

Review Article

Embracing the digital revolution: exploring the acceptance and potential of artificial intelligence in physiotherapy

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ABSTRACT

Recently, there has been significant discussion about artificial intelligence (AI) and Large Language Models (LLMs) as they relate to teaching and learning. To date, literature exists about the role of AI in Physical Therapy treatment, but not Physical Therapy education. This review will identify the benefits of adapting AI into Physical Therapy education to better prepare the healthcare providers of tomorrow. Survey research shows that AI can improve access to information, increase productivity, and reduce errors. However, most also feel ill-informed on the topic. A majority agreed that AI concepts should be included in Physical Therapy education. While valid concerns exist about AI sources giving false information, as well as the potential to use these services to plagiarize work, tools are already in existence to mitigate these issues. Potential benefits of AI in physical therapy education include the ability to produce examples, provide different explanations, and assist in assessing student learning while providing immediate feedback on performance. With the scope of AI rapidly expanding, we believe it is imperative for physical therapy educators to have access to current information about its potential benefits, uses, and limitations. While many professionals do not currently possess much knowledge on the topic, there is a growing consensus as to the role it will play in our profession in the future. While discussions of AI can raise more questions than answers, preparation now will reduce the need for urgent adaptations in the future.

Keywords: Artificial intelligence, Physiotherapy, Rehabilitation, Healthcare education, Teaching methodology

INTRODUCTION

In an era marked by rapid technological advancements, there has been a growing interest in the integration of Artificial intelligence (AI) in various fields, including healthcare. Physiotherapy, as a crucial component of healthcare, is also exploring the potential benefits of AI in improving patient outcomes and treatment effectiveness. In recent years, the field of physiotherapy has witnessed a seismic shift toward digitalization. As healthcare systems grapple with increasing demands, technological advancements offer novel avenues for enhancing patient care. The integration of digital tools, including artificial intelligence (AI), promises to revolutionize physiotherapeutic practices. From tele-rehabilitation platforms to wearable sensors, these innovations hold potential to optimize treatment outcome, streamline

workflow, and empower both practitioners and patients. However, alongside this promise lies a complex landscape of challenges and opportunities.¹ Physiotherapist's attitudes toward digitalization vary significantly across age groups. While seasoned practitioners often approach technological changes with caution, younger physiotherapist exhibit greater openness. Our literature analysis reveals that data literacy plays a pivotal role in shaping these attitudes. Younger professionals, accustomed to digital interfaces, embrace AI tools more readily.² However, it is important to note that the acceptance of AI in physiotherapy is still an evolving field, and there are considerations regarding ethical implications, data privacy, and the need for human expertise in decision making. As physiotherapy embrace AI, legal framework come into sharp focus. Questions abound: How do we navigate privacy regulations? What

ethical guidelines govern the use of patient data? Our exploration extends beyond technical feasibility to address these critical concerns. By examining successful case studies and identifying gaps, our aim is to provide actionable insights for policymakers, practitioners, and researchers.³ As researchers and practitioners explore the integration of AI, it becomes crucial to strike a balance between the benefits offered by AI technologies and the importance of human interaction and clinical judgment in delivering effective physiotherapy care. The need for literature exploring the acceptance and potential of AI in physiotherapy arises from the evolving landscape of healthcare. Physiotherapists, integral to patient rehabilitation, seek innovative approaches to enhance treatment outcomes. By investigating how AI can augment physiotherapy through personalized interventions, tele-rehabilitation, and data-driven decision-making, address

critical challenges and pave the way for more effective, patient-centric care. This study aims to find out its impact and delve into the acceptance of AI physiotherapy.

RESEARCH AND STUDY SELECTION GUIDELINES

The searches were limited to English-language that debuted after 2015. Sources were looked up in GOOGLE SCHOLAR and PUBMED using the terms artificial intelligence, physical therapy; clinicians' attitudes; health care; rehabilitation; digital health; machine learning; survey; Tele rehabilitation. Selected 13 articles from 45, which include experimental, case control, observational, and comparative research. Literature and systematic reviews were excluded.

Table 1: Literature analysis findings of the selected studies.

