

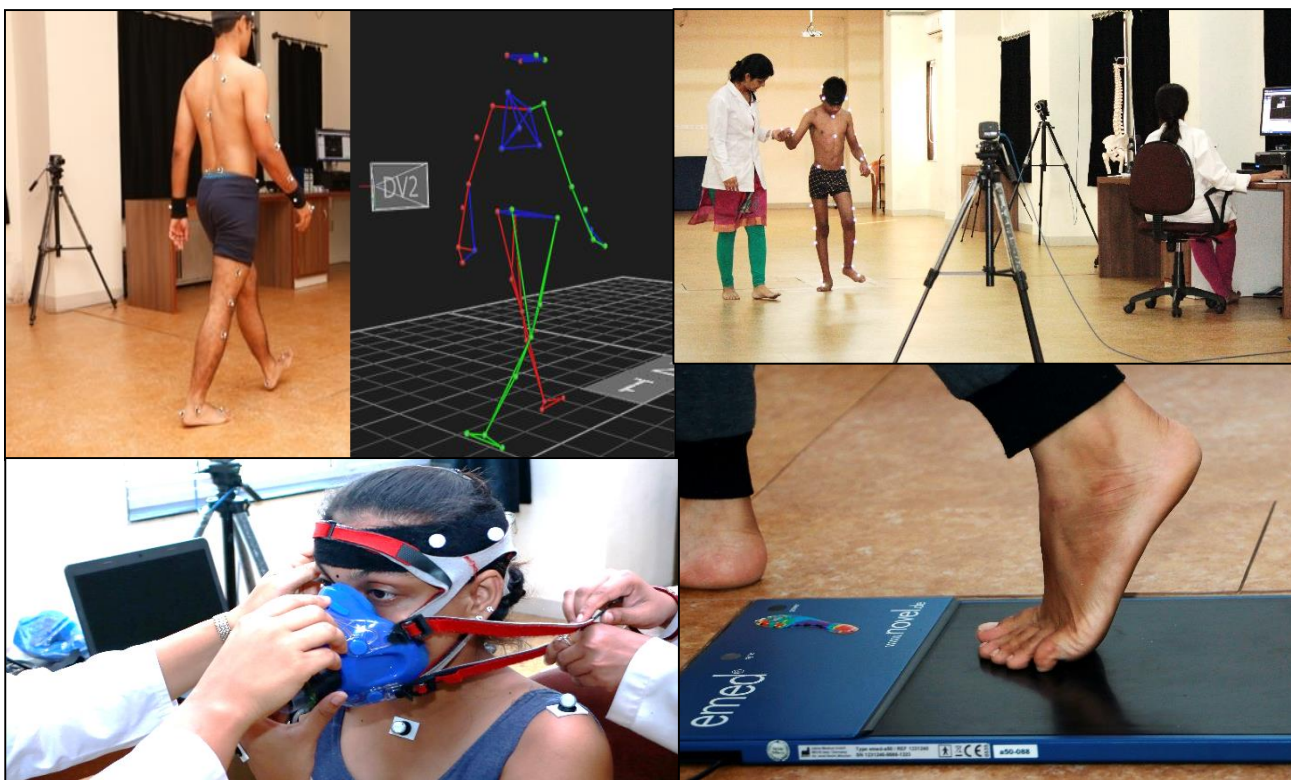


MGM School of Physiotherapy

MGM Institute of Health Sciences, Navi Mumbai

MGM Institute of Health Sciences'
Distinctiveness

MGM Centre of Human Movement Science



Nov 2021-October 2022

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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 7 years.

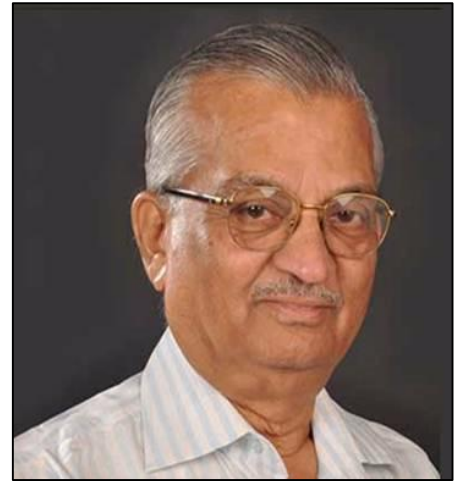
MGM Centre of Human Movement Science is committed to develop this science in India, disseminate fundamental knowledge and study applications of movement science in health promotion and rehabilitation, to address unmet local and global needs of people from across all economic strata of society. The Team 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.

We present this report of activities of the Centre for the period November 2021-October 2022 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

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 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

Executive Summary

MGM Centre of Human Movement Science (MGMCHMS) has accomplished 7 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 7 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 excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Over 2026 students from Physiotherapy (including BPT & MPT), BTech, MTech, BE, Prosthetics & Orthotics (BPO) and Orthopedics (MS) have 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 83 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 published 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. A device for measurement of properties of body part was patented on 9th September 2022. One patent was 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 6 Physiotherapy faculty members and 7 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 7 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



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

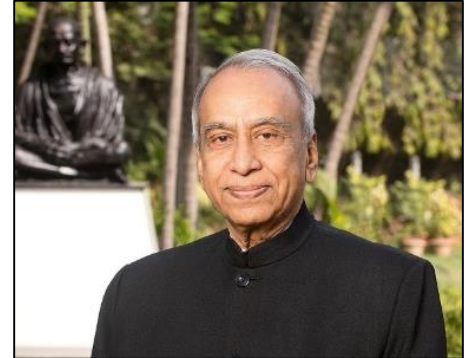
The mission is to provide people with robust & comprehensive movement-analysis facilities following injury/disorder at an affordable cost for precise clinical-decision-making.



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 extremely capable and committed team. This has evolved into one of the finest facilities in the country, perhaps across Asia, for scientific study of human movement. Dr. Rajani and her committed team are 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 in India. Equally important, the facilities have benefitted hundreds of medical and engineering students as well as professionals, by exposing 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.

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 drive 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 7 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



Dr. Triveni Shetty, 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. under 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 Parab (PT) qualified as Masters of Physiotherapy (MPTh) in 2017 under MGM Institute of Health Sciences (MGMIHS), Navi Mumbai.. 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).

