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AWARENESS, ATTITUDE, AND KNOWLEDGE OF ROBOTIC TECHNOLOGY IN NEUROREHABILITATION AMONG PHYSIOTHERAPY INTERNS AND PROFESSIONALS.

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Abstract :

The aim of this study was to assess the awareness, attitude, and knowledge of Robotic technologies used in neurorehabilitation among Physiotherapy interns and Professionals across Maharashtra. A cross-sectional study was conducted in tertiary care hospitals and colleges in Maharashtra, India, using a self-made questionnaire. The results showed that 63% of the individuals are moderately aware, 67% have a positive outlook on the implementation of such advances but only 7.5% have accurate knowledge of the technology and its uses. Most of the participants also believe that Robotic Rehabilitation can be very time effective and reduce the load of the therapist as well as play a very important role in aiding neuroplasticity after rehabilitation. The study demonstrated that a higher degree of understanding and a more positive attitude regarding the application of Robotic Rehabilitation follow from heightened awareness of this field. Enhanced training programs, better integration of technology into rehabilitation practices, addressing time constraints and workload prioritization, and most importantly, overcoming economic barriers will ensure the effective implementation of Robotic therapies for the benefit of the patient and society as a whole. This will revolutionize the field of Physiotherapy and rehabilitation, offering new avenues for improving treatment outcomes and advances in clinical practice. The study concluded that, it is important to generate or enhance awareness towards the most-advancing fields and the uses of Robotic technology in neurological conditions in clinical practice which empowers Physiotherapy to adapt to the changing landscape of healthcare and deliver high-quality, patient-centered care.

Keywords: **Advanced Technology, Artificial Intelligence, Neurorehabilitation, Robotic Physiotherapy, Robotic Rehabilitation, Robotic Technology (RT)**

INTRODUCTION

According to the Robot Institute of America, a robot is defined as, “A re-programmable, multifunctional manipulator designed to move parts or specialized devices through variable programmed motions for the performance of a variety of tasks.” They also defined Advanced Robotics as, “The integration of enabling technologies and attributes embracing manipulators, mobility, sensors, computing (IKBS, AI) and hierarchical control to result ultimately in a robot capable of autonomously complementing man’s endeavors in unstructured and hostile environments.” [1]

Neurorehabilitation is a sophisticated medical technique that helps recover from nervous system injuries and minimizes functional changes. Neurorehabilitation aims to maximize patient independence by focusing on their skills and attitudes.

Robotic Technology refers to the use of therapeutic machines or devices for rehabilitation that allow patients to perform practice movements aided by a robot.[2] It is a growing field that incorporates advances in robotics that are combined with neurosciences and rehabilitation which can define new ways of treating problems related to neurological diseases.[3] Research in

robotics and artificial intelligence aims to create systems that resemble human intellect and have potential applications in neurorehabilitation.[4]

For the objective of rehabilitation, robotics, and artificial intelligence are engineered to stimulate neuronal plasticity and muscle activation synergy through targeted, repetitive motor coordination activities. Since the brain cannot regenerate after injury, any physical ability must come from the brain along active neural connections. This has an impact on therapies that combine experiences, learning, different sensory inputs, and motor training in particular (Poli et al.,2013), demonstrating the connection between neurological patients' recovery and intensive multimodal rehabilitation. In order to replace the lost pathways and functions, it is therefore possible to activate brain pathways that are not normally used. Robotic technologies to support physical therapists can significantly increase the intensity of activating these channels.[4]

Robotic rehabilitation includes the use of various robotic devices that incorporate sensory inputs, experiences, learning, and particularly motor training that are tailored for assisting different sensorimotor functions of the arm, hand, leg, and ankle and assisting therapeutic training and improving sensorimotor performance.[3],[4]

Robotic technology in neurorehabilitation includes various Robotic devices that are advanced and designed to assist in the recovery and rehabilitation of individuals with neurological impairments and conditions. These devices leverage various robotic systems and artificial intelligence to provide precise and customizable therapy interventions. The types of Robotic devices used in neurorehabilitation are as follows:

1. **Robotic Exoskeletons:** Exoskeletons are wearable robotic devices that support and enhance the movement of the upper as well as lower limbs. In neurorehabilitation, exoskeletons can be used to assist patients with functional arm movements or gait training. These devices use sensors and motors to provide controlled movement and can be adjusted according to the patient's needs.
2. **Rehabilitation Robots:** Rehabilitation Robots are designed to aid in the therapy of specific body segments affected by neurological conditions. These robots can assist in various movements, such as wrist and hand exercises or upper and lower limb training. They include intelligence systems that adapt to the patient's abilities and also enable tracking their progress over time.
3. **Robotic Therapy Devices:** These devices are specific robotic devices that target particular neurological impairments, such as Stroke, Spinal Cord Injury, Parkinson's Disease, Cerebral Palsy, etc. For example, robots that aid in hand and finger dexterity and control. These devices provide real-time feedback to the therapist and patient and the difficulty level can be adjusted to challenge the patient appropriately.
4. **Brain-Machine Interfaces (BMIs):** Brain-machine interfaces are advanced technologies that establish a direct communication pathway between the brain and external devices. In neurorehabilitation, these devices can be used to enable individuals to control robotic devices directly with their thoughts. These interfaces interpret brain signals and translate them into commands for the robotic devices, allowing patients to regain movement and perform tasks of daily living.
5. **Adjunct Virtual Reality (AVR) Systems:** Although not specifically robotic devices, VR systems are often integrated with robotics to enhance neurorehabilitation. VR-based rehabilitation systems use immersive virtual environments to provide interactive and engaging therapy sessions. Patients can perform exercises and tasks within virtual settings, which can help to improve motor skills, coordination, and cognitive functions.[1],[2],[4]

