

PREVELANCE, ATTITUDE AND PERCEPTION OF USING ARTIFICIAL INTELLIGENCE FOR LEARNING AMONG UNDERGRADUATE PHYSIOTHERAPY STUDENTS

¹Dr.Purvi K. Trivedi PT ²Dr.Reema B. Sumera PT, ³Dr. Radhika V. Vaniya PT
⁴Dr.Pallavi S. Variyani PT

¹Physiotherapist, ²M.P.T Student, ³Physiotherapist ⁴Assistant Professor
¹Freelancer, ²SBB College of Physiotherapy ³My Health Physiotherapy Clinic ⁴KD Institute of Physiotherapy
^{1,2,3,4}Ahmedabad,Gujarat,India

Abstract :

Background: Artificial intelligence (AI) is increasingly being incorporated into healthcare education and has the potential to support personalized learning, improve learning efficiency, and facilitate clinical reasoning. However, its educational value depends on students' awareness, patterns of use, attitudes, and perceptions, as well as adequate guidance regarding its responsible use. Evidence regarding AI use specifically among undergraduate physiotherapy students remains limited.

Objective: To assess AI use, attitudes, and perceptions regarding the use of AI as a learning tool among undergraduate physiotherapy students, and to explore their perceptions of its application in clinical learning.

Methods: A cross-sectional quantitative study was conducted among undergraduate physiotherapy students from different physiotherapy institutes. Data were collected through an online 32-item questionnaire distributed over four months beginning in January 2025. The questionnaire comprised sections addressing AI use, attitudes, perceptions, and clinical learning. Of 290 responses received, 288 participants provided consent and were included in the analysis. Data were analyzed using descriptive statistics, including frequency, percentage, mean, and standard deviation. Associations between selected categorical variables were examined using the chi-square test, with Cramér's V used to describe effect size.

Results: Among the 288 participants, 276 (95.8%) were aware of AI and 233 (80.9%) reported previous use of AI for learning. ChatGPT was the most frequently reported resource (252, 87.5%), followed by Meta AI (140, 48.6%) and Google Scholar (90, 31.2%). Although 246 (85.4%) students expressed interest in including AI in the physiotherapy curriculum, only 77 (26.7%) had attended an AI-related workshop or class. AI was perceived as helpful for physiotherapy learning by 179 (62.2%) students and as capable of improving learning efficiency by 165 (57.3%). At the same time, 164 (56.9%) agreed or strongly agreed that AI could reduce critical thinking, while only 97 (33.7%) agreed or strongly agreed that AI tools provide accurate information. Perceptions regarding AI-assisted clinical learning were more cautious, with approximately one-third of participants selecting "not applicable" across individual clinical-learning items. Previous AI use was not significantly associated with year of study ($\chi^2=5.287$, $p=0.259$), gender ($p=0.888$), or previous workshop attendance ($p=0.683$).

Conclusion: AI use is widespread among undergraduate physiotherapy students, with particularly high awareness and use of generative AI resources. Students also demonstrated substantial interest in incorporating AI into physiotherapy education; however, formal exposure to AI education was comparatively limited. The coexistence of perceived educational benefits with concerns regarding critical thinking and information accuracy highlights the need for structured AI literacy, critical appraisal skills, ethical guidance, and appropriately integrated AI education within physiotherapy curricula.

Keywords: Artificial intelligence; physiotherapy education; undergraduate students; AI literacy; attitudes; perceptions; clinical learning.

1.INTRODUCTION

Artificial intelligence (AI) has moved rapidly from a predominantly technical field into routine educational and healthcare environments. In education, generative AI and large language models can provide rapid explanations, examples, summaries, question generation and interactive learning support. At the same time, the literature identifies important concerns related to inaccurate or fabricated information, over-reliance, academic integrity, bias and the need for human oversight ^[1-4].

The relevance of AI is particularly important in health-professions education because students are expected to develop both knowledge acquisition and independent clinical reasoning. AI may support individualized learning and access to information, but its use requires the ability to critically appraise generated content rather than accept outputs as authoritative ^[3,4]. Guidance from UNESCO emphasizes human-centred, safe and responsible use of generative AI in education, while the World Health Organization highlights ethics, governance, privacy and human oversight in health-related AI applications ^[10,11].