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. 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. 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 Scholars: Past and present

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 Training 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)

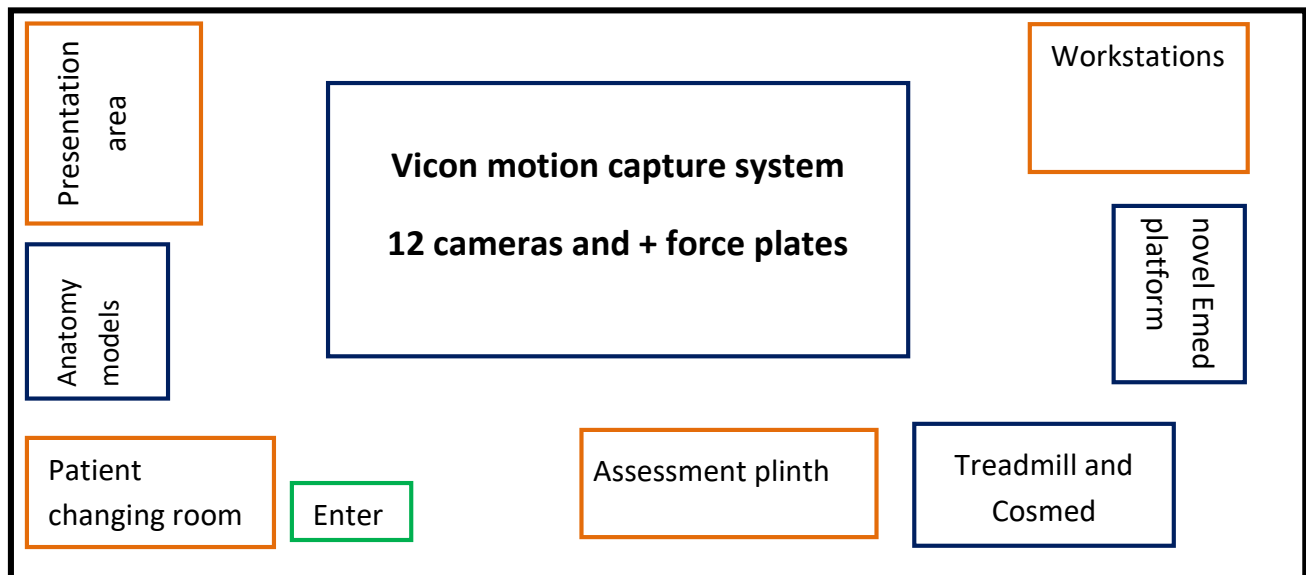


Dr. Misbah Shaikh (PT):

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)

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:

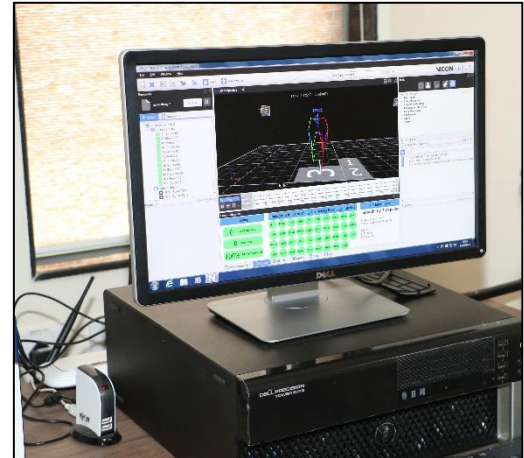
MGM CHMS motion analysis system is a robust gold standard equipment which includes- 12 [Bonita] 240 fps optical cameras (VICON, UK), 2 VGA video camera and three force platforms (AMTI, USA).

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

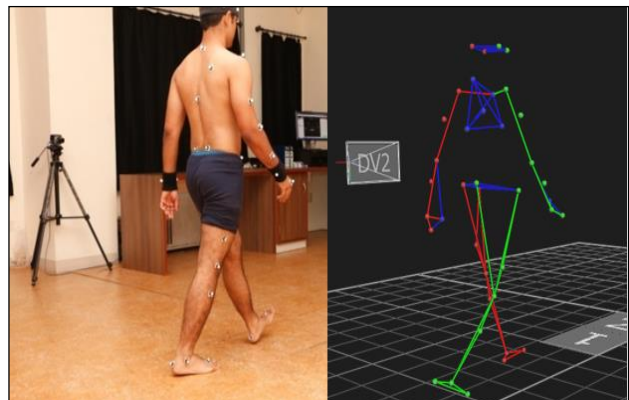
progress. AMTI biomechanics force platforms are designed to measure forces, moments and are sensitive to accelerations. Force plates can be used individually or as a walkway to record multiple footfalls.



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.

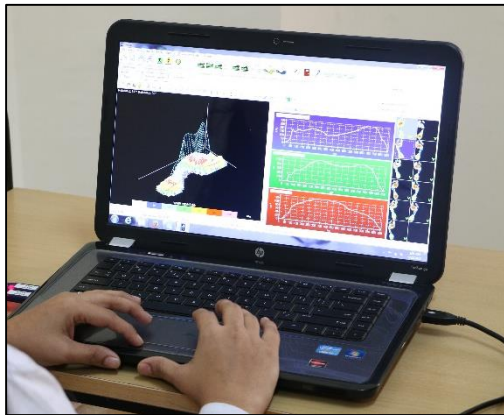
The MGMCHMS is also equipped with Vicon Polygon reporting software. This is an integrated visualization and report editing tool that enables quick and easy creation of a

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/cm², 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 set-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.