Particularly, some of the most commonly used Robotic devices are mentioned as follows:

Lokomat:

The Lokomat is a robotic gait training device used in rehabilitation. It consists of a body-weight support system, robotic leg orthoses, and a treadmill. The patient is suspended in a harness over the treadmill while robotic legs assist in moving their legs in a walking motion. **(Figure 1)**

Fig 1: The Lokomat (Hocoma) is a bilateral gait robotic orthosis that uses body-weight support and controls the patient's leg movements. *Source [5]*

The Lokomat robot is used primarily for rehabilitation in individuals with lower limb impairments, such as those resulting from stroke, spinal cord injury, or neurological disorders like multiple sclerosis. It helps by providing repetitive, task-specific training to improve gait patterns, muscle strength, coordination, and overall mobility. Additionally, it can assist in retraining neural pathways and promoting neuroplasticity to facilitate recovery. **(Fig 2)**

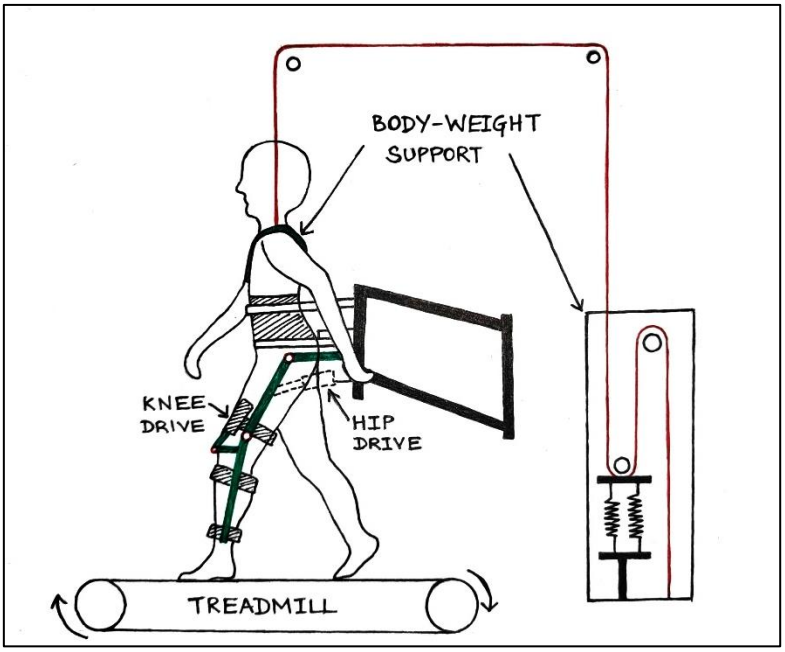


Fig 2: The working of Lokomat involving a treadmill, body harness with a body-weight support system, and Robotic leg orthoses.

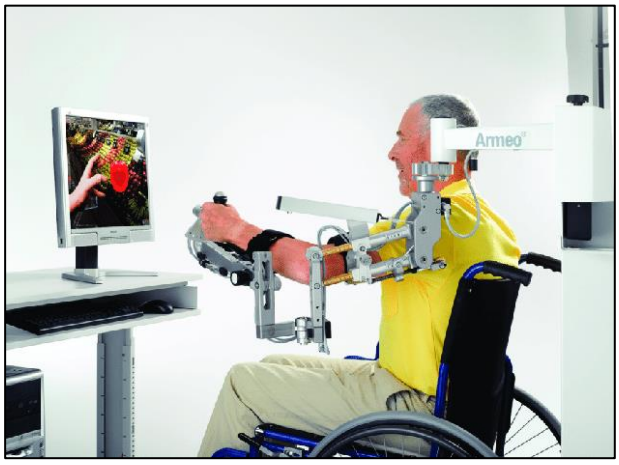
The efficiency of the Lokomat robot in rehabilitation depends on various factors, including the individual's condition, the severity of their impairment, and the consistency of use.

Studies have shown that the Lokomat can be effective in improving gait parameters, muscle strength, and functional mobility in certain patient populations. However, its effectiveness may vary from person to person, and it is often used as part of a comprehensive rehabilitation program tailored to the individual's specific needs and goals.

Armeo:

The Armeo is a type of robotic exoskeleton or robotic arm used for upper limb rehabilitation. Specifically, it is designed to assist individuals with arm impairments in regaining movement, strength, and coordination during rehabilitation therapy sessions. **(Fig 3a & b)**

The Armeo is used for upper limb rehabilitation in individuals with arm impairments resulting from conditions such as stroke, spinal cord injury, traumatic brain injury, or neurological disorders like multiple sclerosis. It helps by providing assistance and resistance during various arm movements, promoting muscle activation, range of motion, and coordination.



