS

A-212 , PRATIK INDUSTRIAL ESTATE , NR. FORTIS HOSPITAL , MULUND – GOREGAON LINK ROAD,BHANDUP (WEST) , MUMBAI – 400078 /PH : 9820159016 / 9930059016 / EMAIL : PAMTRON@YAHOO.COM / GST NO : AEUPM1914P1ZR

QUOTATION – HAND HELD VASCULAR DOPPLER – L150R

DETAILS OF RECEIVER/BUYER (BILLED TO)		KIND. ATTN : DR BELA AGARWAL	QUOTATION NO	165/21-22
NAME	MGM SCHOOL OF PHYSIOTHERAPY	EMAIL :	DATE	20.09.2021
ADDRESS	SECTOR 1, KAMOTHE, NAVI MUMBAI - 410209		GSTIN	27AEUPM1914P1ZR
STATE	MAHARASHTRA		ENQUIRY REF	VERBAL
GST NO			VENDOR CODE	N.A.

SR. NO.	EQUIPMENT NAME	QTY.	RATE PER UNIT INR	TOTAL AMOUNT INR
01	*HAND HELD VASCULAR DOPPLER FOR ABI* ***PRODUCT CODE: L150R*** WITH 8 MHZ PROBE	01	65000/-	65,000/-
	SUPPLIED WITH GEL, SOFT PADDED CARRY POUCH, ABI BP CUFF WITH MANOMETER, SOFTWARE FOR ABI CALCULATION AND MANUAL.			
TOTAL AMOUNT				65,000/-
GST 12 %				7,800/-
TOTAL AMOUNT				72,800/-

TOTAL AMOUNT: RS. SEVENTY TWO THOUSAND EIGHT HUNDRED ONLY

PAMTRONS

A-212 , PRATIK INDUSTRIAL ESTATE , NR. FORTIS HOSPITAL , MULUND – GOREGAON LINK ROAD,BHANDUP (WEST) , MUMBAI – 400078 /PH : 9820159016 / 9930059016 / EMAIL : PAMTRON@YAHOO.COM / GST NO : AEUPM1914P1ZR

TERMS AND CONDITIONS OF SALES

1 : VAILIDTY –UPTO 30 DAYS FROM DATE OF QUOTATION					
2. TAX : GST 12% EXTRA AS SHOWN ABOVE					
3. FREIGHT : INCLUSIVE					
4. TERMS AND PAYMENT: 50 % ADVANCE ALONG WITH CONFIRM PURCHASE ORDER AND BALANCE 50% AGANIEST DELIVERY IN FAVOR OF "PAMTRONS"					
5. DELIVERY : WITHIN 2 WEEKS AFTER CONFIRM PURCHASE ORDER					
6. WARRANTY : ONE YEAR ON ELECTRONIC PARTS AGANIEST ANY MANUFACTURING DEFECTS , ACCESSORIES & CONSUMABLES ARE NOT COVERED UNDER WARRANTY					
7. MODE OF DISPATCH : BY HAND / COURIER					
TERMS AND CONDITIONS OF SALES:-			ADDITIONAL DETAILS IF ANY		
1)	GOODS ONCE SOLD WILL NOT BE TAKEN BACK.		1. MODE OF TRANSPORT		
2)	INTEREST @ 18% WILL BE CHARGED ON BILL NOT PAID WITHIN DUE DATE.		2. TRANSPORTER NAME		
3)	ALL DISPUTES SUBJECT TO THE JURISDICTION OF MUMBAI HIGH COURT.		3. VEHICLE NO.		
CERTIFIED THAT THE PARTICULARS GIVEN ABOVE ARE TRUE AND CORRECT.			4. ELECTRONIC REFERENCE NO.		
BANK DETAILS:					
BANK NAME	STATE BANK OF INDIA		PAMTRONS		
A/C No.	30641369544				
IFSC CODE	SBIN0011672				
BRANCH					
MULUND- GOREGAON LINK ROAD			(AUTHORISED SIGNATORY)		
MULUND (W) , MUMBAI 400080			NAME OF AUTHORISED SIGNATORY:	PARESH MODH	DESIGNATION: PROPRIETOR

O/C

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

MGM/SOP/458 /2021

Date: 23/09/2021

To,
The Research Director,
MGM Institute of Health Sciences,
Navi Mumbai

Subject: Submission of Proposal titled "**SISTER**: Squat **I**ntervention Squat **T**est for **E**valuation & **R**ehabilitation- novel, non-invasive tool to monitor, assess and manage Osteoarthritis of Knee to improve physical function and social participation"

Respected Madam,

We are pleased to inform you that a proposal titled "**SISTER**: Squat **I**ntervention Squat **T**est for **E**valuation & **R**ehabilitation- novel, non-invasive tool to monitor, assess and manage Osteoarthritis of Knee to improve physical function and social participation" submitted to Pfizer competitive grant program 2021 IM G ADVANCE Chronic Pain Research on 23rd September 2021.

Please find attached a copy of the proposal submitted to Pfizer for records.

Thank you for your support.

Kind regards,

Dr. Rajani Mullerpatan

CC: Registrar, MGM Institute of Health Sciences, Kamothe Navi Mumbai

Professor - Director
MGM School of Physiotherapy
MGMIHS, Navi Mumbai

Encl. 1. Submitted Application
2. Acknowledgement Receipt

23/09/2021

Your Submitted Application

The application you previously submitted appears below. No further changes may be made to this application. Click here to return to the Welcome page.

Introduction

* Pfizer Policy on Submission of a Research Proposal	I agree to the Pfizer Research Submission Policy
* Financial Disclosure by Pfizer	I agree to the Financial Disclosure Statement.
Contract Agreement Terms	I agree to the Contract Agreement Terms
Note:	
* Authorized Signatory Name	Dr. Rajani Mullerpatan
* Authorized Signatory Email	rajani.kanade@gmail.com
Additional Authorized Signatory Name (Optional)	
Additional Authorized Signatory Email (Optional)	
Fully Executed Contract	

Contact Information

* Salutation	Dr
* First Name	Rajani
* Last Name	Mullerpatan
* Title/Position	Professor- Director
* E-mail Address	rajani.kanade@gmail.com

* Legal Entity Name	MGM Centre of Human Movement Sciences,MGM School of Physiotherapy,MGM Institute of Health Sciences
Practice or Private Physician Office	No
* Organization Type	Higher Education
* Country	India
* Address 1	Sec 1, Kamothe
Address 2	
* City	Navi Mumbai
Province	
* Zip/Postal Code	410209
Website Address	
Organization Mission Statement	The mission of the organization is focus on finding better, safer and affordable ways diagnosing, treating and preventing diseases while maintaining highest ethical standards

Project Lead/Principal Investigator (PI)

Primary Investigator Information

* PI First Name	Rajani
PI Middle Name	
* PI Last Name	Mullerpatan
* PI Email	rajani.kanade@gmail.com
PI Phone Number	+918876768866
* Principal Investigator (PI) is a US-licensed physician	No
* PI Address Country	India

PI Address Province	Maharashtra
* PI Address Postal Code	410209
PI Current Position Title	
* PI Primary Degree	Ph.D. - Prof / Researcher
* Institution and Location of Primary Degree	Cardiff University, United Kingdom
* Completion Date of Primary Degree	03/01/2007
* Field of Study	Biomechanics
PI Secondary Degree	
Institution and Location of Secondary Degree	
Completion Date of Secondary Degree	
Field of Study of Secondary Degree	
PI Positions and Honors	Dr Mullerpatan is Prof-Director at MGM School of Physiotherapy, MGM Institute of Health Sciences from 2008 till date. Awards and Honours received: (a) International: * Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme on the development of the Package of Interventions for Rehabilitation Honorary Research Associate, Cardiff University, UK (2011-2013) * Dr. PN Berry Scholarship Award. High Commission of India, London, UK, 2002-2003 (b) National: * Indian Association of Physiotherapists Award, 2010.
PI Contributions to Science	Dr. Rajani Mullerpatan has made significant original

exploration of indigenous movements for collateral restoratic of heritage of traditional Indian movement forms of daily living, Yoga, sports and classical dance forms. In parallel, she has utilized this knowledge for design of movement- pertinent technology for enhancement of human movement performance and rehabilitation of people with movement disorders; which is useful for the masses in rural and urban sector to address unmet needs in healthcare- through interdisciplinary collaborative research with engineers at national and international level. The DNA of Dr. Mullerpatan research work is marked by interdisciplinary, translational and sustainable innovations, underpinned by original scientific knowledge of traditional India human movement forms engaging the biomechanical marvel of human body, to address unmet needs in healthcare of people with disposal income and low disposal income, to create a scalable societal and economic impact.

Dr. Mullerpatan efforts to conduct research in human movement science began with first establishing a facility to conduct research in this area in India. She established MGM Centre of Human Movement Science at MGM School of Physiotherapy, MGM Institute of Health Science in 2015. She garnered financial support from MGM Institute of Health Sciences, International Society of Biomechanics and BETIC, IIT-Bombay to create an exclusive facility for inter-disciplinary research, training, patient care and technology design and validation under one roof for health professionals and engineers. Creating such an exclusive facility in a self- funded private Higher Academic Institute in India in 2015 was a huge challenge because of a thin line of mega divide, which exists between Government Institutes and private Institutes in India. Thereafter, she developed an interdisciplinary ecosystem constituted by researchers and innovators from Government and Private Higher Academic Institutes across India, UK, Canada and Australia necessary to embark on the mission of exploring human movement science applications for health promotion, early detection, prevention and rehabilitation of disability.

She commenced this mission by filling the huge knowledge gap identified in scientific literature on the level and profile of function of healthy Indian people because India is the second most populous country, which presents its own exclusive culture, and it would not be appropriate to pick the data off the shelf, which is generated from other population groups. Therefore, it was essential to generate the reference values for Indian population to plan efficient culturally palatable rehabilitation programs. Key sub-areas of work included spine care, upper extremity function, health related fitness in diabetes, evidence-based model of care, biomechanical exploration of traditional daily life postures namely squat:

Additional PI Information	The principal investigator has contributed to a chapter- Chapter Number 19, titled 'Biomechanics of Indigenous Postures' 5th edition of the Textbook titled 'Basic Biomechanics of the Musculo-skeletal System', Wolters Kluwer (2021). The principal investigator has been a part of a number of technologies developed: 1. A device for measurement of tissue stiffness of a body part was developed for early detection of tissues, at risk of breakdown; for e.g. plantar tissue of feet in people with diabetic neuropathy. The device has potential for application in various other clinical conditions. This device was designed in in collaboration with Bio Engineering Incubation Centre at IIT Bombay. 2. 'STIMU': device was designed for measurement of plantar tissue stiffness for screening diabetic foot by early detection of diabetic neuropathy named: in collaboration with Bio Engineering Incubation Centre at IIT Bombay. The device is in stage of clinical trials. 3. A powered transtibial prosthesis was developed for people with below knee amputation incorporating a bi-articular actuator. The study was funded by Department of Biotechnology, Government of India. The patent application for the same is in process. 4. I-sens gait analysis wearable inertial sensor-based system developed by IIT- Madras: Biomechanical input was provided for validation of the gait analysis system with the gold-standard 3D system for motion analysis. 5. A novel spring- loaded passive exoskeleton was designed and developed for reducing muscle activity of trunk muscles (erector spinae group of muscle) in Mathadi workers. The patent application for the same is in process.

Co-Investigator Information

Co-PI First Name	Bela
Co-PI Middle Name	
Co-PI Last Name	Agarwal
Co-PI Primary Degree	Ph.D. - Prof / Researcher

Study Details

* Project Type	General Research: Health Services Research (No focus on a Pfizer Drug)
* Grant Request Type	Funding
* Primary Area of Interest	Pain - Osteoarthritis
Secondary Area(s) of Interest	Pain - Chronic
* Competitive Grant?	Yes
Competitive Grant Program Name	2021 IM G - ADVANCE Chronic Pain Research
* Pfizer-Sponsored Studies/Collaborations	No
* Has your institution submitted this project for consideration to Pfizer previously?	No
* Study Title	SISTER: Squat Intervention Squat Test for Evaluation & Rehabilitation- novel, non-invasive tool to monitor, assess and manage Osteoarthritis of Knee to improve physical function and social participation
* Abstract	Rationale: Current clinical practice for knee osteoarthritis uses radiograph as a common tool for evaluation, monitor disease progression and outcome of range of non- surgical and surgical-interventions for management of pain and enhancement of physical-function. However, no single intervention has proven most effective in delaying functional decline caused by progression of OA. Moreover, frequent exposure to radiographs is known to cause radio necrosis. Therefore, an urgent need to design a novel, non--invasive clinical tool to evaluate physical function, monitor disease progression in knee OA and provide comprehensive management(including functional activity+CBT+Nutritional supplements) for patient adherence. Research Objective: Development of non-invasive clinical bedside toolkit to

Design: Phase I: Analytical Cross- sectional study; Phase II: Randomised controlled trial

Setting: Urban areas of Navi Mumbai, India

Participants: Ninety-two people with knee Osteoarthritis(varying severity); 100 healthy individuals at risk of developing OA knee.

Intervention and procedures: The participants will be evaluated for physical-function, radiological and biochemical marker pre and post exposure to newly-developed novel, non-invasive 30-second stress test on the articular cartilage after ethical-approval. The participants will be re-tested for progression of inflammatory response following 12-week intervention using same outcome-measure.

Measurements: MRI, Non-invasive biomarker, functional(including biomechanical)evaluation

Expected outcome of the research:

Early identification of OA, improve physical function, delay functional decline caused by disease progression, enhance physical-function and social participation.

Potential study limitations: Socio-cultural barriers to participation

* Protocol/Full Proposal	• ADVANCE chronic pain Pfizer 2.docx (861.85 K), uploaded by Dr. Rajani Mullerpatan on 09/22/2021
External Identification Number	
* Estimated Study Start Date	11/15/2021
* Estimated Study End Date	11/30/2024
* Project/activity related to pain or opioids	No
* Will any component of your activity/intervention offer continuing education credit?	No
* Research Setting	Single Site
* Primary Country Site	India

DST/WOS-B/HN-37/2021- Poonam (G)
Government of India
Ministry of Science & Technology
Department of Science & Technology
(WISE-KIRAN Division)

Technology Bhavan,
New Delhi-110016
Dated: 05.1.2022

ORDER

Sub:-Financial assistance for the project titled "**Mobile based application for tele-rehabilitation for self empowerment of community dwelling elderly people for maximization of physical function - A pilot study**"

PI: **Ms. Poonam Desai** , Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.

Sanction of the President is hereby accorded to the approval of the above mentioned project at a total cost of **Rs.30,42,600/- (Rupees Thirty Lac Forty Two Thousand Six Hundred Only)** for a duration of **three** years. The detailed breakup of the grant for General & Capital Components are given below:-

General Component	**Rs.30,15,600/-**
Capital Assets	**Rs.27,000/-**
TOTAL	**Rs.30,42,600/-**

S. No.	Proposed Budget Head	1st year	2nd year	3rd year	Total
Non-Recurring (Capital Assets)					
1.	Pulse oximeter	1,000/-	-	-	1,000/-
2.	Peak flow meter	1,750/-			1,750/-
3.	Weinstein Monofilaments	27,474/-			27,474/-
4.	Portable Stadiometer	1,736/-			1,736/-
A	***TOTAL***	28,960/- **(Rs.27,000/- Restricted)**	-	-	28,960/- **(Rs.27,000/- Restricted)**
Recurring (General)					
Recurring-I (Manpower)					
	Fellowship for Master of Physiotherapy @ Rs.40,000/PM + 24% HRA for 36 months	5,95,200/-	5,95,200/-	5,95,200/-	**17,85,600/-**
Recurring-II (Consumables &Travel)					
	-Consumables: Rs.30,000/- Chemicals, reagents etc. Other Cost: Rs.9,05,000/- -Travel: Rs.50,000/- (Capping for 3 years)	3,30,000/-	3,30,000/-	3,25,000/-	**9,85,000/-**
Recurring-III(Contingency)					
	Miscellaneous Expenses	15,000/-	15,000/-	15,000/-	**45,000/-**
Recurring-IV(Overhead Charges)					
	Overhead Charges	70,000/-	65,000/-	65,000/-	**2,00,000/-**
B	***Total***	**10,10,200/-**	**10,05,200/-**	**10,00,200/-**	**30,15,600/-**
Grand Total (A+B)		**10,37,200/-**	**10,05,200/-**	**10,00,200/-**	**30,42,600/-**

05/01/2022

2. The sanction of the President is also accorded to the release of **Rs.10,10,200/- (Rupees Ten Lac Ten Thousand Two Hundred Only)** to the **MGM Institute of Health Sciences, Navi Mumbai, Maharashtra – 410209** being the first installment of grant for implementation of the above mentioned project.

3. While providing operational flexibility among various sub head under head Recurring-II, it should be ensured that not more than Rs.50,000/- should be spent for Travel in 3 years.

4. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

5. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

6. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE&UC has to be furnished for the released Capital head grant.

7. The grant-in-aid being released is subject to the condition that

(a) As per Rule 149 of GFR, 2017, the Goods (Consumables/equipment) available in GeM portal are to be procured mandatorily online through GeM only.

(b) While submitting Utilization Certificate & Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

(C) ***"GI is advised to start using EAT module and next release will be made only after mapping and following EAT modules by the Grantee Institution".***

8. "The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing account. For Grants released during F.Y. 2019-20 and onwards, all interests and other earnings against released Grant shall be remitted to Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e. www.bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of Grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure / Utilization Certificate for considering subsequent release of Grant/ Closure of Project accounts."

9. (a). DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

(b). DST reserves rights to close the project activity any time based on the review of progress of the project.

(c). A prior intimation to DST by grantee is must before leaving the country for attending conference/availing any short term fellowship abroad during the project tenure.

10. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

Parveen Kumar 05/11/2022

11. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

12. Failure to comply with the terms and condition of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

13. The targeted deliverables along with the timelines as proposed in the project are annexed herewith. The subsequent releases will be made on the basis of "Targets Vs Achievement".

14. The expenditure involved is dubitable to Demand No.88, Department of Science & Technology for the year 2021-22:

3425	Other Scientific Research (Major Head)
60	Others (Sub-Major Head)
60.200	**Assistance to other Scientific Bodies (Minor Head)**
68	Science and Technology Institutional and Human Capacity Building (Sub Head)
01	Disha Programme for Women in Science
68.01.31	**Grants-in-aid General** for the year 2021-22 **(Voted)**
	(Previous: Disha Programme for Women in Science 3425.60.200.55.01.31)

15. The amount of **Rs.10,10,200/- (Rupees Ten Lac Ten Thousand Two Hundred Only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to the **MGM Institute of Health Sciences, Navi Mumbai, Maharashtra – 410209.** The bank details for electronic transfer of funds through RTGS are given below:-

Institution Account Name	MGM Institute of Health Sciences, Dream-E project
Saving Bank Account Number	0183104000334013
Name of Bank	IDBI Bank
Branch Name	Belapur, Navi Mumbai – 400614
RTGS/IFSC Code	IBKL0000183
MICR Code	400259023

16. As per Rule 234 of GFR 2017, this sanction has been entered at S. No.604 in the register of grants maintained in the Division for the scheme **(WISE-KIRAN-WOSB).**

17. This issues with the concurrence of IFD Vide their Concurrence Dy. No. **C/3965/IFD/2021-22** Dated: 03.1.2022.

05/01/2022

(Pawan Kumar)
Scientist-'C'
011-26590290

The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.

Copy for information and necessary action to:-

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Deptt), AGCR Building, New Delhi – 110 002.
4. Sanction Folder
5. Head (WISE-KIRAN)
6. **Ms. Poonam Desai ,** Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.
7. **Dr.Ranjani Mullerpatan** (Mentor), Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.

Pawan Kumar 07/01/2021

(Pawan Kumar)
Scientist-'C'
011-26590290

DST/WOS-B/HN-37/2021- Poonam (C)
Government of India
Ministry of Science & Technology
Department of Science & Technology
(WISE-KIRAN Division)

Technology Bhavan,
New Delh-110016
Dated: 05.1.2022

ORDER

Sub:-Financial assistance for the project titled **"Mobile based application for tele-rehabilitation for self empowerment of community dwelling elderly people for maximization of physical function - A pilot study"**

PI: **Ms. Poonam Desai** , Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.

In continuation of the Sanction Order No. **DST/WOS-B/HN-37/2021- Poonam (G)** dated 05.1.2022 the Sanction of the President is also accorded to the release of **Rs.27,000/- (Rupees Twenty Seven Thousand Only)** to the **MGM Institute of Health Sciences, Navi Mumbai, Maharashtra – 410209** being the grant under "Capital Component" for implementation of the above mentioned project. The details of the equipment to be procured are given below:

S. No.	Proposed Budget Head	1st year	2nd year	3rd year	Total
Non-Recurring (Capital Assets)					
1.	Pulse oximeter	1,000/-	-	-	1,000/-
2.	Peak flow meter	1,750/-	-	-	1,750/-
3.	Weinstein Monofilaments	27,474/-	-	-	27,474/-
4.	Portable Stadiometer	1,736/-	-	-	1,736/-
	TOTAL	28,960/- **(Rs.27,000/- Restricted)**	-	-	28,960/- **(Rs.27,000/- Restricted)**

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

4. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

5. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE&UC has to be furnished for the released Capital head grant.

6. The grant-in-aid being released is subject to the condition that :

Pawan Kumar
05/01/2022

(a) As per Rule 149 of GFR, 2017, the Goods (Consumables/equipment) available in GeM portal are to be procured mandatorily online through GeM only.

(b) While submitting Utilization Certificate & Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

(C) ***"GI is advised to start using EAT module and next release will be made only after mapping and following EAT modules by the Grantee Institution".***

7. **"The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing account. For Grants released during F.Y. 2019-20 and onwards, all interests and other earnings against released Grant shall be remitted to Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e. www.bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of Grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure / Utilization Certificate for considering subsequent release of Grant/ Closure of Project accounts."**

8. DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

10. Capital grant should be utilized within One year from the date of project sanctioned otherwise amount has to be refunded to DST.

11. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

12. Failure to comply with the terms and condition of the Bond (if applicable) will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

13. The expenditure of **Rs.27,000/-** involved is dubitable to Demand No.88, Department of Science & Technology for the year 2021-22:

3425	Other Scientific Research (Major Head)
60	Others (Sub-Major Head)
60.200	Assistance to other Scientific Bodies (Minor Head)
68	Science and Technology Institutional and Human Capacity Building (Sub Head)
01	Disha Programme for Women in Science
68.01.35	**Grants for creation of capital** assets for the year 2021-22 (Voted) (Previous: Disha Programme for Women in Science 3425.60.200.55.01.35)

14. The amount **Rs.27,000/- (Rupees Twenty Seven Thousand Only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to the **Director, MGM Institute of Health Sciences, Navi Mumbai, Maharashtra – 410209.** The bank details for electronic transfer of funds through RTGS are given below:-

Pawan Kumar 05/01/2022

Institution Account Name	MGM Institute of Health Sciences, Dream-E project
Saving Bank Account Number	0183104000334013
Name of Bank	IDBI Bank
Branch Name	Belapur, Navi Mumbai – 400614
RTGS/IFS Code	IBKL0000183
MICR Code	400259023

15. As per Rule 234 of GFR 2017, this sanction has been entered at S. No. 604 in the register of grants maintained in the Division for the scheme **(WISE-KIRAN: WOS-B).**

16. This issues with the concurrence of IFD Vide their Concurrence Dy.No. **C/3966/IFD/2021-22 Dated: 03.1.2022.**

Pawan Kumar 05/01/2022

(Pawan Kumar)
Scientist-'C'
011-26590290

To

The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.

Copy for information and necessary action to:-

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Deptt), AGCR Building, New Delhi – 110 002.
4. Sanction Folder.
5. Head (WISE-KIRAN)
6. **Ms. Poonam Desai ,** Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.
7. **Dr.Ranjani Mullerpatan** (Mentor), Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences, Sector1, Kamothe, Navi Mumbai, Maharashtra – 410209.

Pawan Kumar 05/01/2022

(Pawan Kumar)
Scientist-'C'
011-26590290

PROJECT PROPOSAL

List of Fields to be filled online under WOS-B Personal and Project Details

(A) Personal Details

Name : Poonam Rajesh Desai

Father Name/ Mother Name: Amruta Rajesh Desai

Marital Status : Unmarried

Husband Name : NA

Date of Birth : 16th June, 1991

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Category : Allied Sciences

Employment Status **:** Full time PhD Scholar

(B) Career break after attaining highest qualification:

(C) One year eight months From Date: 1st October, 2017 To Date: 30th June, 2019. Reason for Break: Family issues.

(D) Highest Educational Qualification Details:

Masters in Physiotherapy (MPTh)**:** Sunandan Divatia School of science under Narsee Monji Institute of Management studies, Ville Parle.

Subject:

Musculoskeletal Sciences

Year of Completion:

2017

Dissertation:

Role of hip muscle strength and flexibility on gait in healthy young adults- (MPTh)

(E) Educational Qualification (12th Standard Onwards)

Degree	Year Completion	University/Board/ Institute	Specialization/ Subject	Marks (Percentage)/ CGPA
HSC	2009	Vasant Vihar Jr colleg Thane (w) Maharasht State Board	Physics, Chemistr Biology, Maths and Hindi	72.50%
BPTh	2014	Mahatma Gand Missions Institute Health Science MGM School Physiotherapy, Navi Mumbai	Musculoskeletal Physiotherapy (PT Neuro PT, Cardi vascular PT ar Preventive Community PT	63.37%
MPTh	2017	Sunandan Divat School of Scienc under Narsee Mon Institute of Management studie Ville Parle	Musculoskeletal Physiotherapy	69.6% GPA:3.24/5

(F) Last three Employment Details (in bullets points) (5000 characters Max):

- Nightingales Home Health Services, Vashi (July 2017-September 2017): Clinical Physiotherapist, home health care services: All cases assessment and management.
- Healthspring Community Medical Centre, Thane (July 2014- June 2015): Clinical Physiotherapist, assessment and management of Musculoskeletal, Cardio-pulmonary and Neuro physiotherapy cases at center and home level.

(G) Papers Published:

No. of Papers Published in Referred Journals**:** None

(H) Significant Publications (Best 3 Papers Published) : None

(I) Guide Name, Designation & Address:

Dr. Rajani Mullerpatan (Prof-Director)
Mahatma Gandhi Missions School of Physiotherapy, MGM Institute of Health Sciences,
Sector1, Kamothe, Navi Mumbai,
Maharashtra-410209, India.

(J) Project Details:

Project Title : Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study

Running title : **D**istance **R**ehabilitation of the **A**ged People using **M**obile Based App (DReAM-E)

Project Theme Areas : Built awareness of Physiotherapy and self-empowerment of community dwelling elderly people for maximization of physical function.

Project Duration (in years) : 2 years and 2 months

Total Project Cost (Rs. in lakh) : INR **2415008.00**

Objectives (in bullets points) (2500 characters Max):

- Develop awareness about effects of ageing on body systems, physical function and benefits of geriatric rehabilitation.
- Facilitate independent living through mobile based application for tele-rehabilitation.
- Early detection of risk of falls and commonly encountered neuro-motor conditions for empowering the elderly and referral framework through mobile application.

Review of work done at National and International level including need in Society (in bullets points) (2500 characters Max):

International status:

Telecare has enabled diagnosis, treatment, education, and rehabilitation of number of chronic diseases. Telecare solutions have made it possible to monitor patients with chronic diseases, such as heart failure, diabetes, hypertension, asthma, chronic obstructive pulmonary disease, cardiovascular diseases and stroke.[1] Similarly, tele-rehabilitation has been successfully used for monitoring the rehabilitative progress in patients with stroke (monitoring, user interface, balance recovery), pulmonary conditions, cognitive impairments, (speech pathologies, autism, cognitive stimulation), multiple sclerosis, disabilities, osteoarthritis and cardiac disorders.[2] Telemedicine-based care has proven to provide remote health and social care to maintain older adults level of independence and to improve their quality of life. Although studies have stated a number of benefits for telecare, some limitations were also found. Older people were found resistant to use of new technology, with respect to acquiring the knowledge and skills necessary for use of electronic devices and computer systems.[1]

National status:

Telecare solutions are implemented for monitoring and rehabilitation of patients with knee osteoarthritis, post-total knee arthroplasty, chronic obstructive pulmonary diseases, stroke, cerebral palsy, neuromuscular disorders and cardiopulmonary conditions. A systematic review and meta- analysis were conducted in 2017, concluded that telecare studies conducted in India are very limited.[3] Telemedicine is a new concept, upcoming mobile based awareness of physical function and geriatric rehabilitation for elderly people and caregivers is of utmost importance. It will make them aware about physical function decline at an early stage and will enable them to seek appropriate rehabilitation at the earliest.

Telemedicine Practice Guidelines: Medical Council of India, 2020 https://www.mohfw.gov.in/pdf/Telemedicine.

Need of the study:

- According to 2011 census of India, out of 1.21 billion total population of India, 53 million were females and 51 million were males aged 60 years or above. India is poised to become home to the second largest number of older persons in the world.
- In India there is a rising population of elderly people living alone in the community in both rural and urban settings because the young working adults from villages are migrating to urban cities within India and from the urban cities the youth are migrating International for better working opportunities.
- In the urban settings, radically changing lifestyle and housing designs are responsible for people living alone in their own homes.
- Inaccessible transport, lack of paratransit program and senior shuttle for elderly, makes it difficult for them to travel independently.
- In situations, like the current Covid pandemic, re-occurring natural disasters in most parts of India such as cyclone in Maharashtra and West Bengal, floods in Odisha, landslides in Sikkim, etc, it is next to impossible for the elderly people living on their own to seek health care services.
- Thus, due to physical and mental comorbidities; natural disasters; staying alone; financial and transportation issues elderly individuals find it difficult to commute and to reach the tertiary care centers for checks ups, treatments, rehabilitation or follow up.
- With ageing elderly individuals exhibit an overall physical, functional and cognitive decline. Presence of > 2 multimorbidities, contribute in declining the functional status of older adults. Integrated function decline, increases falls risk. Falls lead to mild-to-severe injuries such as bruises, internal injuries, sprains, grazes, cuts, fractures (hip fractures), traumatic brain injuries, upper limb and lower limb injuries and are also underlying cause of emergency departmental visits. This factor ultimately deteriorates their health-related quality of life.
- Prescription of rehabilitation measures to optimize mobility, maintain muscle strength, functional capacity, improve balance and co-ordination requires periodic upgradation of activity prescription involving multiple visits to health-care facilities. In the absence of scientific feed-back, the elderly remains at a lower level of physical activity due to fear and lack of knowledge regarding safe limits, which can ultimately lead to early functional decline, decreased participation in societal activities and poor quality of life.
- Role of Physiotherapy care in geriatric rehabilitation is well established. Geriatric rehabilitation

aims at maintaining and improving elderly individuals' physical abilities and functional independence thus improving their health-related quality of life.

- However, in India, Physiotherapy care in geriatric rehabilitation is only available in metropolitan cities and only prevail to the affording population. Hence elderly people lack awareness of the same and are deprived of much needed geriatric rehabilitation.
- Considering the day-to-day problems faced by the elderly people in availing rehabilitation facilities; in order to decrease social, financial and economic burden on the society, developing a system for awareness and providing information on role of physiotherapy care in geriatric rehabilitation amongst elderly people and their caregivers in India is deemed essential.
- Mobile based application for tele-rehabilitation will provide the opportunity to develop awareness of physical function decline with ageing, importance of geriatric rehabilitation in improving physical function, aiding self-rehabilitation amongst elderly and an opportunity to discuss issues faced by elderly in performing exercises, thus ensuring greater involvement of the elderly in managing their physical function.

Work Plan (in bullets points) (2500 characters Max):

Key Action Steps	Timeline	Expected Outcome
1.Survey (Questionnaire: open end and closed end questions + Focus Group Discussion)	0-6 months	To understand their knowledge and attitude towards functional decline with ageing, physical problems faced and extent of physical functional decline; identification of existing coping strategies; usual consultation pattern; barrier to care seeking; family support; co-morbidities; ongoing treatment, gaps and to make them aware about the expected physical function decline with ageing
2.Comprehensive physical function assessment: (120 participants) Clinical assessment	6-12 months	(Obtaining a written consent from participant and caregiver) Identification of affected body functions, activity limitation and participation restriction components in elderly people. Briefing the caregivers about the elderly individuals' physical function limitations and emphasizing importance of rehabilitation.
3. First supervised physiotherapy training session for elderly people and caregiver	12- 18months	(Obtaining a written consent from elderly individual and caregiver) For elderly and caregiver: Ensure proper learning technique and awareness about the do's and don'ts, For therapist: To understand their capacity to perform that exercise, to identify appropriate dosage of exercises to be set for mobile based application for tele-rehabilitation

4. A. Development of mobile based application for tele-rehabilitation B. Implementation of mobile based application for tele-rehabilitation for elderly	18-23months	Mobile based application will be available to pilot test 120 elderly individuals from urban and rural setting of Mumbai & Navi Mumbai It would be IT friendly for the elderly and the caregivers Training them in operating the mobile based tele-rehabilitation Self-empowerment of community dwelling elderly people for maximization of physical function through mobile based tele-rehabilitation
4. Report writing	23-26 months	Publication and report submission

METHODOLOGY:

1.*Study Population*: Elderly people 60-80 years will be recruited from Mahatma Gandhi Missions (MGM) hospitals situated in Navi Mumbai, residential areas situated in Mumbai & Navi Mumbai and 5 villages adopted by MGM Institute of Health Sciences by Unnat Bharat abhiyan.

Inclusion criteria: Individuals 60-80 years and able to read, hear, understand and follow the visual data and auditory data.