Within physiotherapy, AI is being explored in education, assessment, rehabilitation and clinical decision support. Research involving practicing physical therapists has demonstrated interest in AI and support for incorporating AI-related education, while also showing caution regarding the replacement of clinicians and the reliability of AI-supported decisions [5,8,9]. Evidence from medical-student populations similarly suggests that awareness of AI can be high while formal understanding and structured educational preparation may remain less developed [6,7,12].

Despite this emerging literature, there remains a need to describe how undergraduate physiotherapy students themselves are using AI as a learning resource, how they perceive its educational value, and what concerns accompany its use. The present study therefore examined AI use, attitudes and perceptions among undergraduate physiotherapy students, including perceptions of AI in clinical learning.

II.NEED OF THE STUDY.

The rapid availability of AI tools means that students may encounter and use these technologies before they receive formal instruction regarding appropriate use. This distinction is important: awareness of AI or use of a chatbot does not necessarily indicate AI literacy, which also requires understanding limitations, verifying information, protecting confidential information and recognizing situations in which human clinical judgement must take precedence [3,10,11].

For physiotherapy education, this issue is especially relevant because learning extends beyond factual knowledge to physical assessment, therapeutic skills, communication, clinical reasoning and supervised decision-making. Existing physiotherapy literature has examined clinicians' knowledge, attitudes and perceptions, but student-level evidence remains comparatively limited [5,8,9].

Understanding students' current patterns of AI use and their expectations and concerns can help educators identify areas for structured AI literacy, curriculum development and responsible integration. The present study was undertaken to provide such a descriptive baseline among undergraduate physiotherapy students.

III.RESEARCH

METHODOLOGY

3.1Population and Sample

The study population comprised undergraduate physiotherapy students. An online questionnaire was disseminated to students from different physiotherapy institutes. A total of 290 responses were received. Two respondents indicated that they did not agree to participate and were excluded. The final analytical sample comprised 288 consenting students.

Characteristic	n	%
Female	214	74.3
Male	73	25.3
Prefer not to say	1	0.3
First year	96	33.3
Second year	60	20.8
Third year	40	13.9
Final year	48	16.7
Intern	44	15.3

Table 1.1 Participants represented all undergraduate academic years and internship. The sample included 96 first-year students (33.3%), 60 second-year students (20.8%), 40 third-year students (13.9%), 48 final-year students (16.7%) and 44 interns (15.3%).

3.2 Data and Sources of Data

Primary data were collected using a structured online Google Form questionnaire over approximately four months beginning in January 2025. The questionnaire contained 32 items organized into four broad domains: AI awareness/use, attitudes toward AI-assisted learning, perceptions of AI in education, and perceptions of AI in clinical learning.

The questionnaire was reviewed by three physiotherapists with more than 15 years of professional experience. It was a study-specific questionnaire and was not treated as a fully validated standardized scale. Responses were collected after informed consent. The dataset was subsequently checked for consent status, age-entry anomalies and internal response inconsistencies.

One age entry of 196 years was considered implausible and excluded from age analysis. Clearly interpretable text variants of ages were standardized to their numerical values, resulting in 286 valid age observations. The mean age was 20.25 ± 1.71 years, median 20 years, with a range of 17–27 years.

A data-quality issue was identified in the tool-selection item: some respondents who reported no previous AI use nevertheless selected tools in a subsequent question. In addition, the tool list included Google Scholar and other resources that cannot uniformly be classified as AI systems. These responses were retained for transparent descriptive reporting rather than being silently recoded.

3.3 Theoretical framework

The Technology Acceptance Model (TAM) was used as an interpretive conceptual framework for understanding students' engagement with AI. TAM proposes that perceived usefulness and perceived ease of use influence attitudes and behavioural intention toward technology adoption [15]. In the present study, items concerning usefulness, learning efficiency, personalization, openness to integration and actual use were interpreted in relation to this framework.

Importantly, the questionnaire was not a validated TAM instrument, and the study did not estimate a formal TAM structural model. TAM was therefore used only to organize interpretation of the observed patterns rather than to claim empirical validation of the model.