(a)

(b)

Fig:3(a) Armeo Spring: an ergonomic arm exoskeleton with integrated springs. **(b)** Armeo power: an exoskeleton based on the ARMin technology. *Source [6]*

Additionally, it offers engaging and interactive therapy sessions to motivate patients and facilitate recovery. The efficiency of the Armeo in rehabilitation varies depending on several factors, including the individual's condition, the severity of their impairment, and the consistency of use. Studies have shown that robotic devices like the Armeo can be effective in improving arm function, range of motion, and muscle strength in certain patient populations.

However, its effectiveness may vary from person to person, and it is often used as part of a comprehensive rehabilitation program tailored to the individual's specific needs and goals. Overall, while the Armeo can be a valuable tool in upper limb rehabilitation, its efficacy should be assessed on a case-by-case basis.

MyoPro:

The MyoPro is an example of a powered orthosis, specifically designed as a myoelectric orthosis for individuals with upper limb impairments. It is not a traditional robot in the sense of autonomous movement but rather an externally powered brace that assists individuals with weak or paralyzed arms in performing activities of daily living by detecting and amplifying their muscle signals. **(Fig 4)**

Fig 4: The MyoPro, powered orthosis from Myomo Inc. *Source [7]*

The MyoPro is used to assist individuals with upper limb impairments, such as those resulting from stroke, spinal cord injury, traumatic brain injury, or neuromuscular disorders like ALS or muscular dystrophy. It helps by restoring movement and function to weakened or paralyzed arms, enabling users to perform activities of daily living independently. The device detects muscle signals from the user's arm and amplifies them to initiate and support arm movement, allowing individuals to perform tasks such as eating, drinking, dressing, and reaching for objects with greater ease and autonomy. **(Fig 5)**

The efficiency of the MyoPro can vary depending on factors such as the individual's specific condition, their level of muscle function, and their ability to adapt to and utilize the device effectively. However, for many users, the MyoPro can significantly improve their ability to perform daily tasks and activities that were previously challenging or impossible due to upper limb impairments.

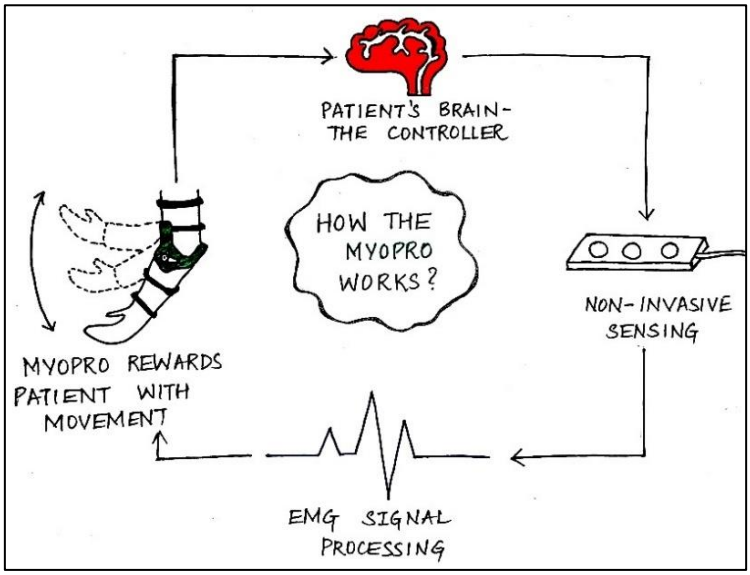


Fig 5: The above figure explains the working of MyoPro where the brain is the controller, and myoelectric signals amplify muscle activity and reward the patient with movements.

Studies and user testimonials have shown that MyoPro can lead to increased independence, improved quality of life, and enhanced participation in social and occupational activities. However, like any assistive device, its effectiveness may vary from person to person, and it is essential to undergo proper training and rehabilitation to maximize its benefits.

Overall, while the MyoPro may not completely restore full function to the affected arm, it can be a valuable tool in helping individuals with upper limb impairments regain a significant degree of independence and functionality.

ReWalk:

The ReWalk is a type of robotic exoskeleton designed to assist individuals with lower limb impairments, such as those caused by spinal cord injury, in standing, walking, and performing other ambulatory activities. Specifically, it is categorized as a powered exoskeleton or robotic walking system. **(Fig 6)**

The ReWalk exoskeleton is used to provide mobility assistance to individuals with lower limb impairments, such as those resulting from spinal cord injury (SCI), stroke, or other neurological conditions affecting mobility. It allows users to stand, walk, and navigate their environment with greater independence and autonomy. By utilizing motors and sensors, the exoskeleton detects the user's movements and provides powered assistance to facilitate walking. Users control the device through shifts in their balance and posture, enabling them to initiate steps, maintain stability, and navigate various terrains.

Fig 6: ReWalk, wearable exoskeleton designed to provide powered assistance to facilitate walking. *Source [8]*

Overall, the ReWalk exoskeleton enhances users' quality of life by promoting mobility, physical activity, and participation in daily activities and social interactions.

The efficiency of the ReWalk exoskeleton can vary depending on factors such as the user's level of impairment, their physical condition, and their ability to adapt to and utilize the device effectively. However, research and user testimonials have demonstrated several benefits like improved mobility, psychological well-being, social interaction, long-term health outcomes, and improved quality of life.