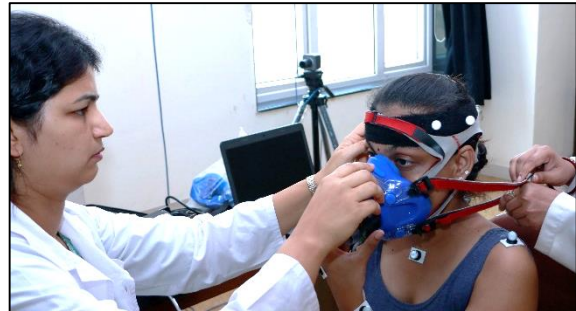


❖ **Oxygen Consumption Analyzer (Fitmate Med, COSMED):**

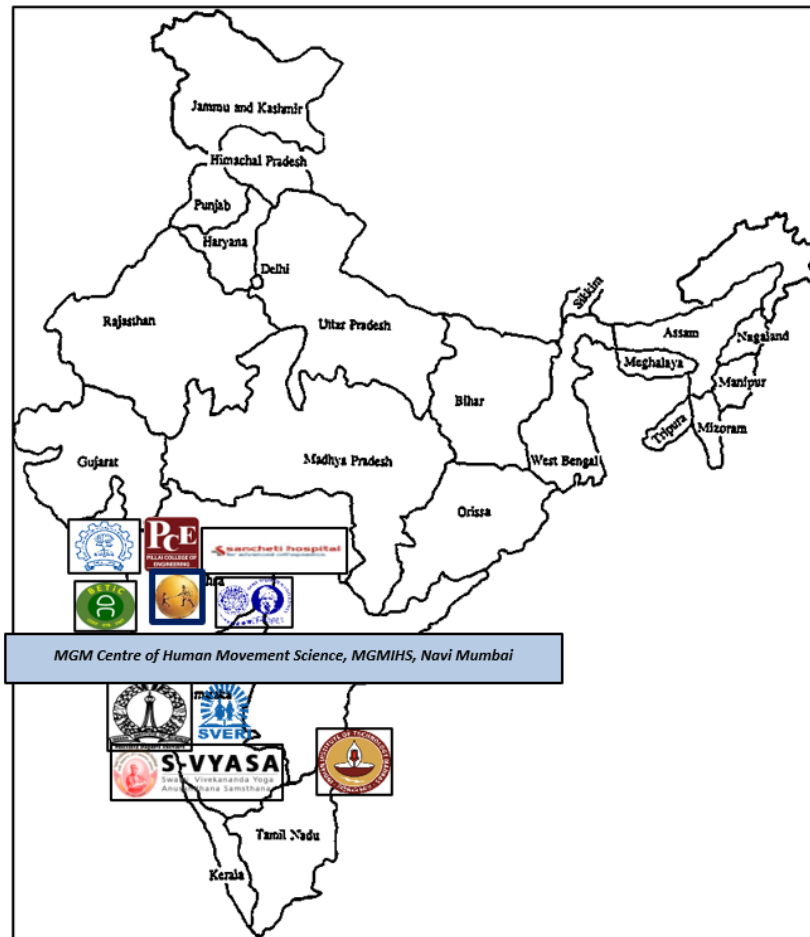


Fitmate Med by COSMED, Italy is an electronic device developed for assessing resting metabolism, cardio-respiratory fitness (VO₂max) and basic spirometry (FVC, SVC, MVV). It allows personalized weight management programs and exercise prescriptions according to the ACSM's latest recommendations. It is 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. VO₂, 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



IIT Bombay- Dr. Abhishek Gupta, Asst Prof, Mechanical Eng. Dept abhi.gupta@iitb.ac.in



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



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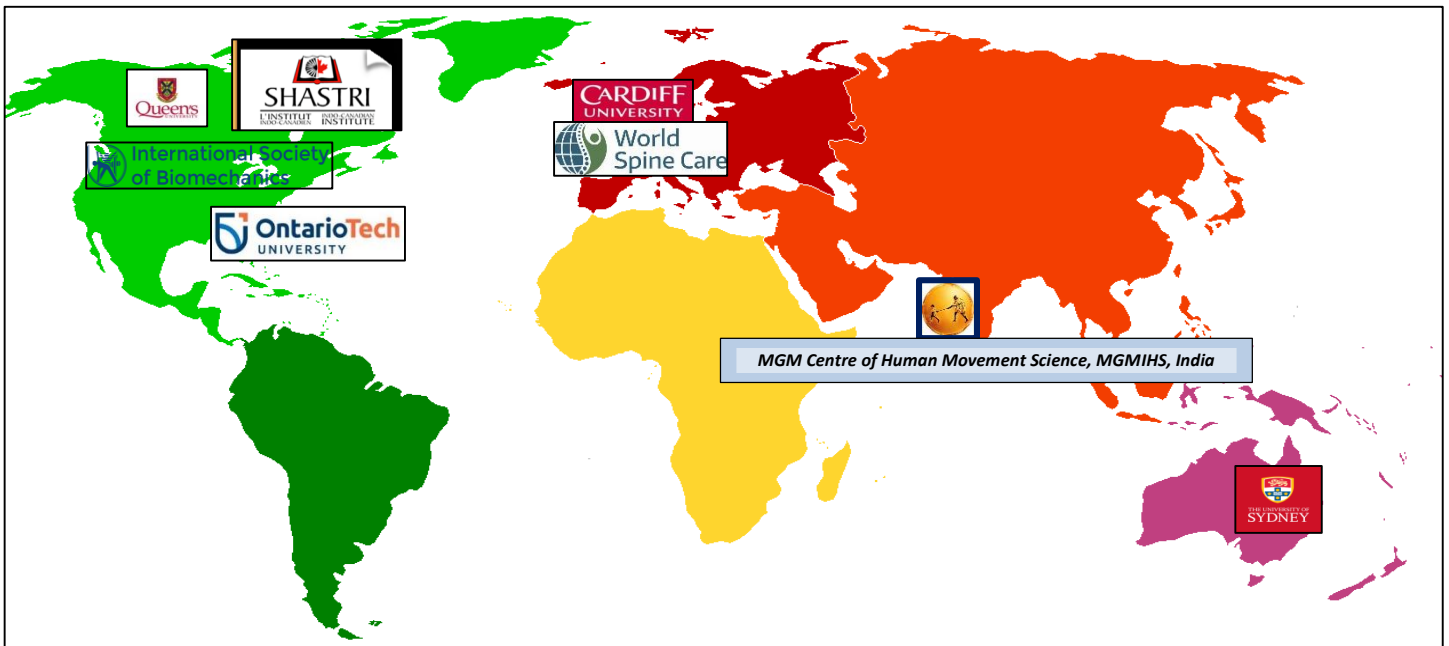


Shri Vithal Education and Research Institute, Pandharpur, Dr. Ranjitsinha Gidde rgidde@coe.sveri.ac.in



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International collaborations