3.4.1 Study design

A cross-sectional quantitative survey design was used to describe AI use, attitudes and perceptions among undergraduate physiotherapy students.

3.4.2 Data collection procedure

The questionnaire was distributed electronically through WhatsApp to students from different physiotherapy institutes. Participation was voluntary and preceded by informed consent. Data collection commenced in January 2025 and continued for approximately four months.

3.4.3 Outcome domains

The questionnaire included categorical questions addressing awareness, previous AI use, frequency of use, reported tools, sources of information, interest in curriculum inclusion, prior workshop/class exposure, perceived potential for educator replacement and perceived contribution to patient outcomes. Attitude and perception items used a five-point Likert response format from strongly disagree to strongly agree. Clinical-learning items additionally included a not-applicable option.

3.4.4 Data management

Descriptive analyses were based on the 288 consenting participants. For clinical-learning items, not-applicable responses were excluded from the Likert denominator and reported separately. Likert responses were summarized both across all five categories and, where useful for interpretation, as combined agreement (agree + strongly agree) or disagreement (disagree + strongly disagree).

3.4.5 Ethical considerations

An ethical approval was received from an Institutional Ethical Committee. Informed consent was obtained before questionnaire participation.

3.5 Statistical tools

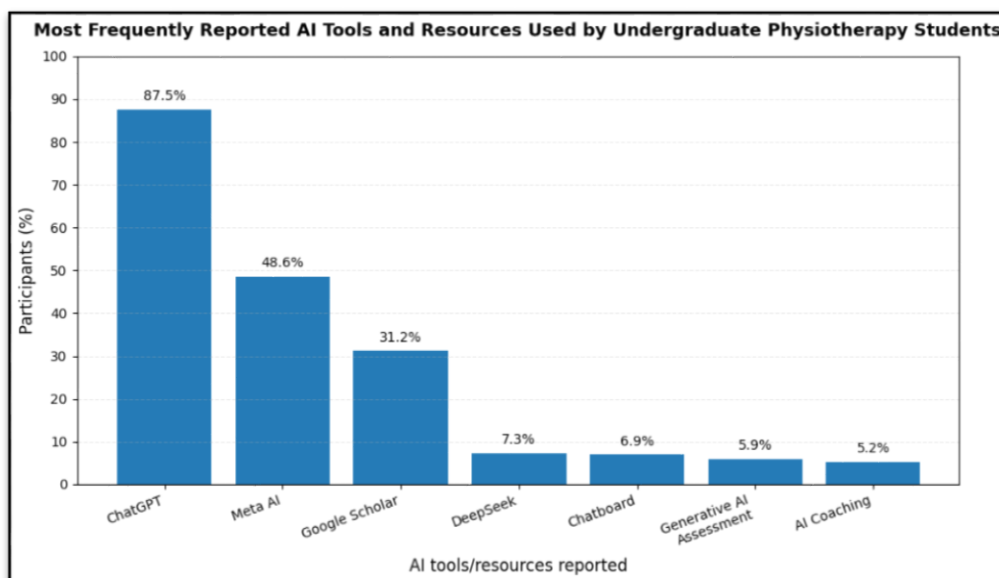
Data were summarized using frequencies and percentages for categorical variables and mean, standard deviation, median and range for age. Associations between categorical variables were examined using Pearson's chi-square test, with Cramer's V reported as an effect-size measure. Statistical significance was set at $p < 0.05$.

For exploratory analysis, selected five-point Likert items collapsed into three categories: disagree/strongly disagree, neutral and agree/strongly agree. Exploratory associations were interpreted cautiously because multiple comparisons were examined, and no multiplicity correction was applied. Internal consistency was examined exploratorily using Cronbach's alpha for grouped attitude, perception and clinical-learning items; because the questionnaire was study-specific and not established as a validated instrument, these coefficients were not interpreted as evidence of construct validity.

The reporting structure was aligned with the principles of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cross-sectional studies^[16].

IV. RESULTS AND DISCUSSION

4.1 AI awareness and use



Graph 4.1: ChatGPT was the most frequently selected resource (252, 87.5%), followed by Meta AI (140, 48.6%) and Google Scholar (90, 31.2%). Because the questionnaire's tool-selection item mixed AI applications with information/search resources, these figures should be interpreted as reported selections rather than as a formal classification of AI technologies. Social media was the most commonly reported first source of information about AI (183, 63.5%), followed by friends or peers (94, 32.6%) and online courses/videos (56, 19.4%). Multiple sources could be selected, so these percentages are not expected to sum to 100%.

