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REVOLUTIONIZING REHABILITATION: THE ROLE OF ARTIFICIAL INTELLIGENCE IN MODERN PHYSIOTHERAPY

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ABSTRACT

Background:
Incorporating Artificial Intelligence in rehabilitation and physiotherapy is deemed to be one of the areas where AI may assist in robotization. Undoubtedly, AI has the potential to autonomously personalize treatment plans, enhance rehabilitation primary methods, and improve patient outcomes. Notwithstanding, the professional groups have varying perceptions of the benefits of AI to the physiotherapy practice. For better utilization of AI in rehabilitation practice, understanding the reasons behind these differences is vital.
Objectives: This research aims to analyze the level of awareness and adoption of AI in physiotherapy which includes ascertaining the extent to which its implementation is perceived to be beneficial or challenging and its statistical correlate to familiarity with AI, professional background, and readiness to accept AI-based rehabilitation aides.
Methods: The quantitative method was applied by gathering descriptive data across a segment to take the cross-sectional survey from a sample of 273 physiotherapists, medical

doctors, patients, and artificial intelligence researchers. Questions were prepared to retrieve information relating to familiarity with AI and its perception, adoption, and barriers. The gathered data was processed through descriptive and inferential statistics using the Chi-square test, T-test ANOVA, and reliability analysis (Cronbach's Alpha). Shapiro-Wilk and D'Agostino K2 Normality Tests were utilized to analyze the distribution of responses, Levene's test measured variation among professional group responses.

Results: The results showed that the adoption of AI in physiotherapy is not linked to the user's professional background (Chi-square $p > 0.05$) meaning, understanding the usages resides on personal exposure, not the individual's profession. In contrast, Levene's test ($p < 0.05$) found differences across professional groups' AI knowledge, showing that some have more understanding of its use than others. The normality tests revealed the presence of a bias in the distribution, with regards to AI, where respondents were grouped into optimists and skeptics. Furthermore, Cronbach's Alpha (-0.18) demonstrated weak reliability on the scale responses, indicating that participants were polled with AI questions inconsistently. Primary reasons for which AI is not adopted include lack of knowledge, adequate training, and monetary and ethical issues.

Conclusion: This study shows there are notable gaps in the adoption of AI in physiotherapy which highlights the need for education and training with integrated standard strategies. AI has the potential to transform rehabilitation programs, as such there is a need to increase awareness, access, and policy for its usage in physiotherapy. Further research should be directed toward AI's longitudinal effects on patient recovery, costs for therapy, and overall efficiency of the healthcare system through experimental trials. Tackling these issues will increase the effectiveness and reliability of AI-driven solutions, thus enabling more widespread adoption in clinical practice.

INTRODUCTION

The use of Artificial Intelligence (AI) in physiotherapy is changing the rehabilitation systems by tailoring treatment plans, providing real-time monitoring, and making it possible to automate business decisions. AI techniques like machine learning and automated robotics-assisted therapy, wearable sensors, and virtual reality rehabilitation are boosting the accuracy of diagnoses, streamlining the therapy processes, and enhancing rehabilitation outcomes. AI has become a decisive factor in addressing the growing challenges in rehabilitation by minimizing manual work, providing predictive analytics for injury prevention, and enabling remote physiotherapy services.

Nevertheless, the introduction of AI in physiotherapy practice is not as widespread as it should be due to differences in the level of knowledge, availability, and attitude of health institutions, patients, and specialists towards such innovation (Mikołajewska et al., 2025).

The demand for advanced physiotherapy techniques has surged due to the global burden of musculoskeletal disorders, sports injuries, and neurological conditions. Traditional rehabilitation approaches often have inconsistencies in treatment results, poor access to qualified physiotherapists, and time-intensive procedures for manually assessing the patient. AI-based solutions have a chance to address these obstacles by automating manual patient assessments, movement pattern analysis, and developing cost-effective treatment plans for each specific patient. Moreover, faster recovery for patients with mobility disabilities is enabled by robotic rehabilitation devices as well as AI-enabled exoskeletons. Aside from these benefits, a majority of physiotherapists remain skeptical about applying AI-assisted tools due to fears of costs, technical intricacies, data protection issues, and the possibility of replacing human intelligence with machines (Bills & KB, 2025).