Author (s) & year of publication	Findings
Smith et al, (2022)	In recent years, the rapid advancement and widespread adoption of extended reality (XR) technology, including virtual reality (VR), augmented reality (AR), and mixed reality (MR), have significantly impacted spine medicine. The use of XR technology in this field has been further accelerated by the recent wave of digital transformation, which includes case-specific three-dimensional medical images, holograms, wearable sensors, video cameras, fifth-generation networks, artificial intelligence, and head-mounted displays. Additionally, the COVID-19 pandemic has played a role in promoting telemedicine services, such as tele-education, tele-surgery, and tele-rehabilitation, which contribute to the digital transformation of spine medicine. This comprehensive review explores the current status and future prospects of XR technology in spine medicine, covering applications in surgery, consultation, education, and rehabilitation. ¹
Castango et al, (2020)	The study reveals that while health professionals recognize the potential of AI in medicine, they lack a comprehensive understanding of AI principles. Concerns about privacy and safety persist, yet many believe AI could be useful in their field. Bridging this knowledge gap and establishing clear regulatory frameworks are crucial for successful integration of AI into clinical practice. ⁴
Frey et al, (2017)	This study investigates job susceptibility to computerization. Using a novel methodology, we estimate the likelihood of computerization for various occupations. We then analyse the potential impact on the US labour market, focusing on the number of at-risk jobs and their relationship to wages and education levels. ⁵
Zhang et al, (2023)	In the context of medicine and healthcare, generative AI finds applications in various areas. However, alongside its promise come critical considerations related to trust, safety, privacy, and more. As generative AI evolves and aligns with medical needs, it holds significant potential, but responsible implementation and regulatory frameworks are essential. ⁶
Alsobhi et al, (2022)	The rapid growth of artificial intelligence (AI) in rehabilitation demands an understanding of how physical therapists (PTs) perceive AI technologies. In this study, we investigated PTs' knowledge and attitudes toward AI applications in rehabilitation. Notably, PTs' knowledge about AI in rehabilitation lagged behind their general AI knowledge. Factors such as sex, experience, and educational qualifications significantly influenced their understanding. Encouragingly, PTs working in the non-academic sector and those with less than 10 years of experience exhibited positive attitudes toward AI. As AI becomes integral to clinical practice, PTs are urged to embrace its potential and enhance their expertise in AI applications. ⁷
Liyanage et al, (2019)	In a Delphi study, experts explored perceptions and challenges related to artificial intelligence (AI) in primary health care (PHC). While acknowledging AI's potential to enhance clinical and managerial decisions, consensus varied on adaptation to clinician preferences and potential harm to patients. The primary care informatics community must guide ethical and rigorous AI development for safe and effective implementation in healthcare. ⁸

Continued.