AI exposure variable	n	%
Aware of AI	276	95.8
Previously used AI for learning	233	80.9
Interested in AI in curriculum	246	85.4
Attended AI workshop/class	77	26.7
Sometimes use AI	187	64.9
Weekly use	42	14.6
Daily use	34	11.8

Table 4.1 : Of the 288 consenting participants, 276 (95.8%) reported awareness of AI and 233 (80.9%) reported previous use of AI-based tools for learning. Regarding frequency of AI use, 187 (64.9%) reported using AI sometimes, 42 (14.6%) weekly, 34 (11.8%) daily, 10 (3.5%) monthly and 15 (5.2%) never. Interest in including AI in the physiotherapy curriculum was high, with 246 (85.4%) expressing interest. In contrast, only 77 (26.7%) reported attending an AI-related workshop or class

4.2 Attitudes toward AI-assisted learning

Statement	SD	D	N	A	SA	A+SA
AI part of daily study routine	20	55	127	73	13	86 (29.9)
Rely on AI to clarify difficult concepts	18	49	131	82	8	90 (31.2)
Open to integrating AI into learning	8	38	126	102	14	116 (40.3)
Excited about AI potential	5	31	111	118	23	141 (49.0)
AI can replace some traditional teaching methods	15	50	86	117	20	137 (47.6)
Learning skills weakened due to frequent AI	21	78	91	85	13	98 (34.0)
Would suggest AI resources to peers	11	40	127	102	8	110 (38.2)

Table 4.2: Regarding whether AI might replace physiotherapy educators in certain areas, 137 (47.6%) selected maybe, 90 (31.3%) selected no and 61 (21.2%) selected yes. For the potential of AI to assist physiotherapists in achieving better patient outcomes, 144 (50.0%) selected maybe, 98 (34.0%) yes and 46 (16.0%) no.

(SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree, SA-Strongly Agree)

4.3 Perceptions of AI in physiotherapy education

Perception statement	A+SA n (%)	D+SD n (%)	Neutral n (%)
AI helpful in learning physiotherapy	179 (62.2)	19 (6.6)	90 (31.3)
AI makes learning more efficient	165 (57.3)	23 (8.0)	100 (34.7)
AI can improve physiotherapy education	157 (54.5)	27 (9.4)	104 (36.1)
AI can personalize learning	153 (53.1)	30 (10.4)	105 (36.5)
AI can reduce critical thinking	164 (56.9)	26 (9.0)	98 (34.0)
AI tools provide accurate information	97 (33.7)	62 (21.5)	129 (44.8)

Table 4.3: Perceived educational benefits were evident. Agreement or strong agreement was reported by 179 (62.2%) participants for AI being helpful in learning physiotherapy, 165 (57.3%) for improving learning efficiency, 157 (54.5%) for improving physiotherapy education and 153 (53.1%) for personalizing learning. Conversely, 164 (56.9%) agreed or strongly agreed that AI could reduce critical thinking. Only 97 (33.7%) agreed or strongly agreed that AI tools provide accurate information; 129 (44.8%) were neutral and 62 (21.5%) disagreed or strongly disagreed.

4.4 Perceptions of AI in clinical learning

Clinical application	Valid n	A+SA n (%)	Not applicable n (%)
Diagnosis speed/accuracy	189	66 (34.9)	99 (34.4)
Clinical decision-making case studies	190	73 (38.4)	98 (34.0)
Interactive clinical learning	194	79 (40.7)	94 (32.6)
Physical assessment skills	193	66 (34.2)	95 (33.0)
Understanding clinical case scenarios	195	77 (39.5)	93 (32.3)
Treatment planning	194	78 (40.2)	94 (32.6)
Exercise prescription	194	85 (43.8)	94 (32.6)
Exercise adherence	196	63 (32.1)	92 (31.9)
Home protocol	191	78 (40.8)	97 (33.7)