Exclusion criteria: Elderly people with a history or current manifestations of Cardiopulmonary diseases, Stroke, Parkinson's, Multiple sclerosis, Myasthenia gravis, Neuromuscular diseases, Encephalitis, Amyotrophic lateral sclerosis, Dementia, Alzheimer's disease, Spinal cord injury, Ataxia, Brain tumors, Cerebral aneurysm, Epilepsy and Seizures, Guillain barre syndrome, Head injuries, Meningitis, Cancer, any Systemic malfunction, Physical disabilities, Spinal disc herniation or dislocation & fractures will be excluded. These medical conditions will make it difficult for elderly people to physically operate the mobile based application as well as to read, understand and follow the visual and auditory data. (Elderly individuals with above mentioned conditions require committed designed applications). This application will only include healthy geriatric individuals.

2.*Sample size*: 120 (60 Urban [30-M; 30-F] & 60 Rural [30-M; 30-F]) assuming 20% attrition rate.

3. *Study Period*: 2 years and 2 months.

4.Procedure:

Phase I: Participants will be recruited from Mahatma Gandhi Missions (MGM) hospitals situated at Navi Mumbai, residential areas situated in Mumbai, Navi Mumbai and 5 villages adopted by MGM Institute of Health Sciences by Unnat Bharat abhiyan.

A questionnaire with open ended and close ended questions will be administered by the researcher (Physiotherapist) in person or through telephone across different age span, gender, socio-economic status, setting (urban and rural) for elderly people to understand their knowledge and attitude towards functional decline with ageing. Questionnaire will be

validated by experts (Physiotherapists (PT)- Musculoskeletal PT, Neuro PT Community-Based Rehabilitation PT, Cardiorespiratory PT, Community Medicine experts and Geriatric Medicine experts).

A sample representative of population will be drawn for focus group discussion. Focus group discussion questions will be defined to address their knowledge and attitude towards functional decline with ageing; their existing coping strategies; usual consultation pattern; barrier to care seeking; family support; co-morbidities; ongoing treatment; feasibility, acceptance and importance of functional monitoring and rehabilitation. This discussion will also help identify their functional limitations in day today life. Elderly people will be made aware about the functional decline observed with ageing, its impact on their activities of daily living and quality of life and physical function rehabilitation will be emphasized.

A consent will be obtained from the participant or caregiver before conducting a comprehensive geriatric assessment and to participant in mobile based application for tele-rehabilitation.

Phase II:

1.Comprehensive geriatric assessment (CGA) will be conducted based on International Classification of Disease (ICD) model by World Health Organization using clinical assessment instruments. Assessment will be conducted on the participant at feasible site that is either at participants own environment or geriatric OPD's at various hospitals of MGM within Navi Mumbai. Outcome variables such as Barthel Index, Lawton Instrumented Activities of Daily Scale and Ground Level Activity Questionnaire will be used to score their basic and instrumented activities of daily living and caregiver strain index to determine level of stress and burden that has consequences on caregiver's overall health while caring for older adults. CGA will help identify the affected body function, activity limitation and participation restriction components in elderly people. Example: Walking can be limited due to lower limb muscle strength, endurance and flexibility; or impaired balance and coordination or impaired cardiorespiratory endurance. Limited walking will eventually lead to restricted outdoor mobility and transportation. Affected physical components, level of activity limitation and participation restriction reported and assessed will aid at designing the components of mobile based application according to and focused on elderly people needs.

2.Comprehensive geriatric assessment (CGA) followed by 1st physiotherapy training session will

be conducted on 120 elderly individuals (60-Urban & 60-Rural) by researcher (Physiotherapist) once before the initiation of mobile based application for tele-rehabilitation. 1st physiotherapy training session will be conducted at a feasible site that is either at participants own environment or geriatric OPD's at various hospitals of MGM within Navi Mumbai for the participant. CGA will enable identification of their level of physical function (Example: Balance: Moderate risk of fall, Fair muscle strength). Whereas 1st physiotherapy training session will help the researcher to understand elderly individuals' capacity to perform that particular exercise and to identify number and type of exercises suitable for them. 1st physiotherapy session will also ensure proper learning technique and do's and don'ts of each and every exercise for the elderly.

Care-giver in detail will be explained about the elderly individuals physical function limitations and about the importance of exercises. It will be ensured that the care-giver also understands the technique and do's and don'ts of each and every exercise. So that he/she can assist and guard the elderly individual during exercises suggested and taught.

Participant and caregiver satisfaction with respect to rehabilitation will be assessed through additional appropriate questions as deemed essential.

3.Recruited participants and their caregivers will be explained in detail about the importance, personal advantage, method of downloading and operating the freely accessible mobile application and about the features and components included in it.

Phase III:

Technology To be Developed/Validated/Improved (in bullets points) (5000 characters Max):

Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function:

- Exercises in the preliminary version of this mobile based application will be approved by experts (Physiotherapists (PT)- Musculoskeletal PT, Neuro PT, Community-Based PT and Cardiorespiratory PT).

- *User criteria*:

  Inclusion Criteria: Elderly people using the application should belong to 60-80 years age group and should be able to read, hear, understand and follow the visual data and auditory data.

  Exclusion criteria: Elderly people with a history or current manifestations of Cardiopulmonary diseases, Stroke, Parkinson's, Myasthenia gravis, Neuromuscular diseases, Encephalitis, Amyotrophic lateral sclerosis, Dementia, Alzheimer's disease, Spinal cord injury, Ataxia, Brain tumors, Cerebral aneurysm, Epilepsy and Seizures, Guillain barre syndrome, Head injuries, Meningitis, Cancer, any Systemic malfunction, Physical disabilities, Spinal disc herniation or dislocation & fractures in past one year will be excluded. These medical conditions will make it difficult for elderly people to physically operate the mobile based application as well as to read, understand and follow the visual and auditory data. (Elderly individuals with above mentioned conditions require committed designed applications). This application will only include healthy geriatric individuals.

- Features of the mobile based application for tele-rehabilitation:

  It will be a free downloading mobile application.

  As soon as the application opens, an audio command in English as well as Regional and National languages (Marathi and Hindi) will ask the user to choose the preferable application operating language (English, Hindi or Marathi). Preferred language will provide easy access and usage for elderly people and their caregivers (in order to assist the elderly people).

(1) User profile:

Under the user profile, the elderly people will have to fill in demographic details (Name, age, gender, birth date, contact details, location, weight and height). Under health history (medical and surgical) and personal history (diet, habits and physical activity status) the user will have to choose the most applicable option to them from the drop box provided.

(2) <u>Early detection and referral framework:</u>

This component will prove beneficial for the users for early detection of risk of falls and early detection of signs of Transient Ischemic Attack, Parkinson's Disease, Alzheimer's Disease and Diabetic Peripheral Neuropathy through close ended questions such as: Example

Have you experienced or are you experiencing any of the following signs: difficulty getting in and out of chair, difficulty in transferring from chair to bed and back; difficulty standing unsupported with feet together; difficulty in reaching forward with outstretched arm; difficulty in picking up object from the floor from a standing position; difficulty standing unsupported with one foot placed forward; difficulty standing on one leg.

YES ( ) NO ( )

If yes than select the signs experienced by you (You can select multiple signs listed below)

( ) Difficulty getting in and out of chair

( ) Difficulty in transferring from chair to bed and back

( ) Difficulty in reaching forward with outstretched arm

( ) Difficulty in picking up object from the floor from a standing position

( ) Difficulty standing unsupported with one foot placed forward

( ) Difficulty standing on one leg

- *<u>Interpretation</u>*: Red flags will be identified through user's response and they will be directed towards recommendations or referral of consultants nearby to user's environment will be suggested through the application.

(3) <u>Awareness and Knowledge based component:</u>

This component of the application will provide information to the elderly people in the form of auditory and visual data (videos) based on effects of ageing on body system (Cardiorespiratory system, Musculoskeletal system, Neurological system; cognitive and mental function & emotional health), effect of ageing on physical function components (muscle strength, endurance, flexibility; balance, coordination; posture; agility and cardiorespiratory strength & endurance), importance of each physical function component in activities of daily living and importance and benefits of geriatric rehabilitation for independent living.

(4) <u>Demonstration of exercises for independent living component</u>:

DISCLAMIER: Before commencing these exercises, the user should get his/her vitals: Blood pressure, heart rate, oxygen saturation, blood glucose levels, thyroid levels monitored from his/her caregiver or treating physician. Elderly people suffering from comorbidities such as hypertension, diabetes mellitus, ischemic heart disease and hyperthyroidism or hypothyroidism should consult their respective treating physician. In case you experience any difficulties during or after the exercises such as shortness of breath, palpitations, chest pain- radiating to left arm, excessive fatigue, feeling of vomiting/nausea, excessive muscle soreness, excessive sweating, cold and clampy palms and feet's, excessive pain and swelling in the joints and extremities, dizziness, feeling of loss of balance or lightheadedness please terminate the exercises and report to the treating physiotherapist or physician. Application will not be responsible for any adverse effects if experienced by the user while performing exercises or after the exercises.

To promote independent living for elderly people, approved, and tested exercises by experts which are easy, safe, beneficial, common, suitable and culturally palatable for elderly people to practice at home will be suggested under this component. Physical function training exercises will target: Improvement in muscle strength, endurance and flexibility; posture, balance, agility and breathing control through exercises example: seated tendo-achilles stretch, seated leg extensions, repeated sit to stand, chair sit and reach, deep breathing exercises-segmental breathing.

Under each exercise instructions to perform the exercises will be displayed in animated, audio and text form so that elderly people having auditory issues can perform the exercise using text and animated data and those with visual issues can perform the exercises using auditory data. These animated, audio and text form data will also help the caregiver to understand the appropriate method of performing the exercises and assist the participant with the same.

(5) Chat-Interaction:

A chat box will be provided for the elderly people. Elderly people can ask his/her queries regarding physical function awareness or exercises suggested through the mobile based

application which will be addressed later.

Mobile based application for tele-rehabilitation utility: This application will enhance the level of awareness regarding effects of ageing on body system, effect of ageing on physical function components, importance of each physical function component in activities of daily living and importance and benefits of geriatric rehabilitation for independent living. Early detection of risk of fall and commonly encountered neuro-motor conditions will help reduce incidence of fatal injuries and it will enable preventive and rehabilitation strategies.

Expected deliverables including target beneficiaries (in bullets points) (2500 characters Max):

- A new comprehensive physical function mobile based application for promoting awareness; providing information regarding decline in physical function with ageing and importance of geriatric rehabilitation; early detection of risk of fall and commonly encountered neuro-motor conditions among elderly people will be available for application in elderly care.
- Development of self-rehabilitation system through mobile application thus empowering community- dwelling elderly people to become independent in rural and urban community settings.

Summary of project (in bullets points) (5000 characters Max)

1.Objectives:

- Develop awareness about effects of ageing on body systems, physical function and benefits of geriatric rehabilitation.
- Facilitate independent living through mobile based application for tele-rehabilitation.
- Early detection of risk of falls and commonly encountered neuro-motor conditions for empowering the elderly and referral framework through mobile application.

2.Methodology:

- Study will be conducted in Rural and Urban Areas of Mumbai and Navi Mumbai on 120 elderly people (60 Urban, 60 Rural).

  Inclusion Criteria: Elderly people using the application should belong to 60-80 years age group and should be able to read, hear, understand and follow the visual data and auditory data.

  Exclusion criteria: Elderly people with a history or current manifestations of Cardiopulmonary diseases, Stroke, Parkinson's, Myasthenia gravis, Neuromuscular diseases, Encephalitis, Amyotrophic lateral sclerosis, Dementia, Alzheimer's disease, Spinal cord injury, Ataxia, Brain tumors, Cerebral aneurysm, Epilepsy and Seizures, Guillain barre syndrome, Head injuries, Meningitis, Cancer, any Systemic malfunction, Physical disabilities, Spinal disc herniation or dislocation & fractures in past one year will be excluded. These medical conditions will make it difficult for elderly people to physically operate the mobile based application as well as to read, understand and follow the visual and auditory data. (Elderly individuals with above mentioned conditions require committed designed applications). This application will only include healthy geriatric individuals.

- A questionnaire with open ended and close ended questions will be administered by the researcher (Physiotherapist) in person or through telephone across different age span, gender, socio-economic status, setting (urban and rural) for elderly people to understand their knowledge and attitude towards functional decline with ageing. A sample representative of population will be drawn for focus group discussion. Focus group discussion questions will be defined to address their knowledge and attitude towards functional decline with ageing; their existing coping strategies; usual consultation pattern; barrier to care seeking; family support; co-morbidities; ongoing treatment; feasibility, acceptance and importance of functional monitoring and rehabilitation. Comprehensive geriatric assessment will be conducted to identify the affected body function, activity limitation and participation restriction components in elderly people.

  Comprehensive geriatric assessment will help identify affected body functions, activity limitations and participation restrictions and establish an Indian reference value for physical function in elderly people in Urban and Rural Setting. Functional outcomes and participant and

caregiver satisfaction with respect to rehabilitation will be assessed using Barthel Index, Lawton's scale, Ground level activity questionnaire & additional appropriate questions will be asked to elderly and caregivers as deemed essential.

- Affected physical components, level of activity limitation and participation restriction reported will aid at designing the components of mobile based application according to and focused on elderly people needs.

- Mobile based application for tele-rehabilitation will be user friendly, free downloading application with the following components: user profile, early detection and referral framework, awareness and knowledge, demonstration of exercises for independent living and chat-interaction. Application will help promote awareness and will provide information regarding decline in physical function with ageing and importance of geriatric rehabilitation among elderly people, empower the community-dwelling elderly to become independent in rural and urban community settings through self-rehabilitation and it will enable early detection of risk of fall and commonly encountered neuro-motor conditions.

(K) Details of Societal Component:

Proposed Societal Intervention (in bullets points) (5000 characters Max):

- Elderly people will gain knowledge about the physical function impairments that occur with ageing and about specific exercises to address these impairments.

- Self-rehabilitation will enable improvement in level of physical function in day-to-day life of the elderly people. Thus, empowering them for independent living.

- Early detection of risk of fall and commonly encountered neuro-motor conditions will help reduce incidence of fatal injuries due to falls, may reduce hospitalization, it will enable preventive and rehabilitation strategies through recommendations and referral framework and decrease social, financial and economic burden on the society.

- This project will encourage promotion of awareness about geriatric rehabilitation through mobile application which is a new emerging approach in rehabilitation world.

- This mobile based application for tele-habitation will later be scaled on a wider level within the State of Maharashtra and other states of India. The mobile based application can be scaled up at an international level for application in countries of similar socio-economic background, a larger group of elderly individuals after making necessary changes in the application according to user feedback.

Technology Readiness Level:

1.Basic concepts observed.

2.Techonology concept formulated.

(L) Host Institution Details

Host Institution Type: Deemed to be University

Host Institution Name: Mahatma Gandhi Missions Institute of Health Sciences, MGM School of Physiotherapy.

Host Institution Correspondence Address Line 1**:** MGM Institute of Health Sciences, Sector-1, Kamothe.

Host Institution Correspondence Address Line 2: MGM School of Physiotherapy, Sector-1,Kamothe.

Host Institution City/District: Navi Mumbai

Host Institution State: Maharashtra

Host Institution Pin code: - 410209

Budget Details

Recurring

Sl.No.	Heading	1st Year (in INR.)	2nd Year (in INR.)	2 Months (in INR.)	Total (in INR.)
1.	Research fellowship	40000.00*12= 480000.00	40000.00*12= 480000.00	40000.00*2= 80000.00	1040000.00
2.	Consumables	15000.00	15000.00	-	30000.00
3.	Travel (within India)	25000.00	25000.00	-	50000.00
4.	Contingencies	30000.00	15000.00	-	45000.00
5.	Development of mobile based application for tele-rehabilitation	905000.00	-	-	905000.00
6.	Institution overhead	315001.00	-	-	315001.00
7.	Equipment's	30007.00	-	-	30007.00
GRAND TOTAL					**INR 2415008.00**

D.Item-wise Justification for the Budget Heads (in INR)

1.Research Fellowship:

1st Year: 40000.00*12= 480000.00
2nd Year: 40000.00*12= 480000.00
2 months: 40000.00*2= 80000.00
Total: **INR 1040000.00**

2. Consumables: Two-way tapes, sterelium, record sheets (required during comprehensive clinical assessment)

1st Year: 15000.00
2nd Year: 15000.00
Total**: INR 30000.00**

3. Travel expenses (within India): (required to travel to various urban and rural areas for conducting comprehensive geriatric assessment and for delivering physiotherapy training sessions)

1st Year: 25000.00
2nd Year: 25000.00
Total: **INR 50000.00**

4. Contingencies:

1st Year: 30000.00
2nd Year: 15000.00
Total: **INR 45000.00**

5. Development of mobile based application for tele-rehabilitation: 905000.00 Rs

6.Institution overhead: INR 315001.00

7.Equipment's: (All equipment's required for comprehensive clinical assessment)

A. AccuSure Pulse oximeter: To assess oxygen saturation: **INR 1564.00 Rs.**

B. OMRON PF9940 Peak Air (R) Peak flow meter: **INR 3730.00**

(Helps to assess the airflow through the airways and thus help determine the degree of obstruction along them)

C. Baseline Tactile Semmes-Weinstein Monofilaments (Fabrication enterprises retail sales):
INR 22914.00
(Sensory impairment assessment)

D. Portable stadiometer: **INR 1799.00** (Anthropometric assessment-height measurement)

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DOCUMENTS AS PER THE LIST

MGM INSTITUTE OF HEALTH SCIENCES

(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

Sector-1, Kamothe, Navi Mumbai – 410 209, Tel: 022-27432471/27431994, Fax: 022-27431094
Website: www.mgmuhs.com Email: vc@mgmuhs.com

VICE CHANCELLOR

12th April, 2021

CERTIFICATION BY THE HEAD OF THE INSTITUTE

(i) Ms. Poonam Rajesh Desai the Principal Investigator of the project entitled **"Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study"** will assume full responsibility for implementing the project.

(ii) The date of appointment starts from the date on which the University/Institute receives the bank draft/cheque from the Department of Science and Technology.

(iii) The investigator will be governed by the rules and regulations of the University/Institute for the duration of project.

(iv) The University/Institute will provide basic infrastructure and other required facilities to the Investigator for undertaking the research project.

(v) The University/Institute will take into its books all assets received under this sanction and its disposal would be at the discretion of the Department of Science and Technology.

(vi) The research grant by the Department of Science and Technology will be used to meet the expenditure on the project and for the period for which the project has been sanctioned as indicated in the sanction order.

(vii) The audited statement of accounts, utilization certificates and other reports and documents as required under the scheme will be submitted to the department.

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Signature of the Head of the Institution

Registered under B.P. Act, 1860
R. No. BAH 177/06 of 2006
on 31/3/06 / 2006

MEMORANDUM OF ASSOCIATION

1. **Name of Society :**
The name of the Society shall be "MGM Institute of Health Sciences", Navi Mumbai, hereinafter referred to as the "MGM Institute".

31/3/06

2. **Address of the Society :**
The registered office of the MGM Institute shall be situated in MGM Campus, Sector – 18, Kamothe, Navi Mumbai – 410 209.

3. **Aims & Objects of the Society ;**
The objects for which the MGM Institute is established are:

1) To provide for instruction and training in such branches of learning as it may deem fit ;

2) To provide for research and for the advancement of and dissemination of knowledge.

3) To extend the benefits of knowledge and skills for development of individuals and society by associating itself closely with local and regional problems of development ;

4) To promote national integration and preserve cultural heritage ;

5) To build up financial self – sufficiency by undertaking academic and allied programmes and resource generative services in a cost effective manner ;

6) To promote better interaction and coordination amongst different Universities and Colleges ;

7) To generate and promote a sense of self respect and dignity amongst the weaker sections of the society including women ;

8) To undertake educational, social, industrial, economic, rural development, co-operation, health, cultural activities / programmes.

9) To promote freedom, secularism, equality and social justice enshrined in the Constitution of India and to be a catalyst in socio – economic transformation by promoting basic attitudes and values of essence to national development ;

10) To do all such other acts and things as may be necessary or desirable to further the objects of the MGM Institute.

11) To publish journal, seminars books and such other literatures as may be useful for furthering the cause of education.

For MGM Institute of Health Sciences
Authorised Signatories

12) To help the poor and needy students to peruse their further study. To promote educational facilities by giving scholarship of various scales to meritorious and brilliant students.

13) To start, maintain, run, open dispensaries, nursing home, medical clinic, medical consulting courses and medical first aid centers.

14) To organize all types of medical camps for medical check up and to give treatment to the people on various disease.

15) To start, maintain and assist relief measures in those parts of the country which are subject to natural calamities, fire, flood, earth quack etc.

4. **Powers and Functions of the MGM Institute –**
To carry out the above objects and for the management of its properties the MGM Institute shall have the following powers :

1) To establish courses of studies and research and to provide instructions in such branches of study as the MGM Institute deems appropriate for the advancement of learning and dissemination of knowledge in such branches ;

2) To MGM Institute and confer Degrees and to grant Diplomas and / or Certificates to persons who have satisfactorily completed the approved courses and / or research as may be prescribed and shall have passed the prescribed examinations ;

3) To MGM Institute and award visitorships, fellowships, exhibits, prizes, medals and such other distinctions ;

4) To organize, maintain and manage schools, departments, laboratories, libraries, museums, academic service units and equipment for teaching and research ;

5) To establish, maintain and manage colleges, institutions, hostels health centres, auditoria and gymnasiums at Kamothe and other places ;

6) To establish and run Medical Colleges for medical education, training and research and to provide basic amenities for the same.

7) To establish and run Dental Colleges for dental education, training and research and in and to provide basic amenities for the same.

8) To establish and run Nursing Schools and Colleges for imparting education, training in Nursing and to make available basic amenities and facilities for the same. So also to establish and run colleges offering courses in Physiotherapy, Occupational therapy, Audio and

speech therapy and other paramedical courses and to provide basic amenities for the same.

9) To create posts of Directors, Principals, Professors Readers, Lecturers and other teaching or non – vacation academic posts required by the MGM and to prescribe qualifications for and make appointments thereto ;

10) To appoint or recognize persons working in any other University or Organisation as adjunct Professors, adjunct Readers, adjunct Lecturers, Visiting Professors of the University for specified periods.

11) To create non – teaching skilled, administrative, ministerial and other posts and prescribe the qualifications and pay scales and to make appointments thereto ;

12) To prescribe the courses of instructions and studies for the various examinations leading to specific Degrees and Diplomas or Certificates;

13) To supervise, control and regulate admissions of students for various courses of studies.

14) To hold examinations for various courses of studies.

15) To confer honorary Degrees or other academic distinctions as prescribed ;

16) To monitor and evaluate the academic performance of faculties, departments, etc.

17) To hold and to manage trusts and endowments and MGM Institute and award fellowships, traveling fellowships, scholarships, studentships, medals and prizes for teachers and students ;

18) To fix, demand and receive or recover such fees and other charges as may be regulated from time to time.

19) To supervise, control and regulate the conduct and discipline of the students ;

20) To make arrangements for promoting welfare of its employees

21) To provide for the training and quality improvement of teachers and non teaching employees ;

22) To provide for periodical assessment of the performance of teachers and non teaching employees ;

23) To provide for conduct and discipline rules for teaching and non teaching staff and the enforcement thereof ;

24) To establish, maintain and manage, whenever necessary ;
   a) a printing and publication department ;
   b) extension boards ;
   c) information bureaus ;
   d) employment guidance bureau ; and
   e) such other activities as may be necessary and possible to fulfill the objects of the MGM Institute ;

25) To make provision for participation of students in –
   a) the national service scheme ;
   b) the national cadet corps ;
   c) home guards and civil defense ;
   d) the national sports organization ;
   e) physical and military training ;
   f) extra mural teaching and research ;
   g) programmes related to adult and continuing education, and extension ;
   h) any other programmes, services or activities directed towards cultural, economic and social betterment as may be necessary and possible to fulfill the objectives of the MGM MGM Institute.

26) To provide for special training or coaching for competitive examinations, for recruitment to the public services, public undertakings and other competitive employment opportunities ;

27) To co – operate or collaborate with any other University, Institution, Authority or Organisation for research and advisory services and for such purposes to enter into appropriate arrangements with other Universities Institutions, Authorities, or Organisations to conduct certain courses as the situation may demand ;

28) To borrow funds for the purposes of the MGM Institute of on the security of the properties of the MGM Institute ;

29) To explore the possibilities of augmenting the resources of the MGM Institute by Identifying or innovating activities such as research and development, consultancy, training programmes and providing services for different clients from industry, trade or any other non – government organizaitions.

30) To undertake academic collaboration programmes with Universities and institutions abroad ;

31) To receive funds for collaboration programmes from foreign agencies subject to rules and regulations of the Central Government and State Government in that behalf ;

32) To lay down for teaching and non – teaching staff service conditions including code of conduct, workload, norms of performance, appraisal, and such other instructions or directions as, in the opinion of the MGM Institute, may be necessary in academic and administrative matters ;

33) To undertake development programmes in higher education, research, consultancy based project and training programmes for outside agencies, by charging fees, so as to generate resources ;

34) To make special provision for higher education in rural and tribal areas;

35) To de–link any School / Department, Course of Study, Discipline, Faculty etc. already MGM Instituted ;

36) To do all such other acts and things as may be necessary for, or incidental or conducive to the attainments of all or any of its objects ;

37) In order to fulfill the objects of the Society to raise loans and to obtain Bank Guarantee etc. from Nationalized Banks, World Bank, Scheduled Banks, Foreign Banks and Financial Agencies, Govt., Semi – Govt., Co-operative, Financial Corporations and Financial Institutions or Private Parties or Financial Institutions by keeping the movable or immovable property of the institution as security or in addition thereto by all other legal means; obtain bank guarantees, letters of credit etc. For the fulfillment of the above objectives with the permission of the executive committee to authorize one or more members of the executive committee to execute all documents in relation to property, sale / lease of land, bank loans, security, mortgage, registration, agreements, MOU's and other legal documents.

38) To raise the funds and to procure the equipment and supplies necessary for the fulfillment of the objects of the society, obtain donations, grants, gifts avail, loans and by all other legal means from the Government, Semi-Government, Co-operative Societies Charitable Trusts, Development Institutions Industrial Organization, Financial Corporations, Credit Societies, National and World Health Organizations and relief organization and Private Parties, Institutions and Business Houses and from the all possible Institutions.

39) To import modern technology, research as also modern equipments, machineries, medicines implements etc. necessary for fulfilling the objects of the society.

40) For fulfilling the objectives of the society to acquire movable and immovable property to maintain development and sell the same, whenever necessary. To give or take the property on lease to give and take on rent and to develop the land and property owned by the institution.

41) In order to fulfill the objects of the society to open its bank account in foreign countries with the permission of the Reserve Bank of India for obtaining funds and equipment from abroad.

5. **Interpretation of the Objects**
The MGM Institute is established for public benefit and accordingly the objects of the MGM Institute as set forth above will be interpreted and restricted to mean such objects and purposes as are regarded in law to be a public charitable in nature.

6. **The MGM Institute Open to All**

i) The MGM Institute shall be open to all persons of whatever race, religion, creed, caste or class. No test or condition shall be imposed related to religious belief or profession for admitting or appointing members, students, teachers, and workers or in any other connection whatsoever.

ii) No capitation fee shall be charged in any form in consideration for admission.

iii) In case of self – financing courses fees to be prescribed shall be as recommended by a Committee of experts.

iv) No Benefactories shall be accepted by the MGM Institute which in its opinion involves conditions and obligations opposed to the spirit and objects of this section.

7. **Income and property of the MGM Institute to be applied for the objects only**

No portion of the income and property of the MGM Institute shall be paid or transferred directly or indirectly by way of profit to the persons, who at any time, or have been members of the MGM Institute or to any of them, provided that nothing herein contained shall prevent the payment in good faith or remuneration to any member thereof or other person in return for any service rendered to the MGM Institute or for traveling, halting and other similar charges.

8. **Management of the MGM Institute**
The names and addresses and occupations of the first members of the Board of Management to whom under rules, the management of the MGM Institute is entrusted till the various authorities in accordance with the rules are constituted, are given below as required under the Societies Registration Act 1860 :

P-14

Sr. No	Name	Address	Designation	Age	Occupation	Nationality
1.	Shri. Kamal Kishore N. Kadam M. Tech.(I.I.T. Bom.),	12, Bhagya Nagar, Nanded, M.S.	Chairman	61	Business	Indian
2.	Dr. Pandurang M. Jadhav, FRCS,	At. Post – Umardari, Tal – Mukhed, Dist - Nanded	Vice Chairman	62	Service	Indian
3.	Shri. Ankush N. Kadam, B.E.,	179, Nandanvan Colony, Chhavni, Aurangabad	Secretary	62	Business	Indian
4.	Shri. Prataprao Borade, M.E,	"Shashbhushan" CIDCO, Aurangabad	Treasurer	65	Service	Indian
5.	Dr. Sudhirchandra N. Kadam, FRCP (Edin.),	Director Residence, MGM Hospital, 1A, CBD-Belapur, Navi Mumbai	Member	59	Business	Indian
6.	Dr. Nitin N. Kadam, MD, DCH	Director Residence, MGM Hospital, Sector – 3, Vashi, Navi Mumbai	Member	50	Business	Indian
7.	Shri. Ujjawalrao N. Kadam, B.E.,	179, Nandanvan Colony, Aurangabad	Member	53	Service	Indian

9 **Review and Inspection –**

The Central Government shall have the right to cause an inspection to be made of the MGM Institute, its buildings, laboratories, its examinations, teaching and other work conducted or done by the MGM Institute, and to cause an enquiry to be made, if considered necessary by the Central Government, in respect of any matter connected with the MGM Institute.

10. We the following persons, signatories of the society desire to form our society under the Societies Registration Act, 1860 and accordingly we have formed the said society on dated 1st January 2006 "MGM Institute" Kamothe, Navi Mumbai and we have signed the Memorandum of Association for the purpose of the society under the Societies Registration Act, 1860.

Sr. No.	Name	Address	Signature
1.	Shri. Kamal Kishore N. Kadam M. Tech.(I.I.T. Bom.), Chairman	12, Bhagya Nagar, Nanded, M.S.	
2.	Dr. Pandurang M. Jadhav, FRCS, Vice Chairman	At. Post – Umardari, Tal – Mukhed, Dist – Nanded	
3.	Shri. Ankush N. Kadam, B.E., Secretary	179, Nandanvan Colony, Chhavni, Aurangabad	
4.	Shri. Prataprao Borade, M.E, Treasurer	"Shashbhushan" CIDCO, Aurangabad	
5.	Dr. Sudhirchandra N. Kadam, FRCP (Edin.), Member	Director Residence, MGM Hospital, 1A, CBD-Belapur, Navi Mumbai	
6.	Dr. Nitin N. Kadam, MD, DCH, Member	Director Residence, MGM Hospital, Sector – 3, Vashi, Navi Mumbai	
7.	Shri. Ujjawalrao N. Kadam, B.E., Member	179, Nandanvan Colony, Aurangabad	

For MGM Institute of Health Sciences

Authorised Signatories

Place :- Navi Mumbai.
Date :- 30th March 2006

I know the aforesaid persons who have signed this memorandum in my presence.

Signature
Advocate / S.E.O. / Notary / C.A.

FINAL (Approved by Secretary DST)

DEPARTMENT OF SCIENCE AND TECHNOLOGY

POLICY ON CONFLICT OF INTEREST

FOR REVIEWER & COMMITTEE MEMBER or APPLICANT or DST OFFICER ASSOCIATED/ DEALING WITH THE SCHEME/ PROGRAM OF DST

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics, are objective measures that is intended to protect the integrity of the decision-making processes and minimize biasness. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence/ unprejudiced dealings, prior to, during and subsequent to the currency of the programme to be entered into with a view to enable public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to prevent corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision-making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision-making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. **Coverage of the Policy**:

a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable on all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in evaluation of proposals and subsequent decision-making process.

b) This policy aims to minimize aspects that may constitute actual Conflict of Interests, apparent Conflict of Interests and potential Conflict of Interests in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflict of interests that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor etc.)

2. **Specifications as to what constitutes Conflict of Interest**.

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

(i) Due to any reason by which the Reviewer/Committee Member cannot deliver fair and objective assessment of the proposal.

(ii) The applicant is a directly relative# or family member (including but not limited to spouse, child, sibling, parent) or personal friend of the individual involved in the decision-making process or alternatively, if any relative of an Officer directly involved in any decision-making process / has influenced interest/ stake in the applicant's form etc.

(iii) The applicant for the grant/award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.

(iv) The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.

(v) The Reviewer/Committee Member is a Head of an Organization from where the applicant is employed.

(vi) The Reviewer /Committee Member is or was, associated in the professional career of the applicant (such as Ph.D. supervisor, Mentor, present Collaborator etc.)

(vii) The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.

(viii) The applicant has joint research publications with the Reviewer/Committee Member in the last three years.

(ix) The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.

(x) The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.

The Term "Relative" for this purpose would be referred in section 6 of Companies Act, 1956.

3. Regulation:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. Self-regulatory mode is however recommended for stake holders involved in scientific research and research management, on issues pertaining to Conflict of Interest and scientific ethics. Any disclosure pertaining to the same must be made voluntarily by the applicant/Reviewer/Committee Member.

4. Confidentiality:

The Reviewers and the Members of the Committee shall safeguard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party, unless the Committee recommends otherwise and records for doing so.

5. Code of Conduct

5.1 To be followed by Reviewers/Committee Members:

(a) All reviewers shall submit a conflict-of-interest statement, declaring the presence or absence of any form of conflict of interest.

(b) The reviewers shall refrain from evaluating the proposals if the conflict of interest is established or if it is apparent.