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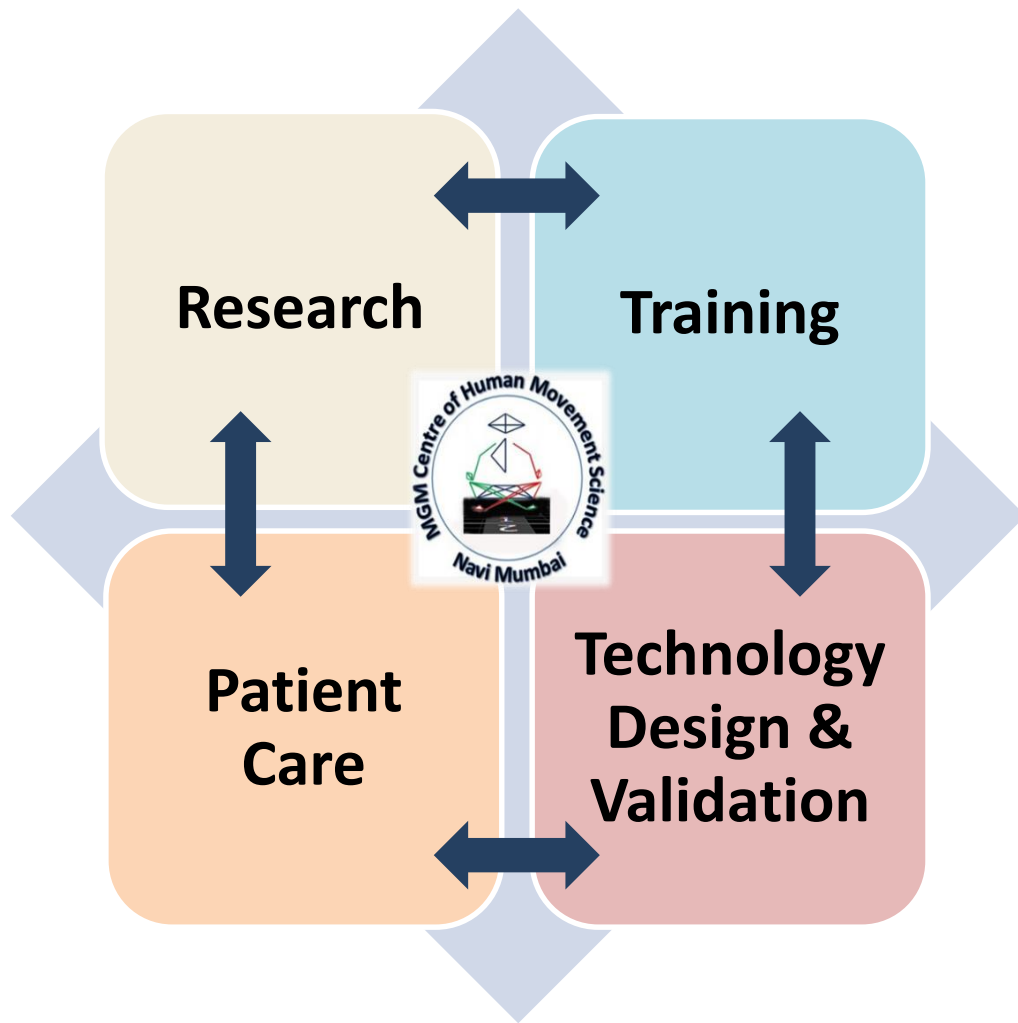


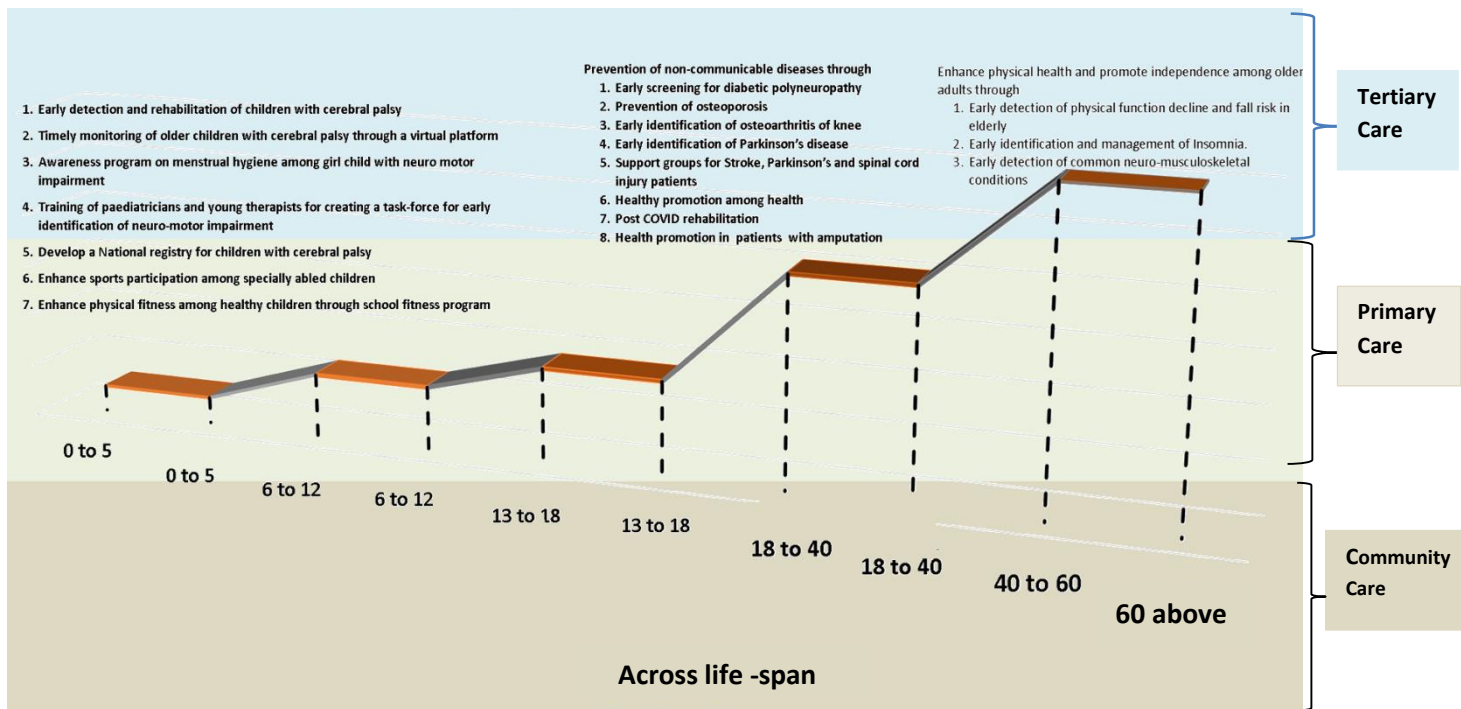
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*Distinctiveness of
MGM Centre of Human Movement Science
Four activity domains*





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):