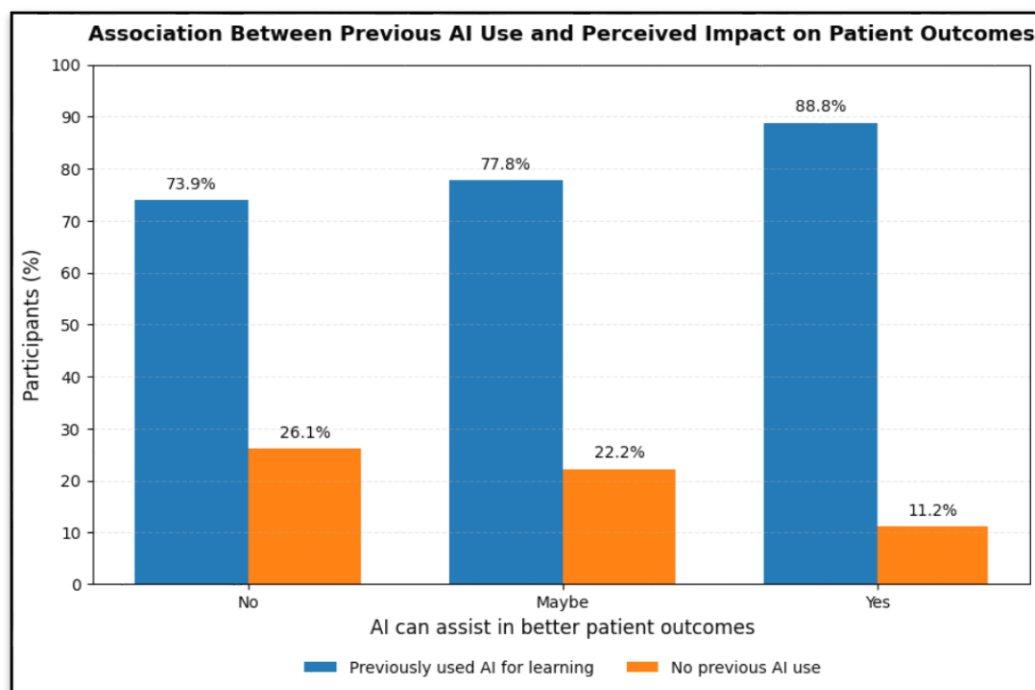
Table 4.4: Clinical-learning items had substantial not-applicable responses, ranging from 92 to 99 participants per item (31.9%–34.4%). Among valid Likert responses, agreement or strong agreement ranged from 32.1% for improving exercise adherence to 43.8% for assistance with exercise prescription.

4.5 Association analyses

Comparison	χ^2	df	p	Cramer's V
Year of study × previous AI use	5.287	4	0.259	0.135
Gender × previous AI use	0.237	2	0.888	0.029
Workshop attendance × previous AI use	0.167	1	0.683	0.024
Curriculum interest × previous AI use	0.395	1	0.530	0.037
Patient-outcome belief × previous AI use	6.296	2	0.043	0.148
Year of study × frequency of use	28.381	—	0.029	0.157

Table 4.5: There was no statistically significant association between year of study and previous AI use ($\chi^2=5.287$, $df=4$, $p=0.259$, Cramer's $V=0.135$). Previous AI use was also not significantly associated with gender, workshop/class attendance or interest in incorporating AI into the curriculum

Year of study was associated with reported frequency of AI use ($\chi^2=28.381$, $p=0.029$, $V=0.157$). This finding should be interpreted cautiously because of response inconsistencies across previous-use, frequency and tool-selection questions and because multiple exploratory associations were examined.



Graph 4.2 : A statistically significant association was observed between previous AI use and perceptions of whether AI could assist physiotherapists in achieving better patient outcomes ($\chi^2=6.296$, $df=2$, $p=0.043$, $V=0.148$); the effect size was small, and the cross-sectional design does not permit causal interpretation.

4.6 Discussion

This cross-sectional study describes AI use, attitudes and perceptions among undergraduate physiotherapy students and demonstrates an important contrast between widespread exposure to AI and comparatively limited formal AI education. Awareness was reported by 95.8% of participants and previous use for learning by 80.9%, whereas only 26.7% reported attending an AI-related workshop or class. At the same time, 85.4% expressed interest in learning about AI within the physiotherapy curriculum.