(c) All discussions and decisions pertaining to conflict of interest shall be recorded in the minutes of the meeting.

(d) The Chairman of the Committee shall decide on all aspects pertaining to conflict of interests.
(e) The Chairman of the Committee shall request that all members disclose if they have any conflict of interest in the items of the agenda scheduled for discussion.
(f) The Committee Members shall refrain from participating in the decision-making process and leave the room with respect to the specific item where the conflict of interest is established or is apparent.
(g) If the Chairman himself/herself has conflict of interest, the Committee may choose a Chairman from among the remaining members, and the decision shall be made in consultation with Member Secretary of the Committee.
(h) It is expected that a Committee member including the Chair-person will not seek funding from a Committee in which he/she is a member. If any member applies for grant, such proposals will be evaluated separately outside the Committee in which he/she is a member.

5.2 To be followed by the Applicant to the Grant/Award:

(a) The applicant must refrain from suggesting referees with potential Conflict of Interest that may arise due to the factors mentioned in specifications described above in Point No. 2.
(b) The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.

5.3 To be followed by the Officers dealing with Programs in DST:

While it is mandatory for the program officers to maintain confidentiality as detailed in point no. 6 above, they should declare, in advance, if they are dealing with grant applications of a relative or family member (including but not limited to spouse, child, sibling, parent) or thesis/ post-doctoral mentor or stands to benefit financially if the applicant proposal is funded. In such cases, DST will allot the grant applications to the other program officer.

6. Sanction for violation

6.1 For a) Reviewers / Committee Members and b) Applicant

Any breach of the code of conduct will invite action as decided by the Committee.

6.2 For Officers dealing with Program in DST

Any breach of the code of conduct will invite action under present provision of CCS (conduct Rules), 1964.

7. Final Appellate authority:

Secretary, DST shall be the appellate authority in issues pertaining to conflict of interest and issues concerning the decision √making process. The decision of Secretary, DST in these issues shall be final and binding.

8. Declaration

I have read the above "Policy on Conflict of Interest" of the DST applicable to the Reviewer/ Committee Member/ Applicant/ DST Scheme or Program Officer # and agree to abide by provisions thereof.

√ I hereby declare that I have no conflict of interest of any form pertaining to the proposed grant

I hereby declare that I have conflict of interest of any form pertaining to the proposed grant * & # (Tick whichever is applicable)

Name of the Applicant: Poonam Rajesh Desai

07.05.2021

(**Signature with date)**

SVKM'S
NMIMS
Deemed-to-be UNIVERSITY

We, the Chancellor, Vice Chancellor and Members of the Board of Management of
SVKM's Narsee Monjee Institute of Management Studies,
certify that

Poonam Desai

(Son/Daughter of Shri. Rajesh and Smt. Amruta)

has been examined and found qualified for the two years degree in

Master of Physiotherapy
(Musculoskeletal Sciences)

The said degree has been conferred on him/her at the convocation
held in the month of August of the year 2017.

In testimony whereof is set the seal of the said
Deemed-to-be University and the signature of the said Vice Chancellor.

Vice Chancellor
Date : August 10, 2017

Student No: 75112150002 Certificate Number: 00088624-02-8YHR

00025326

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

UNDERTAKING

I Poonam Rajesh Desai Daughter of Shri Rajesh Bhagwan Desai ~~studing~~ studying at MGM School of Physiotherapy (Constituent Unit of MGM Institute of Health Sciences), Plot Number- 1&2, Sector-1, Kamothe, Navi Mumbai-410209, Maharashtra, India have proposed a project entitled "Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study" for Women Scientist Scheme-B (hereinafter called WOS-B) for research work to Department of Science & Technology, New Delhi (hereinafter called DST) as 'Principal Investigator' and undertake that:

1. During the entire tenure of the WOS-B Project, I shall abide by the rules and regulations of the DST. Any change in rules and regulations by the DST in future will be applicable to me.
2. As a recipient of the DST's WOS-B Project, I shall also abide by the rules, discipline of the institution where I have been given the facility of work.
3. I shall devote full time to project work during the tenure of WOS-B Project and will not take any other assignment or job without prior permission of DST.
4. I shall complete the project work undertaken by me and submit a detailed consolidated report of project work through the competent authorities on completion of the WOS-B Project.
5. I shall not leave the WOS-B Project before its completion without prior written approval of the DST.
6. I also hereby declare that if the outcome of project can be exploited commercially by taking IPRs or otherwise commercial exploitation, the same shall be communicated to the DST.
7. I have gone through DST Terms & Conditions. I have clearly understood and have accepted all the Terms & Conditions in full effect.

Signature of PI: Desai

Address: MGM School of Physiotherapy
(Constituent Unit of MGM Institute of Health Sciences)
Plot Number- 1&2, Sector-1, Kamothe, Navi Mumbai-410209, Maharashtra, India.

Date: 12.04.2021

Signature with Seal

(Mentor/Guide)
Professor - Director
MGM School of Physiotherapy
MGMIHS, Navi Mumbai

(Head of Institution)
Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

MGM SCHOOL OF PHYSIOTHERAPY

Sector-1, Kamothe, Navi Mumbai – 410209

MGM/SOP/228/2021 Date : 6/ 5 /2021

To,
Pawan Kumar,
Scientist 'C'
KIRAN Division, Department of Science and Technology (DST),
Government of India,
New Delhi-110016.

Subject : Consent letter from mentor for submission of documents.

Respected Sir,

I confirm that Ms. Poonam Rajesh Desai is pursuing her PhD (enrolled for academic year 2019-2020; Registration No: 11950009001) under my guidance at MGM School of Physiotherapy, MGM Institute of Health Sciences, Navi Mumbai.

I hereby consent to the above student for submitting the documents to start process of sanctioning of recommended proposal entitled "Mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function - A pilot study" for WOS-B component of KIRAN Division of DST. Ms. Poonam Rajesh Desai the Principal Investigator, will assume full responsibility for implementing the project.

Thanking you,

Regards,

MGM School of Physiotherapy NAVI MUMBAI

Dr. Rajani Mullerpatan
Professor-Director
Mahatma Gandhi Missions School of Physiotherapy
Mahatma Gandhi Missions Institutes of Health Sciences, Navi Mumbai

विशेष अ जा /मु सा वि /५० म

क्रमांक

नोंदणी प्रमाणपत्र

संस्था नोंदणी अधिनियम, १८६०

(१८६० चा अधिनियम २१)

नोंदणी क्रमांक MAHARASHTRA 177/06 (Raigad)

याद्वारे असे प्रमाणित करण्यात येते की MGM Institute of Health Sciences, Navi Mumbai

खालील तारखेस संस्था नोंदणी अधिनियम, १८६० (सन १८६० चा अधिनियम २१) अन्वये योग्यरीत्या नोंदणी करण्यात आली.

तारीख 31st March 2006 रोजी माझ्या सहीनिशी दिले.

सहायक संस्था निबंधक रायगड विभाग, रायगड-अलिबाग

सहा.संस्था निबंधक 31/3/06

(Shri R. P. Deshmukh)

विभाग

सहाय्यक संस्था निबंधक,

रायगड विभाग, रायगड (अलिबाग)

2007

विशेष/ध.आ./मु.सा.वि./२१.

सत्यमेव जयते

नोंदणीचे प्रमाणपत्र

याद्वारे प्रमाणपत्र देण्यात येते की; खाली वर्णन केलेली सार्वजनिक विश्वस्तव्यवस्था ही आज, मुंबई सार्वजनिक विश्वस्तव्यवस्था अधिनियम, १९५० (सन १९५० चा मुंबई अधिनियम क्रमांक २९) या अन्वये Raigad Region, Raigad येथील सार्वजनिक विश्वस्तव्यवस्था नोंदणी कार्यालयात योग्य रीतीने नोंदण्यात आलेली आहे.

सार्वजनिक विश्वस्तव्यवस्थेचे नाव M G M Institute Of Health Sciences, Navi Mumbai

सार्वजनिक विश्वस्तव्यवस्थांच्या नोंदणी पुस्तकातील क्रमांक F-5466 (Raigad)

Shri Kamalkishor Kadam यांस प्रमाणपत्र दिले.

आज दिनांक 21/05/2006 रोजी माझ्या सहीनिशी दिले.

शिक्का

सही 15/06
(Shri R. P. Deshmukh)
सहाय्यक धर्मादाय आयुक्त
रायगड विभाग, रायगड (अलिबाग)

Budget Details

Recurring

Sl.No.	Heading	1st Year (in INR.)	2nd Year (in INR.)	2 Months (in INR.)	Total (in INR.)
1.	Research fellowship	40000.00*12= 480000.00	40000.00*12= 480000.00	40000.00*2= 80000.00	1040000.00
2.	Consumables	15000.00	15000.00	-	30000.00
3.	Travel (within India)	25000.00	25000.00	-	50000.00
4.	Contingencies	30000.00	15000.00	-	45000.00
5.	Development of mobile based application for tele-rehabilitation	905000.00	-	-	905000.00
6.	Institution overhead	315001.00	-	-	315001.00
7.	Equipment's	30007.00	-	-	30007.00
GRAND TOTAL					**INR 2415008.00**

Principal Investigator:

PDesai

Poonam Rajesh Desai
PhD Scholar
MGM School of Physiotherapy
MGM institute of Health Sciences

Guide:

Dr. Rajàni Mullerpatan
Professor-Director
MGM School of Physiotherapy
MGM institute of Health Sciences

MGM School of Physiotherapy NAVI MUMBAI

Justification for various budget heads (head-wise details) for entire duration of project (2 years, 2 months)

1.Research Fellowship:

1st Year: 40000.00*12= 480000.00
2nd Year: 40000.00*12= 480000.00
2 months: 40000.00*2= 80000.00
Total: **1040000.00 Rs**

2. Consumables: Two-way tapes, sterelium, record sheets (required during comprehensive clinical assessment)

1st Year: 15000.00
2nd Year: 15000.00
Total: **30000.00 Rs**

3. Travel expenses (within India): (required to travel to various urban and rural areas for conducting comprehensive geriatric assessment and for delivering physiotherapy training sessions)

1st Year: 25000.00
2nd Year: 25000.00
Total: **50000.00 Rs**

4. Contingencies:

1st Year: 30000.00
2nd Year: 15000.00
Total: **45000.00 Rs**

5. Development of mobile based application for tele-rehabilitation: 905000.00 Rs

6.Institution overhead: 315001.00 Rs

7.Equipment's: (All equipment's required for comprehensive clinical assessment)

A. AccuSure Pulse oximeter: To assess oxygen saturation: **1564.00 Rs.**

B. OMRON PF9940 Peak Air (R) Peak flow meter: **3730.00 Rs**
(Helps to assess the airflow through the airways and thus help determine the degree of obstruction along them)

C. Baseline Tactile Semmes-Weinstein Monofilaments (Fabrication enterprises retail sales): **22914.00 Rs**
(Sensory impairment assessment)

D. Portable stadiometer: **1799.00 Rs** (Anthropometric assessment-height measurement)

Total Budget: 2415008.00

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MGM institute of Health Sciences

MGM School of Physiotherapy
NAVI MUMBAI

Quotations of permanent equipment and comparative statement

Sr. No.	Name of Item	Qty Reqd.	Name of Company (Price per unit in INR)			Remark
1	Pulse Oximeter	1	AccuSure Cms50D Oled Pulse Oximeter (1564.00 Rs)	Dr Trust (1709.00 Rs)	HealthSense Accu (1499.00 Rs)	We would prefer AccSure Pulse Oximeter as its widely used comparative to other brands
2	Portable Stadiometer	1	PRESTIGE STORE- Height Measuring Scale Stadiometer for Adults and Children-210cm (1550.00 Rs)	IS IndoSurgicals Height Measuring Scale Stadiometer Measurement Tape-210cm (1799.00 Rs)	Vittico- 210 cm Height Measuring Scale (2604.00 Rs)	We would prefer IndoSurgicals Stadiometer as it is a known brand and with good equipment durability
3	Mini Wright Peak Flow meter	1	OMRON PF9940 Peak Air(R) Peak Flow Meter (3730.00 Rs)	Peso Medicare Pvt Ltd -Peso Mini Wright Peak Flow Meter (1750.00 Rs)	Sleep Solutions: Clement Clarke Peak Flow Meter (2000.00Rs)	We would prefer OMRON Peak Flow Meter as it is a known brand and with good equipment durability
4	Baseline Tactile Semmes-Weinstein Monofilaments	1	Electrotech Medi Systems, Set of 20 (38000 Rs)	Fabrication enterprises retail sales, Set of 20 (22914 Rs)		Preferred brand: Fabrication enterprises retail. Because the 20 set of monofilaments by weight are accurate as per our needs and according to literature

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MGM institute of Health Sciences

MGM School of Physiotherapy
NAVI MUMBAI

ELECTRONIC CLEARING SERVICE (Credit Clearing)/ REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

DETAILS OF ACCOUNT HOLDER

NAME OF THE INSTITUTION	MGM Institute of Health Sciences.
COMPLETE CONTACT ADDRESS	3rd Floor, MGM Educational Campus, Plot no. 1 & 2, Sec-1, Kamothe NM-410209
TELEPHONE NO./FAX NO.	022-27432471/2994/7969
E-MAIL ID OF **THE FO/AO/REG/DIR**	accountmumbai@mgmuhs.com

BANK ACCOUNT DETAILS

INSTITUTION ACCOUNT NAME (AS PER BANK RECORD)	MGM Institute of Health Sciences Dream-E Project.
ACCOUNT NO.	018310400033401 3
IFSC CODE	IBKL0000183
BANK NAME (in full)	IDBI Bank
BRANCH NAME	Belapur
COMPLETE BRANCH ADDRESS	39-41, Sector-11, C.B.D. Belapur, Navi Mumbai - 400614
MICR NO.	400259023
ACCOUNT TYPE	Saving

Certified that the Institute's account is in an RTGS enabled branch.
I hereby declare that the particulars given above are correct and complete.

Date: 06/05/2021

Signature of the Competent Authority of the Institution with seal.

Certified that the particulars furnished above are correct as per our records.

Date: 6/5/21

Signature of the Authorized Bank official with Bank Seal.

आईडीबीआई बैंक लि. बेलापूर शाखा BELAPUR BR IDBI BANK LTD.

एंजेला रेचल /ANGELA RACHEL
सहायक प्रबंधक/Assistant Manager
ई.आई.एन./ EIN - 124878

P Desai

Surface EMG of muscles of the pelvic floor and trunk and pelvis kinematics in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in squatting, sitting and modified commode chair sitting positions

I Abstract

Functional defecatory and urination disorders can result from maladaptive toileting position. Squatting has been shown in some studies to be associated with relaxation of the puborectalis muscle, thus facilitating bladder and bowel evacuation. However, kinematic studies of urination and defecation have never been performed in various positions and routinely used surface EMG (sEMG) equipment are plagued with low sensitivity, variability, and lack of standardization. We propose a pilot study to determine sEMG (root mean square and median frequency) of the pelvic floor and trunk muscles using very sensitive surface EMG equipment and kinematics of the pelvis in 5 healthy volunteers, 10 patients with Dysfunctional Voiding and 10 patients with Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in three different positions: squatting, sitting and modified commode chair positions, as a collaborative effort between two University based institutions in Mumbai.

Kinematic data will be obtained at 250 Hz using the Vicon motion capture system with the help of markers secured to various anatomical landmarks on the pelvis/trunk. Pelvic floor and trunk muscle activity will be obtained using telemetric 8 channel sEMG electrodes placed appropriately including a vaginal electrode, perianal electrodes and electrodes placed on the lower rectus abdominus muscle and erector spinae muscles. The obtained sEMG and kinematic measurements will be compared within and between groups.

II Background Review

The two collaborating institutions are premier University-based teaching and research hospitals with strong research credibility. The PI's institution, which was established in 1886, is a 500 bedded tertiary hospital and is one of the oldest hospitals dedicated to the care of women and children in the country. The Division of Urogynecology that has been set up at the institution under the PI (who is an Associate Professor of Urogynecology), is one of the country's very few premier tertiary academic and clinical centers of excellence in the field. The PI was invited by the state Government (of the second largest state of the country) to build the department under the Directorate of Medical Education of the state catering to the underprivileged for free and also to create the first University recognized fellowship in the country in a dedicated Urogynecology department in a University hospital. The center also hopes to be the nodal center for research in the country and this study is a part of the effort to build a strong research base in the field. Within a short period, the Urogynecology clinic has taken off despite the onslaught of covid and women with complex urogynecological problems visit the Center from all over the state. The Center has introduced several treatments for the first time in a University set up in the country.

The PI, trained in Stanford University and Cleveland Clinic Florida is one of the country's leading urogynecologists and is a recognized authority internationally in the field of multicompartment USG imaging of the pelvic floor. She has a strong research background with more than 75 publications and abstracts in peer reviewed journals. She has published multiple papers on imaging of slings and the pelvic floor muscles in international journals. In addition to having abstracts accepted at successive IUGA and AUGS conferences since 2013, she also had 7 oral podium presentations and 2 oral poster presentations at the 2013 AUGS annual meeting at Las Vegas where she won one of the best paper awards. She is also a member of the Editorial Board of the International Urogynecology Journal. Her research acumen is manifest in the fact that she is the only person from her country who has won a prestigious NIH grant, for her field study on dysfunctional voiding in adolescent girls, without any American collaborator. This ongoing study on environmental and contextual determinants of maladaptive toileting behaviors among adolescent girls in an urban, peri-urban and rural setting, is a necessary predecessor to the proposed study and is in keeping with the PI's long term research goals of conducting research in functional voiding and defecatory disorders. Previously, she has presented research on biofeedback techniques and diagnostic methods for functional defecatory and urination disorders at IUGA and AUGS conferences.

The PI is also the founder of one of the country's largest tech-enabled NGOs in the country dedicated to maternal and child health, which works in 18 states in the country and has impacted the lives of over 24 million women and their children and trained over 173,000 health workers. As a part of this work, she has been the PI of several large randomized controlled trials on maternal and child health, funding for which has been provided by the Global Poverty Action Fund (GPAF grant) of Department for International Development, UK, Grand Challenges Canada, Google, Save the Children International, Skoll Foundation and other international funding agencies, in extremely competitive grant competitions with over 700 applications from over 100 countries. Hence the PI has managed grant money of over 1 million dollars dedicated to research and has completed all studies within the designated time frame.

The co-investigator holds a PhD from Cardiff University in physiotherapy and is presently Professor and Director of the School of Physiotherapy and the Centre of Human Movement Science at her premier University-based institution. She has worked on several projects in the field of human movement science and its applications for enhancement of clinical practice. The research in indigenous postures and movement forms such as squatting was supported by International Society of Biomechanics, USA. Parallel collaborative research with engineers continues in design and validation of technology for rehabilitation which can be used for the masses in rural and urban sector to address unmet needs in healthcare. Department of Biotechnology of the Government of the country funded a collaborative interdisciplinary project with a premier engineering school of the country to design bi-articular actuation mechanism with energy storage and foot and knee brace for trans-tibial prosthesis. Research in the field of geriatrics has attracted recommendation for funding by Department of Science and Technology of the Government to develop a mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function. An interdisciplinary research project funded by Indo-Canadian Shastri Institute and Natural Sciences and Engineering Research Council of Canada, was undertaken in collaboration with Department of Mechanical Engineering, Queens University, Canada to explore the influence of various labor postures adopted for childbirth on pelvic dimensions to gain further insight to improve birth experience. Kinematics of pelvic dimension was studied in a

group of non-pregnant women by using 3D motion system. Research work in these areas of human movement science and clinical rehabilitation has resulted in 38 publications in Pubmed and Scopus Indexed Journals.
The research project will be conducted at the Centre of Human Movement Science (CHMS), which is a comprehensive motion analysis centre equipped with state-of-art gold standard equipment for capturing measure kinematics and kinetics, energy cost, muscle activity of human movement. CHMS is equipped with 12 high end 240 fps optical cameras (Vicon, UK) and three force platforms (AMTI, USA) to measure kinematics in terms of 3D motion and kinetics of human movement. AMTI biomechanics force platforms are designed to measure forces, moments and are sensitive to accelerations as well. Force plates can be used individually or arranged in a walkway format to collect multiple footfalls. The Centre is equipped to explore muscle activity during movement using S-EMG systems such as Delsys Bagnoli EMG System (8 channel wire-less device) which is synchronized with VICON motion analysis software. ProComp Infiniti: The ProComp Infiniti SA7500 encoder is another eight (8) channel, multi-modality device for real-time computerized data acquisition, which is available at the institution.

III Specific aims

The specific aim of this pilot study is to determine the surface EMG (root mean square and median frequency) of the muscles of the pelvic floor and trunk and kinematics of the pelvis in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome resulting from pelvic floor dyssynergia, in three different positions: squatting, sitting and modified commode chair sitting positions

IV Primary Outcomes

1. Root mean square and median frequency of pelvic floor muscle activity
2. Kinematic parameters: pelvic joint angles in three planes and distance between the pelvic markers

These primary outcomes will provide insight into the muscle activation and relaxation patterns during voiding and defecation in three different positions: squatting, sitting and modified commode chair sitting positions. Root mean square will inform amplitude of muscle activity in mV. Median frequency will indicate the fatigue in the muscle.

Secondary Outcomes

Root mean square and median frequency of activity of trunk muscles

V Background and Significance

Functional disorders of voiding and defecation are associated with inability to relax the pelvic floor/sphincters

Effective voiding and defecation require increased pressure within the viscus (i.e. bladder or rectum) coordinated with relaxation of the pelvic floor and sphincters.[1] When there is disordered functioning of the pelvic floor and/or sphincters, functional defecatory disorders and dysfunctional voiding may ensue.[1]
In neurologically intact women, dysfunctional voiding (DV) constitutes one of the major functional problems underlying bladder outlet obstruction,[2] a primary cause of urinary retention. DV is an abnormally learned spectrum of voiding behavior in neurologically normal individuals, in whom there is increased external sphincter activity during voluntary voiding; it often evolves from attempt to suppress impending or active bladder contractions by inappropriately contracting the pelvic floor muscles, thereby tightening the urinary sphincter complex.[3] The corresponding colorectal problem is paradoxical non-relaxation of anal sphincter musculature or pelvic floor dyssynergia which is a major functional reason for obstructed defecation syndrome (ODS).[4] Cavallaro et. al. found that dyssynergia was present in over 66.9% of patients with ODS and it was the only disorder identifiable on defecography that was associated with an increase in overall CSI (Constipation Severity Instrument) score.[5] Several studies suggest a link between functional bowel and bladder disorders: symptoms of dysfunctional voiding and uroflowmetric abnormalities occur more frequently in women with a defecatory disorder than in healthy controls.[1]

Toileting position has an important functional impact on voiding and defecation.

Learned and habitual dysfunction of the pelvic floor can result from maladaptive toileting behaviors. [5,6] In developing countries such as India, where two-thirds of the population lack access to proper sanitation facilities and is home to 60% of the global population that practices open defecation,[7] girls and women face several challenges with respect to toileting leading to development of dysfunctional toileting habits. Maladaptive toileting behaviors develop in adolescence in response to the negative perception of the toileting environment at school and can form the basis for future LUTS. [8] In children it is well recognized that certain toileting behaviors are associated with dysfunctional voiding and functional bladder disorders, which may persist into adulthood as OAB.[9]
Posture on the toilet is an important consideration during both defecation[10] and micturition.[5] Compared with the sitting position, squatting is associated with significantly less time to achieve a sensation of satisfactory bowel emptying and a lower degree of subjectively assessed straining. [10] Rad et. al. reported that anorectal angle and perineal plane distance was greater in those who squatted versus those who sat[11]: anorectal angle opens from 92 degrees in sitting position to 132 degrees in the squatting posture. They concluded that squatting caused relaxation of the puborectalis muscle, thus facilitating bladder and bowel evacuation. It has been postulated that the sitting posture stretches the puborectalis muscle, thus choking the urogenital hiatus, whereas squatting relaxes the puborectalis muscle and urogenital hiatus, providing better bladder and bowel emptying. [12]
The relationship between squatting and improved voiding is less clear. In European women with mean age of 33.6 years, no significant difference was found in maximum flow rate (Qmax), average flow rate (Qave) and total micturation time, and straining in these positions increased Qmax, Qave, reducing total voiding time. [13] However, all three positions in this study have the buttocks in contact with the toilet seat. Gupta et. al. [14] found that the squatting posture is associated with significantly higher Qmax and Qave and a lower postvoid residual, compared to the sitting posture. They suggested that squatting posture probably relaxes the puborectalis sling, which relaxes

the pelvic floor, thus providing efficient emptying. However, there are other studies that have shown no differences in uroflowmetry parameters between sitting and squatting. [15]

Historically, man has squatted to defecate[16] and urinate[5], and this practice continues today in underdeveloped countries.[6] While squatting for defecation and urination continues to be the principal position in Asia and Africa, Western populations have become accustomed to sitting on a commode. [10] The widespread use of a sitting toilet began during the nineteenth century when sewage systems were developed to improve sanitation as cities and populations grew. [6] This change in posture has led to a situation whereby entire populations are now not accustomed to squatting: only 43% of participants in a study could squat fully. [5] It may be that voiding in the position (sitting versus squatting) to which the individual is most accustomed also influences uroflowmetry parameters.[5] Sudden changes in defecation habits, such as altering the position from sitting to squatting or introducing a special commode, may add psychological stress and cause incomplete evacuation. [6] Hence modifications of the sitting position such as the 'thinker position' have been proposed in which the upper part of the body is bent forward over the commode. [6] The thinking position has been shown to result in higher rectal and lower anal pressures. [6] It has also been shown to be associated with a significantly wider anorectal angle, larger perineal plane distance and longer puborectalis length, during straining, when compared with the sitting position. [6]

Need for robust evidence

Though there is some radiographic evidence that squatting is associated with improved micturation and defecation, robust evidence regarding pelvic muscle activity and kinematics of the pelvis and the trunk in various positions is entirely lacking. While kinematics analysis of the pelvis in various toileting positions have never been performed, electromyographic studies have various fallacies: the results may not be interpretable due to technical artifacts and may not reflect sphincter activity. Practice standards are lacking for display, time scale, sampling, appropriate position for placing of active electrodes, technical and clinical quality checks and there is variability in analysis, interpretation and reporting.[17] Surface electromyography (sEMG) is a painless and non-invasive method of monitoring muscle activity and resting tonus that can be used both in assessment and bladder and bowel retraining applications. [17] It enables the evaluation of the activity of motor units recruited during motion enabling the researcher to understand the strength of muscle activation during dynamic motion. [17] However, the regular sEMG probes used in urodynamic and biofeedback units cannot help to compute the root mean square and median frequency of pelvic floor and trunk muscle activity with any degree of accuracy as they do not have the desired sensitivity.[17]

As ICS Standards Document 2020-21 has clearly laid out in its chapter on use of EMG, EMG pattern of the pelvic floor muscle under physiological and pathological conditions is an important area for future research. [17] In addition, trunk muscle activity while the body moves into the toileting position needs to be understood. However, multi-channel surface electromyogaphic units that have greater sensitivity to capture signals of small amplitude than biofeedback units are necessary. Simultaneously, studies done previously in pregnant women [18] suggest that pelvic kinematic information will provide insight into understanding the mechanics involved in urinating and defecating in various positions, because it is speculated that pelvic kinematics will influence intra-abdominal pressure which will eventually influence the dynamics of voiding and defecation.

Lastly, in the age of the commode, with entire populations losing the ability to squat, it is important that these studies are performed in habitual squatters so that the true benefits of squatting over the other positions are elucidated. These studies will form the foundation for re-introducing optimal toileting positions back into the community world over and provide the evidence-based platform needed to transform toileting behaviors at large.

VI Methodology

A prospective pilot study will be conducted as a collaborative effort between the country's premier Center for Excellence in Urogynecology and Pelvic Reconstructive Surgery at a University Hospital and the Center of Human Movement Sciences, Department of Physiotherapy at another University based hospital, between January 2022 and February 2023.

Patients: Following approval from the Ethical Committee for Research on Human Subjects of both the institutions, five healthy female volunteers with normal micturition and defecation functions (Group A), ten women with dysfunctional voiding (Group B) and ten women with obstructed defecation syndrome (ODS) due to paradoxical non-relaxation of anal sphincter musculature or dyssynergia (Group C) will be recruited after informed consent.

Inclusion criteria: English speaking women in the age group 18 to 45 years who are habitual squatters and have signed the informed consent (as per Declaration of Helsinki Guidelines; appendix 1). Women in group B and Group C should be diagnosed with dysfunctional voiding and ODS due to dyssynergia, respectively, for at least 6 months.

Exclusion criteria: Pregnant women; women with history of known musculoskeletal conditions that limit the ability to squat such as severe backpain, knee osteoarthritis, severe rheumatoid arthritis, knee or ankle joint instability, recent fractures of spine or lower extremity; women with abdominal or pelvic carcinoma, prolapse, urinary incontinence, overactive bladder syndrome, pelvic inflammatory disorders, bladder pain syndrome and other chronic pelvic floor conditions associated with pain, will be excluded. Similarly, women with slow transit constipation will be excluded. Women with concomitant dysfunctional voiding and functional defecatory disorders will be excluded. Patients with morphological abnormalities including anatomical abnormalities and/or neurological disease responsible for the dysfunctional voiding in Group B and ODS in Group C will be excluded from the study.

All patients will undergo thorough history taking (appendix 2 has the history taking form), physical examination including neurological, abdominal and urogynecological examination, and abdominal ultrasound examination, as necessary. Dysfunctional voiding will be diagnosed based on non-instrumented uroflowmetry, multichannel urodynamics with surface EMG and urethral pressure profilometry[2] and voiding cystourethrogram. [2] Cystoscopy will be performed, if required. Only those patients with diagnosed dysfunctional voiding will be included in Group B. All selected patients in Group B will complete the American Urological Association Symptom Index (AUASI) before further testing.[19] The index will be divided into a total score (sum of all 7 questions), a voiding score (sum of questions 1, 3, 5 and 6) and a storage symptom score (sum of questions 2, 4, and 7).

In potential patients for inclusion in Group C, slow transit constipation will be ruled out with colonic transit studies (ref). MR defecography will then be performed to determine presence of intussusception, enterocele, rectocele and pelvic floor dyssynegia. [4] Presence of dyssynergia will be corroborated with anal manometric studies (ref). Only those patients with diagnosed pelvic floor dyssynergia will be included in Group C. All patients in Group C will fill the Varma Constipation Severity Instrument (CSI) (ref 21 from the dis colon). The CSI is a 16-question survey to assess constipation severity. It is a short, easy to use, reliable, and valid instrument that generates a score of 0 to 73, with increasing scores signifying increased severity of constipation (ref). This index has subscales measuring slow transit, symptoms of obstructed defecation, and symptoms of pain. While all subscales are important in the evaluation of patients with constipation, our analysis will focus on the obstructed defecation subscale of the instrument to determine the cause of ODS and pick up those with pelvic floor dyssynergia.

Surface EMG and Kinematic Studies

A mini-portable box style toilet will be installed to create a hygienic and private atmosphere for the participants within the Centre of Human Movement Science (CHMS) for unobtrusive capture of data without compromising hygiene of the laboratory. Patients will be able to use to toilet in the squatting position, sitting position (commode) and modified commode chair position (by placing a 2 feet stool in front of the commode).

Patient Preparation and Mechanism of Data Capture

The CHMS is a comprehensive motion analysis center that is equipped with state-of-art gold standard equipment for capturing kinematics (motion) and muscle activity. CHMS is equipped with 12 infrared cameras (Bonita 10 VGA Optical camera, 240 fps with varifocal lens and NIR strobe) and VICON Motion System (Westway, Oxford Metrics Group Ltd, Oxford, OX20JB, UK) to measure kinematics of movement. Inverse kinematics and dynamics calculations will be performed within Vicon Nexus software (version 1.6.1).

Kinematic measurements: Kinematic data of the pelvis will be collected at 250 Hz using the Vicon motion capture system and video capture of data capture will be performed using 2 video cameras positioned 2 meters away from capture volume (Bonita 720c video camera, Vicon, UK). Optical retroreflective markers will be placed based on the 'Plug-in-Gait' full body marker set described by Grood and Suntay.[20]

Participants will be prepared for motion capture. Markers will be secured with double-sided adhesive tape on predetermined anatomical landmarks. The markers will be placed bilaterally on iliac crest, pubic symphysis, coccyx, anterior superior iliac spine, posterior superior iliac spine, lateral aspect of thigh, lateral condyle of femur, lateral aspect of tibia, lateral malleolus, posterior aspect of heel, second metatarsal head. Four additional markers will be placed on bilateral iliac crest and medial femoral condyles.

A static trial will be recorded in standing in anatomical position to enable calibration of the system. Three walk trials will be captured for reference, followed by one single dynamic trial of squatting, sitting and modified chair commode sitting. Kinematic data during all three positions will be captured simultaneously with the surface EMG data.

Surface electromyographic measurements: Muscle activity during the above activities will be recorded using telemetric 8 channel surface electromyography system (Bio-infinity, Thought technology Ltd., Canada). Skin surface over the back extensor and abdominal muscle site will be shaved; light repetitive peeling will be done with a sticky tape after cleaning with alcohol to remove dead surface tissues and oil that might reduce conductivity for capturing muscle activity.

Six 1 mm square surface electromyography (sEMG) electrodes will be placed on the midline of the skeletal muscle belly between the myo-tendinous junction and the nearest innervations zone with the detection surface oriented perpendicular to the length of muscle fibers. Placement of electrodes for each muscle will be determined using anatomical landmarks.

