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The Disadvantages Of Artificial Intelligence In Physiotherapy: A Critical Review

Sudha[1], Megha Gakhar[2], Mudit Yadav[3], Nikita[4]

1 MPT Scholar, College of Physiotherapy, Pt BDS PGIMS Rohtak

2 Associate Professor, College of Physiotherapy, Pt BDS PGIMS Rohtak

3 MPT Scholar, College of Physiotherapy, Pt BDS PGIMS Rohtak

4 MPT Scholar, College of Physiotherapy, Pt BDS PGIMS Rohtak

Corresponding Author

Sudha

MPT Scholar, College of Physiotherapy

Pt BDS PGIMS Rohtak, Haryana-124001

ABSTRACT

Artificial intelligence (AI) has emerged as a disruptive innovation in physiotherapy, offering advanced capabilities in diagnostic accuracy, movement analysis, personalized rehabilitation planning, and remote patient monitoring through modalities such as machine learning, robotics, and tele-rehabilitation platforms. Its integration into physiotherapy promises to augment clinical decision-making, increase service accessibility, and support data-driven patient care. However, this review identifies and critically analyzes a spectrum of limitations that challenge the ethical, clinical, and practical viability of widespread AI adoption in physiotherapy settings. Key concerns include limited digital literacy and formal training among physiotherapists, inadequate organizational readiness, algorithmic bias stemming from non-representative datasets, and the absence of legal and regulatory clarity regarding accountability in AI-driven clinical decisions. Additionally, over-reliance on automation threatens the preservation of core professional values such as hands-on skill, therapeutic empathy, and individualized patient engagement. The review also explores how financial constraints, digital infrastructure gaps, and cultural-linguistic mismatches impede AI adoption, particularly in low-resource or rural contexts. Drawing from recent empirical studies, systematic reviews, policy analyses, and practitioner surveys, this paper emphasizes the importance of inclusive algorithm design, robust ethical governance, curricular modernization, and context-sensitive implementation strategies. Ultimately, the review advocates for a hybrid model of care—one that integrates AI as a supportive tool within a human-centered rehabilitation framework—to ensure equitable, safe, and effective physiotherapy practice in an evolving digital healthcare ecosystem.

KEYWORDS: Artificial intelligence, Physiotherapy, Machine learning, Tele-rehabilitation, Clinical ethics, Rehabilitation technology, Digital health.

INTRODUCTION

Physiotherapy, as an integral component of multidisciplinary healthcare, plays a pivotal role in restoring functional abilities and improving quality of life for individuals affected by a wide spectrum of physical impairments and disabilities. However, traditional physiotherapy practice faces several enduring challenges, including reliance on subjective assessments, inter-practitioner variability, limited access to specialized services, and increasing demand driven by demographic changes and chronic disease prevalence [1][2]. Against this backdrop, the advent and rapid evolution of artificial intelligence (AI) and machine learning (ML) technologies are poised to redefine the landscape of physiotherapy, offering unprecedented opportunities to optimize patient care, personalize rehabilitation strategies, and enhance clinical decision-making.

Artificial intelligence, encompassing a suite of computational techniques such as ML, deep learning, natural language processing (NLP), and robotics, enables extraction of meaningful patterns from complex and high-dimensional data sets that exceed human cognitive capacity [3][4][5]. In physiotherapy, AI-assisted tools have already demonstrated potential in automating the analysis of movement patterns through video and sensor data, enabling objective quantification of gait abnormalities and motor impairments [1][2]. Such technologies augment traditional assessments by providing reproducible, sensitive, and high-throughput evaluation modalities, contributing to more precise diagnosis and monitoring of rehabilitation progress.

Moreover, AI facilitates the development of individualized treatment plans that dynamically adapt to patient-specific characteristics, responses to therapy, and evolving clinical states. By harnessing continuous feedback loops, AI systems optimize rehabilitation protocols with real-time adjustments, thus enhancing patient adherence and engagement [1][2]. This level of personalization is further supported by AI-enabled tele-rehabilitation platforms, which expand the reach of physiotherapy services beyond clinical settings, addressing barriers of geographic and logistic accessibility—an advancement accelerated by the exigencies of the recent global pandemic [3][2].