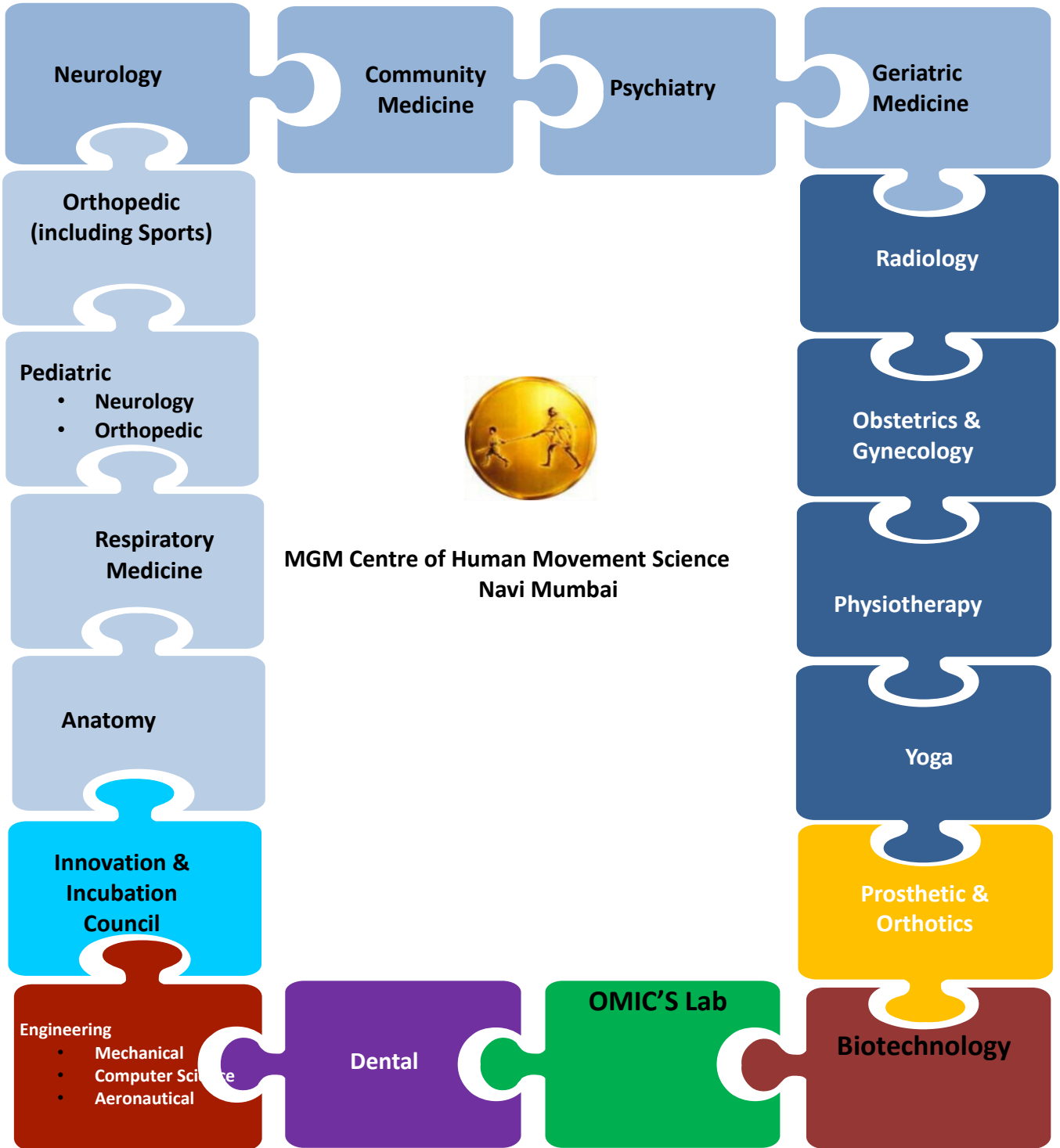
1. Early detection and management of osteoporosis.
3. Health promotion

50 years & above (post-menopausal):

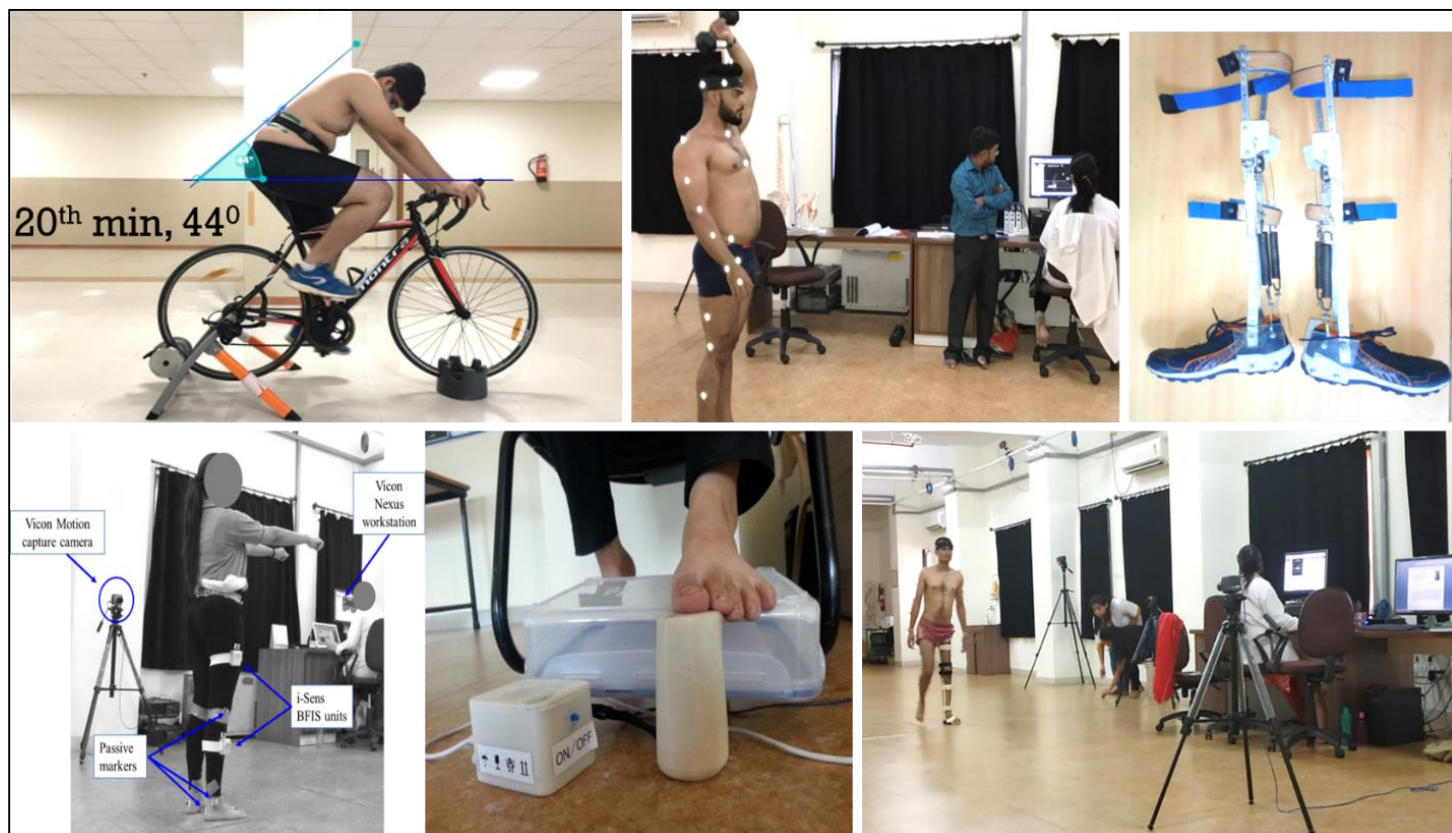
1. Evidence informed exercise for bone health