Erigo:

The Erigo is a type of robotic tilt table specifically designed for early mobilization and rehabilitation of individuals who are bedridden or have limited mobility due to neurological conditions, such as stroke or spinal cord injury. It is categorized as a rehabilitation robot or robotic rehabilitation device. **(Fig 7)**

The Erigo robotic tilt table is primarily used for early mobilization and rehabilitation of individuals who are bedridden or have limited mobility due to neurological conditions, such as stroke, spinal cord injury, or traumatic brain injury. **(Fig 8)**

Fig 7: Erigo Robotic Device. *Source [9]*

Overall, the Erigo plays a crucial role in facilitating early mobilization and rehabilitation, promoting recovery, and improving functional outcomes.

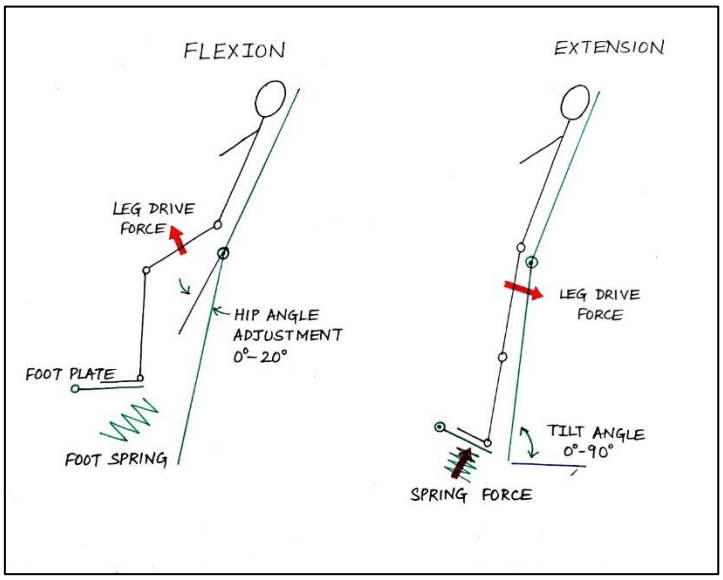


Fig 8: The working of erigo involves gradually raising immobile patients to a vertical position on a tilt table while flexing and extending the legs with Robotic assistance and support.

The use of automation and robotics in neurorehabilitation will help, measure, and record the process.[1] Robotic systems have drawn a lot of interest recently because they improve the accuracy and repeatability of therapy; initially, this approach was meant to complement conventional post-neurological trauma rehabilitation. In comparison to traditional practice alone, robotic technology has demonstrated positive and promising effects in the last several years, along with a moderate increase in gait and motor recovery. [4] According to a number of studies, patients who had undergone robotic-assisted therapy did not experience any negative side effects, found the treatment to be well-tolerated, and experienced significant improvements in their quality of life.

According to the 2011 Census of India, there are five million people with locomotor disabilities in India. Researchers at the Indian Institute of Technology, Jodhpur have designed robotic trainers that can be used for physiotherapeutic applications to treat lower limb disabilities, a common problem in India. Lower limb disabilities are caused by age-related ailments, physical deformations, strokes, polio, and accidents, among others. In this technique, the therapist only needs to provide supervision and the setting up of the device, and the rest is done by the Robotic device. The Robotic trainer is a brace or a wearable device like an exoskeleton that supports the leg. It was provided with a cartesian (3-directional) parallel manipulator to perform the required limb therapeutic motions in the transverse/horizontal/lateral and sagittal/longitudinal plane. It has been designed in such a way to provide rehabilitation to paralytic patients or those who have spinal cord injuries that have led to disruption in their lower limb functions. **(Fig 9)**

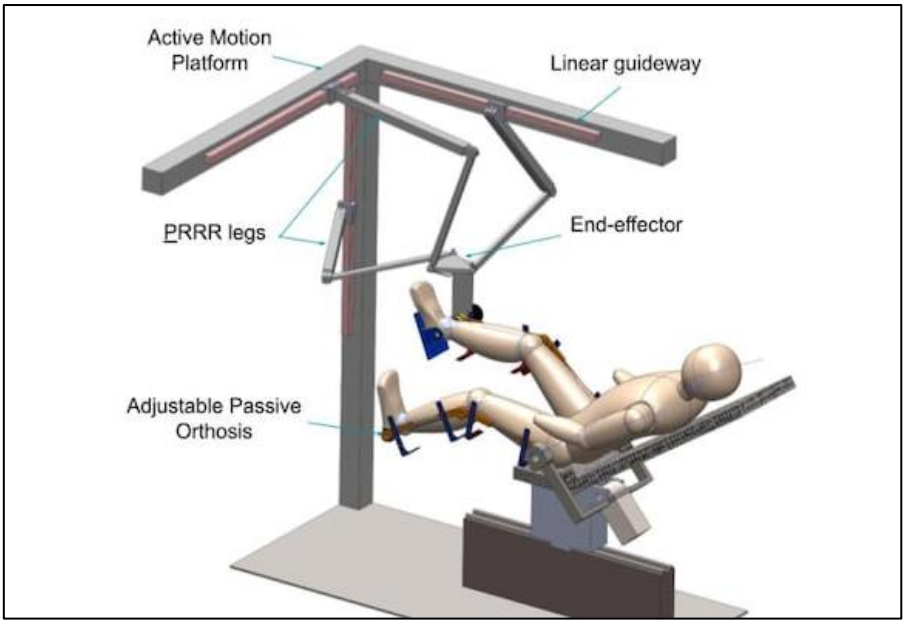


Fig 9: The robotic trainer is an exoskeleton that supports the leg and enables therapeutic motions in all 3 planes. *Source [10]*

Also, researchers from IIT-Delhi, in collaboration with AIIMS, have developed the first robotic hand exoskeleton device for the rehabilitation of wrist and finger joints for stroke survivors. The product secured a US patent for its design and innovation in August 2022 and the device was launched by AIIMS in the month of November 2022 maximum efforts were taken to make the device accessible to patients at a low cost. The device is based on a four-bar mechanical link which can be controlled by patients through muscle activity and visual feedback. It showed improvement in not only the wrist and finger joints of stroke patients but even in brain signals and neuroplasticity.