Despite these promising advances, the integration of AI into physiotherapy practice is accompanied by notable challenges and ethical considerations. Issues of data privacy, potential algorithmic bias stemming from non-representative training datasets, and the risk of diminishing the essential humanistic elements of care, such as empathy and therapeutic touch, warrant careful governance and deliberation [3][1][2]. Empirical studies indicate that while physiotherapists generally recognize the transformative potential of AI and express eagerness to adopt it, many report limited formal training and organizational support, highlighting critical gaps in preparedness [5][6][1]. Furthermore, the automation of tasks traditionally deemed core to physiotherapy challenges long-standing professional boundaries and necessitates a re-envisioning of roles, responsibilities, and educational curricula to equip future professionals with competencies in data literacy, ethical AI use, and interdisciplinary collaboration [1][2][7].

In addition, AI's deployment must be contextually tailored to diverse patient populations and healthcare infrastructures, particularly considering variations in resource availability and regulatory frameworks globally [3][1]. Financial constraints, infrastructure readiness, and resistance to change among healthcare providers remain substantial barriers to widespread implementation [3][6][1].

Given the transformative implications, this review synthesizes current evidence and expert perspectives on AI applications in physiotherapy, encompassing diagnostic tools, rehabilitation technologies, education imperatives, ethical frameworks, and practical considerations. Drawing from peer-reviewed studies, systematic reviews, and field surveys within the last decade, the article aims to provide comprehensive guidance to clinicians, researchers, educators, and policy-makers committed to harnessing AI to advance physiotherapy practice while safeguarding its foundational human values.

METHODS

This study employed a narrative review methodology to critically examine and synthesize current literature on the limitations and challenges of artificial intelligence (AI) in physiotherapy and rehabilitation practice. A comprehensive literature search was conducted across multiple electronic databases, including PubMed**,** Scopus**,** ScienceDirect**,** Google Scholar, covering articles published between 2021 and 2025. The search strategy included combinations of the following keywords: artificial intelligence, physiotherapy, rehabilitation, machine learning, tele-rehabilitation, clinical decision-making, ethical challenges, and healthcare automation.

Author and Year	Design & Characteristics of Participants (Sample Size)	Objective	Materials & Methods	Outcome Measures	Results
Ramanandi et al., 2021[9]	Scientific Review	Analyze the role and scope of AI in physiotherapy	Literature synthesis: applications in care, education	Diagnosis, prediction, and personalization	AI aids in diagnosis and individualized rehab but can worsen inequalities, cause depersonalization, and is sensitive to lack of standardization.
Abuzaid et al., 2022[3]	Cross-sectional Survey; 72 physiotherapists (UAE)	Assess physiotherapists' perceptions and readiness for AI	Online questionnaire covering knowledge, attitude, and challenges	Knowledge, perceptions, readiness	A positive attitude towards AI exists, but significant gaps in knowledge/training, a lack of organizational preparation, concerns about job disruption, and weak skills hinder its adoption.
Rowe et al., 2022[10]	Theoretical/Policy Analysis	Discuss AI's potential to automate PT and ethical/professional impact	Policy/philosophy discussion, case analysis of automated tasks	Task automation, ethical dilemmas, identity	AI is likely to automate core PT tasks, redistribute expertise, risk professional identity loss, skill erosion, black-box decision ambiguity, and present

					accountability challenges.
Sumner et al., 2023[2]	Systematic Review; 28 projects (patients)	Assess availability, effects, and implementation barriers of AI in physical rehab	Review of clinical studies on AI apps, robotics, gaming, and wearables	Clinical effectiveness, barriers/enablers	AI improves access and remote monitoring; however, few high-quality impact studies show inconsistent results, tech literacy issues, digital divide, and hardware challenges which limit implementation.
Rathod & Tiku, 2024[7]	Narrative Review	Examine AI's impact and need for curriculum reforms	Literature and trend analysis in education and clinical use	Modernization in education/clinical care	AI can personalize care and analytics, but data bias, inability to replicate hands-on care, cost, and administrative over-automation are barriers.
Nambi et al., 2024[11]	Practice-Based Review	Analyze AI in physiotherapy clinical practice	Review of AI tools: gait analysis, NLP, robotics, ethical issues	Assessment precision, data privacy issues	AI offers diagnostic precision, but privacy risks, cost barriers, over-reliance, and ethical/legal issues limit uptake, especially in small clinics.
Mohapatra et al., 2024[12]	Narrative Review	Explore digital transformation via AI in PT	Comprehensive literature review; methodology for study selection	Integration, bias, privacy, ethical frameworks	AI/ML enable VR, tele-rehab, and decision support, but data privacy, bias in algorithms, resistance, high costs, and standardization challenges persist.