Muscle activity will be recorded from pelvic floor muscles using one vaginal probe and 2 peri-anal sensors. The vaginal electrode will be secured into the vagina through a lubricating gel and tape. Two electrodes will be placed on the right and left lower rectus abdominus muscle and 2 electrodes will be placed on right and left erector spinae muscles (lumbar segment) to record activity from core muscles.

Root mean square (RMS) and median frequency of the sEMG signal will be recorded during descent, toileting position and ascent activity. Trunk muscle activity will also be recorded during sustenance of toileting position and while urinating and defecating.

Muscle activity recorded up by sEMG is known to be influenced by extrinsic and intrinsic factors influencing amplitude and frequency of signal. Extrinsic factors such as electrode structure and placement with respect to motor points in the muscle will be controlled by reducing skin resistance and ensuring proper placement of electrodes to reduce noise. However, intrinsic factors such as number of active motor units and fiber type composition of the muscle, fiber diameter, depth of muscle and motor unit firing rate; cannot be controlled. Hence, data will be normalized using sEMG activity from 10 sec maximal voluntary contraction (MVC) of each muscle. During MVC test, participants will be instructed to exert maximal effort and contract the pelvic floor muscles to the best of their ability. Data will be normalized using RMS values during middle 8 sec of each 10 sec MVC. Previously established test positions will be used to record MVC of erector spinae and rectus-abdominis muscle activity.

Process for the patients: Trunk and pelvic floor muscle activity and kinematics of the pelvis will be recorded from each participant in 3 positions i.e., squat position, western commode and modified chair commode to study the mechanics of the pelvis along with muscle control which is required for voiding and defecation. Since there are no prior studies exploring trunk and pelvic muscle control and kinematics of the pelvis during voiding and defecation, we will explore the best suited process for data capture on the 5 healthy participants in Group A before performing the study in the women in Groups B and C. The data on the healthy volunteers will be captured during micturition and defecation in the squatting, sitting and modified commode chair sitting position. The patient will be asked to visit the center on three different occasions with comfortably full bladder to assess muscle activity and kinematics during micturition in squatting, sitting and modified commode chair sitting

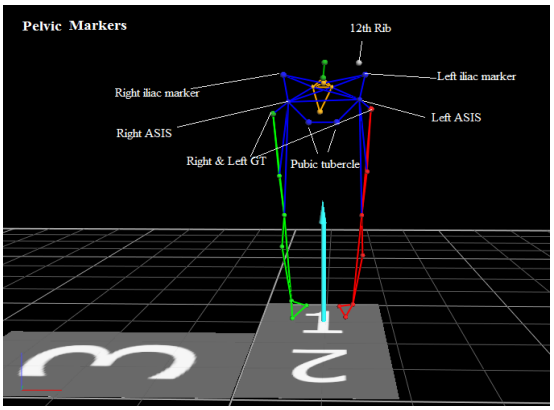

Fig 1: Pelvic marker set for kinematic evaluation

positions. The healthy volunteers will also visit the center on three more occasions to assess the muscle activity and kinematics during defecation in squatting, sitting and modified commode chair sitting positions. Per anal insertion of an oatmeal enema will be done to stimulate defecation prior to the testing for defecation.

Following determination of the best process for data capture, all Group B participants will be asked to come to the Center with comfortably full bladder on three separate days and EMG and kinematics assessment will be done during micturition in squatting, sitting and modified commode chair sitting positions on the three separate days.

Similarly, all Group C participants will be asked to come to the Center on three separate days. Following a per anal oatmeal enema insertion, EMG and kinematic assessment will be done during defecation in the squatting, sitting and modified commode chair sitting positions on the three separate days. The measured parameters will be compared between the three positions within the patients in Group B and C separately and between Groups B and C.

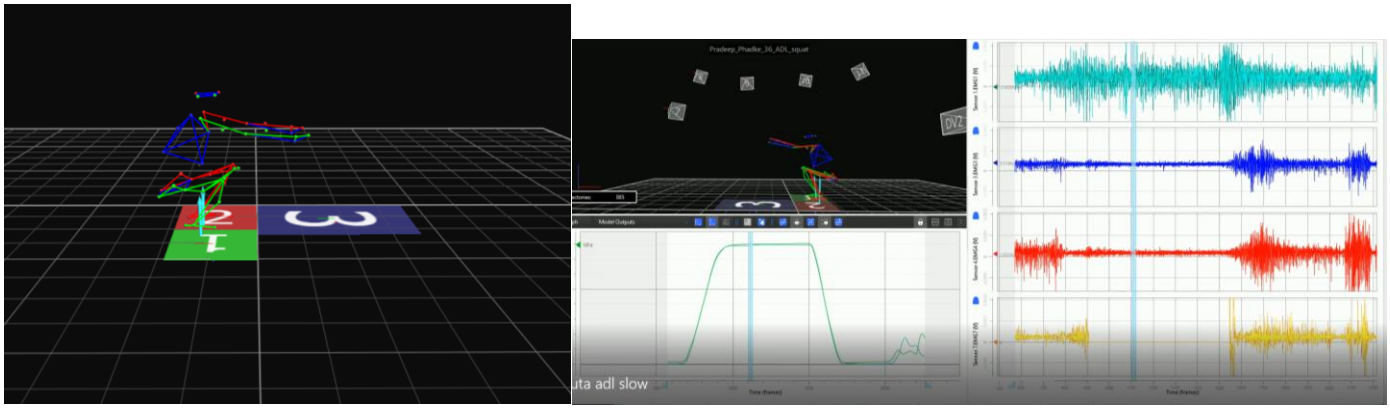

Fig 2: Squat activity with EMG and pelvic kinematics

VII Statistical analysis: Data will be analyzed using statistical tool IBM SPSS version 20. The level of statistical significance will be set at $p \leq 0.05$. Normality of distribution will be ascertained; measures of central tendency and dispersion will be calculated and reported as means and standard deviation if data is normal and median and interquartile range if data is non normal. Within group comparisons will be performed using paired t- test if data is normal and Wilcoxon matched-pair signed-rank test if the data is non normal. Comparison between Groups B and C will be done using t test if the data is normal and Mann Whitney U test if the data is non normal.

VIII Evaluation Criteria and Progress

The two teams at Cama Hospital and MGM will have weekly review meetings to review the progress of the project as compared with the timelines. Patient records will be maintained by the research coordinator working under the guidance of the PI. The data will be transferred in a deidentified manner to an excel spreadsheet and the data will be cross-checked weekly by the PI to ensure accuracy.

IX: Timeline (January 2022- February 2023)

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Project Management															
IRB Submission, Review, Approval															
Recruitment of healthy volunteers															
Data capture in healthy volunteers															
Recruitment of patients of DV and ODS															
Data capture in patients of DV and ODS															
Data analysis															
Manuscript preparation															
Final Submission															

X: Budget:

Head	Item	Quantity	Amount/ Unit (dollars)	Total Cost (dollars)
Equipment	sEMG sensors	6	810.81/-	4864.86/-
	Vaginal electrode	4	148.65/-	594.59/-
Testing Fee		25 participants	162.16/-	4,054/-
Consummables		25 participants	486.49/-	486.55/-
			Total budget in dollars	**10,000/-**

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Surface EMG of muscles of the pelvic floor and trunk and pelvis kinematics in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in squatting, sitting and modified commode chair sitting positions

I Abstract

Functional defecatory and urination disorders can result from maladaptive toileting position. Squatting has been shown in some studies to be associated with relaxation of the puborectalis muscle, thus facilitating bladder and bowel evacuation. However, kinematic studies of urination and defecation have never been performed in various positions and routinely used surface EMG (sEMG) equipment are plagued with low sensitivity, variability, and lack of standardization. We propose a pilot study to determine sEMG (root mean square and median frequency) of the pelvic floor and trunk muscles using very sensitive surface EMG equipment and kinematics of the pelvis in 5 healthy volunteers, 10 patients with Dysfunctional Voiding and 10 patients with Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in three different positions: squatting, sitting and modified commode chair positions, as a collaborative effort between two University based institutions in Mumbai.

Kinematic data will be obtained at 250 Hz using the Vicon motion capture system with the help of markers secured to various anatomical landmarks on the pelvis/trunk. Pelvic floor and trunk muscle activity will be obtained using telemetric 8 channel sEMG electrodes placed appropriately including a vaginal electrode, perianal electrodes and electrodes placed on the lower rectus abdominus muscle and erector spinae muscles. The obtained sEMG and kinematic measurements will be compared within and between groups.

II Background Review

The two collaborating institutions are premier University-based teaching and research hospitals with strong research credibility. The PI's institution, which was established in 1886, is a 500 bedded tertiary hospital and is one of the oldest hospitals dedicated to the care of women and children in the country. The Division of Urogynecology that has been set up at the institution under the PI (who is an Associate Professor of Urogynecology), is one of the country's very few premier tertiary academic and clinical centers of excellence in the field. The PI was invited by the state Government (of the second largest state of the country) to build the department under the Directorate of Medical Education of the state catering to the underprivileged for free and also to create the first University recognized fellowship in the country in a dedicated Urogynecology department in a University hospital. The center also hopes to be the nodal center for research in the country and this study is a part of the effort to build a strong research base in the field. Within a short period, the Urogynecology clinic has taken off despite the onslaught of covid and women with complex urogynecological problems visit the Center from all over the state. The Center has introduced several treatments for the first time in a University set up in the country.

The PI, trained in Stanford University and Cleveland Clinic Florida is one of the country's leading urogynecologists and is a recognized authority internationally in the field of multicompartment USG imaging of the pelvic floor. She has a strong research background with more than 75 publications and abstracts in peer reviewed journals. She has published multiple papers on imaging of slings and the pelvic floor muscles in international journals. In addition to having abstracts accepted at successive IUGA and AUGS conferences since 2013, she also had 7 oral podium presentations and 2 oral poster presentations at the 2013 AUGS annual meeting at Las Vegas where she won one of the best paper awards. She is also a member of the Editorial Board of the International Urogynecology Journal. Her research acumen is manifest in the fact that she is the only person from her country who has won a prestigious NIH grant, for her field study on dysfunctional voiding in adolescent girls, without any American collaborator. This ongoing study on environmental and contextual determinants of maladaptive toileting behaviors among adolescent girls in an urban, peri-urban and rural setting, is a necessary predecessor to the proposed study and is in keeping with the PI's long term research goals of conducting research in functional voiding and defecatory disorders. Previously, she has presented research on biofeedback techniques and diagnostic methods for functional defecatory and urination disorders at IUGA and AUGS conferences.

The PI is also the founder of one of the country's largest tech-enabled NGOs in the country dedicated to maternal and child health, which works in 18 states in the country and has impacted the lives of over 24 million women and their children and trained over 173,000 health workers. As a part of this work, she has been the PI of several large randomized controlled trials on maternal and child health, funding for which has been provided by the Global Poverty Action Fund (GPAF grant) of Department for International Development, UK, Grand Challenges Canada, Google, Save the Children International, Skoll Foundation and other international funding agencies, in extremely competitive grant competitions with over 700 applications from over 100 countries. Hence the PI has managed grant money of over 1 million dollars dedicated to research and has completed all studies within the designated time frame.

The co-investigator holds a PhD from Cardiff University in physiotherapy and is presently Professor and Director of the School of Physiotherapy and the Centre of Human Movement Science at her premier University-based institution. She has worked on several projects in the field of human movement science and its applications for enhancement of clinical practice. The research in indigenous postures and movement forms such as squatting was supported by International Society of Biomechanics, USA. Parallel collaborative research with engineers continues in design and validation of technology for rehabilitation which can be used for the masses in rural and urban sector to address unmet needs in healthcare. Department of Biotechnology of the Government of the country funded a collaborative interdisciplinary project with a premier engineering school of the country to design bi-articular actuation mechanism with energy storage and foot and knee brace for trans-tibial prosthesis. Research in the field of geriatrics has attracted recommendation for funding by Department of Science and Technology of the Government to develop a mobile based application for tele-rehabilitation for self-empowerment of community dwelling elderly people for maximization of physical function. An interdisciplinary research project funded by Indo-Canadian Shastri Institute and Natural Sciences and Engineering Research Council of Canada, was undertaken in collaboration with Department of Mechanical Engineering, Queens University, Canada to explore the influence of various labor postures adopted for childbirth on pelvic dimensions to gain further insight to improve birth experience. Kinematics of pelvic dimension was studied in a

group of non-pregnant women by using 3D motion system. Research work in these areas of human movement science and clinical rehabilitation has resulted in 38 publications in Pubmed and Scopus Indexed Journals.
The research project will be conducted at the Centre of Human Movement Science (CHMS), which is a comprehensive motion analysis centre equipped with state-of-art gold standard equipment for capturing measure kinematics and kinetics, energy cost, muscle activity of human movement. CHMS is equipped with 12 high end 240 fps optical cameras (Vicon, UK) and three force platforms (AMTI, USA) to measure kinematics in terms of 3D motion and kinetics of human movement. AMTI biomechanics force platforms are designed to measure forces, moments and are sensitive to accelerations as well. Force plates can be used individually or arranged in a walkway format to collect multiple footfalls. The Centre is equipped to explore muscle activity during movement using S-EMG systems such as Delsys Bagnoli EMG System (8 channel wire-less device) which is synchronized with VICON motion analysis software. ProComp Infiniti: The ProComp Infiniti SA7500 encoder is another eight (8) channel, multi-modality device for real-time computerized data acquisition, which is available at the institution.

III Specific aims

The specific aim of this pilot study is to determine the surface EMG (root mean square and median frequency) of the muscles of the pelvic floor and trunk and kinematics of the pelvis in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome resulting from pelvic floor dyssynergia, in three different positions: squatting, sitting and modified commode chair sitting positions

IV Primary Outcomes

1. Root mean square and median frequency of pelvic floor muscle activity
2. Kinematic parameters: pelvic joint angles in three planes and distance between the pelvic markers

These primary outcomes will provide insight into the muscle activation and relaxation patterns during voiding and defecation in three different positions: squatting, sitting and modified commode chair sitting positions. Root mean square will inform amplitude of muscle activity in mV. Median frequency will indicate the fatigue in the muscle.

Secondary Outcomes

Root mean square and median frequency of activity of trunk muscles

V Background and Significance

Functional disorders of voiding and defecation are associated with inability to relax the pelvic floor/sphincters

Effective voiding and defecation require increased pressure within the viscus (i.e. bladder or rectum) coordinated with relaxation of the pelvic floor and sphincters.[1] When there is disordered functioning of the pelvic floor and/or sphincters, functional defecatory disorders and dysfunctional voiding may ensue.[1]
In neurologically intact women, dysfunctional voiding (DV) constitutes one of the major functional problems underlying bladder outlet obstruction,[2] a primary cause of urinary retention. DV is an abnormally learned spectrum of voiding behavior in neurologically normal individuals, in whom there is increased external sphincter activity during voluntary voiding; it often evolves from attempt to suppress impending or active bladder contractions by inappropriately contracting the pelvic floor muscles, thereby tightening the urinary sphincter complex.[3] The corresponding colorectal problem is paradoxical non-relaxation of anal sphincter musculature or pelvic floor dyssynergia which is a major functional reason for obstructed defecation syndrome (ODS).[4] Cavallaro et. al. found that dyssynergia was present in over 66.9% of patients with ODS and it was the only disorder identifiable on defecography that was associated with an increase in overall CSI (Constipation Severity Instrument) score.[5] Several studies suggest a link between functional bowel and bladder disorders: symptoms of dysfunctional voiding and uroflowmetric abnormalities occur more frequently in women with a defecatory disorder than in healthy controls.[1]

Toileting position has an important functional impact on voiding and defecation.

Learned and habitual dysfunction of the pelvic floor can result from maladaptive toileting behaviors. [5,6] In developing countries such as India, where two-thirds of the population lack access to proper sanitation facilities and is home to 60% of the global population that practices open defecation,[7] girls and women face several challenges with respect to toileting leading to development of dysfunctional toileting habits. Maladaptive toileting behaviors develop in adolescence in response to the negative perception of the toileting environment at school and can form the basis for future LUTS. [8] In children it is well recognized that certain toileting behaviors are associated with dysfunctional voiding and functional bladder disorders, which may persist into adulthood as OAB.[9]
Posture on the toilet is an important consideration during both defecation[10] and micturition.[5] Compared with the sitting position, squatting is associated with significantly less time to achieve a sensation of satisfactory bowel emptying and a lower degree of subjectively assessed straining. [10] Rad et. al. reported that anorectal angle and perineal plane distance was greater in those who squatted versus those who sat[11]: anorectal angle opens from 92 degrees in sitting position to 132 degrees in the squatting posture. They concluded that squatting caused relaxation of the puborectalis muscle, thus facilitating bladder and bowel evacuation. It has been postulated that the sitting posture stretches the puborectalis muscle, thus choking the urogenital hiatus, whereas squatting relaxes the puborectalis muscle and urogenital hiatus, providing better bladder and bowel emptying. [12]
The relationship between squatting and improved voiding is less clear. In European women with mean age of 33.6 years, no significant difference was found in maximum flow rate (Qmax), average flow rate (Qave) and total micturation time, and straining in these positions increased Qmax, Qave, reducing total voiding time. [13] However, all three positions in this study have the buttocks in contact with the toilet seat. Gupta et. al. [14] found that the squatting posture is associated with significantly higher Qmax and Qave and a lower postvoid residual, compared to the sitting posture. They suggested that squatting posture probably relaxes the puborectalis sling, which relaxes

the pelvic floor, thus providing efficient emptying. However, there are other studies that have shown no differences in uroflowmetry parameters between sitting and squatting. [15]

Historically, man has squatted to defecate[16] and urinate[5], and this practice continues today in underdeveloped countries.[6] While squatting for defecation and urination continues to be the principal position in Asia and Africa, Western populations have become accustomed to sitting on a commode. [10] The widespread use of a sitting toilet began during the nineteenth century when sewage systems were developed to improve sanitation as cities and populations grew. [6] This change in posture has led to a situation whereby entire populations are now not accustomed to squatting: only 43% of participants in a study could squat fully. [5] It may be that voiding in the position (sitting versus squatting) to which the individual is most accustomed also influences uroflowmetry parameters.[5] Sudden changes in defecation habits, such as altering the position from sitting to squatting or introducing a special commode, may add psychological stress and cause incomplete evacuation. [6] Hence modifications of the sitting position such as the 'thinker position' have been proposed in which the upper part of the body is bent forward over the commode. [6] The thinking position has been shown to result in higher rectal and lower anal pressures. [6] It has also been shown to be associated with a significantly wider anorectal angle, larger perineal plane distance and longer puborectalis length, during straining, when compared with the sitting position. [6]

Need for robust evidence

Though there is some radiographic evidence that squatting is associated with improved micturation and defecation, robust evidence regarding pelvic muscle activity and kinematics of the pelvis and the trunk in various positions is entirely lacking. While kinematics analysis of the pelvis in various toileting positions have never been performed, electromyographic studies have various fallacies: the results may not be interpretable due to technical artifacts and may not reflect sphincter activity. Practice standards are lacking for display, time scale, sampling, appropriate position for placing of active electrodes, technical and clinical quality checks and there is variability in analysis, interpretation and reporting.[17] Surface electromyography (sEMG) is a painless and non-invasive method of monitoring muscle activity and resting tonus that can be used both in assessment and bladder and bowel retraining applications. [17] It enables the evaluation of the activity of motor units recruited during motion enabling the researcher to understand the strength of muscle activation during dynamic motion. [17] However, the regular sEMG probes used in urodynamic and biofeedback units cannot help to compute the root mean square and median frequency of pelvic floor and trunk muscle activity with any degree of accuracy as they do not have the desired sensitivity.[17]

As ICS Standards Document 2020-21 has clearly laid out in its chapter on use of EMG, EMG pattern of the pelvic floor muscle under physiological and pathological conditions is an important area for future research. [17] In addition, trunk muscle activity while the body moves into the toileting position needs to be understood. However, multi-channel surface electromyogaphic units that have greater sensitivity to capture signals of small amplitude than biofeedback units are necessary. Simultaneously, studies done previously in pregnant women [18] suggest that pelvic kinematic information will provide insight into understanding the mechanics involved in urinating and defecating in various positions, because it is speculated that pelvic kinematics will influence intra-abdominal pressure which will eventually influence the dynamics of voiding and defecation.

Lastly, in the age of the commode, with entire populations losing the ability to squat, it is important that these studies are performed in habitual squatters so that the true benefits of squatting over the other positions are elucidated. These studies will form the foundation for re-introducing optimal toileting positions back into the community world over and provide the evidence-based platform needed to transform toileting behaviors at large.

VI Methodology

A prospective pilot study will be conducted as a collaborative effort between the country's premier Center for Excellence in Urogynecology and Pelvic Reconstructive Surgery at a University Hospital and the Center of Human Movement Sciences, Department of Physiotherapy at another University based hospital, between January 2022 and February 2023.

Patients: Following approval from the Ethical Committee for Research on Human Subjects of both the institutions, five healthy female volunteers with normal micturition and defecation functions (Group A), ten women with dysfunctional voiding (Group B) and ten women with obstructed defecation syndrome (ODS) due to paradoxical non-relaxation of anal sphincter musculature or dyssynergia (Group C) will be recruited after informed consent.

Inclusion criteria: English speaking women in the age group 18 to 45 years who are habitual squatters and have signed the informed consent (as per Declaration of Helsinki Guidelines; appendix 1). Women in group B and Group C should be diagnosed with dysfunctional voiding and ODS due to dyssynergia, respectively, for at least 6 months.

Exclusion criteria: Pregnant women; women with history of known musculoskeletal conditions that limit the ability to squat such as severe backpain, knee osteoarthritis, severe rheumatoid arthritis, knee or ankle joint instability, recent fractures of spine or lower extremity; women with abdominal or pelvic carcinoma, prolapse, urinary incontinence, overactive bladder syndrome, pelvic inflammatory disorders, bladder pain syndrome and other chronic pelvic floor conditions associated with pain, will be excluded. Similarly, women with slow transit constipation will be excluded. Women with concomitant dysfunctional voiding and functional defecatory disorders will be excluded. Patients with morphological abnormalities including anatomical abnormalities and/or neurological disease responsible for the dysfunctional voiding in Group B and ODS in Group C will be excluded from the study.

All patients will undergo thorough history taking (appendix 2 has the history taking form), physical examination including neurological, abdominal and urogynecological examination, and abdominal ultrasound examination, as necessary. Dysfunctional voiding will be diagnosed based on non-instrumented uroflowmetry, multichannel urodynamics with surface EMG and urethral pressure profilometry[2] and voiding cystourethrogram. [2] Cystoscopy will be performed, if required. Only those patients with diagnosed dysfunctional voiding will be included in Group B. All selected patients in Group B will complete the American Urological Association Symptom Index (AUASI) before further testing.[19] The index will be divided into a total score (sum of all 7 questions), a voiding score (sum of questions 1, 3, 5 and 6) and a storage symptom score (sum of questions 2, 4, and 7).

In potential patients for inclusion in Group C, slow transit constipation will be ruled out with colonic transit studies (ref). MR defecography will then be performed to determine presence of intussusception, enterocele, rectocele and pelvic floor dyssynegia. [4] Presence of dyssynergia will be corroborated with anal manometric studies (ref). Only those patients with diagnosed pelvic floor dyssynergia will be included in Group C. All patients in Group C will fill the Varma Constipation Severity Instrument (CSI) (ref 21 from the dis colon). The CSI is a 16-question survey to assess constipation severity. It is a short, easy to use, reliable, and valid instrument that generates a score of 0 to 73, with increasing scores signifying increased severity of constipation (ref). This index has subscales measuring slow transit, symptoms of obstructed defecation, and symptoms of pain. While all subscales are important in the evaluation of patients with constipation, our analysis will focus on the obstructed defecation subscale of the instrument to determine the cause of ODS and pick up those with pelvic floor dyssynergia.

Surface EMG and Kinematic Studies

A mini-portable box style toilet will be installed to create a hygienic and private atmosphere for the participants within the Centre of Human Movement Science (CHMS) for unobtrusive capture of data without compromising hygiene of the laboratory. Patients will be able to use to toilet in the squatting position, sitting position (commode) and modified commode chair position (by placing a 2 feet stool in front of the commode).

Patient Preparation and Mechanism of Data Capture

The CHMS is a comprehensive motion analysis center that is equipped with state-of-art gold standard equipment for capturing kinematics (motion) and muscle activity. CHMS is equipped with 12 infrared cameras (Bonita 10 VGA Optical camera, 240 fps with varifocal lens and NIR strobe) and VICON Motion System (Westway, Oxford Metrics Group Ltd, Oxford, OX20JB, UK) to measure kinematics of movement. Inverse kinematics and dynamics calculations will be performed within Vicon Nexus software (version 1.6.1).

Kinematic measurements: Kinematic data of the pelvis will be collected at 250 Hz using the Vicon motion capture system and video capture of data capture will be performed using 2 video cameras positioned 2 meters away from capture volume (Bonita 720c video camera, Vicon, UK). Optical retroreflective markers will be placed based on the 'Plug-in-Gait' full body marker set described by Grood and Suntay.[20]

Participants will be prepared for motion capture. Markers will be secured with double-sided adhesive tape on predetermined anatomical landmarks. The markers will be placed bilaterally on iliac crest, pubic symphysis, coccyx, anterior superior iliac spine, posterior superior iliac spine, lateral aspect of thigh, lateral condyle of femur, lateral aspect of tibia, lateral malleolus, posterior aspect of heel, second metatarsal head. Four additional markers will be placed on bilateral iliac crest and medial femoral condyles.

A static trial will be recorded in standing in anatomical position to enable calibration of the system. Three walk trials will be captured for reference, followed by one single dynamic trial of squatting, sitting and modified chair commode sitting. Kinematic data during all three positions will be captured simultaneously with the surface EMG data.

Surface electromyographic measurements: Muscle activity during the above activities will be recorded using telemetric 8 channel surface electromyography system (Bio-infinity, Thought technology Ltd., Canada). Skin surface over the back extensor and abdominal muscle site will be shaved; light repetitive peeling will be done with a sticky tape after cleaning with alcohol to remove dead surface tissues and oil that might reduce conductivity for capturing muscle activity.

Six 1 mm square surface electromyography (sEMG) electrodes will be placed on the midline of the skeletal muscle belly between the myo-tendinous junction and the nearest innervations zone with the detection surface oriented perpendicular to the length of muscle fibers. Placement of electrodes for each muscle will be determined using anatomical landmarks.

Muscle activity will be recorded from pelvic floor muscles using one vaginal probe and 2 peri-anal sensors. The vaginal electrode will be secured into the vagina through a lubricating gel and tape. Two electrodes will be placed on the right and left lower rectus abdominus muscle and 2 electrodes will be placed on right and left erector spinae muscles (lumbar segment) to record activity from core muscles.

Root mean square (RMS) and median frequency of the sEMG signal will be recorded during descent, toileting position and ascent activity. Trunk muscle activity will also be recorded during sustenance of toileting position and while urinating and defecating.

Muscle activity recorded up by sEMG is known to be influenced by extrinsic and intrinsic factors influencing amplitude and frequency of signal. Extrinsic factors such as electrode structure and placement with respect to motor points in the muscle will be controlled by reducing skin resistance and ensuring proper placement of electrodes to reduce noise. However, intrinsic factors such as number of active motor units and fiber type composition of the muscle, fiber diameter, depth of muscle and motor unit firing rate; cannot be controlled. Hence, data will be normalized using sEMG activity from 10 sec maximal voluntary contraction (MVC) of each muscle. During MVC test, participants will be instructed to exert maximal effort and contract the pelvic floor muscles to the best of their ability. Data will be normalized using RMS values during middle 8 sec of each 10 sec MVC. Previously established test positions will be used to record MVC of erector spinae and rectus-abdominis muscle activity.

Process for the patients: Trunk and pelvic floor muscle activity and kinematics of the pelvis will be recorded from each participant in 3 positions i.e., squat position, western commode and modified chair commode to study the mechanics of the pelvis along with muscle control which is required for voiding and defecation. Since there are no prior studies exploring trunk and pelvic muscle control and kinematics of the pelvis during voiding and defecation, we will explore the best suited process for data capture on the 5 healthy participants in Group A before performing the study in the women in Groups B and C. The data on the healthy volunteers will be captured during micturition and defecation in the squatting, sitting and modified commode chair sitting position. The patient will be asked to visit the center on three different occasions with comfortably full bladder to assess muscle activity and kinematics during micturition in squatting, sitting and modified commode chair sitting

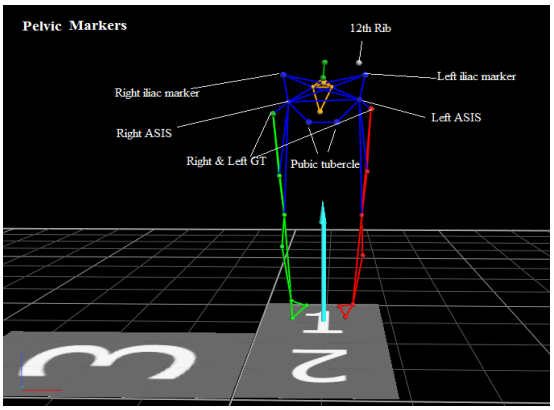

Fig 1: Pelvic marker set for kinematic evaluation

positions. The healthy volunteers will also visit the center on three more occasions to assess the muscle activity and kinematics during defecation in squatting, sitting and modified commode chair sitting positions. Per anal insertion of an oatmeal enema will be done to stimulate defecation prior to the testing for defecation.

Following determination of the best process for data capture, all Group B participants will be asked to come to the Center with comfortably full bladder on three separate days and EMG and kinematics assessment will be done during micturition in squatting, sitting and modified commode chair sitting positions on the three separate days.

Similarly, all Group C participants will be asked to come to the Center on three separate days. Following a per anal oatmeal enema insertion, EMG and kinematic assessment will be done during defecation in the squatting, sitting and modified commode chair sitting positions on the three separate days. The measured parameters will be compared between the three positions within the patients in Group B and C separately and between Groups B and C.

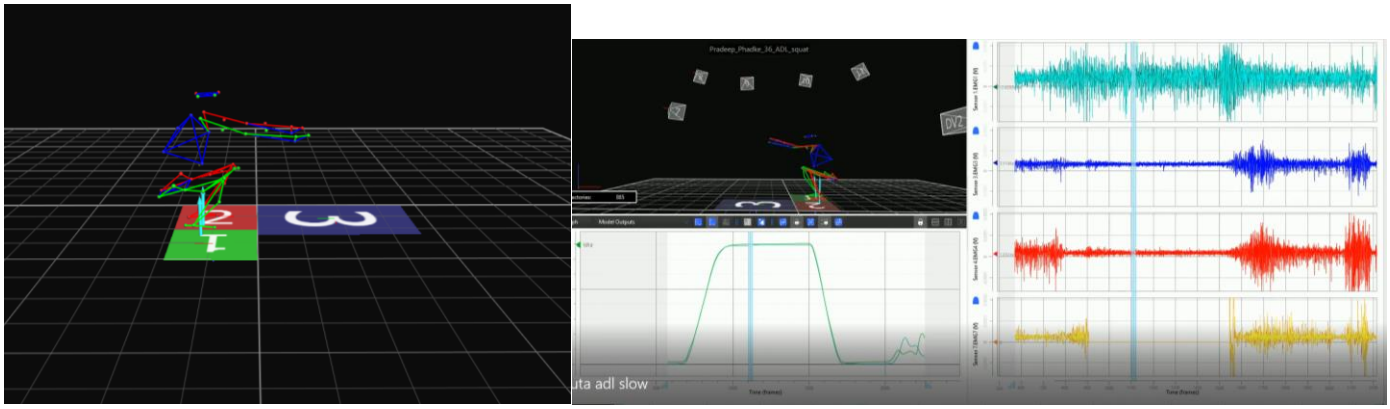

Fig 2: Squat activity with EMG and pelvic kinematics

VII Statistical analysis: Data will be analyzed using statistical tool IBM SPSS version 20. The level of statistical significance will be set at $p \leq 0.05$. Normality of distribution will be ascertained; measures of central tendency and dispersion will be calculated and reported as means and standard deviation if data is normal and median and interquartile range if data is non normal. Within group comparisons will be performed using paired t- test if data is normal and Wilcoxon matched-pair signed-rank test if the data is non normal. Comparison between Groups B and C will be done using t test if the data is normal and Mann Whitney U test if the data is non normal.

VIII Evaluation Criteria and Progress

The two teams at Cama Hospital and MGM will have weekly review meetings to review the progress of the project as compared with the timelines. Patient records will be maintained by the research coordinator working under the guidance of the PI. The data will be transferred in a deidentified manner to an excel spreadsheet and the data will be cross-checked weekly by the PI to ensure accuracy.

IX: Timeline (January 2022- February 2023)

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Project Management															
IRB Submission, Review, Approval															
Recruitment of healthy volunteers															
Data capture in healthy volunteers															
Recruitment of patients of DV and ODS															
Data capture in patients of DV and ODS															
Data analysis															
Manuscript preparation															
Final Submission															

X: Budget:

Head	Item	Quantity	Amount/ Unit (dollars)	Total Cost (dollars)
Equipment	sEMG sensors	6	810.81/-	4864.86/-
	Vaginal electrode	4	148.65/-	594.59/-
Testing Fee		25 participants	162.16/-	4,054/-
Consummables		25 participants	486.49/-	486.55/-
			Total budget in dollars	**10,000/-**

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Appendix 1:

Patient Information Sheet and Consent Form

Project title: Surface EMG of muscles of the pelvic floor and trunk and pelvis kinematics in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in squatting, sitting and modified commode chair sitting positions

Name of the Research participant-……..

Date of Birth /Age …….

Address of the subject…….

Qualification…….