With the recent developments in robotic technology, it's critical to evaluate clinical physiotherapists' awareness, mindset, and degree of expertise regarding these developments.

MATERIALS AND METHODS:

A web-based Google form survey was used to collect data. The study used convenient sampling method.

A total of 385 Physiotherapists were recruited on the basis of the inclusion and exclusion criteria. A self-made questionnaire was used to collect the data, which was validated by the ethical committee. The questionnaire was distributed through various social media apps such as WhatsApp, Telegram, Linkedin, etc. to distribute the questionnaire links to groups of practicing Physiotherapists.

Prior to the study, the participants were informed about the confidentiality of information and their anonymity was given. Participation in the study was entirely voluntary.

The questionnaire was divided into four sections. The first section of the survey was used to gather information about the demographic characteristics of the participants to determine gender, level of education, professional work sector, professional work area, and years of experience. The second section was used to evaluate the participant's level of awareness of Robotic Technology in the field of health care and rehabilitation. The third section sought participants' opinions regarding their willingness to explore this field. The final section assessed the level of knowledge of Robotic technology and its uses as well as its impact and implications in clinical practice in future rehabilitation.

Data was collected from the responses sent by the participants. The answers to each section were assessed using a 5-point Likert scale. A detailed data analysis of each question, under each domain, was done using Python 3.9 version with matplotlib & pandas packages, after which an overall analysis was done to gain the final results and draw a conclusion.

RESULTS:

The research was conducted to get a snapshot of the level of awareness and perception of Physiotherapists regarding Robotic technology in clinical practice. A total of 385 Physiotherapists from different work experiences and workplaces participated in this study. The mean distribution with regard to the respondents was from female therapists (72.2%) having completed their Bachelor's degree (70%) and currently pursuing their internship (38%). **Table 1** gives a descriptive overview of the participants' characteristics.

Table 1: Demographic data and Demographic characteristics

DEMOGRAPHIC CHARACTERISTICS	VALUES
GENDER	
Male	102 (26.5%)
Female	278 (72.2%)
Prefer not to say	5 (1.3%)
LEVEL OF EDUCATION	
Bachelor's Degree	268 (69.6%)
Master's Degree	117 (30.4%)
PROFESSIONAL WORK SECTOR	
Governmental Hospitals	121 (24.3%)
Private Hospitals	377 (75.7%)
PROFESSIONAL WORK AREA	
Urban Area	375 (94%)
Rural Area	24 (6%)
YEARS OF EXPERIENCE	
0 to 6 months	144 (37.4%)

6 months to 2 years	**94 (24.4%)**
2 to 5 years	**95 (24.6%)**
5 to 10 years	**52 (13.5%)**

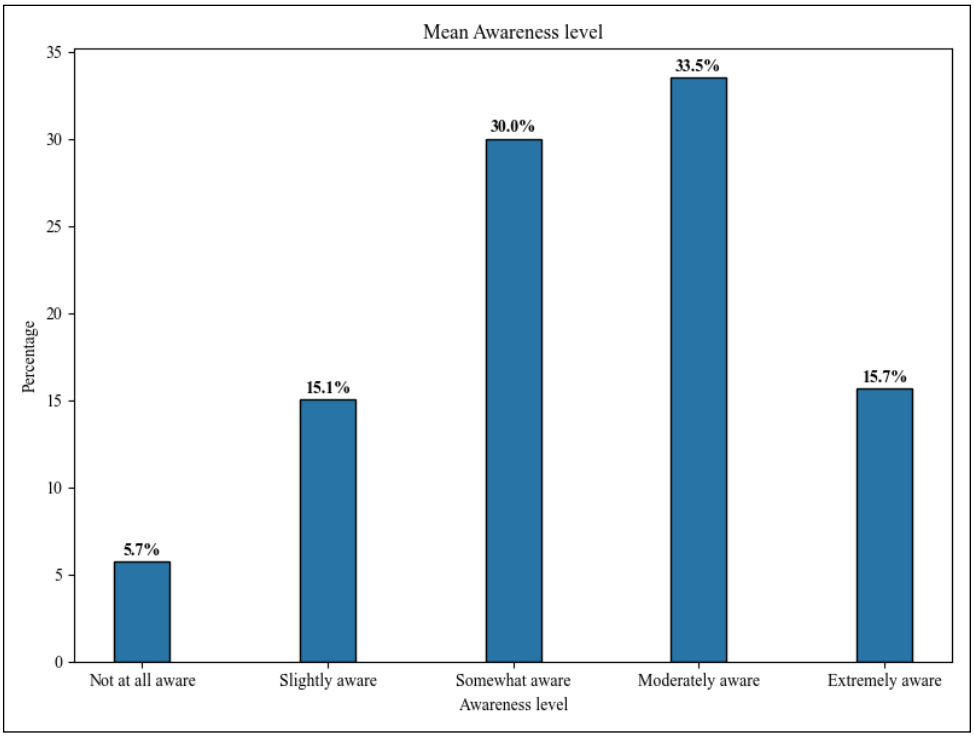
Interpretation: A total of 385 Physiotherapists from different work experiences and workplaces participated in this study. The mean distribution with regard to the respondents was from female Physiotherapists (72.2%), having completed their Bachelor's degree (70%) and currently pursuing their internship (38%). Pie charts depicting gender, level of education, professional work sector, work area, and level of education gave a descriptive overview of the participant's characteristics.

