

NARRATIVE REVIEW

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The role of artificial intelligence in Physical Therapy education

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Abstract

Background and purpose 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.

Rationale 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.

Discussion and conclusion 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, Physical Therapy, Healthcare education, Teaching

Background and purpose

Recently, there has been an exponential growth in the discussion of artificial intelligence (AI) and Large-Language Models (LLMs,) across society and specifically as they relate to all levels of teaching and learning. At this point, however, there is a dearth of published research and informed positions to guide and inform Physical Therapy and Physical Therapy Assistant educators. This position paper seeks to summarize relevant and current

information on these topics which may assist in preparing future providers. This article will examine the relevance of AI/LLMs from three perspectives, that of the educator, of the current student, and of the future provider.

“Artificial intelligence” (AI) is a broad term that refers to technology that enables robots and computers to mimic human intellect [1]. Of particular interest in the context of this discussion is the rise of LLM chatbots, such as chatGPT and Google Bard. This subset of AI is the current prime example of Large Language Models (LLMs,) wherein they rapidly extract responses based on vast amounts of available data. These products have gained popularity in part due to the ability to utilize “Natural Language Processing” (NLP) which better mimics human communication styles. While there are some

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semantic differences between LLMs and the broader definition of AI, for the purposes of this discussion the terms will be largely interchangeable.

To date, much more writing has been done on the impact of AI/LLM on medical education as compared to Physical Therapy or other healthcare professions education. As of the time of this writing in January 2024, a comprehensive database search of PubMed, MEDLINE, EBSCO, and CINAHL provided no valid responses to a search for “Artificial Intelligence” AND “Physical Therapy Education” (Supplementary Fig. 1). With this in mind, the author will derive much of this paper from an analysis of what has been published on AI in medical education with an effort to translate the information to Physical Therapy education.

Rationale

Implications for educators

In a paper by Mollick and Mollick [2], five AI-based strategies for educators were provided:

- Strategy 1: Using AI to Produce Many Varied Examples
- Strategy 2: Using AI to Provide Multiple Explanations
- Strategy 3: Using AI to Develop Low-Stakes Tests
- Strategy 4: Using AI to Assess Student Learning
- Strategy 5: Using AI to Distribute Practice of Important Ideas

While this author believes these are valuable starting points for PT educators, it bears repeating a caution described in the Mollick paper, namely that “AI can hallucinate (make up facts), and instructors will need to assess whether its output is appropriate and valuable for their class.” As an example, the author of this paper posed the following question to one of the primary LLM chatbot applications in May 2023: “Write a quiz question related to shoulder arthrokinematics.” The answer provided was:

“Which of the following is not a type of arthrokinematic movement?”

- A. Rolling
- B. Gliding
- C. Spinning
- D. Expanding

Per the chatbot, “The answer is C- Spinning. Rolling, gliding, and expanding are all types of arthrokinematic movements.”

For anyone who has not recently reviewed their shoulder biomechanics, spin is in fact a movement, whereas “expanding” is not [3]. While the platform does have an

option to provide feedback, it is not possible to know how the incorrect information was sourced. Other examples of “mis-training” LLMs have appeared, further confirming the need for independent verification of accuracy when information is taken from AI sources.

One discussed benefit of AI in healthcare education settings is its ability to provide immediate feedback for students. Within medical education, this has already been documented as a benefit to learning, specifically within the fields of dermatology, pathology, and oncology [4]. At this point, the author is unaware of any Physical Therapy-specific AI-based educational platform; however, in this article, we will discuss other more general medical sources which could be utilized in Physical Therapy education.

One of the likely implications of the growth of AI in healthcare is the need for increased interprofessional collaboration. While we may readily foresee the potential communication channels opened between healthcare providers in the provision of diagnosis and treatment, the broader implications of interdisciplinary teamwork are likely to include computer and data scientists, psychologists/sociologists, and public policy personnel. As leaders and innovators within the Physical Therapy profession, the responsibility to “reach across the aisle” and promote these collaborations may be most incumbent on educators.