A lack of formal training structures for healthcare professionals is an additional significant obstacle to implementing AI in physiotherapy. More than a few physiotherapists and rehabilitation specialists are not familiar with the AI-enabled tools, which creates a gap in their understanding of how physiotherapy can benefit from AI. While some professionals accept that AI can improve treatment efficiency and accuracy, others cast doubt on its dependability with AI-based interventions because of the possibility of misinterpretation of patient data or erroneous treatment suggestions being made. The use of AI in rehabilitation settings is even further attended by ethical concerns about decision-making, consent, data security, and the use of patient information (Aldhahi et al., 2025).

It is important to analyze the level of physiotherapy practitioners and patients' adoption, awareness, and perception of AI technology for the successful implementation of AI-enabled rehabilitation services. This research seeks to investigate the integration of AI in physiotherapy practice by evaluating the level of adoption, recognized benefits, existing barriers, and prospects of AI in physiotherapy practice. The study employs a quantitative approach and collects data from physiotherapists, medical doctors, AI specialists, and patients to rate their knowledge and acceptance of AI-powered Rehabilitation systems and the intention to use them in practice. The research further conducts statistical assessment using normality tests, reliability tests, Chi-square analysis, and ANOVA to test the hypothesis for relationships between the level of awareness of AI and the profession and the adoption pattern (Abbas et al., 2025).

Even with these improvements, the use of AI in physiotherapy is still not widely accepted due to differences in education, availability, and attitudes held by health practitioners, patients, and researchers. Some individuals consider AI to be a game-changing innovation capable of improving the results of physiotherapy while alleviating the workload of therapists. While others express their concerns about cost, ethical aspects, data security, and the likelihood of excessive dependence on technology. In addition, the absence of standard protocols for AI integration and insufficient training programs also encourage the gap in AI usage in different physiotherapy practices. Comprehending these gaps is crucial in getting the most out of AI-enabled rehabilitative technologies while guaranteeing they will be accepted for use in clinical settings (Sali et al., 2025).

This research study aims to evaluate the impact of AI in physiotherapy practice by evaluating its current uptake in practice, perception by professionals, perceived advantages, and obstacles to its adoption. For this particular piece of research, a quantitative research approach was adopted for the collection of data from physiotherapists, medical doctors, patients, and black box

AI developers to ascertain their level of knowledge on AI, willingness to use AI-based rehabilitation tools, and the reasons behind the use prevalence patterns. The study also carried out statistical analyses that focused on normality, reliability, Chi-square, and ANOVA to AI info level vs. occupation and adoption patterns (Bhamidipaty et al., 2025).

LITERATURE REVIEW

The Evolution of AI in Healthcare and Physiotherapy

AI has transformed almost all fields of Healthcare, from improving patient diagnoses to treatment planning and patient care management. In the past decade, physiotherapy has increasingly relied on AI technologies for data-informed rehabilitation decision-making, automating patient monitoring, and developing personalized programs. Machine learning algorithms, deep learning models, robotics-assisted therapy, and virtual reality (VR) rehabilitation technologies have all redefined physiotherapeutic practices. These technologies enhance recovery outcomes by enabling movement tracking, gait analysis, and the provision of tailor-made exercise regimens. Interacting platforms assist physiotherapists with clinical decision-making while enhancing patient compliance with therapy sessions (Andriollo et al., 2025)

Applications of AI in Physiotherapy

The use of AI in physiotherapy revolves around the analysis of movement, prevention of injuries, monitoring of rehabilitation progress, and optimization of therapies. AI-powered wearable technology facilitates remote assessment of the patient's rehabilitation progress by enabling real-time monitoring of the patient's movements. Patel et al., portray computer vision-based AI techniques to analyze the gait of patients and detect any patterns of abnormal movements which would then be matched with appropriate treatment plans. Advances have also been made in powered robotic exoskeletons that are subsequently aiding patients with strokes and spinal cord injuries to walk again. These devices provide the opportunity for individualized therapy by incorporating accurate force settings, real-time adjustments, and feedback for rehabilitation programs. Other than that, machine learning algorithms have been used to analyze patient information data for predicting the duration of recovery which helps physiotherapists to plan rehabilitation sessions better (Chen et al., 2025).

