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Review

The role of ChatGPT in sports trauma: a mini review on strengths and limits of open AI application

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Abstract

Purpose This paper is focused on the role of ChatGPT an artificial intelligence (AI) language model in the area of sports trauma. Sports trauma represents some significant concerns due to its prevalence and impacts. The objective of this study is to present an overview of the literature on how ChatGPT handles information about sports trauma, considering both its strengths and limitations.

Methods A review method is used in this study. Well-known online databases such as PubMed, ScienceDirect, Springer and Google Scholar were searched for the relevant studies. In addition, ChatGPT application was accessed to provide the concise information on the research topic.

Results Search strategy resulted in 30 articles on the topic. Among them only seven studies revealed the potential applications of ChatGPT in sports. The other five studies presented the current status on ChatGPT and sports trauma. The results show that ChatGPT generates information on several types of sports trauma that align with the published literature. However, some limitations of ChatGPT are identified such as its tendency to provide general information about sprains and lack of updated statistics on sports trauma. This study also identified some serious concerns such ethical considerations, data privacy and security regarding the ChatGPT application in sports industry.

Conclusion Despite having some limitations, the ChatGPT application has potential to be used in healthcare, and particularly in sports trauma. The implications of this study guide scholars for the development of enhanced AI systems, which are tailored to redress the challenges of sports trauma.

Keywords Artificial intelligence · ChatGPT · Sports trauma · Bias · Information accuracy · Data privacy

1 Introduction

Trauma is one of the major causes of injuries and deaths among individuals up to 44 years old [1], encompasses various forms of injuries or physical damages, including sports trauma. Sports trauma can be defined as physical damages or injuries, which occur due to athletic activities participating in sports. These physical damages range from severe fractures to the minor sprains and strains, soft tissue injuries or dislocations and accidents occurring during activities in sports [2]. Various parts of body are affected by sports trauma, including ligaments, bones, tendons, muscles and joints. Several factors involve in occurrence of sports trauma such as conditioning or inappropriate warm-up, direct impact, repetitive motions, overuse, and improper techniques. The nature and intensity of sports make athletes more vulnerable to the various types of injuries [3].

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Artificial intelligence (AI)-based applications are used for motion capturing in the sports field. Convolutional neural networks (CNNs) as marker-less motion capturing systems have shown better results [4]. Since sports injuries can have negative impacts on team performance, AI-based systems have been successfully used for assessing and predicting sports injuries [5]. AI techniques analyze patterns from sensors' kinematic and positional data of athletes to enhance players' performance [6]. Cardiovascular and respiratory conditions can be investigated, and physicians may find it helpful in recommending medicine for athletes.

Recently, a large language model ChatGPT has been released by Open AI, a research laboratory located in San Francisco. ChatGPT can process and respond to the text-based inquiries in a humanistic fashion [7]. ChatGPT is rapidly being incorporated with the various areas of research. Since its release, several papers have been published in most reputed journals. In this paper, we take into account a few articles published on ChatGPT and its applications in sports trauma. The online AI application, ChatGPT, has been used for analyzing the quality and readability of information about shoulder stabilization surgery [8]. This study has assisted younger internet users in avoiding unnecessary shoulder surgery. A recent study highlights the use of ChatGPT in sports medicine for image diagnosis, exercise prescription, and sports nutrition [9]. This application serves as an assistant, potentially reducing the need for sports physicians.

Prior to our study, a number of surveys were conducted to examine the role of AI in sports. A survey article primary deals with the AI approaches used for different sports injuries and other risks [10]. Another review article [11] was aimed to examine the role of machine learning to predict and prevent sports injuries. Based on the existing literature and knowledge on the injury risk factors, a review article was aimed to assess the current AI applications [12]. However, these studies do not focus on ChatGPT applications in sports injuries. To bridge this gap, this study is undertaken to review the literature on the ChatGPT applications in sports trauma. Can the ChatGPT application provide us with sufficient information on sports trauma or injuries?

Overall this paper contributes to the literature as follows:

- This paper presents an overview of the recently published works on sports trauma.
- This paper compares the information on sports trauma provided by ChatGPT with the existing literature.