With the understanding that healthcare providers tend to derive much of their practice patterns from their time in school, the ability to help students gain familiarity and comfort with the use of AI in healthcare is a valuable opportunity. While there is an acknowledged lack of research at this time, analysis of trends indicates that our current students will likely use AI in their future practice. These trends and projections are discussed further in the “[Implications for future providers](#)” section of this article.

Implications for current students

As educators, it may be easy to assume that students’ primary goal in using AI is to reduce workload and possibly even plagiarize. This is certainly a concern; however, tools already exist to assist educators in mitigating these potential conflicts. For instance, the commonly used plagiarism check website TurnItIn.com has recently added a function which detects AI-generated writing. With this and other existing tools to help screen for plagiarism in place, the author will not delve further into this particular implication of AI/LLMs in this article.

Some of the potential uses of AI for students in healthcare education programs may include using AI to practice taking a simulated patient history, enhance clinical reasoning skills, and practice the confirmation or refusal of a differential diagnosis [5]. Many of these elements

have historically been performed with the guidance of a faculty member or other knowledgeable simulated patient. A well-trained AI system provides the ability to provide more direct and timely feedback to many students at once, as compared to the physical restraints on how much time an instructor can spend with each individual student practicing these skills (Fig. 1).

Recently, educators in primary and secondary schools have begun to take up an emphasis on integrating AI into traditional classroom learning. One school district in Georgia, USA, for example, has planned out its use of AI as an integral part of learning experiences from elementary through high school [6]. Similar information on the use of AI with younger learners has been seen across the globe [7]. In a few short years, these young students who are learning how to integrate AI with learning will comprise the professional students in PT and PTA programs.

Implications for future providers

In terms of assessing the perspectives of current students looking towards their role as future professionals, a cross-sectional survey of medical students found that the vast majority agreed with the statement that AI has the potential to improve provider’s access to education and reduce errors. However, the majority also felt poorly informed on the topic and expressed concerns about devaluation of the profession and concerns about trust and confidentiality [1].

While no literature was found specific to Physical Therapy Education, there is some in existence related to PT clinical practice. Published articles were found related to Neurologic [8], Pediatric [9], and musculoskeletal Physical Therapy practice [10].

In an article describing the trends of AIs’ role in healthcare, the author predicts that “Almost every type of clinician, ranging from specialty doctor to paramedic, will be using AI technology” [11]. One indication that healthcare is moving towards this future is the introduction of “BioMedLM.” This is an LLM produced by the Stanford Center for Research on Foundation Models (CRFM) [12] which is “trained” to pull its responses from the PubMed database. Initial internal data provided by the developers indicated that BioMedLM provided higher accuracy in answers related to medicine than did general LLMs or other existing biomedical chatbots [13]. At this point, there does not yet exist a user-friendly interface for the majority of these biomedical platforms in the way that ChatGPT is accessible; however, as these programs develop further, they will provide another, more specific, adjunct to assist in the provision of patient care.

In a survey of current PTs, the majority believed that AI has the potential to reduce PTs workloads and increase productivity. 71.9% also indicated that AI courses should be included in the academic preparation of PTs [14].