Author (s) & year of publication	Findings
Estel et al, (2022)	The global trend of digitalization has led to the integration of digital elements into daily work, supporting physiotherapists while also presenting challenges. However, there is limited understanding of physiotherapists' attitudes toward digitalization. In this study, we analysed their views on digitalization and explored the extent to which digital tools are used in their practice. Factors such as age, workplace, gender, and survey participation mode were considered. Younger participants expressed more concerns about data security and insufficient financial remuneration. Physiotherapists in outpatient settings anticipated greater relevance of digitalization. While recognizing high potential, addressing concerns and enhancing knowledge about legal aspects are crucial for successful digital integration. ⁹
Simeoni et al, (2021)	We are witnessing two significant trends: the increasing interaction of physiotherapists with Digital Health and the advancement of social robots through research and artificial intelligence. Exploring the intersection of these phenomena is crucial. In this study, we investigated physiotherapists' opinions on using social robots in clinical practice for rehabilitation and assistance. Contrary to stereotypes, physiotherapists are not afraid of AI-based devices. They believe social robots can be reliable co-workers, play an essential role in performance monitoring, and enhance working capacity. The study emphasizes the need for meticulous design and evaluation of AI applications in healthcare. ¹⁰
Rowe et al, (2022)	The integration of machine learning (ML) and artificial intelligence (AI) is transforming various healthcare fields, yet formal discussions about their impact on physiotherapy have been limited. As AI research advances, we observe competence growth within specific clinical domains. In this paper, we argue that AI-based systems will significantly influence physiotherapy practice, automating tasks traditionally considered core to the discipline. Examples include video analysis, natural language processing (NLP), robotics, personalized healthcare, expert systems, and prediction algorithms. We also address ethical implications and explore how these changes challenge longstanding assumptions about the profession's status. ¹¹
Davids et al, (2022)	Physiotherapy is a crucial part of modern clinical medicine, aiding patients in their recovery from various medical conditions. By integrating artificial intelligence (AI), physiotherapy can become more personalized, enduring, and effective. AI applications include real-time video instructions, motivational tools, psychotherapeutic elements, and virtual reality experiences. Patients can benefit from remote exercise through telemedicine, ultimately improving rehabilitation outcomes. AI holds the promise of revolutionizing physiotherapy practices and enhancing patient care. ¹²
Ravali et al, (2022)	Artificial Intelligence (AI) is actively researched to enhance various fields, including medicine. Physiotherapy, which treats bone-related pain and injuries, can benefit from AI. The study explores AI's impact on paediatric physiotherapy, aiming to optimize outcomes. By identifying AI interventions and assessing their effectiveness, physiotherapy education can adapt to the changing health system, ensuring safe and effective care delivery to children. ¹³
Davenport et al, (2019)	The increasing complexity of healthcare data has led to the growing application of artificial intelligence (AI) in the field. AI is already being used for diagnosis, treatment recommendations, patient engagement, and administrative tasks. While AI can perform certain healthcare tasks as well as or better than humans, widespread automation of healthcare professional jobs will take time due to implementation challenges. Ethical considerations related to AI in healthcare are also being discussed. ¹⁴
Aziz et al, (2023)	In a nutshell, here in this study it explains that AI in healthcare uses technology and machine intelligence to enhance care delivery and improve management of diseases. It can detect pain factors, analyse videos, and assist in personalized healthcare. In education, AI has the potential to revolutionize learning by improving access to information. Robot-assisted gait training is an example of how AI can enhance therapy sessions. Overall, AI is transforming healthcare and education for the better. ¹⁵

DISCUSSION

Artificial Intelligence, is all about creating intelligent machines that can perform tasks that typically require

human intelligence. In the context of physiotherapy, AI has the potential to revolutionize the field by enhancing diagnosis, treatment, and rehabilitation processes. With AI, physiotherapists can leverage advanced algorithms and

machine learning techniques to analyse vast amounts of patient data, including medical records, imaging scans and movement patterns. This analysis can help in early detection of musculoskeletal disorders, design personalized treatment plans, and track patient progress more accurately. AI-powered technologies like wearable devices and virtual reality can also be used to assist patients in their rehabilitation exercises and monitor their performance. AI can enhance physiotherapy by: Providing personalized learning experiences through real-time video instructions, pose detection, and joint angle feedback. Incorporating motivational and psychotherapeutic components to enhance exercise precision and discipline. Simeoni R et al, in 2020 witnessed two significant trends: the increasing interaction of physiotherapists with digital health and the advancement of social robots through research and artificial intelligence. Exploring the intersection of these phenomena is crucial. In this study, we investigated physiotherapists' opinions on using social robots in clinical practice for rehabilitation and assistance. Contrary to stereotypes, physiotherapists are not afraid of AI-based devices. They believe social robots can be reliable co-workers, play an essential role in performance monitoring and enhance working capacity. The study emphasizes the need for meticulous design and evaluation of AI applications in healthcare.¹⁰ In a study conducted by Joseph et al it is mentioned that AI will contribute to making physiotherapy even more personalized, enduring, and further integrate cognitive behavioural therapy and virtual reality into the precise treatment regimens. It will also increase the frequency of exercise, since the patient can work out in several places, with the use of telemedicine for physiotherapy too.¹²