Tanna, 2024[13]	Perspective Article	Discuss clinical importance and implementation of AI	Synthesis of literature in clinical/admin/research roles	Diagnostic support, admin optimization, adoption barriers	AI enables remote care, diagnosis, and workflow automation, but lacks human touch, faces data security/ethics issues, incurs high cost, and struggles with complex interactions.
Olawade et al., 2025[1]	Commentary/Review	Explore AI in disability healthcare, discuss applications/ethical challenges	Narrative review of literature, analyzing AI deployment, accessibility, bias, privacy, and stakeholder engagement	Identification of AI roles, ethical pitfalls, and challenges	AI enhances care and independence for disabilities but faces algorithmic bias, privacy risks, high complexity in inclusive design, and cost barriers.
Bills & Basheer, 2025[5]	Narrative Review/Survey; includes survey & literature	Review acceptance, ethics, and digitalization of AI in PT	Literature review of 13 articles & practitioner surveys	Attitudes, data literacy, ethical/legal challenges	Highlights opportunities for care broadening, but data literacy gaps, privacy, ethical, and employment concerns remain. Human touch and regulatory frameworks are issues.
Aldhahi et al., 2025[4]	Survey; 430 rehab professionals (Saudi Arabia)	Assess perceptions, knowledge, willingness to implement AI	Online Survey Monkey questionnaire; demographic, knowledge, challenge assessment	Perceptions/knowledge, readiness, barriers	Most expect AI to impact practice, but less than 8% trained; lack of organizational strategies, cost, resistance, and unclear legal frameworks are key disadvantages.

DISCUSSION

Artificial intelligence (AI) continues to revolutionize modern healthcare, including physiotherapy and rehabilitation. However, its implementation is fraught with challenges that raise critical concerns about its clinical, ethical, and societal impact. A key limitation is the lack of awareness and preparedness among physiotherapists. Several studies found that while many physiotherapists had a positive attitude toward AI, their actual knowledge and training in using AI tools were limited, leading to hesitation and ineffective application in practice [3][5]. These findings point to an urgent need for curriculum reform and structured continuing education to close the knowledge gap.

Another major disadvantage of AI in physiotherapy is the loss of human touch and the weakening of the therapist-patient relationship. While AI offers precision and automation, it lacks empathy and fails to build rapport with patients, which is crucial in chronic conditions and long-term care [6][8]. Automation of core physiotherapy tasks not only depersonalizes care but also threatens the professional identity of physiotherapists by shifting expertise to machines [10].

The ethical and legal implications of AI use in physiotherapy are also significant. While AI can enhance independence and participation, it may also exacerbate inequality due to algorithmic bias and the exclusion of marginalized populations from training datasets [1]. These algorithms may perpetuate disparities if not developed inclusively, particularly affecting disabled populations and those in low-resource settings. Furthermore, the "black-box" nature of many AI tools raises concerns about decision transparency and clinical accountability when AI-generated recommendations lead to adverse outcomes. [10] The absence of legal frameworks in healthcare settings leaves physiotherapists uncertain about who holds responsibility when AI decisions go wrong—practitioner, developer, or system provider. [5]

Bias in AI algorithms is another limitation that affects equitable care delivery. AI models often rely on homogeneous training data, which leads to tools that may not perform well for diverse patient populations, including those with disabilities or individuals from rural and non-Western backgrounds. [9][12] Stakeholder engagement and inclusive AI design are necessary to overcome these challenges and ensure fairness.