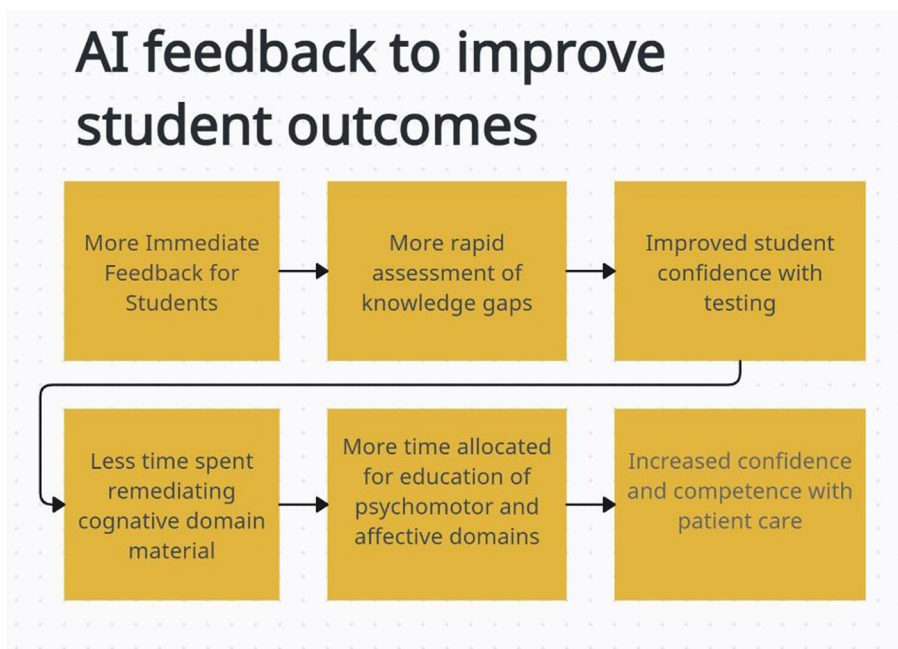


Fig. 1 An example flow chart of how AI resources can be utilized to improve educational efficiency

Discussion and conclusion

Even though integration of AI in our profession has been minimal to date, leaders in the field have already identified the potential growth of its role in our working lives. In a 2019 Editorial entitled “Health Services Research in the 21st Century” by Physical Therapy Journal Editor-in-Chief Alan Jette, the author listed “Developing the full and effective use of artificial intelligence and machine learning as transformational resources for knowledge development and services improvement.” as one of 10 “strategic priorities” for Physical Therapy [15].

Additionally, in an article on another frontier in healthcare, Epigenetics, the authors noted the potential “that artificial intelligence algorithms will someday play a pivotal role in developing more precise practice guidelines by using personalized data about lifestyle as well as genetic/epigenetic molecular signatures” [16].

While the limited evidence in existence shows hesitancy and lack of understanding about the expanded role of AI in healthcare education, observation of trends shows us that it is forthcoming, whether we feel prepared or not. It is the position of the author that since changes and adaptations will come, we have a choice about how and when we begin adaptation.

Based on analysis of the rapidly expanding amount of data related to AI in healthcare and education, the author recommends the following action items to prepare Physical Therapy and Physical Therapy Assistant educators for advantageous integration of AI to the teaching and learning model.

- (1) Further examine how AI is being used in other educational settings.
- (2) Initiate purposeful discussions with colleagues, students, and knowledgeable individuals from other fields, on the role of AI in modern life, specifically in the realms of healthcare and education.
- (3) Challenge students to critically consider ways in which AI may be included in clinical practice in the future. We cannot accurately predict the future ways our students will be able to “delegate” tasks to machines to improve clinical care, but discussions on which tasks require human hands, eyes and/or emotion may assist future providers in recognizing their value to patients, even when AI may assist with data analysis.
- (4) Lastly, begin to creatively integrate the use of AI into classroom and clinical experiences. Some examples may include:

Comparing the students’ ideas about a differential diagnosis with the response from a LLM platform

Asking the students to use a chatbot to ask them knowledge comprehension questions, similar to how a student may use flashcards to study

Having the LLM platform provide ideas as to how to translate medical jargon to patient-friendly education

Using AI to provide different verbiage for explanation of concepts.

Limitations of this research are largely related to the aforementioned lack of empirical research data published which is specific to Physical Therapy education. Future studies should examine both the qualitative and quantitative elements of how AI can be best put to use within the existing structure of PT training.

Currently, discussions of AI tend to raise more questions than answers. That being said, preparation now is imperative to reduce more urgent adaptations in the future. While current PT education and practice have not yet been largely impacted by AI, indications are that it will be a large part before very long. Perhaps one day, we will even re-write the pillars of evidence-informed practice to include a 4th element, namely the use of artificial intelligence to aid in clinical decision making.

Abbreviations

LLM	Large Language Model
AI	Artificial intelligence
PT	Physical Therapy
PTA	Physical Therapy Assistant
USA	United States of America

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43161-024-00177-8>.

Supplementary Material 1.

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