The remainder of the paper is organized as follows:

Section 2 outlines the review methodology employed in this study. Section 3 offers an overview of the current status of ChatGPT applications, including their strengths, weaknesses, and potential applications in sports trauma. Section 4 provides a summary of the key points discussed in this study.

2 Methods

A comprehensive literature search was conducted using PubMed, ScienceDirect, Springer, and Google Scholar databases. Keywords such as "ChatGPT and Sports Trauma" were utilized on these databases to collect relevant articles. Various types of articles including research studies, letters to the editor, comments, and clinical trials were considered for this study.

Below, we provide the inclusion and exclusion criteria for studies in this review article.

2.1 Inclusion criteria

- Studies discussing various types of sports trauma.
- Studies discussing the potential applications of ChatGPT in sports.
- Studies discussing strength and weaknesses of using ChatGPT in sports trauma.
- Studies published in English.

2.2 Exclusion criteria

- Studies published in languages other than English were excluded.
- Studies discussing sports trauma without ChatGPT applications were excluded.
- Grey literature on the topic was excluded.

Based on the aforementioned inclusion and exclusion criteria, the titles and abstracts of the extracted 45 articles were screened for this review study. Subsequently, full-length articles that did not meet the inclusion criteria were examined. Following this, results were extracted and reviewed by two colleague authors for further assessment and correction. A total of 30 articles were selected and reviewed in this study.

3 Results and discussion

This section presents results and their discussion.

3.1 Current status on ChatGPT and sports trauma

Critics of ChatGPT claim that ChatGPT generates text, which is almost identical to the existing literature, and can be used to manipulate the results from the previously published studies. However, they also state that the text generated by ChatGPT can mislead researchers or readers [13]. This claim made by researcher is somewhat valid for reviewers who cannot distinguish contents generated by ChatGPT and human being. However, we disagree with their next claim about inaccuracy and bias by ChatGPT. From a technical standpoint, if unbalanced data is used to train the data, we may encounter biasness in the text generated by ChatGPT. This claim is consistent with findings that ChatGPT application has potential for biased recommendations in sports [14]. Overall, ChatGPT does not show bias to any of its users. It provides answers based on the text used as input and does not take into account the identity of users utilizing the ChatGPT application. To validate this point, we asked ChatGPT to reveal common examples of sports trauma. We received the answer below:

> "Common examples of sports trauma include sprained ankles, torn ligaments, concussions, muscle strains, fractures, and dislocations. These injuries can result from contact sports, repetitive motions, overuse, or accidents during athletic activities, requiring proper medical attention and rehabilitation."

We aimed to assess the accuracy of the provided examples of sports trauma. To this inquiry, we obtained six types of sports trauma. Upon examining the literature on the sports trauma, this paper presents an analysis of published works to identify data related to various types of sports-related injuries.

Table 1 shows us data on sports trauma types from ChatGPT and published works. Although a large body of literature is focused on sports trauma and its types, we randomly chose three articles that show discussion on the sports trauma and its types. Overall, eight sports trauma types qualified for this research work. ChatGPT seems to have maximum information on the mentioned injuries, except contusions and wrestler ear injury. Study by Elmagd [15] covers all the injuries mentioned, while Nalliah et al. in [16] focused on sprains, strains, fractures and contusions. Aleman and Meyers [17] presented information on strains, fractures, dislocation, overuse injuries, and wrestler ear injury but missed concussions or contusions.

3.2 ChatGPT pros and cons for sprains

Moreover, we demonstrate how ChatGPT can explain the occurrence, symptoms, treatment, rehabilitation, and physical therapies associated with sprains. Our aim was to identify the strengths and limitations of ChatGPT's application in the context of sprains. The sprains are common ligament injuries, which occur due to tearing or stretching of ligaments. These ligaments are bends of connective tissues, which involve in stabilizing joints. Most common type of sprains are ankle sprains. Besides this ChatGPT's information, we find that ankle sprain is one of the common musculoskeletal injuries and