Occupation- student/self-employed/service/housewife/other (please tick as appropriate)

Introduction:

You are invited to participate in a research study. It is important that you read this description of the study and understand your role in it including the nature and risks of participation. Please give your consent to participate in this clinical study only if you have completely understood the nature and course of this study and if you are aware of your rights as a participant. Your participation in this study is voluntary.

Purpose of the study:

Pelvic floor disorders are extremely common in women across all age groups. However, symptoms of nonrelaxing pelvic floor dysfunction are often incompletely understood and underdiagnosed. These may include problems with defecation and urination, which require relaxation and coordination of pelvic floor muscles and urinary and anal sphincters. These symptoms can adversely affect a woman's quality of life.
Many factors, including environmental, social , cultural norms, and abnormal physiology may impact toileting. Also, position at the time of voiding is an important consideration both while urination and defecation. However, very little is known about how these factors influence the activity of the pelvic floor muscles and lead to non-relaxation and dysfunction. It has been postulated that certain positions may not lead to sufficient relaxation of the pelvic floor at the time of urination and defecation. There is some evidence that suggests squatting position relaxes the pelvic floor muscles providing better bladder and bowel emptying. However, there is lack of robust evidence regarding pelvic muscle activity and kinematics of various positions. The purpose of this study, therefore, is to understand and gain insights in the mechanics of the pelvis and activation and relaxation patterns of the pelvic floor and trunk muscles in patients with difficulty in urination and defecation due to non-relaxation of pelvic floor muscles in squatting, sitting and modified commode chair sitting positions.

We have obtained permission from the Ethics Committee for conducting this study.

Site, expected duration of the study and number of research participants:

You will be one of approximately 25 women who will participate in this study. This study will be conducted in the Urogynecology O.P.D of Center for Urogynecology and Pelvic Reconstructive Surgery, Cama Hospital, Grant Medical College, Mumbai and the MGM Center of Human Movement Sciences, Mahatma Gandhi Mission Institute of Health Sciences, Navi Mumbai.

Study duration will be from January 2022 to February 2023.

Study procedures to be followed:

If you agree to participate in this study, a thorough medical, surgical, obstetric and urogynecological history will be taken. General physical, gynecological and urogynecological examination will be done and findings will be noted in a patient evaluation form. You will undergo necessary laboratory tests, imaging studies, urodynamic assessment and anorectal manometry depending on your diagnosis. You may also be asked to fill a standardised questionnaire in English as per your diagnosis. All included participants will be divided into 3 groups (depending on their diagnosis):

- Group A: Healthy volunteers
- Group B: Patients with diagnosed dysfunctional voiding
- Group C: Patients with diagnosed ODS due to pelvic floor dyssynergia

Patient preparation and data capture: Trunk and pelvic floor muscle activity and kinematics of the pelvis will be recorded at the MGM Centre of Human Movement Science. To prepare you for motion capture, markers will be secured with double-sided adhesive tape on predetermined anatomical landmarks. Six additional surface electromyography (sEMG) electrodes will be placed on the midline of the skeletal muscle belly using anatomical landmarks. Muscle activity will be recorded from pelvic floor muscles using one vaginal probe and 2 peri-anal sensors. The vaginal electrode will be secured into the vagina through a lubricating gel and tape. Electrodes will also be placed on rectus abdominus muscle and erector spinae muscles (lumbar segment) on both sides to record activity from core muscles. Trunk and pelvic floor muscle activity and kinematics of the pelvis will be recorded from each participant in 3 positions i.e. squatting, sitting and modified commode chair sitting position during the process of urination and defecation.

For the purpose of urination and defecation, a mini-portable box style toilet will be installed to create a hygienic and private atmosphere for the participants within the MGM Centre of Human Movement Science. You will be able to use the toilet in the squatting, sitting (commode) and modified commode chair sitting positions.

Number of visits and process for the participants:

Group A: If you are a healthy volunteer, you will be asked to visit the center on 6 days. On three of these days you will be advised to come comfortably full bladder, to assess muscle activity and kinematics during urination in squatting, sitting and modified commode chair sitting positions (one position/ day). On the rest of the three days muscle activity and kinematics during defecation in squatting, sitting and modified commode chair sitting positions (one position/day) will be assessed. For the defecation studies, you will be given an oatmeal enema per anally to simulate defecation.

Group B: If you are a group B participant, you will be asked to visit the center with comfortably full bladder on three days and EMG and kinematics assessment will be done during urination in squatting, sitting and modified commode chair sitting positions on the three separate days (one position/day).

Group C: If you are a group C participant, you will be asked to visit the center on three days. Following a per anal oatmeal enema insertion, EMG and kinematic assessment will be done during defecation in the squatting, sitting and modified commode chair sitting positions on the three separate days (one position/day).

Risks and discomforts of participating:

During the course of the study, safety of the patient will not be compromised in any way. There will be no discomfort to patients during the interview or examination.

Possible benefits of the study:

Pelvic floor kinematics and surface EMG will provide insight into understanding the mechanics involved in urinating and defecating in various positions and thereby help in optimising treatment of dysfunctional voiding and obstructed defecation syndrome due to non-relaxation of pelvic floor muscles.

Possible benefits to other people:

Your participation in this study will help in understanding the underlying physiology of functional voiding and defecation disorders and influence of various positions on urination and defecation. This will help in improving management and also contribute to scientific evidence globally.

Compensation for Participation:

Participation in this study will be at no cost to you.

Right to withdraw from the study:

Participation in this study is entirely voluntary. You may choose not to take part or you may leave the study at any time. Your decision will not affect your further treatment at this institute.

Confidentiality of the information obtained from you

You have the right to confidentiality regarding the privacy of your medical information (personal details, results of physical examinations, investigations, and your medical history). By signing this document, you will be allowing the treating physician, other study personnel, hospital ethics committee to view your data, if required. The results of clinical tests and therapy performed as part of this research may be included in your medical record. The information from this study, if published in scientific journals or presented at scientific meetings, will not reveal your identity.

Right to new information

If the research team gets any new information during this research study that may affect your decision to continue participating in the study, or may raise some doubts, you will be told about that information.

Contact persons

For further information / questions, you can contact us at the following address:

In case of conflicts, you can contact the chairperson (convener) of our hospital ethics Committee at the following address:

Patient consent form

Title:

Name of the participant: _____

Name of the Principal Investigator: ____ _____

Name of the Institution:

Documentation of the informed consent

I, … … … … … … … … …., have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in "**Surface EMG of muscles of the pelvic floor and trunk and pelvis kinematics in patients with Dysfunctional Voiding and Obstructed Defecation Syndrome due to pelvic floor dyssynergia, in squatting, sitting and modified commode chair sitting positions".**

(1) I have read and understood this consent form and the information provided to me.

(2) I have had the consent document explained to me.

(3) I have been explained about the nature of the study.

(4) My rights and responsibilities have been explained to me by the investigator.

(5) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose.

(6) I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms.

(7) I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in the hospital.

(8) I am also aware that the investigators may terminate my participation in the study at any time, for any reason, without my consent.

(9) I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the ethics committee. I understand that they may inspect my original records.

(10) My identity will be kept confidential if my data are publicly presented.

(11) I have had my questions answered to my satisfaction.

(12) I have decided to be in the research study.

I am aware, that if I have any questions during this study, I should contact at one of the addresses listed above. By signing this consent from, I attest that the information given in this document. I will be given a copy of this consent document.

Participant's initials: _____

Name and signature / thumb impression of the participant (or legal representative if participant incompetent): _____ (Name)

_____ (Signature)

Date: _____ Time: _____

Name and signature of impartial witness (required for illiterate patients):

_____(Name)

_____ (Signature)

Date: _____ Time: _____

Address and contact number of the impartial witness:

Name and signature of the Investigator or his representative obtaining consent:

_____ (Name) _____ (Signature) _____ (Date)

Appendix 2:

Filled by:

Dr. _____

Date:

Patient evaluation sheet

1. Name :
2. Age:
3. Husband's Name:
4. Name of the Hospital/ Center:
5. MRD/ UHID No.:
6. Educational status:

7. Occupation:

8. History of any chronic medical disorders:

9. History of any surgical procedures in the past:

10. Drug history:

11. History of anxiety/ depression/ any other psychiatric illness:

12. Menstrual history:
    - Cycle length/ days/ flow
    - Regular/irregular
    - LMP:
13. Obstetric history:
    - Gravida
    - Parity
    - Living
    - Abortions

14. History of previous pregnancy:

S. no.	Antenatal period	Intrapartum period	Mode of delivery	If vaginal, Episiotomy/ Instrumental	If LSCS, Elective/ Emergency	Baby weight

History of Urinary symptoms:

1. Do you leak urine on sneezing, coughing or physical activity?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) would you typically leak? _____

How long has this been an issue? _____

2. Do you ever have such a strong need to urinate that if you don't go you will leak?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

3. If Yes to No. 2, Does urine ever leak before you can get to the toilet?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) would you typically leak? _____

How long has this been an issue? _____

4. How often do you pass urine during the day?
    ……..

5. How often do you wake up at night to pass urine?
    ……

6. Have you wet the bed in the last year?
    a. Yes
    b. No

7. Do you ever leak during or after sexual intercourse?
    a. Yes
    b. No

8. Do you have to wear a pad/ liner/ diaper because of leaking of urine?
    a. Yes
    b. No

If yes: quantity per day _____

9. Do you have pain in your bladder before or after passing urine?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

10. Do you have history of recurrent UTI (> 2 episodes in 6 months/ > 3 episodes in a year)?
    a. Yes
    b. No

11. Is there a delay before you can start to urinate?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

12. Do you have to strain to urinate?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

13. Do you feel that you have a slow stream of urine?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

14. Do you stop and start more than once while you urinate?
    a. Yes
    b. No

If yes, how many times per day or week (please specify)? _____

How long has this been an issue? _____

15. After urinating do you feel you have completely emptied your bladder?
    a. Yes
    b. No

If yes, how many times per day or week (please specify)? _____

How long has this been an issue? _____

16. After urinating, do you have dribbling of urine when you stand up?
    a. Yes
    b. No

17. Any treatments taken in the past for your urinary complaints?
    a. Yes
    b. No

18. If yes to no. 17, mention the complaints and details of treatment taken.
    ……
    ……
    ……

19. What is the most common position in which you prefer to pass urine?
    a. Squatting
    b. Sitting
    c. Standing

20. Do you ever hover/ bend to pass urine?
    a. Yes
    b. No

Toileting behaviors:

1. Do you have Place preference for voiding?
    a. I prefer my home toilet only and avoid public toilets as far as possible
    b. I can use any clean toilet

2. Do you often do convenience voiding (emptying the bladder in the absence of the sensation to void)
    a. Yes, mostly
    b. sometimes
    c. No

3. Do you often delay voiding? (Waiting to void despite an urge)
    a. Yes, mostly
    b. Sometimes
    c. No

Defecatory Symptoms

1. Do you have to strain to pass stools?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

2. Do you have lumpy or hard stools?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

3. Do you have abdominal pain/ cramps at the time of passing motion?
    a. Yes
    b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

4. Mean time spent in the toilet for passing motion?
    a. <= 5 mins
    b. 6-10 min
    c. 11-20 min
    d. 20-30 min
    e. > 30 min

5. Number of attempts to defecate/day
    a. 1
    b. 2
    c. 3-4
    d. 5-6
    e. >6

6. Do you have to use anal/ vaginal digitation to pass motion?
    a. Yes

b. No

If yes, how many times per day or week (please specify)? _____

How long has this been an issue? _____

7. Do you routinely have to use a laxative to pass motion?
   a. Yes
   b. No

8. After passing motion, do you feel that you have completely emptied your bowel?
   a. Yes
   b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

9. Any history of treatment done for above symptoms?
   a. NO
   b. Yes

10. If yes, Mention the details……..

11. What is the most common position in which you prefer to pass motion?
    a. Squatting
    b. Sitting

Other symptoms:

1. Do you have a sensation of something coming out of your vagina/ vaginal bulge?
   a. Yes
   b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

2. Do you have pain in your pelvic region (not associated to menstruation)?
   a. Yes
   b. No

If yes, how many times per day or week (please specify) _____

How long has this been an issue? _____

Examination:

Vitals at the time of admission:

- Pulse:
- B.P:
- R.R:
- Temp:

- Height
- Weight
- BMI
- GPE:
    - Pallor
    - Lymphadenopathy
    - Thyroid
    - Pedal edema
- Chest examination:
- CVS examination:
- Per abdomen:
- Local examination:
- P/S:
- P/V:
- P/R:
    - Tone of anal sphincter
- Oxford score:
- POP-Q (In case of prolapse)
- Assessment of pelvis and pelvic floor: (To be evaluated in terms of VAS score 0 – 10)

Sites	Rt	Lt
Sacroiliac joint		
Anterior superior iliac spine		
Rectus insertion		
Obturator internus		
Levator ani		

Investigations:

- Uroflowmetry
  - Maximum flow rate
  - Average flow rate
  - Voided volume
  - Flow time
  - Time to maximum flow
  - Interpretation:
    ……
    …….
    ……
    …….

  - PVR

- Urine analysis:

- Multi- channel Urodynamic study with UPP and surface EMG:

- Interpretation of Voiding Cystourethrogram:

- Colonic transit study

- Anorectal manometry

- MR Defecography

- Surface EMG and Kinematic Studies:
    - Kinematics during squatting and Sitting and modified sitting
        - Hip flexion angle (degrees)
        - Knee flexion
        - Ankle Dorsiflexion
        - Pelvic tile
        - Spine angle
        - Distance between Posterior superior iliac spine (PSIS) and Anterior superior iliac spine (ASIS) (in mm)
        - Distance between R PSIS and L PSIS
        - Distance between R ASIS and L ASIS
    - Muscle activity
        - RMS of muscle activity micro volts and median frequency (Hz) from
        - Erector Spinae
        - Rectus Abdominis
        - Gluteus maximus
        - Hamstring
        - Pelvic floor muscle
        - Perianal muscles

Rajiv Gandhi Science & Technology Commission
Government of Maharashtra

No. RGSTC/File-2021/DPP-249/CR-36/237
Apeejay House, 3rd Floor,
Dinshaw Vacha Road,
Near K.C. College,
Churchgate, Mumbai-400 020.
Tel: No. 022-22024711/22024755
E-mail: rgstcmaha@rediffmail.com
Date:- 10 MAY 2022

Sanction Order

Sub: - Project Proposal titled, "Development of mobile technology (**D**etect, **RE**habilitate and **M**onitor (DREaM): Empowerment of primary caretakers of children with Cerebral palsy"

Ref: - 1) Detailed Project Proposal dated, 26th February, 2021 received from MGM School of Physiotherapy, Kamothe, Navi Mumbai.
2) RGSTC Letter dated, 3rd March, 2022 and 5th April, 2022 to the Institute.
3) Revised Detailed Project Proposal dated, 7th April, 2022 received from the Institute.
4) Email dated, 8th April, 2022 received from the Institute.

For advancement, propagation and promotion of applications of Science and Technology for development and to tackle various problems faced by the society, the Government of Maharashtra has set up Rajiv Gandhi Science and Technology Commission. One of the objectives of the commission is to catalyze application of innovations in sectors like food processing, energy, water, agriculture, fisheries, industries, bio-diversity conservation etc. to create knowledge based society for sustained economic progress.

2. Rajiv Gandhi Science and Technology Commission (RGSTC), under its Scheme "Assistance for Science and Technology Applications" has received a detailed project proposal titled, "**D**etect, **RE**habilitate and **M**onitor (DREaM): Empowerment of primary caretakers of children with cerebral palsy" of 2 years duration with total estimated cost of Rs.34,25,000/- for financial support from MGM School of Physiotherapy, Kamothe, Navi Mumbai. The various objectives of the project are to develop a mobile based application, Monitor normal child development and detect red flags to identify developmental delay, Early detection of deterioration of function among children with cerebral palsy.

3. The proposal was duly processed and reviewed by the Project Appraisal Committee (PAC) of RGSTC in its meeting dated 14th and 15th February, 2022. Accordingly, the Institute vide its letter dated 07th April, 2022 has submitted the revised Detailed Project Proposal of 2 years duration with total cost of Rs.22,54,000/- (Rs. Twenty Two Lakh Fifty Four Thousand Only).

4. In view of the above, Rajiv Gandhi Science and Technology Commission is pleased to sanction the above project of **Rs.22,54,000/- (Rs. Twenty Two Lakh Fifty Four Thousand Only)** for the **duration of 2 years** and release **Rs.16,49,000/- (Rs. Sixteen Lakh Forty Nine Thousand only)** as the first installment to MGM School of Physiotherapy, Kamothe, Navi Mumbai for

implementation of the project. RGSTC (Norms of Funding) Regulations, 2011 and Supplementary Guidelines for implementation of Projects sanctioned by RGSTC are enclosed for necessary information.

5. The amount may be released in favor of MGM School of Physiotherapy through RTGS. The bank details of the said institute are as follows:

Name of Account Holder	: MGM School of Physiotherapy
Bank Name	: State Bank of India, Kamothe Branch
Account Number	: 37979141344
Type of Account	: Saving Account
IFSC Code	: SBIN0002271

6. The Institute is requested to acknowledge receipt of the payment immediately. The Institute should constitute a Project Review Committee (PRC) in consultation with RGSTC for periodic monitoring the progress of the project and a copy of the same should be sent to RGSTC. Beside representative of RGSTC, the PRC should include the domain experts and downstream partners.

7. The project status will be reviewed in terms of objectives and achievements, at the end of every six months / one year from the date of receipt of instalment. The Institute should submit Annual /Six monthly progress reports of the project along with the Utilization Certificate and the Statement of Expenditure to enable the Commission to follow the reviewing process.

(Dr. N. G. Shah)
Member Secretary

Copy forwarded with compliments for information and necessary action to:-

1. Dr. Rajani Mullerpatan, MGM School of Physiotherapy, MGM University Campus, Plot No. 1 & 2, Sector-1, Kamothe, Navi Mumbai- 410 209.
2. Vice Chancellor, MGM School of Physiotherapy, MGM University Campus, Plot No. 1 & 2, Sector-1, Kamothe, Navi Mumbai- 410 209.
3. Account Section, RGSTC
4. Select File, RGSTC

Copy for information to:-

5. Chairman, RGSTC.
6. Principal Secretary (IT and S&T).

(Screen 4/4)

Indian Council of Medical Research (ICMR)

Deptartment of Health Research
(Ministry of Health and Family Welfare)

Application of **ICMR Adhoc Project Program** detailed proposal

Date of submission: 17-Dec-2021 01:34:30 PM

Proposal Id: 2021-14014, **Version Id:** F1, **Proposal Title:** Adding breathes to life of patients with chronic respiratory disorders

Personal Details of PI

Name of PI (IN BLOCK LETTERS)	DR BELA MANISH AGARWAL	**Designation**	Professor
Email	BAGARWAL@MGMSOPNM.EDU.IN	**Contact**	9699969313
Date of Birth	20-Apr-1972	**Date of Superannuation**	20-Apr-2042
Nature of Employment	Permanent	**Institute**	MGM Institute of Health Sciences

Proposal Details

Advertisement	CALL FOR RESEARCH PROPOSALS OF AD-HOC PROJECT UNDER EXTRAMURAL RESEARCH PROGRAM OF ICMR FOR THE YEAR 2021	**Title of the Research Proposal**	Adding breathes to life of patients with chronic respiratory disorders
Institute Type	Private	**Valid DSIR Certificate** (Validity)	YES (03-Mar-2022)
Broad Area	Non Communicable Diseases	**Major Discipline**	DISABILITY AND REHABILITATION
Detailed Proposal	1639724073_269072024.pdf		
Project Duration (in Months)	24 Months	**Data Collection/Analyzing Data** (in Months)	18/6 Months
Objective of Study	1. To study biomechanics of thorax during Yoga breathing techniques- Anulom-Vilom, Omkar, Bhramari and Kapal-bhatti Pranayama though 3D motion analysis via marker displacement and computation of thoracic diameters during inhalation and exhalation 2. To evaluate biochemical response in terms of antioxidant activity following Pranayama intervention 3. To evaluate cardiorespiratory response and energy expenditure of Anulom-Vilom, Omkar, Bhramari and Kapal-bhatti Pranayama 4. To evaluate effect of a 12 week intervention of Anulom-Vilom, Omkar, Bhramari and Kapal-bhatti Pranayama on muscle activity, biomechanics, biochemical alteration, energy expenditure and frequency of hospital admissions		

Expected Outcome	a) Motion of thorax: Chest wall motion during Yoga breathing techniques will be measured using 3D motion-capture system (Vicon Oxford Metrics, Ltd., Oxford, UK; sampling rate 60 Hz). Reflective markers will be placed over bony landmarks on the upper, middle, and lower ribcage to define the thorax. (Lee et al., 2010). Change in diameter of the chest wall will be measured as distance between the sensors during end of inspiration and end of expiration with reference to midpoint point at sternum. (Lee et al., 2010) b) Muscle Performance : Muscle activity will be recorded from intercostals, diaphragm, sternocleidomastoid and abdominal muscles using surface EMG system (Delsys Trigno Wireless EMG System; Delsys, Inc., Boston, MA, USA) with a sampling rate of 2,000 Hz and bandwidth of 20–450 Hz, (Hawkes et al., 2007; Kang et al., 2015; Lima et al., 2014).Muscle activity will be assessed using surface EMG from intercostals, abdominals and accessory Muscle activity will be recorded during quite tidal breathing, Anulom vilom, Omkar, Bhramari and Kaplabhati Pranayam. Maximal voluntary contraction (MVC) will be captured while performing peak inspiratory pressure and peak expiratory pressure assessment using a Respiratory Strength Measurement Device (Pony, Cosmed, Italy). c) Measurement of energy cost of activity: Physiological responses will be recorded using heart rate, blood pressure and respiratory rate at rest and during pranayam using Fitmate Med metabolic cart. Fitmate Med (Cosmed, Italy) a portable, light weight, highly accurate and sensitive apparatus will be used to evaluate the physiological and metabolic function. Functional capacity evaluation using metabolic carts is considered to be the gold standard for assessment of energy expenditure. d) Biomarker analysis: Profound literature supports that performing Yoga improves functional capacity and meditation actually reduces oxygen consumption thereby promoting relaxation. Antioxidant activity will be analyzed from salivary sample to study the immune status of the body following pranayama. Antioxidant and inflammatory activity in salivary fluid will be analyzed at the MGM OMICS Research Center, MGMIHS using Modified Nitroblue Tetrazolium (NBT)assay

Ethical Clearance	yes	**Participating Agencies (Project Type)**	1 (Individual)
Fund received by ICMR before	N	**Fund received by Other Agency before**	N

Investigator Details

#	Name	Institute	Designation	Email	Contact No.	Role in Proposal
1	Dr Bela Manish Agarwal	MGM Institute of Health Sciences	Professor	bagarwal@mgmsopnm.edu.in	9699969313	PI
2	Dr Rajani Mullerpatan Prashant Mullerpatan	MGM Institute of Health Sciences	Director Professor	rajani.kanade@gmail.com	9819000674	Co-PI

Documents consideration

#	Proposal Id	Document Name	Is Applicable?	Uploaded Document	Remarks
1	2021-14014/F1	Declaration & Attestation Form(duly signed by Head of Department/ Director)	Yes		Declaration & Attestation Form(duly signed by Head of Department/ Director)
2	2021-14014/F1	Non submission to other agency	Yes		Declaration of Non submission to other agency
3	2021-14014/F1	Undertaking of Proposal limits	Yes		Declaration of Undertaking of Proposal limits
4	2021-14014/F1	Research Experience of PI during last 10 years	Yes		Research Experience of PI during last 10 years is NIL, sending data for Research Experience as Co investigator during last 10 years
5	2021-14014/F1	Certificate of previous ICMR Project	Yes		Certificate of previous ICMR Project

Budget Details

Year	Institute Name	Manpower	Contingency	Equipment	Travel	Overhead Charges	Total Budget (Rs.)
Year:1	MGM Institute of Health Sciences	372,000.00	50,000.00	100,000.00	15,000.00	10,000.00	547,000.00
Year:2	MGM Institute of Health Sciences	372,000.00	50,000.00	0.00	15,000.00	10,000.00	447,000.00
	Total(Rs.):	**744,000.00**	**100,000.00**	**100,000.00**	**30,000.00**	**20,000.00**	**994,000.00**

Budget Breakup Details (Staff/Manpower)

#	Budget Year	Institute	Designation	No. of Person(nos)	Require Month(nos)	Cost Per Person(Rs.)	Total Cost(Rs.)
No Record							

Budget Breakup Details (Contingency)

#	Budget Year	Institute	Contingency Name	Total Cost(Rs.)	Justification
No Record					

Budget Breakup Details (Equipment)

#	Budget Year	Institute	Equipment Name	Equipment Model	Equipment Manufacturer	Equipment Type	Total Cost(Rs.)	Justification
No Record								

Declaration

I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.

(Screen 4/4)

Indian Council of Medical Research (ICMR)

Deptartment of Health Research
(Ministry of Health and Family Welfare)

Application of **ICMR Adhoc Project Program** detailed proposal

Date of submission: 17-Dec-2021 01:34:46 PM

Proposal Id: 2021-13953, **Version Id:** F1, **Proposal Title:** Screening for early Peripheral Vascular Disease and influence of patient-education with self-care using mobile application based guided telerehabilitation

Personal Details of PI

Name of PI (IN BLOCK LETTERS)	DR RAJANI MULLERPATAN PRASHANT MULLERPATAN	**Designation**	Director
Email	RAJANI.KANADE@GMAIL.COM	**Contact**	9819000674
Date of Birth	24-May-1972	**Date of Superannuation**	24-May-2042
Nature of Employment	Permanent	**Institute**	MGM Institute of Health Sciences

Proposal Details

Advertisement	CALL FOR RESEARCH PROPOSALS OF AD-HOC PROJECT UNDER EXTRAMURAL RESEARCH PROGRAM OF ICMR FOR THE YEAR 2021	**Title of the Research Proposal**	Screening for early Peripheral Vascular Disease and influence of patient-education with self-care using mobile application based guided telerehabilitation
Institute Type	Private	**Valid DSIR Certificate** (Validity)	YES (31-Mar-2022)
Broad Area	Non Communicable Diseases	**Major Discipline**	DISABILITY AND REHABILITATION
Detailed Proposal	1639723420_45815805.pdf		
Project Duration (in Months)	24 Months	**Data Collection/Analyzing Data** (in Months)	18/6 Months
Objective of Study	1) To screen people for early peripheral vascular diseases using a non-invasive clinical screening tool. 2) To explore the influence of lower extremity vascular surgeries/ conditions on practice of Ground level activity. 3) To explore lower extremity vascularization in ground level activity such as squat, cross legged sitting and kneel. 4) To develop exercise program to stimulate collateral vascularisation prior peripheral vascular surgeries of upper extremity and lower extremity. 5) To develop a mobile based app for long term monitoring of people with PVD.		
Expected Outcome	• Development of noninvasive novel tool for early identification of Peripheral Vascular disease and prevention of long-term complications. • Implementation of self-care-based intervention to delay functional disabilities caused by Peripheral Vascular disease.		
Ethical Clearance	yes	**Participating Agencies (Project Type)**	1 (Individual)
Fund received by ICMR before	N	**Fund received by Other Agency before**	Y

Investigator Details

#	Name	Institute	Designation	Email	Contact No.	Role in Proposal
1	Dr Rajani Mullerpatan Prashant Mullerpatan	MGM Institute of Health Sciences	Director	rajani.kanade@gmail.com	9819000674	PI
2	Dr Bela Manish Agarwal	MGM Institute of Health Sciences	Professor	bagarwal@mgmsopnm.edu.in	9699969313	Co-PI

Documents consideration

#	Proposal Id	Document Name	Is Applicable?	Uploaded Document	Remarks
1	2021-13953/F1	Declaration & Attestation Form(duly signed by Head of Department/ Director)	Yes		Declaration and Attestation Form signed by Director
2	2021-13953/F1	Non submission to other agency	Yes		Project has not been submitted to any funding agency or institution other than the Indian Council of Medical Research(ICMR)
3	2021-13953/F1	Non submission to other agency	Yes		Project has not been submitted to any funding agency or institution other than the Indian Council of Medical Research(ICMR)
4	2021-13953/F1	Undertaking of Proposal limits	Yes		Declaration of Undertaking of Proposal Limits
5	2021-13953/F1	Research Experience of PI during last 10 years	Yes		Research Experience of PI
6	2021-13953/F1	Certificate of previous ICMR Project	Yes		Certificate of Previous ICMr project

Budget Details

Year	Institute Name	Manpower	Contingency	Equipment	Travel	Overhead Charges	Total Budget (Rs.)
Year:1	MGM Institute of Health Sciences	3,720,000.00	15,000.00	380,000.00	20,000.00	10,000.00	4,145,000.00
Year:2	MGM Institute of Health Sciences	3,720,000.00	15,000.00	0.00	25,000.00	10,000.00	3,770,000.00
	Total(Rs.):	**7,440,000.00**	**30,000.00**	**380,000.00**	**45,000.00**	**20,000.00**	**7,915,000.00**

Budget Breakup Details (Staff/Manpower)

#	Budget Year	Institute	Designation	No. of Person(nos)	Require Month(nos)	Cost Per Person(Rs.)	Total Cost(Rs.)

No Record

Budget Breakup Details (Contingency)

#	Budget Year	Institute	Contingency Name	Total Cost(Rs.)	Justification

No Record

Monday, July 17, 2023 12: 58: 03: PM

Budget Breakup Details (Equipment)

#	Budget Year	Institute	Equipment Name	Equipment Model	Equipment Manufacturer	Equipment Type	Total Cost(Rs.)	Justification
No Record								

Declaration

I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.

Monday, July 17, 2023 12: 58: 03: PM

(Screen 4/4)

Indian Council of Medical Research (ICMR)

Deptartment of Health Research
(Ministry of Health and Family Welfare)

Application of **ICMR Adhoc Project Program** detailed proposal

Date of submission: 17-Dec-2021 01:47:52 PM

Proposal Id: 2021-13800, **Version Id:** F1, **Proposal Title:** Mobile based application for tele-rehabilitation of older adults with primary insomnia

Personal Details of PI

Name of PI (IN BLOCK LETTERS)	DR RAJANI MULLERPATAN PRASHANT MULLERPATAN	**Designation**	Director
Email	RAJANI.KANADE@GMAIL.COM	**Contact**	9819000674
Date of Birth	24-May-1972	**Date of Superannuation**	24-May-2042
Nature of Employment	Permanent	**Institute**	MGM Institute of Health Sciences

Proposal Details

Advertisement	CALL FOR RESEARCH PROPOSALS OF AD-HOC PROJECT UNDER EXTRAMURAL RESEARCH PROGRAM OF ICMR FOR THE YEAR 2021	**Title of the Research Proposal**	Mobile based application for tele-rehabilitation of older adults with primary insomnia
Institute Type	Private	**Valid DSIR Certificate** (Validity)	YES (03-Mar-2022)
Broad Area	INNOVATION & TRANSLATIONAL RESEARCH	**Major Discipline**	AFFORDABLE TECHNOLOGIES
Detailed Proposal	1639728824_22450181.pdf		
Project Duration (in Months)	24 Months	**Data Collection/Analyzing Data** (in Months)	18/6 Months
Objective of Study	• To maximize functional level and self-empower elderly for independent living. • To implement the concept of geotechnology for rehabilitation of Indian older adults. • To check the effectiveness of long-term comprehensive exercise program on sleep quality and physical functioning in elderly.		
Expected Outcome	• Tele-rehabilitation through active interphase mobile application will be developed. • Distance rehabilitation will be facilitated through enhancement of physical activity and improving sleep quality and physical fitness. • Self-monitoring and referral framework will enable the older adults to become independent.		
Ethical Clearance	yes	**Participating Agencies (Project Type)**	1 (Individual)
Fund received by ICMR before	N	**Fund received by Other Agency before**	N

Investigator Details

#	Name	Institute	Designation	Email	Contact No.	Role in Proposal
1	Dr Rajani Mullerpatan Prashant Mullerpatan	MGM Institute of Health Sciences	Director Professor	rajani.kanade@gmail.com	9819000674	PI
2	Dr Bela Manish Agarwal	MGM Institute of Health Sciences	Professor	bagarwal@mgmsopnm.edu.in	9699969313	Co-PI
3	Dr Shreeja Nair	MGM Institute of Health Sciences	Associate professor	drshreejakumar@gmail.com	9167039711	Co-PI

Documents consideration

#	Proposal Id	Document Name	Is Applicable?	Uploaded Document	Remarks
1	2021-13800/F1	Research Experience of PI during last 10 years	Yes		Details of Research Experience as Principal Investigator during last 10 years
2	2021-13800/F1	Declaration & Attestation Form(duly signed by Head of Department/ Director)	Yes		Declaration and Attestation
3	2021-13800/F1	Undertaking of Proposal limits	Yes		Undertaking
4	2021-13800/F1	Non submission to other agency	Yes		Non submission of project to other agencies
5	2021-13800/F1	Certificate of previous ICMR Project	Yes		Certificate

Budget Details

Year	Institute Name	Manpower	Contingency	Equipment	Travel	Overhead Charges	Total Budget (Rs.)
Year:1	MGM Institute of Health Sciences	372,000.00	45,000.00	2,035,000.00	30,000.00	12,510.00	2,494,510.00
Year:2	MGM Institute of Health Sciences	372,000.00	20,000.00	100,000.00	15,000.00	11,760.00	518,760.00
	Total(Rs.):	**744,000.00**	**65,000.00**	**2,135,000.00**	**45,000.00**	**24,270.00**	**3,013,270.00**

Budget Breakup Details (Staff/Manpower)

#	Budget Year	Institute	Designation	No. of Person(nos)	Require Month(nos)	Cost Per Person(Rs.)	Total Cost(Rs.)

No Record

Budget Breakup Details (Contingency)

#	Budget Year	Institute	Contingency Name	Total Cost(Rs.)	Justification

No Record

Budget Breakup Details (Equipment)

#	Budget Year	Institute	Equipment Name	Equipment Model	Equipment Manufacturer	Equipment Type	Total Cost(Rs.)	Justification
No Record								

Declaration

I hereby declare that the entries in this form and the additional particulars, if any, furnished herewith are true to the best of my knowledge and belief. I understand that in the event of my information being found false or incorrect at any stage, my project/proposal shall be liable to cancelation / termination without notice or any compensation in lieu thereof.