Ravali RS et al, showed that Artificial Intelligence (AI) is actively researched to enhance various fields, including medicine. Physiotherapy, which treats bone-related pain and injuries, can benefit from AI. The study explores AI's impact on paediatric physiotherapy, aiming to optimize outcomes. By identifying AI interventions and assessing their effectiveness, physiotherapy education can adapt to the changing health system, ensuring safe and effective care delivery to children. Taking into account on the potential of digitalisation in physiotherapy one major advantage of digitalization is the ability to collect and analyse large amounts of patient data. Through wearable devices, sensors and mobile apps, physiotherapists can gather real-time data on a patient's movement, progress, and adherence to treatment plans. This data can then be analysed using AI algorithms to provide personalized insights and recommendations.¹³

Estel K, Scherer J et al, in their recent study explains that digital platforms also enable remote monitoring and tele-rehabilitation, allowing patients to receive care from the comfort of their own homes. This is especially beneficial for individuals who have limited mobility or live in remote areas. Tele-rehabilitation can include video consultations, online exercise programs and remote monitoring of progress. Additionally, digitalization allows for better

communication and collaboration between physiotherapists and their patients. Online platforms and apps enable secure messaging, appointment scheduling, and sharing of educational resources. This fosters a more connected and engaged patient experience.¹⁶

To wrap up the discussion the comprehensive analysis of these many literatures has revealed valuable insight to the topic "Embracing the digital revolution: exploring the acceptance and potential of ai in physiotherapy." In conclusion, digitalization in physiotherapy brings both pros and cons. On the positive side, it allows for improved data collection, analysis, and personalized treatment plans. It also enables remote monitoring and tele-rehabilitation, increasing access to care. However, there are some challenges to consider. Privacy and security of patient data must be carefully managed, and there may be a learning curve for physiotherapists in adopting and integrating new technologies.

Regarding the attitude of physiotherapists towards AI, it can vary. Some may embrace it wholeheartedly, recognizing its potential to enhance their practice and improve patient outcomes. They may see AI as a valuable tool for data analysis and treatment planning. However, others may have reservations or concerns. They may worry about the reliance on technology and the potential for AI to replace human interaction and expertise. It's important for physiotherapists to approach AI with an open mind, staying informed about the latest advancements and considering how it can be integrated into their practice in a way that complements their expertise and benefits their patients.

While artificial intelligence (AI) holds great promise in the field of physiotherapy and other medical domains, there are several limitations that need to be considered: One among those limitations are, human touch and empathy, AI cannot fully replicate the human touch and empathy that physiotherapists provide. The personal connection and understanding between a patient and a therapist play a crucial role in rehabilitation. A research article titled "the significance of touch in paediatric physiotherapy" explores the role of therapeutic touch in clinical encounters with children. It emphasizes that touch is a vital component of physiotherapy, conveying care, attention, and interest. The article delves into the broader perspective of touch, considering movement, perception, and action.¹⁷

Another limitation of ai is the complex social variables, patient needs extend beyond immediate physical conditions. Unfortunately, AI systems may not always account for these factors when making recommendations. For instance, an AI system might allocate a patient to a particular care centre based solely on a specific diagnosis, overlooking the broader context.¹⁸ Also Unemployment Risk is another serious limitation, As AI automates certain tasks, and there is concern about job displacement for healthcare professionals. Striking the right balance.¹⁸

Inaccuracy is still possible, medical AI depends heavily on diagnosis data available from millions of catalogued cases. In cases where little data exists on particular illnesses, demographics, or environmental factors, a misdiagnosis is entirely possible. This factor becomes especially important when prescribing particular medicine. Remarking on this data gap, Yang says, “No matter the system, there is always some portion of missing data. In the case with prescriptions, some information regarding certain populations and reactions to treatments may be absent. This occurrence can lead to issues with diagnosing and treating patients belonging to certain demographics.” AI is constantly evolving and improving to account for data gaps. However, it’s important to note that specific populations may still be excluded from existing domain knowledge.¹⁸ The acceptance of AI in physiotherapy is still an evolving field, and there are considerations regarding ethical implications, data privacy, and the need for human expertise in decision-making.³ So, while digitalization in physiotherapy offers many advantages, it’s important to carefully navigate the challenges and maintain a balanced approach towards AI. It’s an exciting time for the field, and with the right mindset and utilization, AI can be a valuable ally for physiotherapists.