Based on the study by Kim et al., another emerging application of AI under physiotherapy includes the use of Virtual Reality (VR). Integrative physiotherapy with VR goggles supports motor skill learning and spatial coordination in people who are recovering from stroke rehabilitation. These systems of AI-powered VR physiotherapy have been shown to improve the motivation of patients to perform rehabilitation training, thus making patients more compliant with the prescribed rehabilitation exercises. Although these technologies have progressed greatly over the years, the integration of AI into physiotherapy practices is much younger in development. Most research and development is being concentrated on improving the precision, trust, and acceptance of AI-powered rehabilitation services (Miran et al., 2025).

Benefits of AI in Physiotherapy

Incorporating AI into physiotherapy improves diagnostic precision, real-time data communication, therapist workload, and overall patient experience. Advanced motion tracking systems powered by AI remove subjective biases in movement evaluations providing objective quantities assessments of musculoskeletal disorders. AI can also aid rehabilitation programs that allow remote supervision, decreasing the need for in-person therapy sessions and assisting those in rural areas (Kapil et al., 2025).

In improving individualized treatment plans, AI's analysis of patient-specific information helps recommend certain rehabilitation exercises. Garcia et al. conducted a systematic review stating that compared to traditional physiotherapy, rehabilitation made easier with the assistance of AI proved to be more effective for the functional recovery of patients having neurological and musculoskeletal disorders. In addition, AI-powered chatbots and virtual assistants that offer real-time feedback have also been developed to aid patients by providing exercise reminders and guiding them through their therapy routines thus increasing adherence to rehabilitation protocols (Orenuga et al., 2025).

Another advantage brought about by AI in physiotherapy is predicting treatment results with the help of past patient data. Machine learning models can evaluate pre-treatment assessments, demographic data, and rehabilitation phases to estimate recovery rates and aid physiotherapists in deciding how best to adjust treatments. Furthermore, robotic assistance during therapy adds accuracy in performing exercises that require repetitiveness, especially in people whose mobility is limited, which aids in speeding up the efficiency of achieving neuroplasticity and recovery of motor functions (Martínez-Cid et al., 2025).

Challenges and Barriers to AI Adoption in Physiotherapy

While AI can transform physiotherapy, it is still not being used on a wide scale primarily due to high implementation costs, lack of training, and ethical as well as patient-related concerns. One of the major barriers to adopting AI is the cost associated with the employment of rehabilitation aids and communication tools which makes it unfeasible for small clinics and healthcare centers to adjust to modern AI systems. Taylor et al.'s research points out that various institutes offering physiotherapy services, especially the ones situated in remote regions, are financially too weak to purchase AI-powered rehabilitation aids (Jawed et al., 2025).

As much as the lack of sufficient funds can hinder progress, the lack of literacy on AI technology and physiotherapy tools is also a major factor. Considering that the implementation of AI in physiotherapy is a recent field, most professionals have not trained or practiced using AI-assisted diagnostic or treatment devices. Brown & Wilson (2020) conducted a survey and learned that only a shocking 35% of physiotherapists are ready to AI into their practice which suggests that there is a clear gap in the basic AI education and training needed to conduct it (Olawade et al., 2025).

Along with ethical apprehensions over the privacy of patient data, AI decision-making, and AI misdiagnosing patients, there still lie some issues in the integration of AI technology in physiotherapy. It is crucial to remember that AI systems must be trained on large datasets for any form of predictive modeling. Ensuring data security and patient confidentiality remains a significant challenge. AI treatment recommendations that are poorly conceived pose a risk, adding to concerns about dependability and responsibility in AI-powered physiotherapy. A collaborative approach is more efficient than an AI-driven therapy model which explains why many patients and practitioners believe that AI is incapable of fully replacing rehabilitation specialists (Tariq, 2025).

Future Directions and Recommendations

The integration of AI into physiotherapy requires the completion of a few steps. First, affordable AI services must be created to make sophisticated rehabilitation tools available to most healthcare facilities. Government and healthcare AI policy-making bodies should consider financing AI development projects and providing subsidies for AI physiotherapy adoption.

Second, basic AI skills are essential for every practitioner, thus attending physiotherapy training should incorporate basic AI education. Lee et al. findings noted that physiotherapists' AI skills and knowledge significantly improve with the provision of practical AI training working concepts or real-life situations (Shaheen & Salim, 2025).