The high level of reported use is consistent with the broader expansion of generative AI in education. Large language models can support rapid explanations, summarization, examples and interactive learning, but the literature also emphasizes that their outputs require verification and that fluent responses should not be equated with accuracy ^[1-4]. In a physiotherapy context, this distinction is important because students must learn to integrate evidence, assessment findings and patient-specific considerations rather than rely on generated answers.

The gap between informal exposure and formal education is particularly relevant. Students most commonly identified social media, peers and online courses/videos as sources through which they first learned about AI. Informal exposure may explain rapid familiarity with widely available tools, but it does not necessarily provide systematic education regarding hallucinations, bias, privacy, academic integrity or appropriate clinical boundaries. UNESCO and WHO guidance both emphasize structured competencies, safeguards and human oversight ^[10,11].

The attitude findings were mixed rather than uniformly positive. Almost half of the participants were excited about AI's potential, and 40.3% were open to integrating AI into learning. However, fewer than one-third agreed or strongly agreed that AI formed part of their daily study routine or that they relied on it to clarify difficult physiotherapy concepts. This distinction suggests that familiarity and occasional use should not automatically be interpreted as confident or systematic integration.

Students nevertheless identified several educational benefits. More than half agreed or strongly agreed that AI could help with physiotherapy learning, improve learning efficiency, improve physiotherapy education and personalize learning. These perceptions correspond with reported potential benefits of generative AI, including individualized explanations and flexible access to

educational resources ^[1-4]. Similar interest in AI education has been reported among healthcare professionals and medical students ^[5-7,12].

The most prominent concern was critical thinking: 56.9% agreed or strongly agreed that AI could reduce critical thinking. Only 33.7% agreed or strongly agreed that AI tools provide accurate information, while 44.8% remained neutral. This pattern is compatible with published concerns that generative AI can produce convincing but factually incorrect or unsupported responses ^[2-4]. The present data, however, measure students' perceptions and do not establish that AI use actually reduced their critical-thinking ability.

Responses concerning weakened personal learning skills were similarly divided. Approximately one-third agreed or strongly agreed that frequent AI use had weakened their learning skills, while a similar proportion disagreed or strongly disagreed. The finding is better understood as evidence of ambivalence than as evidence of a direct harmful effect. Educational strategies that require students to generate an initial answer independently, critique an AI response, identify errors and justify their final decision may allow AI to be used while retaining active cognitive engagement.

Almost half of the participants selected 'maybe' when asked whether AI could replace physiotherapy educators in certain areas. Existing health-professions literature generally frames AI as an augmentation tool, while practical instruction, communication, therapeutic handling, professional behavior and supervised clinical reasoning remain human-centred components of physiotherapy education ^[5,8].

Perceptions of clinical applications were more cautious. Approximately one-third of participants selected not applicable for each clinical-learning item, and agreement among valid responses ranged from 32.1% to 43.8%. The relatively high not-applicable proportion may indicate limited exposure to clinically oriented AI applications or uncertainty about how such tools should be used. Physiotherapy literature similarly characterizes clinical AI as an emerging field requiring appropriate professional education and evidence-based implementation ^[5,8,9].

The association analyses did not show a statistically significant relationship between year of study and previous AI use. Although descriptive use increased across academic levels, the statistical test did not support the conclusion that senior students used AI more than junior students. A small association was found between previous AI use and perceptions of AI-assisted patient outcomes ($V=0.148$), but this should not be interpreted causally.

The study also highlights an important questionnaire-design issue. Some respondents who reported no previous AI use nevertheless selected tools in the subsequent tool question, and the tool list included Google Scholar alongside AI applications. Such inconsistencies reduce the precision with which individual tool-use frequencies can be interpreted. They do not negate the main descriptive findings, but future studies should use programmed branching logic and clearly distinguish generative AI, search engines, academic databases and validated clinical decision-support systems.

Taken together, the findings support an AI adoption–education gap: students are already encountering and using AI, while structured preparation is less common. The educational implication is not simply to increase or decrease AI use, but to teach students how to use AI critically, transparently and within appropriate professional boundaries. AI literacy should include prompt formulation, source verification, critical appraisal, privacy and confidentiality, bias and hallucinations, academic integrity, disclosure of AI assistance and supervised clinical applications ^[10,11].