Monday, July 17, 2023 1: 00: 27: PM

DEPARTMENT OF BIOTECHNOLOGY
TATA INNOVATION FELLOWSHIP 2020-21

Proforma for Application

Title : Prof.

2. Name Rajani Mullerpatan

3. Address with Tel.No./Fax/e-mail : MGM School of Physiotherapy,
MGM Institute of Health Sciences
Phase 1, Kamothe, Navi Mumbai 410209
e-mail: rajani.kanade@gmail.com

4. Date of Birth : 24 May 1972

5. Gender : Female

6. Academic Qualification :

Degree (onwards)	University	Subject (s)	Year of Passing	% of Marks
Ph.D.	Cardiff University, UK	Physiotherapy	March 2007	
Diploma	Cardiff University, UK	Research Methods and Medical Statistics	July 2005	
MSc (PT)	University of Mumbai, India	Physiotherapy	May 1995	55
BSc (PT)	University of Mumbai, India,	Physiotherapy	November 1992	60

7. **Details of employment from the currently held position:**

Current Affiliation
Professor-Director 2008-till date
MGM Centre of Human Movement Science (2015 onwards)
MGM School of Physiotherapy, Navi Mumbai, India

Lecturer
School of Medical Sciences, University of Nottingham July 2006-June 2008

Full Time Researcher PhD studentship
Research Centre for Clinical Kinesiology, Cardiff University, UK April 2003-June 2006

Full Time Research Scholar July 2002 - Mar 2003
Dr. P N Berry Scholarship High Commission of India, London, UK

Lecturer Sep 2000 – June 2002
Topiwala National Medical College, Mumbai, India

Head of Dept & Assistant Professor May 1999- May 2000
Kasturba Medical College, Manipal Academy of Higher Education, India

Assistant Professor Sep 1996 -April 1999
Kasturba Medical College, Manipal Academy of Higher Education, India

8. Area of Specialization: <u>Human Health</u>

a) List of Publications during the last five years (last 5 years):

1. Lubna Khan, Mamta Shetty, Shifa Kherada, Reema Kava, Mubina Kazi, Prachita Walankar, **Rajani Mullerpatan**. Dough kneading exposure at kitchen workstation: its influence on handgrip strength and implications for therapy in hand rehabilitation. WORK: A Journal of Prevention, Assessment & Rehabilitation. Accepted for publication. 29 Nov 2021. (Impact factor: 1.132). PubMed indexed

2. Vaidya SS, Agarwal B, Singh Y, **Mullerpatan R**. Effect of Yoga on Performance and Physical Fitness in Cricket Bowlers. International Journal of Yoga Therapy. 2021 Sep 22. (Impact factor: 0.74). PubMed indexed

3. Pahade AJ, Wani SK, **Mullerpatan RP**, Elizabeth Roach K. Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis. Hong Kong Physiotherapy Journal. 2021 Dec 19;41(02):139-46. (Impact factor: 0.97) PubMed indexed

4. Agarwal BM, van Deursen R, **Mullerpatan RP.** Electromyographic evaluation of spine and lower extremity muscles during repeated and sustained bodyweight deep-squat. Trends in Sport Sciences, 2021, 28(1): 19-27. (Impact factor: 0.63). Scopus indexed.

5. **S**cott Haldeman, Margareta Nordin, Patricia Tavares, **Rajani Mullerpatan et al**. Distance Management of Spinal Disorders During the COVID-19 Pandemic and Beyond: Evidence-Based Patient and Clinician Guides from the Global Spine Care Initiative. JMIR Public Health Surveill. 2021 Feb 17;7(2): 25484. doi: 10.2196/25484. (Impact factor: 4.11) PubMed indexed

6. Jinny P Kanjirathingal, **Rajani P Mullerpatan**, Girish Nehete, Nagarathna Raghuram. Effect of Yogasana intervention on standing balance performance among people with diabetic peripheral neuropathy: A pilot study. International Journal of Yoga; 2021; 14 (1) 60-70. (Impact factor: 0.74) PubMed indexed

7. **Rajani Mullerpatan**, Triveni Shetty, Yuvraj Singh, Bela Agarwal. Lower extremity joint loading during Bounce rope skip in comparison to run and walk. Journal of Bodywork & Movement Therapies. 26 (2021) 1-6. (Impact factor: 1.34) PubMed indexed.

8. Dharod R, Shetty T, Shete R, **Mullerpatan R**. Effect of Plyometric Training on Explosive Power, Agility, Balance, and Aerobic Performance of Young Adult Male Kabaddi Players. Critical Reviews™ in Physical and Rehabilitation Medicine. 2020;32(3). (Impact factor: 0.11) Scopus indexed.

9. **Rajani P Mullerpatan**, Bela M Agarwal, Triveni V Shetty. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga; 2020 13 (2): 137-143. (Impact factor: 0.74) PubMed indexed

10. **Mullerpatan R**, Nahar S, Singh Y, Cote P, Nordin M. Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India. European Spine Journal. 2020 Sep 10:1-7 (Impact factor: 2.634) PubMed indexed

11. **Mullerpatan R,** Agarwal B, Shetty T. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga.; 2020. 13 (2): 137-143. (Impact factor: 0.74) PubMed indexed.

12. Bharnuke J, **Mullerpatan R,** Hiller C. Evaluation of Standing Balance Performance in Indian Classical Dancers. Journal of Dance Medicine & Science. 2020 Mar 15;24(1):19-23. (Impact factor: 1.06) PubMed indexed.

13. **Mullerpatan R**, Kamath MV. Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(4). (Impact factor: 0.11) Scopus Indexed

14. Shetty M, Balasubramanian S, **Mullerpatan R.** Grip and Pinch strength: Reference values for children and adolescents from Indian: Journal of pediatric rehabilitation medicine. Journal of Pediatric Rehabilitation Medicine. 2019; 12(3):255-262 (Impact factor: 1.1) PubMed indexed.

15. **Mullerpatan Gi**rdhar P, Singh Y, Salgotra KR, Wilkey A, Nordin M. Evidence-Based Rehabilitation of Spine-Pain Disorders among Underserved Individuals in Navi Mumbai, India: A Two-Year − Observational Report. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11) Scopus indexed

16. **Mullerpatan R**, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B. Functional Outcome Following Lower Extremity Amputation: A Review of Contextual Factors Influencing Function in Low-to Middle-Income Group Countries. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11) Scopus indexed

17. **Mullerpatan R**, Shetty T, Ganesan S, Johari A. Review of lower extremity function following Single event multiple level surgery (SEMLS) in children with cerebral palsy. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2) (Impact factor: 0.11) Scopus indexed

18. Preface: Challenges in Rehabilitation; **Mullerpatan R,** Kamath MV Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11) Scopus indexed

19. Preface: Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in Middle-Income Countries. **Mullerpatan R**. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1). (Impact factor: 0.11) Scopus indexed

20. A Study of Fine and Manual Hand Dexterity among People with Parkinson's Disease; Shah T, Shetty M, Bose M, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 21-19 (Impact factor: 0.11) Scopus indexed

21. Gait Kinematics in Bharatanatyam dancers with and without low back pain; Mullerpatan **R**, Bharnuke J, Hiller C; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 11-20 (Impact factor: 0.11) Scopus indexed
22. Energy expenditure using three different walking techniques in individuals with spinal cord Injury; Naryanan G, Bose M, Parab S, Agarwal B, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 32-39 (Impact factor: 0.11) Scopus indexed

23. Level of sports participation and performance among people with spinal cord injury; Amberkar O, Agarwal B, Singh Y, Shete R, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 49-55 (Impact factor: 0.11_) Scopus indexed

24. Exploration of Gait Deviation Index in children with cerebral palsy with severe gait impairment; Shetty T, Johari A, Ganesan S, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 29-35 (Impact factor: 0.11) Scopus indexed

25. Exploration of sports participation in children with mild intellectual disability; Iyer P, Shetty T, Ganesan S, Nair S, Rao N, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 56-61 (Impact factor: 0.11) Scopus indexed

26. Development of deep-squat milestone in typically developing children; MeeraThanawala, Bela Agarwal, SailakshmiGanesan; **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 62-67 (Impact factor: 0.11) Scopus indexed

27. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. **Mullerpatan RP**, Agarwal BM, Shetty T, Nehete GR, NarasipuraOS.Int J Yoga. 2019 May;12(2):124-131 (Impact factor: 0.452) PubMed indexed

28. Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis; Agarwal B, Advani M, Deursen RV, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine; 2019; 23-34 (Impact factor: 0.11) Scopus indexed

29. Lower Extremity Muscle Strength and Endurance in Ambulatory Children with Cerebral Palsy; Shetty T, Parab S, Ganesan S, Agarwal B, Mullerpatan R, Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 1-10 (Impact factor: 0.11). Scopus indexed

30. Health-Related Physical Fitness of People with Type 2 Diabetes Mellitus. Nair S, Agarwal B, Chatla J, Mullerpatan R; Critical Reviews™ in Physical and Rehabilitation Medicine. 2019; 31 (1); 11-21 (Impact factor: 0.11). Scopus indexed

31. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Pisal A, Agarwal B, **Mullerpatan R**, Critical Reviews™ in Physical and Rehabilitation, Medicine; 2018; 30 (3) (Impact factor: 0.11). Scopus indexed.

32. The Global Spine Care Initiative: methodology, contributors, and disclosures. Johnson **C *et a***, European Spine Journal, 2018, Sep; 27(6):786-795 (Impact factor: 2.634) PubMed indexed

33. The Global Spine Care Initiative: a systematic The Global Spine Care Initiative: care pathway for people with spine-related concerns. Haldeman S *et al*; E review for the assessment of spine-related complaints in populations with limited resources and in low- and middle-income communities. Nordin **M *et al***, European Spine Journal, 2018, **Sep;** 27(6), pp. 816-827. (Impact factor: 2.634) PubMed indexed

34. The Global Spine Care Initiative: classification system for spine-related concerns; Haldeman S *et al*, European Spine Journal; 2018, 2018 Sep;27(6):889-900 (Impact factor: 2.634) PubMed indexed

35. The Global Spine Care Initiative: resources to implement a spine care program; Giles D K *et al*; European Spine Journal, 2018; 2018 Sep;27(6):882-900 (Impact factor: 2.634) PubMed indexed

36. The Global Spine Care Initiative: model of care and implementation Johnson **C *et al***, European Spine Journal; 2018; 2018 Sep;27(6):864-882 (Impact factor: 2.634) PubMed indexed

37. Influence of Habitual Deep Squatting on Kinematics of lower extremity, pelvis and trunk Agarwal B, van Deursen RWG, **Mullerpatan RP**. International Journal of Health and Rehabilitation Sciences, March 2018;7(1):1-19 (Impact factor: 0.09).
38. Survey of Musculoskeletal Disorders among Indian Dancers in Mumbai and Mangalore. Nair S, Kotian Nair S, Hiller C, **Mullerpatan R**. J Dance Med Sci. 2018; 22(2) ; 124-129 (Impact factor: 1.06)PubMed indexed

39. Hand function in people with Type 1 and 2 diabetes; Wani S, **Mullerpatan R**; International Journal of Diabetes in developing countries; 2018; 24(1); 118-121 (Impact factor: 0.569)

40. Surface Electromyograhic Activity of Shoulder Muscles among People with Type 2 Diabetes- A Case Control Study; Wani S K., **Mullerpatan RP**; Journal of Clinical and Diagnostic Research; 2019; 13 (3); YC01 - YC05 (Impact factor: 0.14)

41. Birthing experience of women who have undergone normal delivery in a selected community of India. Pereira NF, Gaikwad S, Hemmerich A, **Mullerpatan RP,** Agarwal B. International Journal of Innovative Knowledge Concepts, 6(2) February, 2018,121-125. (Impact factor: 0.12)

42. Comparison of Muscle Activity and Energy Cost between Various Bodyweight Squat Positions. Sahasrabudhe S, Agarwal B, **Mullerpatan RP**. Clinical Kinesiology 71(2); Summer, 2017, 19-24. (Impact factor: 1.604). Scopus indexed

43. Effect of Inspiratory Muscle Training in Individuals with Parkinson's Disorder. Agarwal B, Mukri A, Shah M, Ganesan S, **Mullerpatan RP**. International Journal of Health Sciences and Research. June 2017; 30.;Vol 7, Issue 6: 178-185. (Impact factor: 0.422)

44. Reference values of manual dexterity using Minnesota Rate of Manipulation Test for Indian Adults. Rane S, Paul A, **Mullerpatan R**, Hand Therapy, January 2017; vol. 22, 2: pp. 1-7. (Impact factor: 1.704)

b) Cumulative impact factor of publications over the last 5 years:3.4

c) List of Patents: i) applied/filed for:

Patent Applications					
Sr.No	**Name/(s) of the Patentees**	**Patent Number**	**Title of Patent**	**Date of Application**	**Published/Applied**
1	**Rajani Mullerpatan,** Amit Maurya, Bhallamudi Ravi, Ghyar Rupesh	1431/MUM/2015	A device for measurement of properties of a body part	07/4/2017	Published
2	Nishant Kathpal, Ghyar Rupesh, Chetan Pakhare, Yash Gupte, Bhallamudi Ravi, **Mullerpatan Rajani**	20182100 5692	A device for screening of a diabetic foot	15/02/2018	Published
3	Indian Institute of Technology, Bombay; MGM Institute of Health Sciences, Navi Mumbai; Dept of Biotechnology(DBT), Govt of India.	201921033581	A device for assisting human walking	21/08/2019	Applied

Registered copyrights				
Sr.No.	**Copyright work Title**	**Name of Authors**	**Copyright Registration Number**	**Date of Registration**
1.	MGM Reference values for Centre of pressure (CoP) trajectory in quiet stance among healthy Indian people aged 7-65 years.	**Rajani Mullerpatan,** Triveni Ranga Shetty	L-103788/2021	27/05/21
2.	MGM Reference Values for Foot Geometry and Pressure Distribution of Indian Classical Bharatanatyam Dancers	**Rajani Mullerpatan**	L-105701/2021	23/07/2021
3.	MGM Reference Values for Kinematics and Muscle Activity During Suryanamaskar	**Rajani Mullerpatan**, Triveni Shetty Bela Agarwal	L-105719/2021	23/07/2021
4.	MGM Reference Values for Anthropometric Measurements Among Individuals Ages 5-65 yr.	**Rajani Mullerpatan,** Triveni Shetty	L-105704/2021	23/07/2021
5.	MGM Reference Values for Gait Kinematic Variables in Healthy Indian Adults	**Rajani Mullerpatan,** Triveni Shetty Bela Agarwal	L-103652/2021	25/05/2021
6.	Reference values for hand grip and pinch strength for healthy Indian adults	**Rajani Mullerpatan**, Mamta Shetty	L100130/2021	06/03/2021
7.	3-Dimensional Gait Report for children: 6-9 years	**Rajani Mullerpatan** Triveni Shetty	L-97873/2020	21/12/20
8.	Translated and validated Marathi version of Shoulder Pain and Disability Index (SPADI)questionnaire	Apeksha Pahade, Surendra Wani, **Rajani Mullerpatan**	L-97633/2020	12/11/20
9.	Pediatric fitness report females 13-18 years	Bela Agarwal, **Rajani Mullerpatan**	L-91340/2020	21/05/2020
10.	Reference Values for Spatiotemporal Variables of Gait in Healthy Indian Adults	**Rajani Mullerpatan**, Triveni Shetty	L-92919/2020	17/07/2020
11.	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 years and Adolescents: 13-17 years	Bela Agarwal, **Rajani Mullerpatan**	L-92917/2020	17/07/2020
12.	3-Dimensional Gait Report for Children: 9 to 12 years	**Rajani Mullerpatan,** Triveni Shetty	L-93922/2020	8/21/2020
13.	MGM Pediatric Fitness Testing Report: Males 13-18 Years	Bela Agarwal, **Rajani Mullerpatan**	L-93923/2020	8/21/2020
14.	Pediatric Fitness testing Report: Males 6-12 Years	Bela Agarwal, Bhoomika Sawant, **Rajani Mullerpatan**	L-97874/2020	21/12/2020
15.	Comparison of palmar abduction in three wrist positions among health adults using conventional finger goniometer	**Rajani Mullerpatan,** Anisha Gulati	L-97865/2020	21/12/2020
16.	Reference values for hand grip and pinch strength for healthy Indian Adolescents	**Rajani Mullerpatan,** Mamta Shetty	L-97877/2020	21/12/2020
17	MGM Ground Level Activity Exposure Questionnaire	Bela Agarwal and **Rajani Mullerpatan**	L-76907/2018	27/07/18

d) List of books written:

1. Rajani Mullerpatan (2021). 'Biomechanics of Indigenous Postures' in Margareta Nordin, Victor H Frankel (5th ed.).
Basic Biomechanics of the Musculoskeletal System: Wolters Kluwer. 469-490.

10. Awards and Honors received:

(a) International (list):

- Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme for development of the Package of Interventions for Rehabilitation 2020-21
- Honorary Research Associate, Cardiff University, UK (2011-2013)
- Dr. PN Berry Scholarship Award, High Commission of India, London, UK, 2002-2003

(b) National (list):

- Indian Association of Physiotherapists Award, 2010.

11. Mentorship provided (Students guided, teaching etc.):

Sr. No	Title	Principle Investigator	Supervisor	Research Scholars/Fellow (Year)
PhD Scholar Research Projects Supervised by Dr. R P Mullerpatan				
1	Comprehensive analysis of shoulder muscles among people with type II diabetes **(2010-2018)**			In-service PhD Scholar
2	Effect of squatting on knee articular cartilage in healthy adults **(2014 - 2020)**			In-service PhD Scholar
3	Long term monitoring of functional outcome following multi-level orthopedic surgeries in children with cerebral palsy **(2016 - till date)**			In-service PhD Scholar
4	Level of functional outcome in geriatric people from urban and rural setting (**2019 - till date**)			Full time PhD scholar
5	Early detection, patient education and management of Peripheral Vascular Disease using mobile application based tele-rehabilitation **(registered in academic year 2021-2022)**			In-service PhD Scholar
6	Exploration of Challenges and solutions for effective competent Physiotherapy training using CBCS curriculum among millennial learners **(registered in academic year 2021-2022)**			In-service PhD Scholar
7	How attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work **(registered in academic year 2021-2022)**			
Master's (MPT) Scholar Research Projects				
1	Development of a Two-dimensional method for evaluating movements of temporomandibular joint			2020-2022
2	Influence of Classical Kathak Dance training on postural control			2020-2022

Master's (MPT) Scholar Research Projects		
3	Review of physical fitness and biomechanical demands in Indian classical dancers	2019-2021
4	Review of kinesthetic function among people with diabetes mellitus with and without frozen shoulder	2019-2021
5	Review of determinants of hand function in children and adolescents with Down's syndrome-	2019-2021
6	A Review on Efficacy of Yoga intervention on middle aged and older adults	2020-2021
7	Effect of Yoga on Low Back Pain, Physical and Psychological (Anxiety, Depression and Quality of Life) Function in Postpartum Women	2018-2020
8	Exploration of Upper extremity function among people with shoulder dysfunction with Diabetes Mellitus and effect of Gomukhasana on shoulder function	2018-2020
9	The effect of Yoga on neck Pain, Muscle Strength, Function and Psychosocial Factor in Sedentary Workers with chronic Mechanical Neck	2018-2020
10	Comparison of Plantar Cutaneous Sensory Thresholds in Bare Foot and Shod Adults	2017-2019
11	Evaluation of Performance Based and Patient Reported Outcomes After Total Hip Replacement and Total Knee Replacement in India	2017-2019
12	Comparison of Erector Spinae Muscle Activity in Healthy Adults and Mathadi Workers with Mechanical Low Back Pain with and Without Spring Loaded Passive Exoskeleton	2017-2019
13	Comparison between the Effectiveness of Suryanamaskar and Exercises on Pain, Strength, Function and Psychosocial Factors in Patients with Chronic Non-Specific Low Back Pain	2017-2019
14	Comparison of effects of Yoga intervention and balance exercises on standing balance in people with diabetic peripheral neuropathy	2016-2018
15	Functional Performance in People with Hip pain	2016-2018
16	Evaluation of Palmar Abduction in Three Wrist Positions Among Healthy Adults	2016-2018
17	Survey of Spine Pain in Indian Rural Population	2015-2017
18	Evaluation of Balance in Indian Classical Dancers and Age- Matched Controls: A Comparative Study	2015-2017
19	Survey of Spinal Pain in Indian Rural Population	2015-2017
20	Squatting Milestone in Children and Measurement of Its Development	2015-2017
21	Evaluation of Daily Walking Activity in People with Parkinson's Disease	2014-2016
22	Evaluation of Medial Longitudinal Arch in Urban and Rural Children	2014-2016
23	Normative Data of Grip and Pinch Strength for Healthy Indian Pediatric Population	2013-2015
24	Effect of Osteoarthritis on Health-Related Fitness	2013-2015
19	A Study of Fine and Manual Hand Dexterity Among People with Parkinson's Disease	2013-2014
20	Functional Outcome in People with Lower Limb Amputation in Urban and Rural	2013-2014

Master's (MPT) Scholar Research Projects		
21	Evaluation of Cardio-Pulmonary Function and Lower Limb Muscle Activity in Different Squat Positions	2013-2014
22	Foot Structure and Function in Mallakhamb Gymnasts	2012-2013
23	Evaluation of Long-Term Functional Outcome in People with Unilateral Below knee Amputation	2012-2013
24	Manual Hand Dexterity: Normative Data for Healthy Indian Adults	2012-2013
25	Effect of Mulligan Bent Leg Raise Maneuver on Back Extensor Performance During Bending Activity in Patients with Non-Specific Low Back Pain: A Quantitative E.M. G	2011-2012
26	Effect of Foot Postures on activity of Tibialis Anterior, in Single Limb Stance using Surface EMG	2010-2011

12. Technologies Developed/Transferred:

(a) Number of Technologies developed:

1. A device for measurement of tissue stiffness of a body part was developed for early detection of tissues, at risk of breakdown; for e.g. plantar tissue of feet in people with diabetic neuropathy. The device has potential for application in various other clinical conditions. This device was designed in collaboration with the Bio Engineering Incubation Centre at IIT Bombay.

2. 'STIMU': device was designed for measurement of plantar tissue stiffness for screening diabetic foot by early detection of diabetic neuropathy named: in collaboration with Bio Engineering Incubation Centre at IIT Bombay. The device is in the stage of clinical trials.

3. A powered Transtibial prosthesis was developed for people with below knee amputation incorporating a bi-articular actuator. The study was funded by the Department of Biotechnology, Government of India. The patent is published.

4. I-sens gait analysis wearable inertial sensor-based system developed by IIT- Madras: Biomechanical input was provided for validation of the gait analysis system with the gold-standard 3D system for motion analysis. The manuscript is submitted for publication.

5. A novel spring- loaded passive exoskeleton was designed and developed for reducing muscle activity of trunk muscles (erector spinae group of muscle) in Mathadi workers. The patent application for the same is in process.

(b) Number of Technologies transferred to industry

1. One device was designed in collaboration with Bio Engineering Incubation Centre at IIT Bombay for validation of plantar tissue stiffness for early detection of diabetic neuropathy named: 'STIMU'. The device was commercialized through a Start-up named- Ayati Devices Private Limited, a Medical Device Designer & Manufacturer (Dec 2018).

(c) Number of Technologies commercialized: None

13. Significant research contributions made in his/her area of research (highlighting the innovative component of work) :(not exceeding 5 pages)

Dr. Rajani Mullerpatan 's significant research contribution is in the area of interdisciplinary scientific exploration of human movement to enhance human health by addressing unmet healthcare needs at a time when engineers and clinicians were working in silos in India in the area of biomechanics.

Dr. Mullerpatan has made innovative contributions to science in promotion of human movement as a therapeutic device in health promotion, prevention/reduction of disability, optimization of function and attenuation of burden of non-communicable diseases. While pursuing this research endeavor, she has focused on scientific exploration of indigenous movements for collateral restoration of heritage of traditional Indian movement forms of daily living, Yoga, sports and classical dance forms. In parallel, she has utilized this knowledge for design of movement-pertinent technology for enhancement of human movement performance and rehabilitation of people with movement disorders. The output of her interdisciplinary collaborative research with engineers at national and international level has been useful for the masses in rural and urban sector to address unmet needs in healthcare. The DNA of Dr. Mullerpatan's research work is marked by interdisciplinary, translational and sustainable innovations, underpinned by original robust biomechanical knowledge of traditional India human movement forms engaging the biomechanical marvel of human body, to address unmet healthcare needs of people with disposal income and low disposal income, to create a scalable societal and economic impact. World Health Organization took cognizance of this work and invited her to join as a Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme on the development of the Package of Interventions for Rehabilitation (2020-2021).

Dr. Mullerpatan's efforts to conduct research in human movement science began with creating a facility to conduct research in this specialized area in India. She established MGM Centre of Human Movement Science at MGM School of Physiotherapy, MGM Institute of Health Science in 2015. She garnered financial support from MGM Institute of Health Sciences, International Society of Biomechanics and BETIC, IIT-Bombay to create an exclusive facility for inter-disciplinary research, training, patient care and technology design and validation under one roof for health professionals and engineers. Creating such an exclusive facility in a self-funded private Higher Academic Institute in India in 2015 was a huge challenge because of a thin line of mega divide, which exists between Government Institutes and private Institutes in India.

Thereafter, she developed an interdisciplinary ecosystem constituted by researchers and innovators from Government and Private Higher Academic Institutes across India, UK, Canada and Australia, which was necessary to embark on the mission of exploring human movement science applications for health promotion, early detection, prevention and rehabilitation of disability.

She commenced this mission by filling the huge knowledge gap identified in scientific literature in the level and profile of function of healthy Indian people; because India is the second most populous country, marked by exclusive anthropometric and socio-cultural characteristics. Hence it would not be appropriate to pick the normative reference data off the shelf, which was generated from western population groups. Therefore, it was essential to generate the reference values for the Indian population.

Reference ranges for Indian population in human movement performance: Exploration of human movement science at MGM Centre of Human Movement Science began with generation of reference ranges for-fundamental human postures among healthy Indian people in all biological age groups. She studied kinematic and kinetic characteristics of gait of 1121 healthy people (5-73 yr.) to understand the profile of healthy people's gait. Findings of gait profile are used for various clinical, research, training and gait-technology design and validation purposes. Alongside, she explored foot geometry and plantar pressure distribution of 700 children to create a foot profile of Indian children which is valuable in research, clinical, training and footwear design. In parallel, hand grip and pinch strength was studied in 1289 healthy people, aged 5-89 yr. because hand grip strength is a vital clinical sign of frailty. In addition to hand grip strength, comprehensive evaluation of health-related physical fitness was conducted over 2000 healthy people aged 6-60yr to draw a comprehensive profile of health-related physical fitness.

After generation of reference values for critical markers of the function matrix of healthy Indian people, Dr. Mullerpatan conducted original research projects designed for biomechanical exploration of various Indian traditional and ancient movement forms such as daily life postures-for e.g. squatting, Yogasanas, classical dance form namely Bharatanatyam and traditional sports such as Mallakhamb, Kabaddi, Bounce rope Skipping and Kho-Kho.

Key sub-areas of work include spine care, upper extremity function, health related fitness in diabetes, evidence-based model of spine care, biomechanical exploration of-traditional daily life postures namely squat; Suryanamaskar; classical dance forms namely Bharatanatyam and Kathak; Parkinson's disease, cerebral palsy and lower extremity amputation.

Structural, biomechanical and biochemical exploration of widely adopted common daily life posture: Squat: Exploration of traditional daily life postures began with development of a tool named 'MGM Ground level Activity Exposure Questionnaire' for quantification of exposure to high flexion ground level postures and record deterioration or improvement in function among people with knee osteoarthritis. This novel, reliable and valid tool is published and copyrighted and is available to researchers in the public domain free of cost.

Clinical studies adopting this tool reported that -although there is an on-going quandary of magnitude of permissible squatting activity in people with knee OA, longer exposure to deep squatting activities confers greater knee range of motion and lower extremity muscle strength. People with knee OA with moderate squat exposure for ADL (30 ± 36 min) present with greater knee ROM compared to people with knee OA who had given up squatting.

It was found that squatting activates all prime movers of spine namely erector spinae-rectus abdominis and lower extremity muscles such as vastus-lateralis, biceps-femoris, gluteus-maximus, gluteus-medius and gastrocnemius. Dynamic squatting results in greater activation of muscles compared to sustained-squat indicating that engagement in dynamic body-weight squat training may be useful for both people with no

squat exposure as well as habitual squatters resulting in greater activation of knee stabilizers, which may be beneficial in maintaining sound musculoskeletal health.

Positive associations between structural changes, biomechanical variables at macro-level and biochemical markers at micro-level were noted while studying squat exposure. People with moderate squat exposure demonstrated the lowest prevalence of early structural changes of knee osteoarthritis. High body mass, increase in urinary cartilage proteins, antioxidant activity and knee adductor moment may serve as non-invasive biomarkers for identification of early knee osteoarthritis and degeneration of articular cartilage. A rise in inflammatory activity in sweat from the knee in healthy people may serve as a novel biomarker to identify early inflammatory changes in the knee joint at a stage where cartilage damage may not be sufficiently high.

Thus, early identification of risk factors using non-invasive methods and institution of early preventive therapeutic measures such as maintenance of ideal body mass, engaging in moderate level of activities that optimally load the knee joint such as squatting, enhancing antioxidant status of the body through physical activity, may delay onset of symptomatic knee OA.

Biomechanical and physiological exploration of Yogasanas: Dr. Mullerpatan passionately and robustly explored the biomechanics of Yogasanas in the land of origin of Yoga, because although Yoga is practiced worldwide for health benefits, there are gaps in knowledge for safe prescription of Yoga. The most widely practiced Yogasanas-namely Suryanamaskar was explored to unfold its kinematics (motion) of spine, lower extremity and upper extremity joints, kinetics (forces to indicate weight bearing) on upper extremity and lower extremity joints and energy cost.

Suryanamaskar, a composite Yogasanas producing a balance between flexion and extension is known to have positive health benefits for obesity and physical fitness management, upper limb muscle endurance, and body flexibility. Kinematic exploration of Suryanamaskar demonstrated that the spine moved through a range of 58° flexion to 44° extension, which is near full range of motion. Hence, Suryanamaskar holds potential to increase the mobility of almost all body joints, with stretch on anterior and posterior soft tissues and challenge postural balance mechanisms through a varying base of support. A study conducted to explore of muscle activity using Surface EMG while performing Suryanamaskar revealed that Suryanamaskar elicited high-to-moderate muscle activation of major postural muscles of the trunk and lower extremity during alternating flexion-extension movements of the spine. Erector spinae demonstrated the highest muscle activation in Hastapadasana.

Findings of these series of studies are being synthesized to draft a brochure, which will provide evidence-based information to Yoga practitioners and clinicians for safe prescription of Suryanamaskar. Research studies continue to explore other commonly practiced Yogasanas and kriyas.

Negligible scientific information on rich heritage of Indian classical dance forms motivated Dr. Mullerpatan to explore indigenous postures of Indian classical dance forms with an objective of using the knowledge for scientific application in health promotion, rehabilitation of movement disorders and promotion of dancer's

health. Indian classical dance has earned recognition across the globe; however, health of the dancers carrying forth this heritage has not received any attention. Survey of musculoskeletal disorders among Indian dancers in Mumbai and Mangalore revealed common sites of injury, commonly perceived causes of injury and factors influencing injury. Original research studies conducted to explore biomechanics of classical dance forms revealed how training in Indian classical dance forms results in greater standing balance performance because of the engagement of three prime systems in neuronal circuitry which are responsible for balance performance i.e. visual system (during Bhavang), vestibular system (Chakkars/spins) and proprioceptive system (tatkara or footwork). Further work revealed the influence of typical postures of Bharatanatyam dance form spilled over in motion of spine, pelvis and hip joints during daily-performed activity such as- gait.

In the sports arena, as much glamour is captured by Cricket, Football, etc. In India, traditional sports such as Mallakhamb, Kabaddi, Kho Kho and Skipping have remained in silo for many years, not only on the sports field; but also, in sports science and research. As Kabaddi is now gaining recognition as a competitive sport on national and international forum, research was conducted to explore ways to enhance performance of Kabaddi players and it was found that plyometric training could be integrated along with conventional training regime to enhance sports performance of Kabaddi players. Traditionally played, Mallakhamb (pole gymnast) poses huge challenges to the architecture and function of the ankle foot complex because the gymnast is expected to pivot the body with the ankle foot complex around the pole. Findings on biomechanical adaptations caused by practice of Mallakhamb provide useful considerations to Coaches and Clinicians for training and rehabilitation. Comparison of lower extremity joint loading during bounce rope skipping, running and walking revealed that skipping causes low loading on hip, knee and ankle joints compared to run which supports its prescription as joint protective exercise for health promotion in young adults and helps to clear myths about loading caused by skipping. Such a series of studies continue to unravel the biomechanical demands of daily traditional ground level activities, Yogasanas, traditional sports and classical dance forms.