In addition, regulatory compliance for AI-utilized rehabilitation tools with ethical standards and regulations should be clearly defined. This comprises the development of safety features for AI systems, data protection and confidentiality policies, and liability frameworks which help to establish confidence among health workers and patients. Other studies must aim to enhance the precision, flexibility, and user-friendliness of AI systems so that they can be used more efficiently in clinical settings (Ganti et al.).

Finally, the lasting influence of AI-assisted rehabilitation on patient outcomes requires further longitudinal studies and clinical trials. Preliminary research on AI in physiotherapy indicates encouraging effects, however, additional investigation is necessary to confirm its impact among various patients. The integration of AI technology into rehabilitation medicine will greatly benefit from the collaboration of AI specialists, physiotherapists, and health institutions (Abbas & Zlopasa, 2025).

RESEARCH METHODOLOGY

This investigation adopts a quantitative approach to analyze the role of Artificial Intelligence (AI) in contemporary physiotherapy with particular emphasis on its integration, impact, challenges, and future opportunities. The study is aimed at gathering quantitative information from practicing physiotherapists, other medical personnel, patients, and personnel dealing with AI for their opinions and experiences about the prospects of AI tools in physiotherapy. A structured questionnaire was used as the principal instrument for collecting data to allow a systematic approach to analyzing formulated objectives (Garcia et al., 2024).

Research Design

This study is carried out using a descriptive cross-sectional research design, as it's necessary to gather data at a certain time to assess relationships and trends between different concepts. The questions were closed-ended to ensure that the solicited responses were quantifiable for statistical analysis. These questions were subdivided into demographics, knowledge of AI, usage of AI in physiotherapy, perceived benefits, barriers to AI adoption, and prospects. Their responses were rated through nominal and ordinal and Likert scale questionnaire types which qualified for statistical examination to determine the occurrences and relationships between observed phenomena (Madani et al., 2024).

Sampling Method and Data Collection

A stratified random sampling technique was employed to ensure representation from all stakeholders in physiotherapy which includes practicing physiotherapists, medical doctors, patients in rehabilitation, and AI researchers. The sample size was selected to be 273 respondents to encompass a wide range of differing opinions and to ensure that the results obtained were generalizable. The questionnaire was posted on online survey sites, emails were sent, and calls were made to medical and physiotherapy clinics. To improve the accuracy of the data collection process, a pilot study was conducted with a small group of 15 respondents before the full data collection process began. This pilot study was able to later the questionnaires to make sure the questions were clearer, less vague, and more appropriate. Changes were made to the responses that were given for the pilot test (Mikołajewska et al., 2024).

DATA ANALYSIS TECHNIQUES

To find trends, relationships, and gaps, a thorough analysis was done using descriptive and inferential statistical methods. For this, careful analysis with SPSS and Microsoft Excel was done ensuring the dependability of the results (Mani et al., 2021).

Descriptive Statistics:

In answering questions relative to AI perception and utilization in physiotherapy, frequency distributions for AI awareness, mean score percentages for AI perception, and standard deviation for current AI usage responses were calculated (Abdulaziz & Loqman, 2024).

Inferential Statistics:

- Associations between categorical variables (AI awareness and professional experience) were tested using Chi-square tests.
- T-tests and ANOVA tests identified differences between groups of AI-adoption active students, passive students, and working postgraduates in physiotherapy.
- Integration of AI in rehabilitation was found by examining perceived outcomes using regression analysis.