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 7 years is attracting major industry innovators for this purpose.

In the duration November 2021 to October 2022, 2 students and 1 faculty from MGM School of Physiotherapy participated in an E-Hackathon for development of rehabilitation technology was hosted by IIT Bombay. Both the faculty and student won prizes for their innovative design. The Centre reached out to various Innovation Centers across India to inform them of availability of robust, gold-standard technology available for validation of technology pertinent to rehabilitation through e platforms. In the duration of one year, one developer contacted the Centre for validation of a knee ankle foot orthotic device. Pilot testing was done on 2 patients with post-polio residual limb.

Training

In past 7 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 excellent feedback on knowledge base and awareness of applications of biomechanics in clinical evaluation and rehabilitation; research and technology design. Until now, over 2026 students from Physiotherapy (including BPT & MPT), BTech, MTech, BE, Prosthetics & Orthotics (BPO) and MS(Orthopedics) have benefitted from biomechanics training.

In the duration November 2021 to October 2022, training was conducted through 1 3D gait analysis workshop for 27 students. Lab facilities were demonstrated through 42 tours, for students, faculty members and clinicians from engineering and healthcare fields. Over 429 students from Physiotherapy (including BPT & MPT), Prosthetics & Orthotics (BPO) and MS(Orthopedics) benefitted from biomechanics training conducted during the curricular training.

Curricular training



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

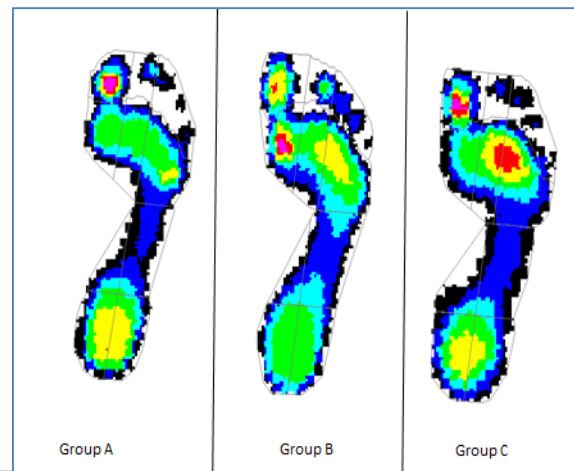
Research

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 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 and its scientific application in healthcare. Research activities in these areas have yielded 83 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 is published 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 7 years, MHMCHMS has evaluated over 2593 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.

In the duration November 2021 to October 2022 the center has published 15 papers and submitted 9 proposals to extramural funding agencies. Three copyrights were registered with Indian copyright office and three copyrights were filed.



Publications

Sr. No	Title	Authors	Journal	Year	Database Indexing
Exploration of Yoga					
1.	A review of the physiological effects of Suryanamaskar in children. MGM Journal of Medical Sciences	Kanojia AK, Bagwe HS, Agarwal BM	International Journal of Yoga	2022 Jul	DOAJ
Dance Biomechanics					
2.	Differences in Foot Characteristics Between Bharatanatyam Dancers and Age-Matched Non-Dancers	Mullerpatan RP, Bharnuke JK	Medical Problems of Performing Artists Mangalore	2022 Mar	PubMed
Clinical Rehabilitation					
3.	SPINE20 recommendations 2021: spine care for people's health and prosperity	Costanzo G, Misaggi B, Ricciardi L, AlEissa SI, Tamai K, Alhelal F, Alqahtani Y, Alsobayel HI, Arand M, Balsano M, Blattert TR	European Spine Journal	2022 Jun	PubMed, Scopus
4.	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	Patel G, Mullerpatan R, Agarwal B, Shetty T, Ojha R, Shaikh-Mohammed J, Sujatha S	Journal of Engineering in Medicine	2022 May	PubMed
5.	National Education Policy 2020: Call for reconfiguration of physiotherapy education and research in India.	Mullerpatan RP	Journal of Society of Indian Physiotherapists	2022 Jan	EBSCO Publishing's Electronic Databases
6.	Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis	Pahade AJ, Wani SK, Mullerpatan RP, Elizabeth Roach K	Hong Kong Physiotherapy Journal	2021 Dec	Scopus

7.	Evaluation of Early Knee Osteoarthritis Using Biomechanical and Biochemical Markers	Agarwal BM, Yadav RP, Tambe SD, Kulkarni CC, Mullerpatan RP	Critical Reviews™ in Biomedical Engineering	2021	Scopus
8.	Pilot implementation of rural rehabilitation services, India.	Mullerpatan R, Waingankar P, Parab S, Agarwal B, Nagrale O, Dalvi S.	Bulletin of the World Health Organization	2022	PubMed
9.	Dough kneading exposure at the kitchen workstation: Influence on handgrip strength and implications for therapy in hand rehabilitation.	Khan L, Shetty M, Kherada S, Kava R, Kazi M, Walankar P, Mullerpatan R.	Work	2022	PubMed
10.	Effect of Low Intensity Transcutaneous Electrical Nerve Stimulation (TENS) on Vastus Medialis Obliquus Muscle Activation for Reduction in Pain and Improvement in Function in Patients with Chronic Osteoarthritis of Knee Joint,.	Mamta Shetty, Rucha Pradhan	Journal of Society of Indian Physiotherapist	2022	UGC
Geriatric Rehabilitation					
11.	Functioning of Older adults in low middle income countries: A literature review	Poonam Desai, Rajani Mullerpatan	Reviews in Physical and Rehabilitation Medicine	2022	Scopus
Cardiopulmonary and Respiratory Rehabilitation					
12.	Evaluation and Physiotherapy Management of Diaphragm Dysfunction in Patients Admitted to the Medical Critical Care Unit: A Review of the Literature.	Bagwe H, Agarwal BM, Mullerpatan R	Critical Reviews™ in Physical and Rehabilitation Medicine.	2022	Scopus
13.	Physical Function in Critically Ill Patients during the Duration of ICU and Hospital Admission.:	Aglawe DR, Agarwal BM, Sawant BD.	Indian Society of Critical Care Medicine	March 2022	PubMed
Neuromotor impairments					
14.	Determinants of hand function in children and adolescent with Down Syndrome-A scoping review.	Padia N, Bose M, Parab S.	Journal of Hand Therapy.	September 2022	PubMed
15.	Physical Function Assessment Tools in the Intensive Care Unit: A Narrative Review.	Aglawe DR, Agarwal BM, Sawant BD.	Critical Reviews™ in Physical and Rehabilitation Medicine	March 2022	Scopus