Multilateral efforts of Dr. Mullerpatan continued to engage in researching sustainable, effective, evidence-based patient-care models for the underserved. Spine pain is one of the most common cause for disability. Hence, she researched factors pertinent to spine care and reported the burden of spine pain among rural and tribal population of six villages (n=2323) in Raigad district of Maharashtra State of India through point prevalence of neck and low back pain. Additionally, attitudes and beliefs of rural people towards spine pain and disability caused by spine pain were researched because this information was valuable in designing a culturally palatable rehabilitation program for spine pain.

While researching the local situation, she contributed to the spine care model developed by Global Spine Care Initiative, which is published and referred globally by clinicians from various health disciplines. A multi-center (MGMIHS-India, Manitoba University-Canada, University of Botswana-South Africa) clinical trial to test the model of spine care is awaited to commence. In parallel, pilot studies were conducted to study the effectiveness of Yoga and Suryanamaskar in management of chronic mechanical neck and low back pain. Promising results of these studies contribute hugely to the rehabilitation toolbox, by providing an alternate

form of mind and body exercise because patients suffering from chronic ailments such as back pain find one form of exercise monotonous, leading to non-compliance to exercise (manuscripts are in pipeline for publication).

The lens of rehabilitation was also focused on neurological disorders resulting in life-long functional limitations like Cerebral palsy because much-needed biomechanical exploration of impairments among children with cerebral palsy residing in low resource settings like India provided deeper insight on exclusive clinical features at various stages of involvement and socio-cultural specific needs for clinical rehabilitation. In childhood, cerebral palsy is the most common cause of physical disability. Cerebral palsy impacts functioning, inclusive of body structures (e.g., limbs), body functions (e.g., strength), activities (e.g., walking), and participation (e.g., playing a sport), which in turn may cause disabilities affecting health-related quality of life.

Gait reflects the overall status of sensory motor function in children with cerebral palsy. Severity in motor disability reflects on the walking pattern of the child. Hence robust instrumented 3D gait analysis was conducted among children with severe walking impairment, which illustrated detailed gait characteristics of children walking with higher crouch angle. Further studies were conducted to inform researchers and clinicians lower extremity muscle strength and endurance of Indian children with cerebral palsy with greater impairments, which is crucial for planning of treatment and monitoring treatment outcome.

Parallel attempts were made to review the functioning of children following surgical interventions. Among the various interventions available for children with cerebral palsy, single event multi-level surgery is the preferred method to treat musculoskeletal deformities in cerebral palsy and has proven to be the most effective. Therefore, lower extremity function was reviewed following single-event multiple level surgery in children with cerebral palsy to understand the value of surgical intervention in restoration of function. Over and above research efforts to maximize function, Dr. Mullerpatan dreams of an inclusive environment in India for children with cerebral palsy in education and sport. In an attempt to introduce and enhance sports participation among children with cerebral palsy in India, she explored the level (district and national) and nature of participation in sports and barriers to sports participation among children with mild intellectual disability.

Taking cognizance of challenges faced by parents/caregivers to travel with a child with cerebral palsy in our country, which has limited accessible environment, a mobile-based application is in the process of development to monitor functioning of children with cerebral palsy in between visits for early detection of markers indicating deterioration in human movement performance.

Dr. Mullerpatan continues to integrate knowledge generated from robust, comprehensive 3D exploration of human movement performance into design and development of valid, reliable surrogate measures/devices, which can be widely used in routine clinical settings for health promotion, prevention of disability and optimization of function.

Membership of Scientific/Societies/other Professional bodies:

- Member of International Society of Biomechanics
- Executive Council Member, International Society of Biomechanics (2017-2019)
- Former Member of European Diabetic Foot Study Group
- Research Grant Committee Member of Society of Indian Physiotherapist
- Lifetime Member of Society of Indian Physiotherapist

15. Major R&D projects/programmes implemented during the last 5 years:

(i) Completed projects (if applicable):

Please provide title, grant size, duration, funding agency, achievements vis-à-vis objectives.

(ii) Ongoing projects (if applicable):

Please provide title, grant size, duration, funding agency, achievements vis-à-vis objectives achieved so far.

No	Project Title	Principal Investigator	Funding Agency / Institutes	Total Fund Received (INR)	Research Fellow	Objectives
Completed Projects						
1.	Development of powered transtibial prosthesis (2015 – till date)	Dr. Rajani Mullerpatan	Department of Biotechnology, New Delhi, India	33,00,000	1 Research fellow for 3 years	Design Bi-articular actuation mechanism with energy storage and return foot and knee brace for transtibial prosthesis
2.	The effects of labor and birth positioning on pelvic dimensions: gaining further insight to improve birth experience (2016 – 2018)	Dr. Rajani Mullerpatan	Indo-Canadian Shastri Institute, Canada	1,12,000	1 Research fellow 1 Research Associate 1 Field visit coordinator for 12 months	Use motion capture device to investigate the effects of birthing positions on pelvic dimensions in a group of non-pregnant Indian subjects. Better understand rural Indian women's current experiences and aspirations around childbirth.
3.	Biomechanical exploration of 3 types of Suryanamaskar (2017-19)	Dr. Rajani Mullerpatan	Sancheti College of Physiotherapy, Pune, India	1,72,000		Evaluate kinematics, kinetics of traditional, Chair and Wall Suryanamaskar using 3D motion analysis system Compare kinematics, kinetics, energy expenditure, quality of life, muscle activity between 3 types of Suryanamaskar
4.	Gait Analysis using i-sens wearable system and 3 D motion analysis (2017-19)	Dr. Rajani Mullerpatan	IIT Madras, Chennai, India	75,000		Compare gait kinematics and kinetics using a new wearable inertia sensor (i-Sens) system that has been developed at IIT Madras with the 3D multi-camera motion capture system in healthy adults
5.	Establishment of MGM Centre of Human Movement Science (2014 – 2015	Dr. Rajani Mullerpatan	International Society of Biomechanics, IIT Bombay, Mumbai, India	99,05,830 Equipment donation		Generate a task force within the country to undertake research & conduct integrated training for healthcare professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders
Ongoing project						
6.	Telemonitoring of physical function and distance-rehabilitation of community dwelling elderly people	PhD scholar; Supervised by Dr Rajani Mullerpatan	Women Scientist Scheme- B, Department of Science & technology, New Delhi, India	24,15,008 Approved for sanction	1 Research Fellow sanctioned for 3 years	Maximization of Independent function, self- empowerment of community dwelling elderly people for monitoring physical function and tele- monitoring using mobile based application.

No	Project Title	Principal Investigator	Funding Agency / Institutes	Total Fund Received (INR)	Research Fellow	Objectives
Ongoing project						
7.	Validation of an indigenously developed device for measuring stiffness of plantar tissue in people with Type II diabetes (2019 – till date)	Dr. Rajani Mullerpatan	IIT Bombay, MGM IHS, Mumbai, India	1,70,519(IITB) + 1,50,000(MGM)	1 Research Fellow appointed for 6 months	Early detection of diabetic neuropathy and prevention of consequent foot complications.
8.	How attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work	PhD scholar; Supervised by Dr Rajani Mullerpatan	World Spine Care, Europe	12,56,805	1 Junior research fellow appointed for 3 years	Explore how attitudes and beliefs of rural and tribal people with spine pain influence functional outcome and return to work

16. **The relevance of proposed area of research & summary of the proposed work to be carried out**

Title:

Re-configuration of management of osteoporosis in children and adults: a shift in paradigm from treatment to prevention using a novel biotechnology device

(a) Objectives:

1. Develop a novel, portable, non- invasive, handheld device to estimate fracture risk by measuring bone mineral density at the radial styloid bone using cortical sound velocity as an outcome measure.
2. In-vitro, non-invasive measurement of bone cortical sound velocity in human radius bone to study bone mineral density.
3. Establish a reference band of cortical bone sound velocity ranging from healthy to osteoporotic bone density for screening people with osteoporosis.
4. To evaluate the potential of the novel device to detect minimal clinically important difference, following a bone health 12-month exercise program (Asthi-Swasthya), which will be targeted to reduce the risk for fall.

(c) **Relevance of study:**

Bone health assumes a critical role in overall human health and ultimately health-related quality of life of people across all age groups, because healthy bones permit mobility and protect against injuries. Clinical manifestations of poor bone health are presented in the two age groups at both ends of life span; i.e. children and elderly- who are the dependent and vulnerable age groups.

Osteoporosis is a major public health problem in both developing and developed nations in these age groups. It is increasing in prevalence because of the rising elderly population and reduction of physical activity in adolescents (Bland et al 2020) worldwide. It is characterized by low bone mass(density) and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. Osteoporosis predisposes individuals to increased risk of fractures of hip, spine, wrist and other skeletal sites for e.g. pelvis, proximal humerus, distal femur and ribs. Skeletal fracture marks the beginning of a clinical sequelae in an elderly, which causes a decline in physical activity and functional capacity; morbidity and dependence in daily living and ultimately results in poor health-related quality of life and increased disability-adjusted life span (disability adjusted years of life (DALY, WHO). Similarly, poor bone health is also commonly encountered in children which is defined as rickets (in growing children) or osteomalacia (in adult life).

Fractures caused by osteoporosis (particularly hip fractures) are also associated with a high rate (15–20%) of mortality in both elderly men and women.

Globally, it is predicted that 1 in 3 women; 1 in 5 men over the age of 50yr may suffer osteoporotic fractures (Kanis JA 2000). Nationally, 20% of Indian women over the age of 50yr present with osteoporosis. The prevalence ranges between 8% (40-50yr) to 62% (above 65yr) in Indian women among different age groups. The prevalence of osteoporosis in males older than 50yr ranges between 9 to 25%. Prevalence of nutrition-related reduction in bone mineral density of children is estimated to be 16.4% (Creo, 2016).

Moreover, management of fracture places a high healthcare cost on an individual, household, insurance companies and national health systems. It increases the economic burden on elderly people and households directly, who pay out-of-pocket for health care from constrained resources or belong to marginalized populations.

Currently, management of osteoporosis follows a twofold approach i.e. i) measurement of bone mineral density for estimation of fracture risk and ii) pharmacologic and non-pharmacologic treatment of osteoporosis. However, both the approaches are inadequate due to limited resources and also inappropriate in certain populations.

i)Measurement of BMD is conducted by self-administered questionnaire tools such as the Fracture Risk Assessment Tool, (although valid and reliable to measure the 10-yr prediction of risk of fracture) which is speculated to underestimate the risk of fractures and requires additional validation in Asian population i.e. it can estimate fracture risk caused by osteoporosis in people above 40 yr.

The clinical gold standard tool recommended for measurement of bone mineral density to diagnose osteoporosis by International Osteoporosis Federation is dual-energy X-ray absorptiometry (DEXA) scan. However, according to the International Osteoporosis Federation, the availability of DEXA is only 0.26 per million in India, compared to recommended 10.6 per million globally. Secondly, radiologic laboratory assessments of bone mineral density generally should be reserved for patients at highest risk, including all women over the age of 65yr, younger postmenopausal women with risk factors, and all postmenopausal women with a history of fractures (Lane et al 2016). Moreover, most DEXA scan facilities are available only in urban areas, and even many large cities in India do not have DEXA facilities which is an opportunity for development of a portable and accessible tool.

ii) Following diagnosis, osteoporosis is treated by addressing modifiable and non-modifiable risk factors of osteoporosis, which include pharmacological (nutritional supplements, hormone replacement therapy) and non-pharmacological interventions (exercise therapy). Cost of osteoporosis management using hormonal replacement therapy for more than 15 yr. is estimated to be US $204 000.However as per the Office of Technology Assessment (1995) report, this cost could be reduced to US $14 620 if the women were screened early.

Therefore, in view of the huge health care cost of management of fractures caused by osteoporosis and resultant morbidity and mortality, it is critical to reconfigure the management of osteoporosis by integrating bio-technology in the model of care of osteoporosis. Developing nations like India cannot afford to strain the already constrained (by management of infectious diseases, which challenge the health care system repeatedly) health care resources for management of osteoporosis. Hence, effective prevention strategies engaging simple, bold bio-technology including artificial intelligence solutions should be prioritized to shift the paradigm of osteoporosis care from management of fractures to reduction of risk of occurrence of fractures.

Hence, the present study is designed to re-configure the management of osteoporosis by shifting the clinical paradigm from treatment to prevention. Designing and implementation of a prevention model will identify people at risk by screening the masses in urban and rural sectors and utilize the current time lost (which is the time when an individual is at risk to develop fracture due to osteoporosis) to convert it into a golden opportunity window to

improve bone health. Early detection of osteoporosis and treatment of potentially modifiable risk factors using exercise and calcium and vitamin D supplementation forms an important adjunct to pharmacologic management of osteoporosis (Srivastava M 2002), which will reduce risk fractures and enable the vulnerable population to lead an active independent life and participate in all activities of personal, work and social relevance.

To conclude, relevance of this research work lies in its need for urgent action to detect people with osteoporosis in order to reduce the risk of fractures by timely intervention and therefore reduce the socio-economic and financial burden on the society at large. It will empower the health care workers at PHC level to detect and report such risks and enhance health related quality of life in the current pandemic situation of COVID 19 and beyond it. As per the Indian Society of Bone and Mineral Research position statement the awareness of osteoporosis is low in India, with surveys indicating that only 10-15% of Indians are aware of the disease.

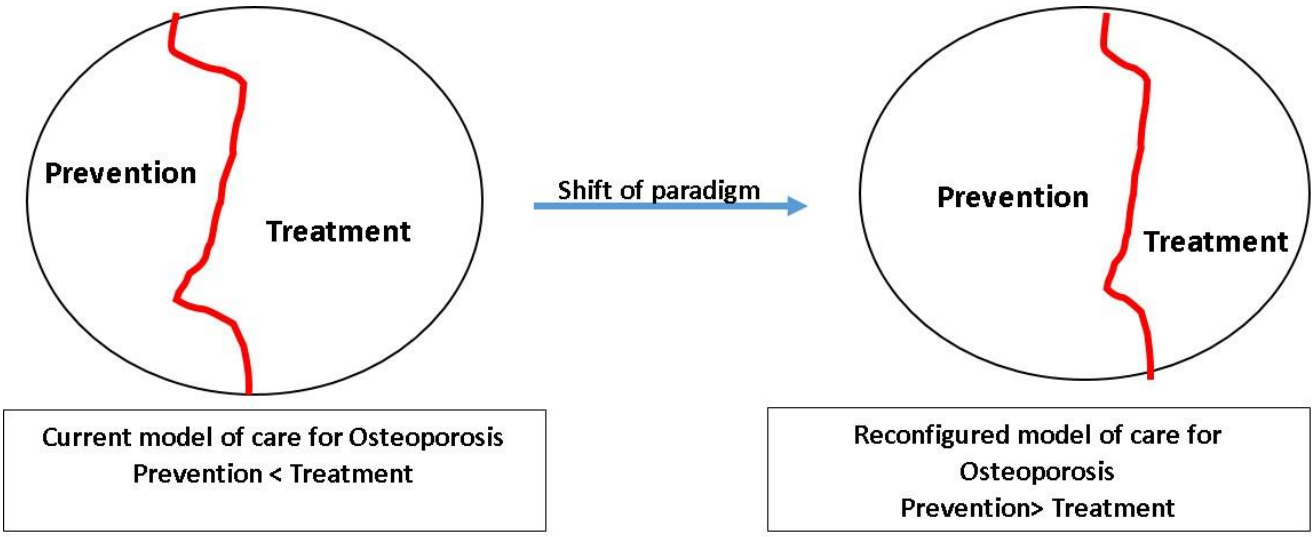
(c) Innovative component of the work:

Background: It is established through in vivo (bovine) research that cortical thickness (CrTh) and cortical sound velocity, are surrogate biomarkers of cortical porosity (Ct. Po) for patients at high fracture risk. In a laboratory-based study, these two biomarkers were validated with DEXA scan, which is routinely used in clinical practice globally to measure BMD. Both variables demonstrated high correlation ($R2>0.99$) to detect difference in porosity of bovine tibia compared to reference values generated on various biomaterials. However, amongst the 2 variables, cortical sound velocity can be measured using non-invasive portable device. Hence, cortical sound velocity was selected as the outcome variable in current study. Therefore, the current study aims to measure cortical bone sound velocity using vibration stimulus through portable handheld device.

Summary: Design an innovative solution, which can reduce the risk of bone fractures caused by reduced bone mineral density in children and adults with osteoporosis in both urban and rural sectors by developing a device which can be added to the primary health care toolkit of Health Care Workers operating in child health and maternal health elderly care. Inclusion of bone health screening in health promotion programs for children in routine clinical practice will reconfigure the treatment of osteoporosis by shifting the paradigm from existing model of care which is focused on treatment to a reconfigured model of care where detection and prevention is the focus.

The innovation is to develop a novel non- invasive, portable, handheld, easy-to-use device to measure bone density through sound wave propagation. The development of the device will be based on principle of converting calibrated mechanical stimulus of vibration into sound to measure cortical sound velocity. Development of the device will commence after performing in-vitro research using cadaveric human radius to establish the difference between healthy and osteoporotic bone. Human radius bone is a cortical bone in the peripheral skeletal system which is one of the commonest sites of fracture in individuals>50 yr. that is accessible to testing.

It is hypothesized that the vibration stimulus applied to the cortical bone surface (which will be established with a pilot study) will produce different sound velocity based on the porosity of the cortical bone surface. The sound velocity output will then be converted into a digital numerical value for ease of recording. The innovative work is designed in following 6 steps:



- Design a novel, portable, non-invasive, handheld device to estimate fracture risk by measuring bone mineral density at the radial styloid using cortical sound velocity.
- Establish a band of waveform (based on cortical bone sound velocity) ranging from healthy to abnormal bone density by measuring cortical sound velocity in 5 adult cadaveric human radius/tibia-6 months.
- The device will be tested for reliability using test-retest intra-tester approach and inter-tester approach on 50 healthy individuals.
- Criterion-related validity will be established against the gold standard measure of BMD in the age group of pediatric 7-18yr and adult 40-70yr ranging from healthy to people with osteoporosis by measuring the sound waveform in human radius/tibia (healthy= 500, at risk: n=500; established based on other clinical signs and symptoms and people with osteoporosis: n=500).
- Translational research to establish a reference band of waveform (based on cortical bone sound velocity) ranging from healthy to abnormal bone density by measuring cortical bone sound velocity in children and adults using all 3 variables. These findings will help to establish a pediatric fracture threshold and an adult fracture threshold.
- Detect minimal clinically important difference, following 9 months' intervention on a sub-set of people (adults) drawn from the larger sample in 3 groups, who will be administered an evidence-based culturally palatable exercise intervention program.
- Inclusion of bone health screening in health promotion programs for children in routine clinical practice.

(**e) Milestones/Timelines**

Time Line									
	Year 1			Year 2			Year 3		
Task	0-6months	6-9 months	10-12 months	0-3months	5-9 months	10-12 months	0-4 months	5-9 months	10-12 months
Design and development of the device									
In-vitro measurement to generate the reference band									
Clinical research on 1500 volunteers for validation and establishment of the reference range from healthy people to people with osteoporosis									
Implementation of exercise intervention for 12 weeks (n= 120)									
Post intervention evaluation and follow-up (n=120)									
Dissemination of knowledge and report writing									

c) Work Plan:

Groundwork:

Preliminary findings reveal that 51% participants were aware about osteoporosis; and 6% had suffered a fracture due to non-traumatic cause (out of a total 18% who had suffered fracture before the age of 50 years). The commonest site of fracture was reported to be the wrist (5.3%).

Indian Osteoporosis Society survey reports that, only 10-15% people in India are aware of osteoporosis. We conducted an extensive survey to help to understand the profile of risk factors associated with osteoporosis among Indian people above the age of 45 years.

Preliminary findings reveal that > 50% participants received only 10-30 min of sunlight exposure throughout the day; against the recommended dose of 30- 60 min sunlight exposure per day for sound bone health (Saeko Fujiwara, 2005). Forty- five percent of individuals were engaged in either sitting job or sedentary work. Eighteen percent of participants responded that they engaged in any form of physical activity. As per the Bone Health and Osteoporosis report, daily 30 min of exercise is recommended to promote bone health.

Out of a total 18% who had suffered fracture before the age of 50 years,35% had suffered a fracture due to non-traumatic cause. The commonest site of fracture was reported to be the wrist (5.3%).

These pilot findings endorse the need for reconfiguration of management of osteoporosis with an urgent shift in paradigm from prevention and early detection to pharmacological and non-pharmacological treatment.

The work plan is designed as follows-

i) Develop a novel, non- invasive, handheld device to measure bone mineral density through sound wave propagation.

A device will be designed to apply a defined frequency of vibration stimulus to the biomaterial i.e. tissue surface over the radial styloid bone. The soundwave produced as a result of the vibration will be recorded numerically as cortical sound velocity using a blue tooth recording device.

The device will be tested for safety of application on human subjects by adhering to the requirements laid out by the Electronic Regional Test Laboratory, Govt. of India. A mechanical engineer will be recruited as a Junior Research Fellow for 6 months to contribute to development of the designed device. After securing Safety certification, in vitro research will continue.

ii) Establish in-vitro, non-invasive measurement of bone cortical sound velocity in adult human cadaveric radius bone to study bone mineral density.

The device will be tested in vitro after approval from the Institutional Ethical Review Board registered with DCGI, Govt. of India. A pilot study will be conducted to record cortical sound velocity on 5 adult human cadaveric radius bones with different porosity characteristics to provide baseline data which will be useful in understanding the ability of the device to detect varying range of cortical sound velocity i.e. from healthy bone to osteoporosis. Confounding variables likely to influence cortical sound velocity will be controlled in the laboratory testing.

iii)To study the reliability and validity of the device in healthy adults-

Test retest reliability and intra- tester reliability of the device will be established on 50 healthy adults with no history of any neuro-musculoskeletal disorders, musculoskeletal injury (fracture/ dislocation or soft tissue injury in the past 12 months). People with low back pain (VAS >5), neurological deficit, stroke, diabetes or hypertension, congenital or acquired bony deformities of lower extremities and spine and those having cognitive issues will be excluded. The healthy adults will be recruited after obtaining signed informed consent form. All participants will be tested on 2 consecutive days by 2 individual raters for reliability.

Reliability test will be conducted only on healthy adults, as the objective is to test the reproducibility of results from the device and hence it is not deemed essential to test reliability and validity of the device in children.

Criterion-related validity will be established against the gold standard measure of BMD i.e. DEXA scan in the pediatric age group of 7- 18 yr. (n= 75) and adult 40- 70 yr. (n=75) ranging from healthy to people with osteoporosis by measuring the sound waveform in human radius/tibia (healthy= 50 at risk: n=50; established based on other clinical signs and symptoms and people with rickets/ osteoporosis: n=50). People with severe osteoarthritis (grade 3 and 4), low back pain (VAS >5), neurological deficit, stroke, diabetes or hypertension, congenital or acquired bony deformities of lower extremities and spine and those having cognitive issues will be excluded. All 150 participants will be tested by 2 individual raters on novel device and for BMD using DEXA Scan.

The reference range of cortical sound velocity will be determined based on the cortical bone characteristics. The Bland Altman test will be applied to determine the correlation between the cortical sound velocity and DEXA score.

iv) Establish a reference band of waveform (produced based on cortical bone sound velocity) ranging from healthy to osteoporotic bone density for screening people with osteoporosis.

A total of 1500 people will be studied in two age groups: children 7- 18 yr. (n= 750) and adults aged 40- 70 yr. (n=750) will be recruited for establishing a reference band after obtaining a written informed consent form (from participants and parents) and assent form wherever applicable.

The data from cortical sound velocity will be stratified to determine the underlying cortical bone porosity. All the participants will also undergo evaluation of bone mineral density using the novel device and DEXA scan.
Further statistical analysis will aim to understand the association between cortical bone sound velocity and bone mineral density. The expertise will be sought from experts in endocrinology (Dept. of Obstetrics and Gynecology, Pediatrics and Geriatrics) in determining pediatric and adult fracture threshold based on the large dataset informing the reference values from the current study. And this threshold will be weaved into the clinical guidelines informing indications for BMD testing in children and adults, and interpret the findings in association with clinical pathognomonic signs and symptoms of osteoporosis.

v) To study change in bone health following a therapeutic exercise intervention program for 12-month period.

Following the establishment of reference values, 120 participants will be allocated randomly to 4 groups (n=30 in each group) - Group 1 will undergo exercise (Asthi-Swasthya exercise program), diet, nutritional supplementary intervention, Group 2 will undergo exercise (Asthi-Swasthya exercise program) and dietary intervention, Group 3 will undergo only exercise intervention (Asthi-Swasthya exercise program) and group 4 will serve as a control group with no intervention for 12 months. Following the study period, the most useful intervention will be advocated to all groups.
Physical activity is a low cost, widely accessible, non- invasive, non-pharmacological treatment option, known to positively influence BMD (Troy KL 2018), muscle strength and balance impairment. The physical activity program will include a graded progressive exercise plan inclusive of warm up and stretching exercises, squat and Suryanamaskar protocol and cool down. The duration of activity will be progressed through the 12 month-period of training starting from 15min and progressing upto 60 min. The cohort of the studied participants will be followed up each month over a period of 12 months beyond the duration of the study.
Two Junior Research Fellows will assist in establishing the reliability and validity of the device and execute the physical activity intervention program.
Findings of the study will be reported to Tata Innovation Fellowship Board as project summary. An information sheet will be communicated to the participants of the study including parents of the children. Additionally, research findings will be disseminated through scientific journals. General public will be informed through local health magazines and public media via newspapers, television and appropriate social media channels.

(**g) Expected outcome/deliverables etc.:**

Outcome:

- Findings for stratification of risk for fracture in children and adults based on bone mineral density.
- Development of novel hand-held portable device for measurement of bone mineral density
- Data generated will be used to create reference values for cortical sound velocity ranging from normal bone health to rickets in children and osteoporosis in adults
- Determination of fracture threshold in adult and pediatric population based on the reference values generated from the current study
- Regression analysis will help to identify which clinical biomarker correlates best with cortical bone sound velocity and Bone Mineral Density.
- Clinically important change in bone health in children and adults.
- Findings of the project will be used to inform National Health Policies in order to integrate bone health programs in child, mother and elderly care.
- Findings will be used to create bone health education modules for continuing professional education.
- Findings of the project will be used to feed into curricular training of healthcare professionals.

Collateral outcome:

Current project will result in collateral outcome at various levels, namely- higher education, general health of children and adults.

The project will enhance the inter-disciplinary research environment at Masters Level in Higher Academic Health Institutes by collaborative research activity between health profession and engineering research scholars which is synched with National Education Policy 2020 to cultivate multidisciplinary team approach among health profession and engineering Master students. Such an active, interdisciplinary, on-field research experience early on life as they fulfil minimal requirement for Master's program dissertations will create a sustainable practice of interdisciplinary research in the new generation at higher education.

In parallel, the project will result in collateral health benefits such as improvement of overall health of adults of postmenopausal women including specific improvement in physical fitness, level of physical activity and reduction in spine pain, and ultimately, expand the existing productive years of work beyond menopause.
Likewise, it will help to improve overall health of children and ultimately enhance their growth and participation in studies, sport and development.

Deliverables:

- Validated survey tool for screening people at risk for osteoporosis in resource constrained settings who can be referred for BMD
- Data generated will be used to establish reference values for cortical sound velocity ranging from normal bone health to rickets in children and osteoporosis in adults
- Pediatric and adult fracture threshold which will be highly useful for reference in routine clinical management of osteoporosis
- Reliable and valid, novel, hand -held portable device for measurement of bone mineral density which can be commercialized for mass screening in urban and rural sectors
- Effective physical activity program to improve bone health in adults
- Scientific publications arising from original research
- Inform findings of the study to National Health Mission to guide National Health policy for children and adult for specific bone health and general health.
- Feed into the curriculum/training of Physiotherapy and other Health profession students to prepare them with knowledge and skills necessary for health promotion of postmenopausal women.
- Feed into continuing education programs for concerned health professionals.

17. Any other relevant information:

The deliverables will contribute to the Make in India initiative of Government of India and boost development of Health Technology to achieve the goal set by Technology Vision 2035 Document.

Collaterally, the proposed scientific project, the project will add vibrancy to the existing interdisciplinary research in Human Movement Science in India.

18. Certificate by the host Institute:

This is to Certify that **Prof. Rajani Muller patan**, if given the Tata Innovation Fellowship by the Department of Biotechnology, he / she will be provided office and laboratory space, access to equipment and library facilities etc. for implementing the research project proposal submitted by him/ her under this fellowship.

30.11.21

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Signature of the Head of the Institution with Stamp

…….

DEPARTMENT OF BIOTECHNOLOGY
TATA INNOVATION FELLOWSHIP 2020-21

Proforma for Application

1. **Title: Prof.**

2. **Name: Rajani Mullerpatan**

3. **Address with Tel.No./Fax/e-mail:**
MGM School of Physiotherapy,
Phase 1, Kamothe, Navi Mumbai 410209
e-mail: rajani.kanade@gmail.com

4. **Date of Birth: 24 05 1972**
5. **Gender: Female**
6. **Academic qualifications:**

Degree (onwards)	University	Subject (s)	Year of Passing	% of Marks
Ph.D.	Cardiff University, UK	Physiotherapy	March 2007	
MSc (PT)	University of Mumbai, India	Physiotherapy	May 1995	55
BSc (PT)	University of Mumbai, India,	Physiotherapy	November 1992	60

7. **Details of employment from the currently held position:**

1. Current Affiliation:

Professor-Director

MGM Centre of Human Movement Science (2015 onwards) 2008- till date

MGM School of Physiotherapy, Navi Mumbai, India

2. Lecturer July 2006-June 2008

School of Medical Sciences, University of Nottingham,

3. Full Time Researcher PhD studentship April 2003-June 2006

Research Centre for Clinical Kinesiology, Cardiff University, UK

4. Dr. P N Berry Scholarship July 2002- Mar 2003

High Commission of India, London, UK

5. Lecturer Sep 2000 – June2002

Topiwala National Medical College, Mumbai, India

6. Head of Dept & Assistant Professor May 1999- May2000

Kasturba Medical College, Manipal Academy of Higher Education, India

7. Assistant Professor Sep 1996 -April 1999

Kasturba Medical College,

Manipal Academy of Higher Education, India

8. **Area of Specialization: (Please tick one)**

Human Health

8. a) List of Publications during the last five years (last 5 years):

1. **Mullerpatan R**, Nahar S, Singh Y, Cote P, Nordin M. Burden of spine pain among rural and tribal populations in Raigad District of Maharashtra State of India. European Spine Journal. 2020 Sep 10:1-7 (Impact factor: 2.634)
2. Exploration of muscle activity using surface electromyography while performing Suryanamaskar. International Journal of Yoga. **Mullerpatan R,** Agarwal B, Shetty T; 2020. 13 (2): 137-143. (Impact factor: 0.452)
3. Evaluation of Standing Balance Performance in Indian Classical Dancers. Journal of Dance Medicine & Science. Bharnuke J, **Mullerpatan R,** Hiller C. 2020 Mar 15;24(1):19-23. (Impact factor: 1.06)
4. Preface: Rehabilitation with a Focus on Pathologies that Significantly Impact the Quality of Life. **Mullerpatan R**, Kamath MV. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(4). (Impact factor: 0.11)
5. Grip and Pinch strength: Reference values for children and adolescents from Indian: Journal of pediatric rehabilitation medicine. Shetty M, Balasubramanium S, **Mullerpatan R,** Journal of Pediatric Rehabilitation Medicine. 2019; 12(3):255-262 (Impact factor: 0.11)
6. Evidence-Based Rehabilitation of Spine-Pain Disorders among Underserved Individuals in Navi Mumbai, India: A Two-Year − Observational Report. **Mullerpatan R,**Girdhar P, Singh Y, Salgotra KR, Wilkey A, Nordin M. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11)
7. Functional Outcome Following Lower Extremity Amputation: A Review of Contextual Factors Influencing Function in Low-to Middle-Income Group Countries. **Mullerpatan R**, Sonkhia M, Thomas B, Mishra S, Gupta A, Agarwal B. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11)
8. Review of lower extremity function following Single event multiple level surgery (SEMLS) in children with cerebral palsy. **Mullerpatan R**, Shetty T, Ganesan S, Johari A. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2) (Impact factor: 0.11)
9. Preface: Challenges in Rehabilitation; **Mullerpatan R,** Kamath MV Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(2). (Impact factor: 0.11)
10. Preface: Physical Fitness and Functional Performance in People with Musculoskeletal and Neurologic Disorders and Challenges to Rehabilitation in Middle-Income Countries. **Mullerpatan R**. Critical Reviews™ in Physical and Rehabilitation Medicine. 2019;31(1). (Impact factor: 0.11)
11. A Study of Fine and Manual Hand Dexterity among People with Parkinson's Disease; Shah T ,Shetty M, Bose M , **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 21-19 (Impact factor: 0.11)
12. Gait Kinematics in Bharatanatyam dancers with and without low back pain; **Mullerpatan R**, Bharnuke J, Hiller C; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 11-20 (Impact factor: 0.11)
13. Energy expenditure using three different walking techniques in individuals with spinal cord Injury; Naryanan G, Bose M, Parab S, Agarwal B, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 32-39 (Impact factor: 0.11)
14. Level of sports participation and performance among people with spinal cord injury; Amberkar O, Agarwal B, Singh Y, Shete R, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation, Medicine, 2019; 31 (1); 49-55 (Impact factor: 0.11)
15. Exploration of Gait DeviationIndex in children with cerebral palsy with severe gait impairment; Shetty T, Johari A, Ganesan S, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 29-35 (Impact factor: 0.11)
16. Exploration of sports participation in children with mild intellectual disability; Iyer P, Shetty T, Ganesan S, Nair S, Rao N, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 56-61 (Impact factor: 0.11)
17. Development of deep-squat milestone in typically developing children; MeeraThanawala, BelaAgarwal, SailakshmiGanesan; **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 62-67 (Impact factor: 0.11)