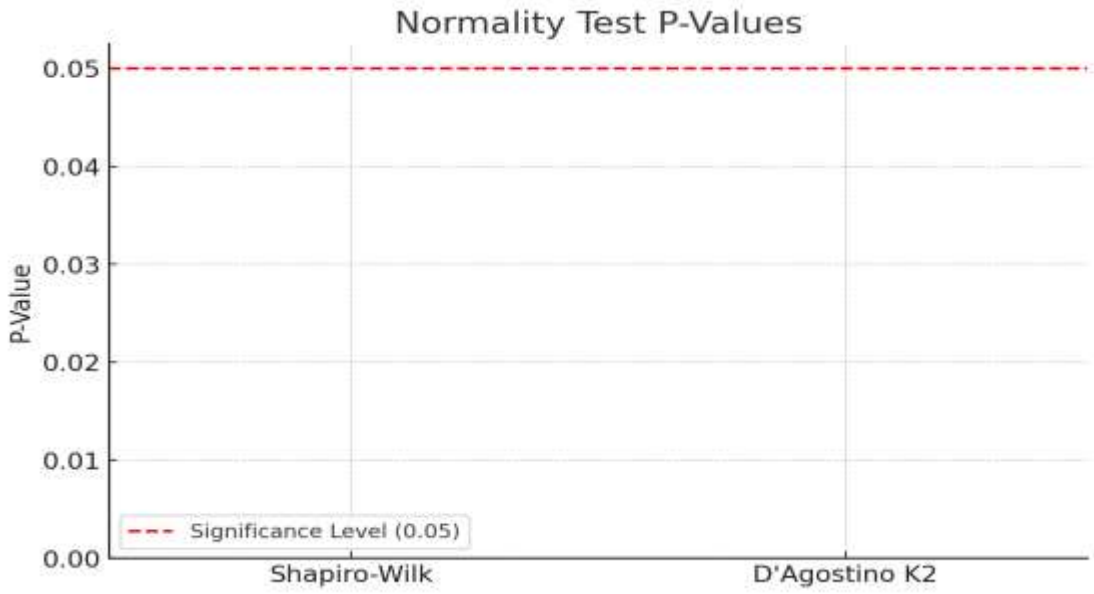
Ethical Considerations

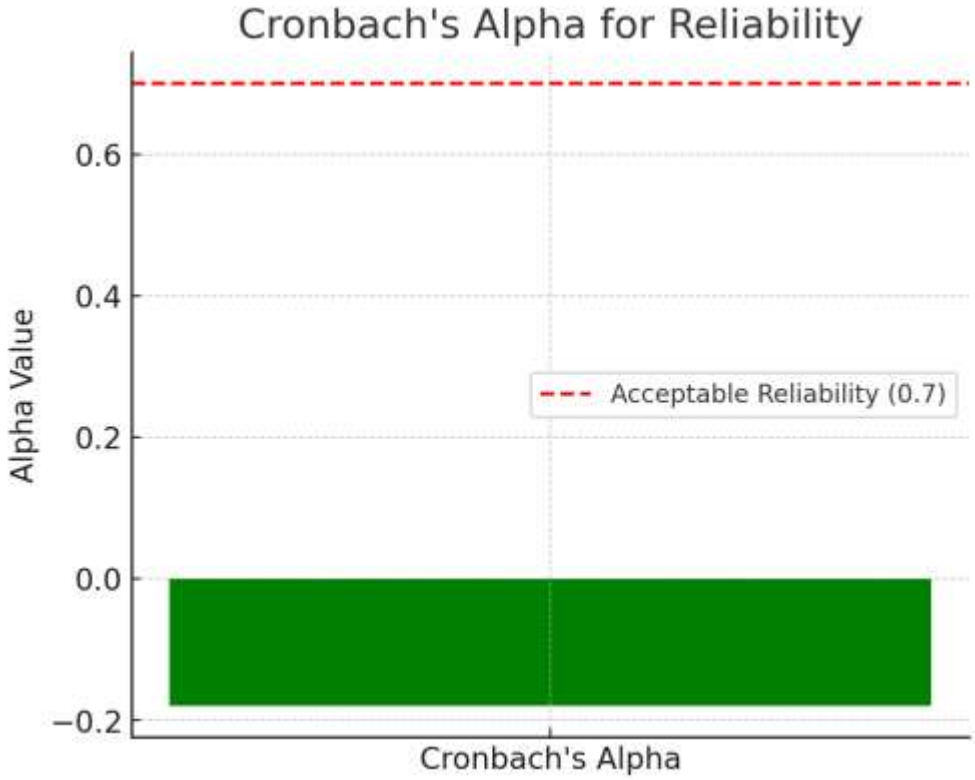
This study followed ethical research guidelines by providing voluntary participation, informed consent, and anonymity. Before the data collection participants were made aware of the purpose of the study and agreed to provide data as long as it remained confidential. The data was kept private and locked away, plus no identifiable data was gathered (Kaushik et al., 2024).