Ongoing Research Projects

Summary of Ongoing Projects	
Faculty	7
PhD	2
MPT	10
Interns	13
Total	32

Sr.no	Faculty Project Title
1.	Telemetric Lifestyle Intervention: for SELF administration of a novel, prophylactic tool to delay disability caused by Osteoarthritis of knee (MARK-1)-A Longitudinal study
2.	Biomechanical and Biochemical exploration of effect of Yoga in low back pain – an experimental study
3.	Effect of Telemetric Rehabilitation in Patients with Mild-Moderate Covid-19 Affection
4.	Deep squat intervention of a novel, early self-administered prophylactic tool to delay disability caused by osteoarthritis of knee- a longitudinal study
5.	Health related physical fitness in healthcare workers posted in COVID 19 care: A longitudinal study
6.	Mobile-based application for telerehabilitation for self-empowerment of community-dwelling elderly people for maximization of physical function - A pilot study".
7.	Development of mobile technology (Detect, Rehabilitate and Monitor (DREaM)): Empowerment of primary caretakers of children with Cerebral palsy

Sr.no	Project Title
PhD Scholars	
1.	Long term monitoring of functional outcome of multilevel orthopaedic surgeries in children with cerebral palsy
2.	Level of Physical Function in Elderly in Urban and Rural Setting
MPT Scholars	
1.	Exploration of ground level activity performance in the elderly: A cross-sectional study
2.	Development of a Two-dimensional method for evaluating movements of temporomandibular joint
3.	Dance therapy as an intervention to improve functional performance in patients with Parkinson's Disease: A Pilot
4.	A Study to assess ground level activities in Stroke patients.
5.	Effects of telerehabilitation on people with Parkinson's Disease - A systematic review and meta-analysis
6.	Association between CT scan findings, Lung function and Functional Capacity in patients with COVID19
7.	Exploring effects of pranayam on lung functions in Chronic respiratory condition- A Systematic Review and Meta-Analysis

8.	Kinanthropometric and physical fitness profiles of sub-elite Kho Kho players
9.	Kinanthropometric and physical fitness profiles of sub-elite Kabaddi players
10.	Influence of Classical Kathak Dance training -A Case control study
BPT Scholars – Internship project	
1.	Exploration of Musculoskeletal Impairments In Individuals Post Covid-19 Infection in the Long Covid Period of 9-12 Months: A Survey Study
2.	Evaluation Of Balance, Core Muscle Endurance And Flexibility of Lower Limb In Rhythmic Gymnasts And Ballet Trained Rhythmic Gymnasts: A Cross Sectional Study
3.	Perception of BPT Graduates Regarding Offline and Online mode of Training : A survey.
4.	Effect of peer mentorship in comparison to traditional mentorship in physiotherapy students
5.	Effect of physiotherapy telerehabilitation on the physical, cognitive and psychosocial domains of sedentary work-from-home IT professionals
6.	Validation of Hindi and Marathi version of MGMGLAE brief questionnaire
7.	Awareness and Effectiveness of online exercise regime-a survey
8.	Prevalence of Work- Related Musculoskeletal Problems among Students Undergoing Medical Laboratory Training : A Survey Study
9.	Effects of 6 weeks of triphasic training protocol on sports fitness parameters of semi pro basketball players
10.	Impact of Physical Activity on Obese Pregnant Women to prevent Gestational Diabetes Mellitus - A Narrative Review
11.	Knowledge of awareness about home programme among caregivers for prevention of chest complications in children and adolescence with neurological conditions
12.	Awareness and Application of Online teaching and learning methods among faculty of Healthcare profession
13.	Exploration of Physical Fitness Attributes, Kinanthropometry and Skill Assessment in Indian sub-elite football players

Awards and recognition

In 7 years, the Centre has received funding for 2 projects from Department of Science and technology (DST), Govt of India and Rajiv Gandhi science and technology commission (RGSTC), Government of Maharashtra.

Women Scientists Scheme (WOS)

This initiative by Department of Science and Technology (DST) primarily aims at providing opportunities to women scientists and technologists between the age group of 27-57 years to encourage projects related to Science & Technology (S&T) interventions for societal benefit.

Year of grant application to DST: 2020

Grant received in: January, 2022

Fund Approved (INR): Rs. 24,15,008.00

Project name:

Mobile-based application for telerehabilitation for self-empowerment of community-dwelling elderly people for maximization of physical function - A pilot study".

Principal Investigator: Poonam Desai (Ph. D Scholar)

Guide: Dr. Rajani Mullerpatan (Professor-Director)

Project Progress:

A Transcript of the mobile-based application has been prepared based on the findings of the comprehensive geriatric assessment on 120 elderly adults.

A framework will be developed during the process to detect the risk of falls and neuro-motor disorders in the elderly.

The mobile application will be developed comprising of tools for early detection and referral component of elderly adults at risk of falls.

The proposed mobile application will allow administration of a guided rehabilitation program to the elderly based on findings of clinical assessment and risk assessment.

Rajiv Gandhi Science & Technology Commission (RGSTC)

Rajiv Gandhi Science & Technology Commission (RGSTC) launched a scheme under 'Assistance for Science and Technology' scheme during 2021 to encourage innovative application of science and technology for socio-economic development.