The high cost and technological infrastructure needed to support AI is another key disadvantage. Despite promising applications, implementation is hindered by financial constraints, the digital divide, and lack of supportive infrastructure in many clinical settings. [2] These limitations are especially evident in small or rural physiotherapy clinics, which often lack advanced tools or trained staff. The high cost of devices and software, combined with privacy and ethical compliance issues, makes AI adoption impractical in less-equipped centers. [11]

Another core issue is the absence of standardized protocols and clinical guidelines for AI use in physiotherapy. There is currently no consensus on how AI tools should be validated, applied, or monitored in physiotherapy practice, leading to inconsistency and confusion among practitioners.[9] Many existing studies lack rigorous evaluation, making it difficult to draw firm conclusions about the long-term impact of AI in clinical rehabilitation. [2]

There is also growing concern about over-reliance on AI and the potential erosion of clinical reasoning among physiotherapists. While AI systems can support data processing, they cannot replicate the nuance of human decision-making in complex clinical cases. [7] Overdependence may lead to "deskilling," where reliance on AI erodes the manual, cognitive, and interpersonal skills that define expert physiotherapy practice. [10]

Resistance to change and psychological barriers also slow AI adoption. Older physiotherapists in particular experience hesitation due to fears of job displacement and discomfort with digital tools.[3] Poor organizational support and lack of institutional incentives further demotivate practitioners and can lead to burnout. [6]

Legal uncertainty further complicates AI use in physiotherapy. If an AI-driven recommendation causes harm or worsens a patient's condition, there is no universally accepted legal policy outlining accountability. [10] Robust legal and ethical standards are needed to define the limits of AI-driven decision-making and ensure protection for both patients and clinicians. [5]

Even the promising area of AI-assisted tele-rehabilitation is not without disadvantages. While remote interventions improve accessibility, they are limited by the inability to provide tactile feedback, real-time manual correction, and nuanced human interaction. [2] Poor internet connectivity, limited technical support, and low digital literacy reduce the effectiveness of tele-rehabilitation, particularly in elderly or rural populations. [12]

The educational implications of AI in physiotherapy are also concerning. Although technology-enhanced learning tools can aid training, they should not replace foundational clinical experiences like manual therapy and patient interaction. [7] Overexposure to simulation and automation may result in new graduates who are less confident in manual assessments. [12]

Cultural and linguistic barriers further restrict AI effectiveness in diverse settings. Most AI platforms are developed in English and do not accommodate the language needs of patients in non-Western or multilingual contexts, limiting usability and compliance. [1] In regions like India, where regional language and cultural norms strongly influence patient-therapist interaction, failure to localize AI tools could severely limit adoption.

AI's inability to interpret emotional and psychosocial cues is a critical shortcoming in rehabilitation. Patients recovering from trauma or surgery often rely on emotional motivation and reassurance. AI lacks empathy, active listening, and contextual awareness, reducing engagement and adherence [6][8].

Interdisciplinary collaboration is another challenge as AI becomes more prominent. Effective rehabilitation requires coordination between professionals. AI systems designed in isolation can disrupt communication and reduce holistic patient care. [4] Integration with broader healthcare systems and cross-functional training are essential to ensure continuity and safety.

Ultimately, despite its potential, AI in physiotherapy must be approached with caution. While tools like robotic therapy, gait analysis software, and predictive analytics can support clinical decisions, they cannot replace the ethical reasoning, empathy, and manual skills of human therapists. Transparent algorithms, legal clarity, inclusive design, and affordable technology are essential to ensure AI supports, rather than replaces, effective physiotherapy practice.

CONCLUSION

While artificial intelligence offers significant potential to transform physiotherapy through enhanced diagnostic precision, remote care, and data-driven personalization, its integration into clinical practice remains deeply complex and fraught with limitations. The current landscape reveals several critical barriers: lack of training among physiotherapists, ethical and legal ambiguities, high costs, algorithmic biases, and risks of professional deskilling. Furthermore, AI technologies fall short in capturing the humanistic and empathetic elements of physiotherapy, which are vital to patient motivation, trust, and therapeutic alliance.

The absence of standardized protocols, inadequate infrastructure in low-resource settings, and cultural-linguistic mismatches further restrict equitable and effective AI adoption. Without clear policies and robust clinical guidelines, practitioners may face confusion and potential legal liability. Moreover, over-reliance on AI could gradually erode manual and cognitive clinical skills, distancing physiotherapy from its hands-on, personalized foundations.

To address these challenges, future AI integration in physiotherapy must be guided by inclusive design principles, transparent algorithms, continuous education, and patient-centered ethics. Legal safeguards and regulatory standards must evolve alongside technology to protect both patients and providers. Rather than replacing physiotherapists, AI should be positioned as a supportive tool—enhancing clinical decision-making and efficiency while preserving the core values of human care. A hybrid model, blending technological innovation with the therapist's clinical judgment and compassion, represents the most promising path forward for sustainable, ethical, and effective rehabilitation care.

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