The results have highlighted concerns regarding the awareness level of Robotics Technology among Physiotherapists in neurorehabilitation. It concludes that only 15% of the Physiotherapists are extremely aware of such technology, while 33% have limited comprehension of the uses and benefits of integrating these devices with their treatment plan. It was reported that more than half of the individuals (55%) lack awareness about Robotic Rehabilitation **(Table 2, Graph 1)**

Table 2: Overall awareness

Awareness Level	Frequency	Percentage
Not at all aware	110	5.7%
Slightly aware	290	15.1%
Somewhat aware	578	30%
Moderately aware	645	33.5%
Extremely aware	302	15.7%

Graph 1: Mean Awareness Level



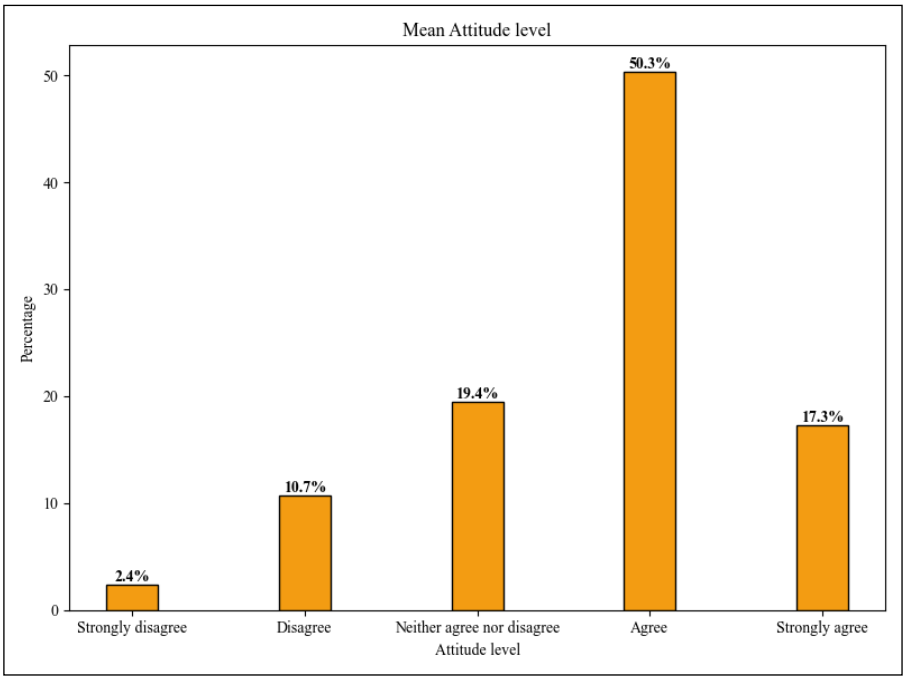
Interpretation: The above graph reveals that more than half (63%) of the Physiotherapists have somewhat to moderate awareness regarding Robotic technology.

Furthermore, the results obtained for the attitude of Physiotherapists are very surprising. 67% of the individuals have a very positive outlook on the implementation of such advances and also believe that Robotic Rehabilitation can be very time effective. However, 76% of individuals think that the cost and limited accessibility may be a drawback. **(Table 3, Graph 2)**

Table 3: Overall attitude

Attitude Level	Frequency	Percentage
Strongly disagree	109	2.4%
Disagree	493	10.7%
Neither agree nor disagree	897	19.4%
Agree	2323	50.3%
Strongly agree	798	17.3%