Year of grant application to RGSTC: 2022

Grant received in: May, 2022

Fund Approved (INR): Rs. 22,54,000

Project name:

Development of mobile technology (Detect, REhabilitate and Monitor (DREaM)): Empowerment of primary caretakers of children with Cerebral palsy' submitted under the Scheme

Principal Investigator: Dr. Rajani Mullerpatan (Professor-Director)

Co-investigator: Dr. Sailaxmi Ganesan, Hon' Professor, MGMSOPNM,
Dr.Triveni Shetty , Associate Professor, MGMSOPNM,
Dr. Revathi Natesan, Assisat Professor, Pediatrics, MGM College, NM,
Mr. Vijay Bhonsale, HOD, Computer Science, MGM College of Engineering, NM.

The project aims to develop a mobile-based application to create referral framework pathway that serves as a link between rural areas/urban slums and tertiary hospitals to-

- Monitor normal child development and detect red flags to identify developmental delay
- Detect deterioration of function among children with cerebral palsy at an early stage.
- Develop a mobile-based Tele-rehabilitation module for children with cerebral palsy-
 - 1) particularly those children and care-givers residing in remote areas of India, who are devoid of care because they cannot access care and
 - 2) those in the cities who cannot afford routinely offered typical contact-care in rehabilitation services.

Project Progress:

A functioning prototype of the mobile application has been developed.

Currently the content is being translated to Hindi and Marathi versions.

A survey is being done on primary caregiver of children with Cerebral Palsy to understand their Knowledge, Attitude and Practices.

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 yrs.) were analyzed to generate normative reference data for Indian population and this is still ongoing. Over 3000 patients have been tested for gait evaluation, balance testing and foot pressure analysis.

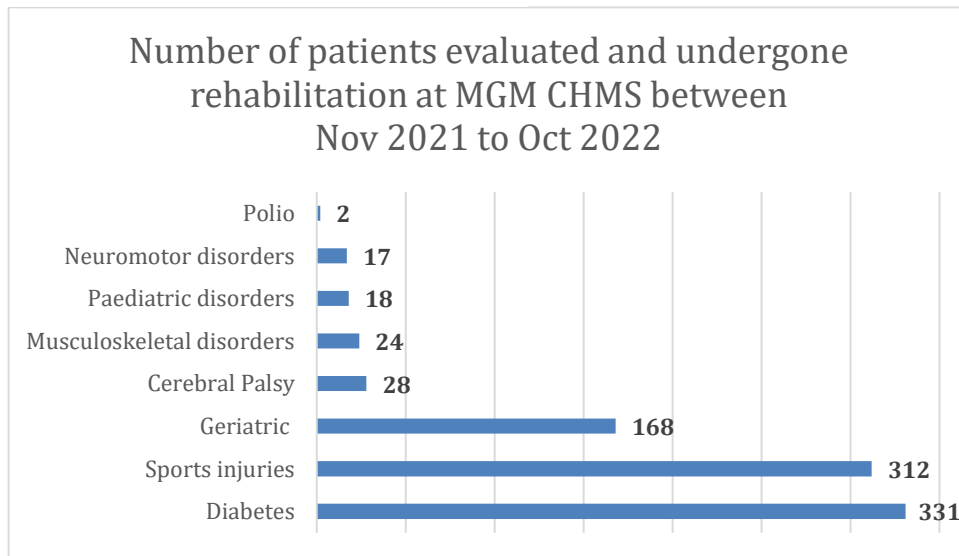
In the duration November 2021 to October 2022, 900 patients availed testing and rehabilitation facilities at MGM CHMS.



Gait analysis of Child with cerebral palsy



Energy cost of gait of patient with amputation



Graphs presents number of patients evaluated and undergone rehabilitation at MGM CHMS between Nov 2021 to Oct 2022

Eminent Visitors



L-R: Mr. Binsu Babu, Assistant Professor, PCE, Dr. Bela Agarwal, Dr. P.S. Goyal, Professor and Dean Research and Development department, PCE, Dr. Triveni Shetty, Dr. Rajani Mullerpatan and faculty from Pillai College of Engineering Mrs. Divya Padmanabhan, Mrs. Anuya Nijasure, Dr. Richa Agarwal

"Excellent facility and very competitive staff. Visit was very educative"
- Dr. P.S Goyal

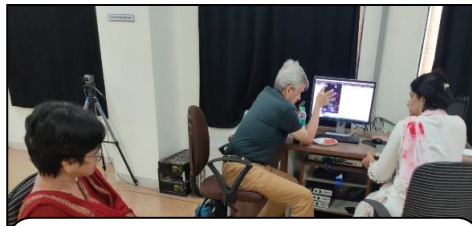


L-R: Mr Rameshwar Naik, NRHM Advisor Govt of Madhya Pradesh, Dr Anand Bang, Director SEARCH, Dr Rajani Mullerpatan, Dr. Bela Agarwal

"Honored to visit the centre and learn about the scientific work done here, I am keenly looking forward for continued engagement"
- Dr. Anand Bang



Dr Triveni Shetty demonstrating VICON system to Mr .C.K.Vhare, Assistant Professor, and Mr.S.Y.Salunkhe, Assistant Professor from Shri Vithal Education and Research Institute Pandharpur.



L-R: Mrs. Anjani Telang, Joseph Daly, Bharatanatyam dance instructor, New york expert in field of Bharatanatyam and Dr Triveni Shetty



Mr. Balaji Ramamurti, Professional Education Manager, Johnson & Johnson Medical, Dr. Rajani Mullerpatan and Dr. Triveni Shetty

"Impressive lab with great potential in application to real life orthopedic problems"
-Mr. Balaji Ramamurti



L-R NAAC Peer team members Dr Mahesh Gupta, Professor & HOD Pharmacology PGIMS, Dr Hansa Goswami, Professor and Head, Department of Pathology, B.J. Medical College, and Dr Amar Rai, Former Vice Chancellor North Eastern Hill University.



L-R Dr.Triveni Shetty discussing process of prosthetic device validation at MGM CHMS with Mr.Wahab Sheikh and Mr.Yuvaraj Karoshi, Co-founders of Combat Robotics

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.

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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.

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Objectives:

- ✓ Understand 2D motion analysis
- ✓ Understand the basic principles of 3D motion analysis
- ✓ Understand theories of movement control and loading
- ✓ Able to integrate and apply the above to analyze movement problems encountered in patient population

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Dr. Akhila Natesan, Asst Prof.
Dr. Victoria Kuttan, Asst Prof.

Clinical Biomechanics



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Objectives:

- ✓ Understand biomechanics of gait
- ✓ Understand theories of movement control and loading
- ✓ Apply principles of 2D motion capture in evaluation of gait and management of musculoskeletal disorders

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