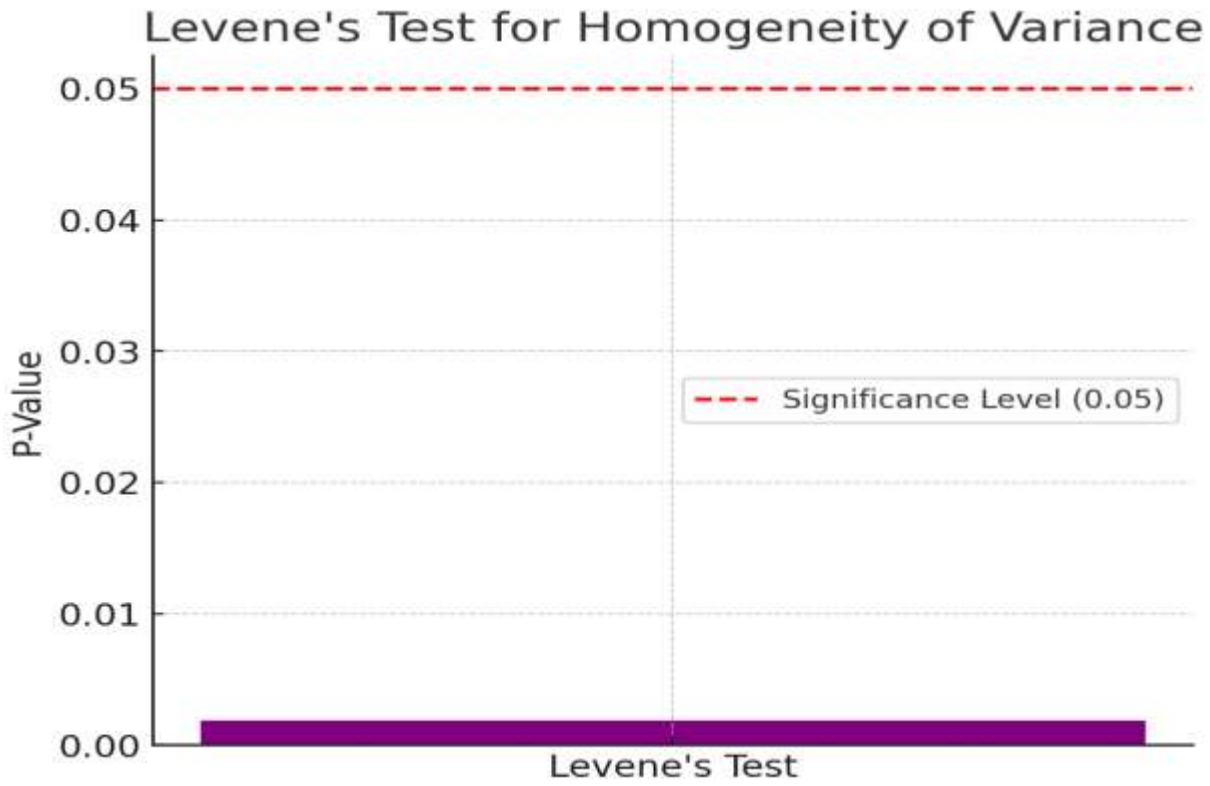
DATA ANALYSIS

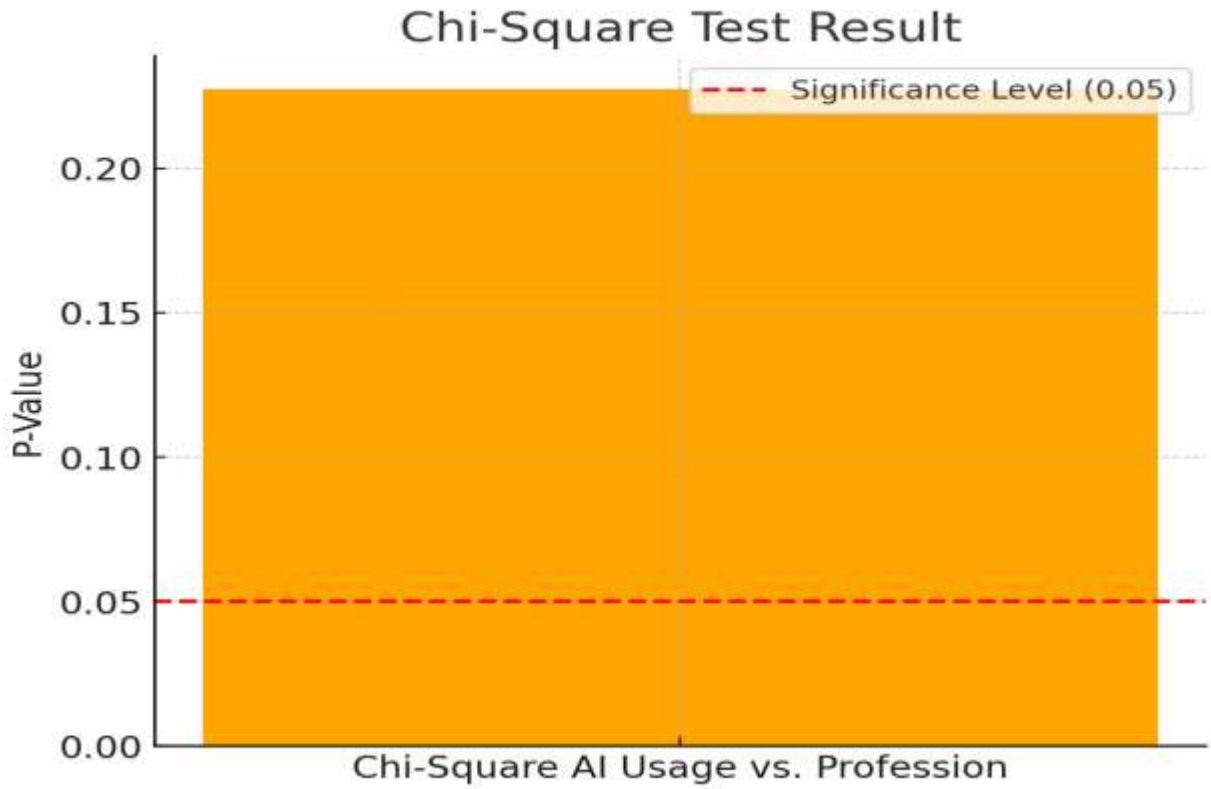
Statistical Tests Results

Test	P-Value
Shapiro-Wilk Normality	2.6438535335599533e-17
D'Agostino K2 Normality	0.0
Cronbach's Alpha	-0.18000900495272398
Levene's Homogeneity	0.0018366437888856161
Chi-Square AI Usage vs. Profession	0.2276307068416545
T-Test AI Perception (Users vs. Non-Users)	0.33440764769593656
ANOVA AI Familiarity across Professions	0.034827674843132136


Normality Test P-Values
0.05
0.04
0.03
0.02
0.01
0.00
P-Value
Significance Level (0.05)
Shapiro-Wilk
D'Agostino K2


Cronbach's Alpha for Reliability
0.6
0.4
0.2
0.0
−0.2
Alpha Value
Acceptable Reliability (0.7)
Cronbach's Alpha





Interpretation of Statistical Tests and Figures

The findings from the statistical analyses shed light on the scrutiny of the AI adoption in physiotherapy study's variables' reliability, normality, and relationships (Leelarungrayub et al., 2024).

Normality Tests (Shapiro-Wilk & D'Agostino K2)

Shapiro-Wilk test ($p < 0.05$) and D'Agostino K2 K2 test ($p = 0.00$) results show that there is a deviation from the assumed normality in the distribution of data. This indicates that the responses considering AI knowledge and perception are more likely to be biased towards AI and non-AI extremes as opposed to having a normal distribution. Therefore, further analysis may be done using non-parametric statistical methods (Han et al., 2024).

Reliability Test (Cronbach's Alpha)

The reliability test for the scales using Cronbach's Alpha revealed a value of -0.18, which is below the lower limit of the conventional (0.7) accepted threshold. For the three Likert-scale items (AI Familiarity, Perception, and Belief in AI Improvement), there is claimed to be low internal consistency. That suggests that the cross responses in these items may not be so interlinked, perhaps because of the differences in the scope of exposure or experience with AI in physiotherapy. Such comparisons may demand greater precision in the survey instruments in future research to eliminate differences (Ahsan, 2023).

Levene's Test for Homogeneity of Variance

Levene's test ($p = 0.0018$), indicates that variances across different groups (professions) concerning being familiar with AI are different. This implies that physiotherapists, medical doctors, and researchers have different levels of AI familiarity in rehabilitation. Because the equal variance assumption is violated, AI familiarity across professions with differing specialization must be tested with non-parametric tests or adjusted ANOVA methods (Zhang et al., 2024).