18. Kinematics of Suryanamaskar Using Three-Dimensional Motion Capture. **Mullerpatan RP**, Agarwal BM, Shetty T, Nehete GR, NarasipuraOS.Int J Yoga. 2019 May;12(2):124-131 (Impact factor: 0.452)
19. Influence of Varying Squat Exposure on Knee Pain and Function among People with Knee Osteoarthritis; Agarwal B, Advani M, Deursen RV, **Mullerpatan R**; Critical Reviews™ in Physical and Rehabilitation Medicine; 2019; 23-34 (Impact factor: 0.11)
20. Lower Extremity Muscle Strength and Endurance in Ambulatory Children With Cerebral Palsy; Shetty T, Parab S, Ganesan S, Agarwal B, Mullerpatan R, Critical Reviews™ in Physical and Rehabilitation Medicine, 2019; 31 (1); 1-10 (Impact factor: 0.11)
21. Health-Related Physical Fitness of People with Type 2 Diabetes Mellitus. Nair S, Agarwal B, Chatla J, Mullerpatan R; Critical Reviews™ in Physical and Rehabilitation Medicine. 2019; 31 (1); 11-21 (Impact factor: 0.11)
22. Evaluation of Daily Walking Activity in Patients with Parkinson Disease. Pisal A, Agarwal B, **Mullerpatan R**, Critical Reviews™ in Physical and Rehabilitation, Medicine; 2018; 30 (3) (Impact factor: 0.11)
23. The Global Spine Care Initiative: methodology, contributors, and disclosures. Johnson **C *et a***, European Spine Journal, 2018, Sep; 27(6):786-795 (Impact factor: 2.634)
24. The Global Spine Care Initiative: a systematic review for the assessment of spine-related complaints in populations with limited resources and in low- and middle-income communities. Nordin **M *et al***, European Spine Journal, 2018, **Sep;** 27(6), pp. 816-827. (Impact factor: 2.634)
25. The Global Spine Care Initiative: classification system for spine-related concerns; Haldeman S *et al*, European Spine Journal; 2018, 2018 Sep;27(6):889-900 (Impact factor: 2.634)
26. The Global Spine Care Initiative: care pathway for people with spine-related concerns. Haldeman S *et al*; European Spine Journal ; 2018; 2018 Sep;27(6):901-914 (Impact factor: 2.634)
27. The Global Spine Care Initiative: resources to implement a spine care program; Giles D K *et al*; European Spine Journal, 2018; 2018 Sep;27(6):882-900 (Impact factor: 2.634)
28. The Global Spine Care Initiative: model of care and implementation Johnson **C *et al*** , European Spine Journal; 2018; 2018 Sep;27(6):864-882 (Impact factor: 2.634)
29. Influence of Habitual Deep Squatting on Kinematics of lower extremity, pelvis and trunk Agarwal B, van Deursen RWG, **Mullerpatan RP**. International Journal of Health and Rehabilitation Sciences, March 2018;7(1):1-19 (Impact factor: 0.09)
30. Survey of Musculoskeletal Disorders among Indian Dancers in Mumbai and Mangalore. Nair S, Kotian Nair S, Hiller C, **Mullerpatan R**. J Dance Med Sci. 2018; 22(2) ; 124-129 (Impact factor: 1.06)
31. Hand function in people with Type 1 and 2 diabetes; Wani S, **Mullerpatan R**; International Journal of Diabetes in developing countries; 2018; 24(1); 118-121 (Impact factor: 0.569)
32. Surface Electromyograhic Activity of Shoulder Muscles among People with Type 2 Diabetes- A Case Control Study; Wani S K., **Mullerpatan RP**; Journal of Clinical and Diagnostic Research; 2019; 13 (3); YC01 - YC05 (Impact factor: 0.14)
33. Birthing experience of women who have undergone normal deliver in a selected community of India. Pereira NF, Gaikwad S, Hemmerich A, **MullerpatanRP,**Agarwal B. International Journal of Innovative Knowledge Concepts, 6(2) February, 2018,121-125. (Impact factor: 0.12)
34. Comparison of Muscle Activity and Energy Cost between Various Bodyweight Squat Positions. Sahasrabudhe S, Agarwal B, **Mullerpatan RP**. Clinical Kinesiology 71(2); Summer, 2017, 19-24. (Impact factor: 1.604)
35. Effect of Inspiratory Muscle Training in Individuals with Parkinson's Disorder. Agarwal B, Mukri A, Shah M, Ganesan S, **Mullerpatan RP**. International Journal of Health Sciences and Research. June 2017; 30.;Vol 7, Issue 6: 178-185. (Impact factor: 0.422)
36. Reference values of manual dexterity using Minessota Rate of Manipulation Test for Indian Adults. Rane S, Paul A, **Mullerpatan R**, Hand Therapy, January 2017; vol. 22, 2: pp. 1-7. (Impact factor: 1.704)
37. Grip and pinch strength in children with Down syndrome. John R, DhanveA,**Mullerpatan RP;** Hand Therapy, September 2016; vol. 21, 3: pp. 85-89. (Impact factor: 1.704)

38. Incremental Shuttle walk test: reference values and predictive equation for healthy adult Indians. Agarwal B, Shah M, Andhare N; **Mullerpatan R**. Lung India. 2016. Jan-Feb 33 (1): 36-41 (Impact factor: 0.15)
39. Prevalence of shoulder dysfunction among Indian people with type II diabetes. Wani SK, **Mullerpatan RP**. International Journal of Diabetes in Developing Countries. Feb 2015. 10.1007/s13410-015-0303-6. (Impact factor: 0.569)

b) Cumulative impact factor of publications over the last 5 years: 0.70

c) List of Patents:i) applied/filed for:

Patent Applications					
Sr.No.	Name/(s) of the Patenter	Patent Number	Title of Patent	Date of Application	Published/Applied
1	**Rajani Mullerpatan,** Amit Maurya, Bhallamudi Ravi, Ghyar Rupesh	1431/MUM/2015	A device for measurement of properties of a body part	7/4/2017	Applied
2	Nishant Kathpal, Ghyar Rupesh, Chetan Pakhare, Yash Gupte, Bhallamudi Ravi, **Mullerpatan Rajani**	20182100 5692	A device for screening of a diabetic foot	15/02/2018	Applied

Registered Copyright				
Sr. No.	Name/(s) Copyright awardee	Copyright Number (ROC Number)	Title of Copyright	Date of copyright registration
1	Bela Agarwal and Rajani Mullerpatan	L-76907/2018	MGM Ground Level Activity Exposure Questionnaire	27/7/2018
2	Bela Agarwal and Rajani Mullerpatan	L-91340/2020	Pediatric Fitness Testing Report Females 13-18 years	21/05/2020
3	Rajani Mullerpatan, Triveni Shetty	L-92919/2020	Reference Values for Spatiotemporal Variables of Gait in Healthy Indian Adults	17/07/2020
4	Rajani Mullerpatan, Bela Agarwal	L-92917/2020	Reference Values for Physical Fitness in Healthy Indian Children: 6-12 years and Adolescents: 13-17 years	17/07/2020
5	Rajani Mullerpatan, Triveni Shetty	L-93922/2020	3 Dimensional Gait Report for Children : 9+ to 12 years	21/08/2020
6	Bela Agarwal, RajaniMullerpatan	L-93923/2020	MGM Pediatric Fitness Testing Report: Males 13-18 Years	21/08/2020

Submitted Copyright Applications			
Sr. No	Name of Applicant	Diary Number	Title of Copyright
1	RajaniMullerpatan, Triveni Shetty	4992/2020-CO/L	MGM Reference Values for Gait Kinematic Variables in Healthy Indian Children
2	Bela Agarwal, RajaniMullerpatan	4990/2020-CO/L	MGM Pediatric Fitness Testing Report: Males 13-18 Years
3	Bela Agarwal, Bhoomika Sawant, Rajani Mullerpatan	4982/2020-CO/L	Pediatric Fitness Testing Report: Males 6-12 Years
4	Bela Agarwal, Hiranmayee Bagwe, Rajani Mullerpatan	4356/2020-CO/L	Pediatric Fitness Testing Report Template: Females 6-12 years
5	Rajani Mullerpatan, Anisha Gulati	3954/2020-CO/L	Comparison of palmar abduction in three wrist positions among healthy adults using conventional finger goniometer
6	Rajani Mullerpatan, Triveni Shetty	3306/2020-CO/L	3 Dimensional Gait test Report for children: 13-18 years
7	Rajani Mullerpatan, Triveni Shetty	3114/2020-CO/L	3 Dimensional Gait Report for children: 6-9 years
8	Rajani Mullerpatan, Mamta Shetty	12701/2020CO/L	Reference values for hand grip and pinch strength for healthy Indian adolescents
9	Rajani Mullerpatan, Mamta Shetty	12699/2020CO/L	Reference values for hand grip and pinch strength for healthy Indian adults
10	Rajani Mullerpatan, Mamta Shetty	12721/2020CO/L	Reference values for hand grip and pinch strength for healthy Indian adults

d) List of books written:

1.One Chapter Number 19, titled 'Biomechanics of Indigenous Postures' is due for publication in the 5thedition of the Textbook titled 'Basic Biomechanics of the Musculo-skeletal System', Wolters Kluwer (tentative date for publication: Dec 2020).

10. Awards and Honours received:

(a) International (list):

- Member of the Development Group for Low Back Pain- part of WHO Rehabilitation Programme on the development of the Package of Interventions for Rehabilitation
- Honorary Research Associate, Cardiff University, UK (2011-2013)
- Dr. PN Berry Scholarship Award, High Commission of India, London, UK, 2002-2003

(b) National (list):

- Indian Association of Physiotherapists Award, 2010.

11.Mentorship provided (Students guided, teaching etc.):

Sr. No	Title	Principle Investigator	Supervisor	Research Scholars/Fellow (Year)
PhD Scholar Projects Supervised by Dr.R P Mullerpatan				
1	Comprehensive analysis of shoulder muscles among people with type II diabetes (2010-2018)			In-service PhD Scholar
2	Effect of squatting on knee articular cartilage in healthy adults (2014 - till date) – Dr. Bela A (PT)			In-service PhD Scholar
3	Long term monitoring of functional outcome following multi-level orthopedic surgeries in children with cerebral palsy (2016 - till date) – Dr. Triveni S (PT)			In-service PhD Scholar
4	Level of functional outcome in geriatric people from urban and rural setting (2019 - till date) – Dr. Poonam D (PT)			Full time PhD scholar
Master's (MPT) Scholar Projects				
1	Effect of Yoga on Low Back Pain, Physical and Psychological (Anxiety, Depression and Quality of Life) Function in Postpartum Women			2018-2020
2	Exploration of Upper extremity function among people with shoulder dysfunction with Diabetes Mellitus and effect of Gomukhasana on shoulder function			2018-2020
3	The effect of Yoga on neck Pain, Muscle Strength, Function and Psychosocial Factor in Sedentary Workers with chronic Mechanical Neck			2018-2020
4	Comparison of Plantar Cutaneous Sensory Thresholds in Bare Foot and Shod Adults			2017-2019
5	Evaluation of Performance Based and Patient Reported Outcomes After Total Hip Replacement and Total Knee Replacement in India			2017-2019
6	Comparison of Erector Spinae Muscle Activity in Healthy Adults and Mathadi Workers with Mechanical Low Back Pain with and Without Spring Loaded Passive Exoskeleton			2017-2019
7	Comparison between the Effectiveness of Suryanamaskar and Exercises on Pain, Strength, Function and Psychosocial Factors in Patients with Chronic Non-Specific Low Back Pain			2017-2019
8	Comparison of effects of Yoga intervention and balance exercises on standing balance in people with diabetic peripheral neuropathy			2016-2018
9	Functional Performance in People with Hip pain			2016-2018
10	Evaluation of Palmar Abduction In Three Wrist Positions Among Healthy Adults			2016-2018
11	Survey of Spinal Pain in Indian Rural Population			2015-2017
12	Evaluation of Balance in Indian Classical Dancers and Age- Matched Controls : A Comparative Study			2015-2017
13	Survey of Spinal Pain in Indian Rural Population			2015-2017
14	Squatting Milestone in Children and Measurement of Its Development			2015-2017
15	Evaluation of Daily Walking Activity in People with Parkinson's Disease			2014-2016
16	Evaluation of Medial Longitudinal Arch in Urban And Rural Children			2014-2016
17	Normative Data of Grip and Pinch Strength for Healthy Indian Pediatric Population			2013-2015
18	Effect of Osteoarthritis on Health Related Fitness			2013-2015
19	A Study of Fine and Manual Hand Dexterity Among People with Parkinson's Disease			2013-2014
20	Functional Outcome In People with Lower Limb Amputation in Urban And Rural			2013-2014
21	Evaluation of Cardio-Pulmonary Function and Lower Limb Muscle Activity in Different Squat Positions			2013-2014
22	Foot Structure and Function in Mallakhamb Gymnasts			2012-2013
23	Evaluation of Long Term Functional Outcome in People With Unilateral Below knee Amputation			2012-2013
24	Manual Hand Dexterity : Normative Data for Healthy Indian Adults			2012-2013
25	Effect of Mulligan Bent Leg Raise Maneuver on Back Extensor Performance During Bending Activity in Patients with Non-Specific Low Back Pain : A Quantitative E.M.G			2011-2012
26	Effect of Foot Postures on activity of Tibialis Anterior, in Single Limb Stance using Surface EMG			2010-2011

12.Technologies Developed/Transferred:

(a) Number of Technologies developed:

1. A device for measurement of tissue stiffness of a body part was developed for early detection of tissues, at risk of breakdown; for e.g. plantar tissue of feet in people with diabetic neuropathy. The device has potential for application in various other clinical conditions.This device was designed in in collaboration with Bio Engineering Incubation Centre at IIT Bombay.

2. 'STIMU' : device was designed for measurement of plantar tissue stiffness for screening diabetic foot by early detection of diabetic neuropathy named: in collaboration with Bio Engineering Incubation Centre at IIT Bombay. The device is in stage of clinical trials.

3. A powered transtibial prosthesis was developed for people with below knee amputation incorporating a bi-articular actuator. The study was funded by Department of Biotechnology, Government of India. The patent application for the same is in process.

4. I-sens gait analysis wearable inertial sensor-based system developed by IIT- Madras: Biomechanical input was provided for validation of the gait analysis system with the gold-standard 3D system for motion analysis.

5. A novel spring- loaded passive exoskeleton was designed and developed for reducing muscle activity of trunk muscles (erector spinae group of muscle) in Mathadi workers. The patent application for the same is in process.

(b) Number of Technologies transferred to industry

1. One device was designed in collaboration with Bio Engineering Incubation Centre at IIT Bombay for validation of plantar tissue stiffness for early detection of diabetic neuropathy named: 'STIMU'. The device was commercialized through a Start-up named- Ayati Devices Private Limited, a Medical Device Designer & Manufacturer (Dec 2018).

(c) Number of Technologies commercialized: None

13.Significant research contributions made in his/her area of research (highlighting the innovative component of work):(not exceeding 5 pages)

Dr. Rajani Mullerpatan has made significant original contribution to science to explore promotion of human movement as a therapeutic device in health promotion, prevention/reduction of disability, optimization of function and attenuation of burden of non-communicable diseases. While pursuing this research endeavor, she has focused on scientific exploration of indigenous movements for collateral restoration of heritage of traditional Indian movement forms of daily living, Yoga, sports and classical dance forms. In parallel, she has utilized this knowledge for design of movement- pertinent technology for enhancement of human movement performance and rehabilitation of people with movement disorders; which is useful for the masses in rural and urban sector to address unmet needs in healthcare- through interdisciplinary collaborative research with engineers at national and international level. The DNA of Dr. Mullerpatan's research work is marked by interdisciplinary, translational and sustainable innovations, underpinned by original scientific knowledge of traditional India human movement forms engaging the biomechanical marvel of human body, to address unmet needs in healthcare of people with disposal income and low disposal income, to create a scalable societal and economic impact.

Dr. Mullerpatan's efforts to conduct research in human movement science began with first establishing a facility to conduct research in this area in India. She established MGM Centre of Human Movement Science at MGM School of Physiotherapy, MGM Institute of Health Science in 2015. She garnered financial support from MGM Institute of Health Sciences, International Society of Biomechanics and BETIC, IIT-Bombay to create an exclusive facility for inter-disciplinary research, training, patient care and technology design and validation under one roof for health professionals and engineers. Creating such an exclusive facility in a self-funded private Higher Academic Institute in India in 2015 was a huge challenge because of a thin line of mega divide, which exists between Government Institutes and private Institutes in India. Thereafter, she developed an interdisciplinary ecosystem constituted by researchers and innovators from Government and Private Higher Academic Institutes across India, UK, Canada and Australia necessary to embark on the mission of exploring human movement science applications for health promotion, early detection, prevention and rehabilitation of disability.

She commenced this mission by filling the huge knowledge gap identified in scientific literature on the level and profile of function of healthy Indian people because India is the second most populous country, which presents its own exclusive culture, and it would not be appropriate to pick the data off the shelf, which is generated from other population groups. Therefore, it was essential to generate the reference values for Indian population to plan efficient culturally palatable rehabilitation programs. Key sub-areas of work included spine care, upper extremity function, health related fitness in diabetes, evidence-based model of care,

biomechanical exploration of-traditional daily life postures namely squat; Suryanamaskar; classical dance forms namely Bharatanatyam; Parkinson's disease and cerebral palsy.

Reference ranges for Indian population in human movement performance: Exploration of human movement science at MGM Centre of Human Movement Science began with generation of reference ranges for-fundamental human postures among healthy Indian people in all biological age groups. She studied kinematic and kinetic characteristics of gait of 547 healthy people (5-73 yr) to understand the profile of healthy people's gait (part of original data are copyrighted; whereas part of the data are in the process of being copyright. The manuscript is in pipeline for publication). Findings of gait profile will be useful for various clinical, research, training and gait-technology design and validation purposes. Alongside, she explored foot geometry and plantar pressure distribution of 447 children studied to create a foot profile of Indian children (original data are in the process of being copyright. The manuscript is in pipeline for publication); which will be valuable in research, clinical, training and footwear design. In parallel, hand grip and pinch strength was studied in 1289 healthy people, aged 5-89 yr because hand grip strength is a vital clinical sign of frailty (part of original data are copyrighted and published; whereas part of the data are in the process of being copyright and publication). In addition to hand grip strength, comprehensive evaluation of health related physical fitness was conducted over 2000 healthy people aged 6-60yr(The manuscript is in pipeline for publication) to draw a comprehensive profile of health related physical fitness.

After generation of reference values for critical markers of the function matrix of healthy Indian people, Dr.Mullerpatan conducted original research projects designed for biomechanical exploration of various Indian traditional and ancient movement forms such as daily life postures-for e.g. squatting, Yogasanas, classical dance form namely Bharatanatyam and traditional sports such as Mallakhamb, Kabaddi and bounce rope skipping.

Structural, biomechanical and biochemical exploration of widely adopted common daily life posture: Squat: Exploration of traditional daily life postures began with development of a tool named 'MGM Ground level Activity Exposure Questionnaire' for quantification of exposure to high flexion ground level postures and record deterioration or improvement in function among people with knee osteoarthritis. This novel, reliable and valid tool is published and copyrighted and is available to researchers in public domain free of cost.

Clinical studies adopting this tool reported that -although there is an on-going quandary of magnitude of permissible squatting activity in people with knee OA, longer exposure to deep squatting activities confers greater knee range of motion and lower extremity muscle strength. People with knee OA with moderate squat exposure for ADL (30 ± 36 min) present with greater knee ROM compared to people with knee OA who had given up squatting.

It was found that squatting activates all prime movers of spine namely erector spinae-rectus abdominis and lower extremity muscles such as vastus-lateralis, biceps-femoris, gluteus-maximus, gluteus-medius and gastrocnemius. Dynamic squatting results in greater activation of muscles compared to sustained-squat

indicating that engagement in dynamic body-weight squat training may be useful for both people with no squat exposure as well as habitual squatters resulting in greater activation of knee stabilizers, which may be beneficial in maintaining sound musculoskeletal health.

Positive associations between structural changes, biomechanical variables at macro-level and biochemical markers at micro-level were noted while studying squat exposure. People with moderate squat exposure demonstrated lowest prevalence of early structural changes of knee osteoarthritis. High body mass, increase in urinary cartilage proteins, anti-oxidant activity and knee adductor moment may serve as non-invasive biomarkers for identification of early knee osteoarthritis and degeneration of articular cartilage. A rise in inflammatory activity in sweat from knee in healthy people may serve as a novel biomarker to identify early inflammatory changes in the knee joint at a stage where cartilage damage may not be sufficiently high.

Thus, early identification of risk factors using non-invasive methods and institution of early preventive therapeutic measures such as maintenance of ideal body mass, engaging in moderate level of activities that optimally load the knee joint such as squatting, enhancing anti-oxidant status of the body through physical activity, may delay onset of symptomatic knee OA.

Biomechanical and physiological exploration of Yogasanas: Dr.Mullerpatan passionately and robustly explored the biomechanics of Yogasanas in the land of origin of Yoga, because although Yoga is practiced worldwide for health benefits, there are gaps in knowledge for safe prescription of Yoga. The most widely practiced Yogasana-namely Suryanamaskar was explored to unfold its kinematics (motion) of spine, lower extremity and upper extremity joints, kinetics (forces to indicate weight bearing) on upper extremity and lower extremity joints and energy cost.

Suryanamaskar, a composite Yogasana producing a balance between flexion and extension is known to have positive health benefits for obesity and physical fitness management, upper limb muscle endurance, and body flexibility. Kinematic exploration of Suryanamaskar demonstrated that the spine moved through a range of 58° flexion to 44° extension, which is near full range of motion. Hence, Suryanamaskar holds potential to increase the mobility of almost all body joints, with stretch on anterior and posterior soft tissues and challenge postural balance mechanisms through a varying base of support. A study conducted to explore of muscle activity using Surface EMG while performing Suryanamaskar revealed that Suryanamaskar elicited high-to-moderate muscle activation of major postural muscles of the trunk and lower extremity during alternating flexion-extension movements of the spine. Erector spinae demonstrated the highest muscle activation in Hastapadasana.

Findings of these series of studies are being synthesized to draft a brochure, which will provide evidence based information to Yoga practitioners and clinicians for safe prescription of Suryanamaskar. Research studies continue to explore other commonly practiced Yogasanas and kriyas.

Negligible scientific information on rich heritage of Indian classical dance forms motivated Dr.Mullerpatan to explore indigenous postures of Indian classical dance forms with an objective of using the knowledge for scientific application in health promotion, rehabilitation of movement disorders and promotion of dancer's health. Indian classical dance has earned recognition across the globe; however, health of the dancers carrying forth this heritage has not received any attention. Survey of musculoskeletal disorders among Indian dancers in Mumbai and Mangalore revealed common sites of injury, commonly perceived causes of injury and factors influencing injury. Original research studies conducted to explore biomechanics of classical dance forms revealed how training in Indian classical dance forms results in greater standing balance performance because of the engagement of three prime systems in neuronal circuitry which are responsible for balance performance i.e. visual system (during Bhavang), vestibular system (Chakkars/spins) and proprioceptive system (tatkara or footwork). Further work revealed the influence of typical postures of Bharatanatyam dance form spilled over in motion of spine, pelvis and hip joints during daily-performed activity such as- gait.

In the sports arena, as much glamour is captured by Cricket, Football, etc; in India, traditional sports such as Mallakhamb, Kabaddi and Skipping have remained in silo for many years not only on the sports field; but also in sports science and research. As, Kabaddi is now gaining recognition as a competitive sport on national and international forum, research was conducted to explore ways to enhance performance of Kabaddi players and it was found that plyometric training can be integrated along with conventional training regime to enhance sports performance of Kabaddi players. Traditionally played Mallakhamb (pole gymnast) poses huge challenges to the architecture and function of ankle foot complex because the gymnast is expected to pivot the body with ankle foot complex around the pole. Findings on biomechanical adaptations caused by practice of Mallakhamb provide useful considerations to Coaches and Clinicians for training and rehabilitation. Comparison of lower extremity joint loading during bounce rope skipping, running and walking revealed that skipping causes low loading on hip, knee and ankle joints compared to run which supports its prescription as joint protective exercise for health promotion in young adults and helps to clear myths about loading caused by skipping. Such a series of studies continue to unravel the biomechanical demands of daily traditional ground level activities, Yogasanas, traditional sports and classical dance forms.

Multilateral efforts of Dr.Mullerpatan continued to engage in researching sustainable, effective, evidence-based patient-care models for the underserved. Spine pain is one of the most common cause for disability. Hence she researched factors pertinent to spine care and reported the burden of spine pain among rural and tribal population of six villages (n=2323) in Raigad district of Maharashtra State of India through point prevalence of neck and low back pain. Additionally, attitudes and beliefs of rural people towards spine pain and disability caused by spine pain were researched because this information was valuable in designing culturally palatable rehabilitation program for spine pain.

While researching the local situation, she contributed to the spine care model developed by Global Spine Care Initiative, which is published and referred globally by clinicians from various health disciplines. Further, pilot studies were conducted to study the effectiveness of Yoga and Suryanamaskar in management of chronic mechanical neck and low back pain. Promising results of these studies will contribute hugely to the rehabilitation toolbox, by providing an alternate form of mind and body exercise because patients suffering

from chronic ailments such as back pain find one form of exercise monotonous, leading to non-compliance to exercise (manuscripts are in pipeline for publication).

The lens of rehabilitation was also focused on neurological disorders resulting in life-long functional limitations like Cerebral palsy because much-needed biomechanical exploration of impairments among children with cerebral palsy residing in low resource settings like India provided deeper insight on exclusive clinical features at various stages of involvement and socio-cultural specific needs for clinical rehabilitation. In childhood, cerebral palsy is the most common cause of physical disability. Cerebral palsy impacts functioning, inclusive of body structures (e.g., limbs), body functions (e.g., strength), activities (e.g., walking), and participation (e.g., playing a sport), which in turn may cause disabilities affecting health-related quality of life.

Gait reflects the overall status of sensory motor function in children with cerebral palsy. Severity in motor disability reflects on the walking pattern of the child. Hence robust instrumented 3D gait analysis was conducted among children with severe walking impairment, which illustrated detailed gait characteristics of children walking with higher crouch angle. Further studies were conducted to inform researchers and clinicians lower extremity muscle strength and endurance of Indian children with cerebral palsy with greater impairments, which is crucial for planning of treatment and monitoring treatment outcome.

Parallel attempts were made to review functioning of children following surgical interventions. Among the various interventions available for children with cerebral palsy, single event multi-level surgery is the preferred method to treat musculoskeletal deformities in cerebral palsy and has proven to be the most effective. Therefore lower extremity function was reviewed following single-event multiple level surgery in children with cerebral palsy to understand the value of surgical intervention in restoration of function. Over and above research efforts to maximize function, Dr.Mullerpatan dreams of an inclusive environment in India for children with cerebral palsy in education and sport. In an attempt to introduce and enhance sports participation among children with cerebral palsy in India, she explored level (district and national) and nature of participation in sports and barriers to sports participation among children with mild intellectual disability.

Taking cognizance of challenges faced by parents/caregivers to travel with a child with cerebral palsy in our country, which has limited accessible environment, a mobile-based application is in the process of development to monitor functioning of children with cerebral palsy in between visits for early detection of markers indicating deterioration in human movement performance.

Dr.Mullerpatan continues to integrate knowledge generated from robust, comprehensive 3D exploration of human movement performance into design and development of valid, reliable surrogate measures/devices, which can be widely used in routine clinical settings to address unmet needs.

4. Membership of Scientific/Societies/other Professional bodies:

- Lifetime Member of Society of Indian Physiotherapist
- Grant Committee Member of Society of Indian Physiotherapist
- Executive Council Member, International Society of Biomechanics (2017-2019)
- Ex-Member of European Diabetic Foot Study Group

15.Major R&D projects/programmes implemented during the last 5 years:

(i) Completed projects (if applicable):
Please provide title, grant size, duration, funding agency, achievements vis-à-vis objectives.

(ii) Ongoing projects (if applicable):
Please provide title, grant size, duration, funding agency, achievements vis-à-vis objectives achieved so far.

No	Project Title	Principal Investigator	Funding Agency/ Institutes	Total Fund Received (INR)	Research Fellow	Objectives
Completed Projects						
1.	Development of powered transtibial prosthesis (2015 – till date)	Dr. Rajani Mullerpatan	Department of Biotechnology DBT, New Delhi, India	33,00,000	1 Research fellow for 3 years	Design Bi-articular actuation mechanism with energy storage and return foot and knee brace for transtibial prosthesis
2.	The effects of labour and birth positioning on pelvic dimensions: gaining further insight to improve birth experience (2016 – 2018)	Dr. Rajani Mullerpatan	Indo-Canadian Shastri Institute, Canada	1,12,000	1 Research fellow 1 Research Associate 1 Field visit coordinator for 12 months	Use motion capture device to investigate the effects of birthing positions on pelvic dimensions in a group of non-pregnant Indian subjects. Better understand rural Indian women's current experiences and aspirations around childbirth.
3.	Biomechanical exploration of 3 types of Suryanamaskar (2017-19)	Dr. Rajani Mullerpatan	Sancheti College of Physiotherapy, Pune, India	1,72,000		Evaluate kinematics, kinetics of traditional, Chair and Wall Suryanamaskar using 3D motion analysis system Compare kinematics, kinetics, energy expenditure, quality of life, muscle activity between 3 types of Suryanamaskar
4.	Gait Analysis using i-sens wearable system and 3 D motion analysis (2017-19)	Dr. Rajani Mullerpatan	IIT Madras, Chennai, India	75,000		Compare gait kinematics and kinetics using a new wearable inertia sensors (i-Sens) system that has been developed at IIT Madras with the 3D multi-camera motion capture system in healthy adults
5.	Establishment of MGM Centre of Human Movement Science (2014 – 2015	Dr.Rajani Mullerpatan	International Society of Biomechanics, IIT Bombay, Mumbai, India	99,05,830		Generate a task force within the country to undertake research & conduct integrated training for health care professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders
Ongoing project						
6.	Validation of an indigenously developed device for measuring stiffness of plantar tissue in people with Type II diabetes (2019 – till date)	Dr. Rajani Mullerpatan	IIT Bombay, MGM IHS, Mumbai, India	1,70,519(IITB) + 1,50,000(MGM)	1 Research Fellow appointed for 6 months	Early detection of diabetic neuropathy and prevention of consequent foot complications.

16. **The relevance of proposed area of research & summary of the proposed work to be carried out**

(a) **Title: 'Cultivation of Health Sanskar among post-menopausal women for Swasthya and Asthi-tavasya (i.e. asthi=bone; tavasya=strength, power).**

(b) Objectives:

1) To conduct a nation-wide survey to study-

- knowledge of postmenopausal women about changes occurring in the body and health challenges posed by menopause using a pre-tested questionnaire.
- awareness and their attitudes and beliefs about benefits of exercise, nutrition and nutritional supplements for health promotion and bone mineral density following menopause.

2) level of physical fitness/physical activity and bone mineral density of postmenopausal women.

3) to cultivate Health Sanskar in postmenopausal women by adopting a women-centric, mobile-app based, therapeutic traditional movement based exercise program integrated with the natural resource of sunlight, to improve physical fitness and bone mineral density.

4) effectiveness of such an exercise program in improving physical fitness and bone mineral density using bio-mechanical, radiologic and bio-molecular markers.

5) treatment outcome in case of positively diagnosed cases among the studied healthy post-menopausal women.

(c) Relevance of study:

COVID 19 pandemic has awakened us to notice our negligible investment in public health in India. Health promotion has proved effective to modern public health in tackling disease origins, individual behavior, and social and economic conditions (Theodore H. Tulchinsky, 2014). 'Health promotion is the process of enabling people to increase control over and to improve their health' (Sanghamitra Pati, et al 2012).Hence, enrichment of culturally palatable health promotion strategies can contribute to effective self-empowerment of the masses to improve their health because compliance to strategies developed in different socio-economic settings is poor.

As we dream of Health for All by 2022, it is essential to address specific health needs of both women and men at specific biological age groups to achieve equity in health promotion for all in India; because specific health needs at different biological age groups among males and females pose exclusive challenges. Utilization of existing health resources, access to health care and priority of health is low among women in India because of various socio-cultural reasons. Since independence, Government of India has taken serious cognizance of maternal health challenges, which is reflected in our National Health Policies. However, menopausal health remains neglected. With rising population of the aged in the second most populous country in the world, India is faced with a huge challenge of health promotion of post-menopausal women to prevent/delay disability, maintain independence in daily functioning, and improve health-related quality of life at this critical biological milestone.

Menopause causes micro and macro changes in the biochemistry and biomechanics profile of the body; some of which are documented and others are yet to be discovered. Osteoporosis is one of the known major condition

18. **Certificate by the host Institute**

Certify that **Prof. / Dr. Rajani Mullerpatan**, if given the Tata Innovation Fellowship by the Department of Biotechnology, he / she will be provided office and laboratory space, access to equipment and library facilities etc. for implementing the research project proposal submitted by him/ her under this fellowship.

MGM INSTITUTE OF HEALTH SCIENCES Deemed University Navi Mumbai ★ NAVI MUMBAI ★

Dr. Shashank D. Dalvi
Vice Chancellor
MGM Institute of Health Sciences
Navi Mumbai - 410209

Signature of the Head of Institution with Seal

Place: Navi Mumbai

Date: 11.11.2020