Graph 2: Overall attitude



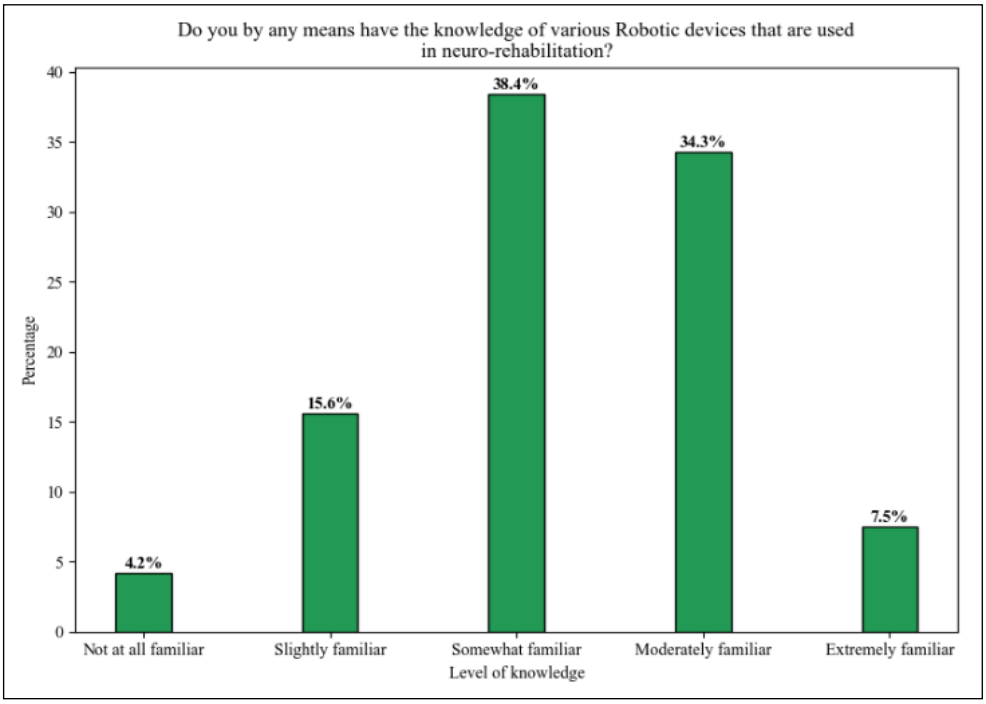
Interpretation: The graph reveals that only 50% of the distribution have a positive outlook towards RT and its implementation.

Since the level of awareness is considerably low the study reveals that Physiotherapists lack the necessary knowledge. Around 62% of individuals fit into this description, emphasizing the importance of education in this field. **(Table 4 & 5, Graph 3 & 4)**

Table 4: Mean Familiarity Level:

Knowledge Level	Frequency	Percentage
Not at all familiar	16	4.2%
Slightly familiar	60	15.6%
Somewhat familiar	148	38.4%
Moderately familiar	132	34.3%
Extremely familiar	29	7.5%

Graph 3: Familiarity of Robotic technology



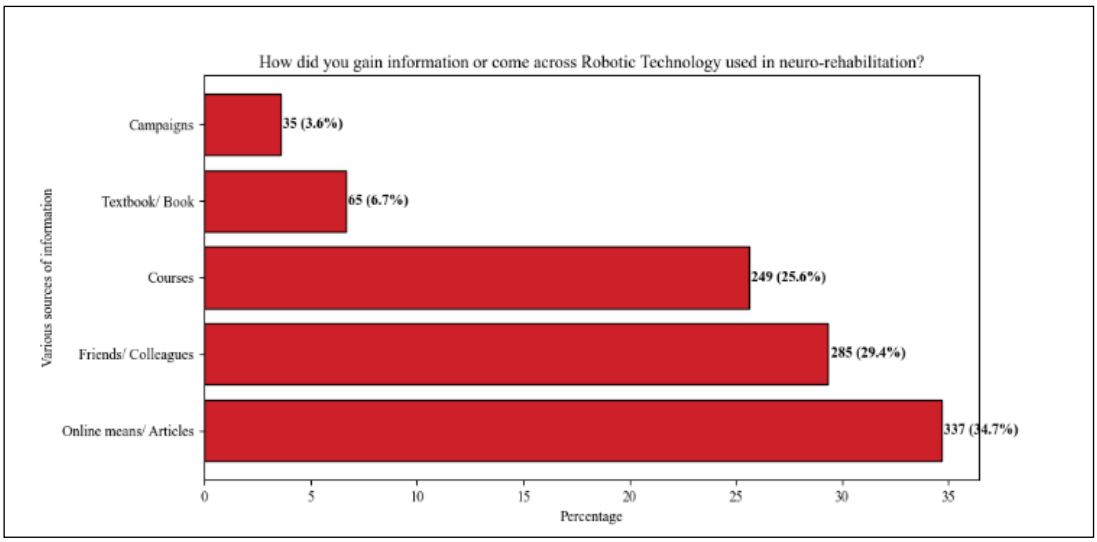
Interpretation: Graph reveals that more than 75% of the distribution are somewhat to moderately familiar with the technology.

Table 5: Various sources of information

VARIOUS SOURCES OF INFORMATION	FREQUENCY	PERCENTAGE
Campaigns	35	3.6%

Textbook/ book	65	6.7%
Courses	249	25.65
Friends/ Collegues	285	29.4%
Online means/ Articles	337	34.7%

Graph 4: Various sources of information



Interpretation: The above graph suggests that most of the knowledge gained (34.7%) is from online means and articles and only 6.7% is from textbooks.

Hence, it revealed the importance of incorporating Robotic technologies in Physiotherapy core curriculum and courses that would help smoothen future Physiotherapist's engagement with the new era of intelligent technologies in rehabilitation practices.

DISCUSSION:

The study aimed to assess the awareness, attitude, and knowledge of Robotic technologies used in rehabilitation among Physiotherapy interns and Professionals across Maharashtra. The main purpose of this study was to obtain an overall snapshot of the perception and attitude of physiotherapists.

This study assessed the relationships among multiple factors including gender, work experience, professional work sector, and educational qualification. The study findings may help add to the existing knowledge and awareness regarding why it is important to generate or enhance awareness towards the most- advancing fields and the uses of Robotic technology in neurological conditions in clinical practice which empowers Physiotherapists to adapt to the changing landscape of healthcare and deliver high-quality, patient-centered care.