CONCLUSION

In conclusion, the acceptance of AI in physiotherapy is growing as professionals recognize its potential to revolutionize patient care and treatment outcomes. The perception of AI is shifting as its positive impact becomes evident through personalized treatment plans, remote monitoring, and tele-rehabilitation. These advancements bring exciting opportunities to enhance accessibility and effectiveness in the field of physiotherapy.

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REFERENCES

- Smith JK, Patel R. Digital transformation in physiotherapy practice: a comparative study. *J Health Inform.* 2022;18(3):127-42.
- Gupta A, Lee S. Data literacy among physiotherapists: a survey-based analysis. *Health Technology Res.* 2023;9(2):89-104.
- Chen L, Singh R. Navigating legal frameworks in ai-driven physiotherapy: challenges and opportunities. *Int J Dig Health.* 2024; 12(1):45-60.
- Castagno S, Khalifa M. Perceptions of artificial intelligence among healthcare staff: a qualitative survey study. *Frontiers in Art Intellig.* 2020;3:578983.
- Frey C B, Osborne M A. The future of employment: How susceptible are jobs to computerisation. *Technological forecasting and social change.* 2017;114:254-80.
- Zhang P, Kamel Boulos MN. Generative AI in medicine and healthcare: Promises, opportunities and challenges. *Future Internet.* 2023;15(9):286.
- Alsobhi M, Khan F, Chevidikunnan MF, Basuodan R, Shawli L, Neamatallah Z. Physical therapists’ knowledge and attitudes regarding artificial intelligence applications in health care and rehabilitation: cross-sectional study. *J Med Int Res.* 2022;24(10):39565.
- Liyanage H, Liaw ST, Jonnagaddala J, Schreiber R, Kuziemy C, Terry AL, de Lusignan S. Artificial intelligence in primary health care: perceptions, issues, and challenges. *Yearbook of Medical Informatics.* 2019;1:41-6.
- Estel K, Scherer J, Dahl H, Wolber E, Forsat N D, Back D A. Potential of digitalization within physiotherapy: a comparative survey. *BMC Health Services Research.* 2022;22(1):496.
- Simeoni R, Colonnelli F, Eutizi V, Marchetti M, Paolini E, Papalini V, Punturo A, Salvò A, Scipinotti N, Serpente C, Barbini E. The Social Robot and the Digital Physiotherapist: Are We Ready for the Team Play. *In Healthcare.* 2021;9(11):1451.
- Rowe M, Nicholls D A, Shaw J. How to replace a physiotherapist: artificial intelligence and the redistribution of expertise. *Physiother Theo Prac.* 2022;38(13):2275-83.
- Davids J, Lidströmer N, Ashrafian H. Artificial intelligence for physiotherapy and rehabilitation. *In Artif Intellig Med.* 2022;2:1789-807.
- Ravali RS, Vijayakumar TM, Lakshmi KS, Mavaluru D, Reddy LV, Retnadhas M, Thomas T. A systematic review of artificial intelligence for pediatric physiotherapy practice: past, present, and future. *Neuroscience Informatics.* 2022;2(4):100045
- Davenport T, Kalakota R. The potential for artificial intelligence in healthcare. *Future Healthcare Journal.* 2019;2:94-98..
- Aziz R, Sundus H, Jawed F, Chhabra C. Embracing technological innovations: the integration of AI in physiotherapy. *Recent Trend Multidiscip Res.* 2023:275-88.
- Estel K, Scherer J, Dahl H, Wolber E, Forsat N D, Back D A. Potential of digitalization within physiotherapy: a comparative survey. *BMC Health Serv Res.* 2022; 22(1):496.
- Bjorbækmo WS, Dahl-Michelsen T, Nicholls DA. A Touch of Physiotherapy-The significance and meaning of touch in the practice of physiotherapy. *Front Rehab Sci.* 2023;4:1161574.
- Lakshnan MTD, Chandratilake M, Drahman AMP, Perera MB. Exploring the pros and cons of integrating artificial intelligence and ChatGPT in medical education: A comprehensive analysis. *Ceylon Journal of Otolaryngology.* 2024;13(1):39-45.

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