Strengths and limitations

The study included students across all undergraduate academic years and internships and examined multiple domains spanning awareness, use, attitudes, educational perceptions and clinical-learning perceptions. The study also transparently reports questionnaire inconsistencies rather than silently altering responses.

Several limitations should be considered. The cross-sectional design prevents causal inference. Online voluntary recruitment may limit representativeness and generalizability. AI technologies are rapidly changing, so usage patterns may evolve. The questionnaire was study-specific and was not established as a validated standardized instrument. AI use was self-reported and may be affected by recall or reporting bias. Response inconsistencies were identified, and the tool-selection item mixed AI and non-AI resources. Finally, the high proportion of not-applicable responses to clinical-learning items indicates that not all participants had sufficient exposure to clinically oriented AI applications.

References

- [1]. Kasneci E, Sessler K, Küchemann S, Bannert M, Dementieva D, Fischer F, et al. ChatGPT for good? On opportunities and challenges of large language models for education. *Learn Individ Differ*. 2023;103:102274.
- [2]. Lo CK. What is the impact of ChatGPT on education? A rapid review of the literature. *Educ Sci*. 2023;13(4):410.
- [3]. Sallam M. ChatGPT utility in healthcare education, research, and practice: systematic review on the promising perspectives and valid concerns. *Healthcare (Basel)*. 2023;11(6):887.
- [4]. Tlili A, Shehata B, Adarkwah MA, Bozkurt A, Hickey DT, Huang R, et al. What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learn Environ*. 2023;10:15.
- [5]. Alsobhi M, Khan F, Chevidikunnnan 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 Internet Res*. 2022;24(10):e39565. doi:10.2196/39565.
- [6]. Al Hadithy ZA, Al Lawati A, Al-Zadjali R, Al Sinawi H. Knowledge, attitudes, and perceptions of artificial intelligence in healthcare among medical students at Sultan Qaboos University. *Cureus*. 2023;15(9):e44887. doi:10.7759/cureus.44887.
- [7]. Jackson P, Ponath Sukumaran G, Babu C, et al. Artificial intelligence in medical education - perception among medical students. *BMC Med Educ*. 2024;24:804.

- [8]. Shawli L, Alsobhi M, Chevidikunnan MF, Rosewilliam S, Basuodan R, Khan F. Physical therapists' perceptions and attitudes towards artificial intelligence in healthcare and rehabilitation: a qualitative study. *Musculoskelet Sci Pract.* 2024;73:103152.
- [9]. Nambi G, Alghadier M, Mohamed SH, Aldhafian OR, Alshahrani NA, Albarakati AJ. Clinical usefulness of artificial intelligence in physiotherapy – a practice-based review. *SBV J Basic Clin Appl Health Sci.* 2024;7(4):184-188.
- [10]. UNESCO. Guidance for generative AI in education and research. Paris: UNESCO; 2023.
- [11]. World Health Organization. Ethics and governance of artificial intelligence for health: WHO guidance. Geneva: World Health Organization; 2021.
- [12]. Alghamdi SA, Alashban Y. Medical science students' attitudes and perceptions of artificial intelligence in healthcare: a national study conducted in Saudi Arabia. *J Radiat Res Appl Sci.* 2024;17(1):100815.
- [13]. Aggarwal R, Ganvir SS. Artificial intelligence in physiotherapy. *J Indian Assoc Physiother.* 2021;15(2):55-57. doi:10.4103/pjiap.pjiap_3_22.
- [14]. AlKetbi H, Hegazy F, Alnaqbi A, Shousha T. Evidence-based practice by physiotherapists in UAE: investigating behaviour, attitudes, awareness, knowledge and barriers. *PLoS One.* 2021;16(6):e0253215. doi:10.1371/journal.pone.0253215.
- [15]. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* 1989;13(3):319-340.
- [16]. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet.* 2007;370(9596):1453-1457.

Copyright & License:



© Authors retain the copyright of this article. This work is published under the Creative Commons Attribution 4.0 International License (CC BY 4.0), permitting unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.