The results have highlighted concerns regarding the awareness level of Robotics Technology among Physiotherapists in neurorehabilitation. Only 15% of the Physiotherapists are extremely aware of such technology, while 33% have limited comprehension of the uses and benefits of integrating these devices with their treatment plan and goal. It was reported that more than half of the individuals (55%) lack awareness about Robotic Rehabilitation and AI and the various setups within Maharashtra that implement Robotic technology in their intervention. A similar study by Mashael et al concluded that Physiotherapist's knowledge and awareness about AI applications in rehabilitation was low.

According to the mean qualification of the participants, the results showed that most of the young adults or recently qualified Physiotherapists (0 to 6 months) are moderately aware of the technology, understand the facts about it, and are also familiar with the working of it. This could be inferred that these respondents are well aware and informed about the recent advances either through mobile apps, latest articles, news, or new edition textbooks and the increase in the number of workshops and courses being conducted in recent times. Younger adults or millennials are born in a digital world and are reported to be good at handling technology and have shown a lot of interest in robots and automation right since their schooling. The current generation is in the fast-developing automation era where positive effects to improvements of existing technology and larger trends of automation, digitalization, and technologisation are seen.[34]

Awareness about Robotic technology and AI among Physiotherapists is essential for driving innovation, improving patient care, and ensuring professional competence in an evolving domain. A recent study by Christopher et al found out that Robotic

technology allows for high-dosage and high-intensity training to provide advantages in patients and improve recovery in neurological impairments or those recovering from stroke or brain injury. Another study by Khadijeh et al concluded the benefits that, robots can improve musculoskeletal strength, sensation, perception, vibration, and muscle coordination, reduce spasticity improve flexibility and ROM, and empower people by providing a variety of rehabilitation capabilities.

The results obtained for attitude of Physiotherapists are very surprising. 67% of the individuals have a very positive outlook on the implementation of such advances and also believe that Robotic Rehabilitation can be very time effective and reduces the load of the therapist as well as plays a very important role in aiding neuroplasticity post-rehabilitation. These findings were similar to those studies by Mascheal et al where other clinicians were evaluated about their knowledge of AI. A controlled trial study by Neha et al concluded that Robotic rehabilitation plays a crucial role in enhancing neuroplasticity by stimulating cortical reorganization, promoting motor learning, and facilitating functional recovery in neurological conditions.[36] However, 76% of individuals think that the cost and limited accessibility of such devices may be a drawback. To deal with this issue, the IITians from Delhi and Mumbai have started working on creating similar devices at a lower cost so that they can be easily accessible to most of the healthcare areas across India thus cutting the cost of importing expensive devices. In addition, the results also show that more than 60% feel that Robotic rehabilitation can never replace standard conventional therapy. A similar study was concluded by Oh S et al who found that the majority of doctors favor trusting their own decisions and treatment goals over that of the AI application.

Since the level of awareness is considerably low, the findings reveal that significant Physiotherapists lack the necessary knowledge, understanding, and benefits of Robotic rehabilitation. Around 62% of individuals fit into this description, emphasizing the importance of education in this field. It also shows that there is a need for enhanced training programs, better integration of technology into rehabilitation practices, addressing time constraints and workload prioritization, and most importantly, overcoming economic barriers to ensure the effective implementation of robotic therapies for the benefit of the patient and society as a whole.

On the contrary, it was noted that most of the Physiotherapists with higher education levels were less aware of the technology, did not understand much about the facts about it, and were not familiar with its working mechanism. Furthermore, more than half of the physiotherapists think that they could benefit from these devices if used as an intervention, while a handful of them with 5-10 years of experience therapists do not trust such advances and prefer to stick with the conventional therapy as they believe that AI can have a negative impact on their clinical practice. A similar study by Mascheal et al noted that clinicians with more experience have less confidence in such recent advancements and Robotic devices.

The study also showed that male participants reported having more knowledge, awareness, and a positive outlook regarding the application of robotic technology than most of the female participants. A similar study was reported by Mashael et al who found that male therapists were more aware and interested in AI and Robotics.[27]

The professional work sector too was one of the major parts of this study. It was seen that there was a statistically significant difference in responses based on their professional work area. Participants working in Private Hospitals and Setups were more aware, confident, and ready to accept Robotic applications in their clinical practice than those working in Government hospitals or setups.

In this study, the results indicate that there is insufficient awareness and knowledge about Robotic rehabilitation and AI and their applications. Incorporating AI technologies in Physiotherapy core curriculum and courses would help smoothen future Physiotherapist's engagement with the new era of intelligent technologies in rehabilitation practices. Previous studies also suggested integrating different courses related to AI into undergraduate and post-graduate programs may help clinicians understand and apply AI in their medical practice.

CONCLUSION:

Based on the data analytics collected from 385 Physiotherapists, and the narrow scope of the study, we can conclude that more than half of the participants are aware of Robotics Technology, 50% of them have a positive attitude towards its application but only a handful have complete and precise knowledge about its implementation.

Generating awareness about this advanced field is essential to improve access, enhance recovery outcomes, ensure a safe, effective, and personalized approach and supervision, and provide tailored, precise, controlled, and consistent care to regain lost functions.

Hence, Physiotherapists are encouraged to take advantage of the advancements in technology and the development of Robotic technologies, and enrich their knowledge about, and enhance their skills with its applications.

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