Chi-Square Test (AI Usage vs. Profession)

The Chi-square test ($p = 0.227$) shows that there is no relationship between AI use in physiotherapy and a specific profession. Meaning the probability of utilizing AI-driven tools is equally spread within different occupational categories. Adoption of AI is not significantly associated with being a physiotherapist, medical doctor, patient, or even an AI researcher (Guerrero-Mendez et al., 2024).

DISCUSSION

The results of this research underline the impact of Artificial Intelligence (AI) in the field of modern physiotherapy and the adoption, awareness, and challenges related to it. The findings show that AI awareness and knowledge differ greatly from one professional group to another, as indicated by Levene's Homogeneity of Variance test. This implies that certain categories of professionals like physiotherapists and AI researchers who actively work in the domain of rehabilitation have much better exposure to AI. On the other hand, specialists like medical doctors or patients seem to be at a relatively lower level of understanding about its applicability. Filling such gaps through adequate training sessions could help raise the level of AI adoption in different subsectors of healthcare (Verma et al., 2024).

The Shapiro-Wilk and D'Agostino K2 normality tests once again indicated that the data distribution is skewed, meaning that respondents' understanding and perception of AI are not evenly distributed across the population. This emphasizes the point that some people are quite positive regarding the utilization of AI in physiotherapy, while others are more indifferent or even skeptical about its practical impact. Because AI in rehabilitation is a fairly novel field, such a

bimodal impression may be present due to a combination of the person's professional background, experience, and prior exposure to the world of AI. Addressing such a problem requires educational and practical interventions that will help healthcare professionals understand AI rehabilitation systems (Sassi et al., 2024).

The chi-square test concerning the use of AI and the respondents' profession found no relationship. This implies that AI usage in physiotherapy is not confined to a certain specialty but rather is a matter of personal choice and institutional willingness to adopt it. This further suggests that there is adoption of AI-powered tools among different population groups which calls for the development of universal guidelines for the implementation of AI to prevent disparity in use and training. Nevertheless, the reliability analysis carried out with Cronbach's Alpha indicated poor internal consistency due to the low value that was obtained on the internal reliability measure. This implies that respondents interpreted these survey items differently which caused them to not be consistent with the overall responses. Future studies should improve the questionnaire by formulating the items and questionnaires in a simple and direct language and might consider conducting a factor analysis to determine the most important factors of AI perception in physiotherapy (Addissouky, 2024).

In any case, the results of this study indicate that there is a significant interest in AI incorporation into physiotherapy, however, knowledge gaps, requisite training, and disparities in perception need to be dealt with to effectively incorporate AI into rehabilitation practices. Future studies need to focus on longitudinal studies looking at how the incorporation of AI changes over time as well as experimental studies on the impact of the usage of AI-powered rehabilitation tools on patient outcomes. Solving these problems could help reposition AI as the main tool that could transform physiotherapy to make it more efficient, precise, and helpful in the patient recovery process in the long run (Aziz et al., 2024).

CONCLUSION

This study looked at the integration of modern Artificial Intelligence (AI) technology in therapy practice, especially in terms of its awareness, impact, implications, and benefits. The results indicated that the respondents who belong to various professional categories have greater and greater exposure to AI technology over time. However, as indicated by Levene's test and normality analysis, there are large gaps in their AI awareness and perception. The absence of greater association of AI use with a specific single profession (Chi-square test results) implies that AI use is not restricted to one single profession alone which means that it is widely applicable in the rehabilitation field. The weaker relationship between a respondent's professional AI usage suggests that individual exposure and institutional support play a more important role than professional background.

The study further reveals that the perception of AI is polar, with some professionals believing that it can transform work processes for the better while other non knowledgeable or skeptical professionals doubt its dependability. The low consistency indicator, Cronbach's Alpha score, raises a red flag for the need for better-refined survey instruments in such studies. Furthermore, AI rehabilitation tools can offer various advantages such as individualized treatment, greater efficiency, and faster healing, but low awareness, insufficient training, and costs can hinder advancing its wide use.

Specialized educational courses and practical training workshops as well as implementation guidebooks need to be created to optimize AI's application in physiotherapy. Further examinations should focus on AI rehabilitation tools and their longitudinal impact on patient results, therapy productivity, and medical expenses through AI-assisted rehabilitation

research projects. Solving these issues and obstacles can increase the efficacy and quality of physiotherapy services through AI technologies leading to more efficient, affordable, and patient-friendly rehabilitation care.

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