Table 1 Sports trauma types by ChatGPT and published literature

Study source	Sprains	Strains	Fractures	Dislocation	Concussions	Overuse injuries	Wrestler ear injury	Contusion
ChatGPT	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Elmagd [15]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Nalliah et al. [16]	Yes	Yes	Yes	No	No	No	No	Yes
Aleman and Meyers [17]	No	Yes	Yes	Yes	No	Yes	No	Yes

ranges between 15 to 20% in sports injuries [18]. When compared to the literature, it is known that ChatGPT provides very basic and general information about ankle sprains such as its symptoms, initial treatment, rehabilitation exercises, and physical therapies. Literature is largely focused on ankle sprains and their treatment strategies. Rest, ice, compression and elevation (RICE) therapy is mainly discussed in the literature [19, 20]. ChatGPT recommends that RICE therapy must be applied immediately when an injury occurs. RICE therapy must be continued for the first 48–72 h. This information is consistent with the previous study [21]. However, ChatGPT failed to provide an appropriate source of this information.

We were interested to seek some recent information about ankle sprain in sports. We subsequently posed the question to ChatGPT, requesting recent information on ankle sprains in sports.

> "Recent research underscores ankle sprains' prevalence in sports, emphasizing early diagnosis, proper treatment, and comprehensive rehabilitation for improved outcomes."

However, the response we received was largely consistent with the previously discussed information. It is important to note that the training data for OpenAI's application was last updated in September 2021, and therefore, it lacks information published after that date, particularly in the field of health.

Moreover, the literature suggests that the accuracy of ChatGPT is still questionable, as the AI application could generate passing grades [22]. Therefore, data generated by ChatGPT in sports and medicine fields needs to be tested on a large amount of information for accurate performance. Furthermore, ChatGPT application is used to calculate the sample size for a sports medicine study. It showed 25% correct results in calculating the accurate sample size [23]. However, it improved its results when the question was asked again. Therefore, ChatGPT must be used cautiously when utilized in future works. ChatGPT application may have potential problems and disadvantages in the field of research (sports medicine), as contents generated by ChatGPT are considered plagiarized since authors did not write them themselves [13].

The management aspect of sports has been highlighted in a study. In response to short questions from authors, ChatGPT provided quality, accurate, and complete answers [24]. This indicates the better use of ChatGPT applications in sports management in higher education classrooms. This helps us understand how ChatGPT can supplement and support sports management classes. In the event of sports management, content creation is a time-consuming task [25]. However, the launch of ChatGPT and other generative tools such as Dall-E2 can alleviate the time faculty spend on content creation regarding events in sports management.

In the following section, we summarize the studies on sports trauma regarding ChatGPT.

3.3 Potential applications of ChatGPT in sports

Other studies [22, 24, 26, 27] present that ChatGPT can give us prompt and accurate answers for inquiries about sports topics (Table 2). One of the main features as apparent in these studies is the coherency in writing on different topics. ChatGPT has strong feature of writing coherent answers because of its tendency to provide connected ideas in an academic writing. Other studies by Cheng et al. [9, 28] and He et al. [29] primarily focus on sports medicine, providing support for surgeons dealing with joint arthroplasty and spinal issues in sports. Despite of these information, literature has limited data on the role of ChatGPT in some specific areas. For example, there is limited published data on the application of ChatGPT in the field of physical medicine and rehabilitation (PM&R) [30]. Other than these limitations, ChatGPT is not efficient in considering the ethics, and gender equality in sports. Security and privacy are fundamental potential risks, which are associated with the surgical tasks in sports industry.

4 Conclusion

In summary, this paper examines the literature on the sports trauma in relation to the ChatGPT application. The main focus of the paper is on the bias and accuracy of information presented by ChatGPT. While ChatGPT may confuse reviewers during the editorial process of an article, it does not display bias towards its users. The paper identifies various types of sports trauma, which have been well documented in the literature and ChatGPT application. ChatGPT is trained on the literature but fails in providing the exact information about information sources. This paper also finds that ChatGPT provides only general information about sprains and lacks up-to-date statistics on sports trauma. To overcome these limitations, future research can be conducted to explore ChatGPT's capabilities in sports and other related research areas.

Table 2 Summary of the literature on sports trauma

Sr. no.	Advantages	Disadvantages	Suggestions	References
1.	ChatGPT provides accurate and free of grammatical errors answers to questions	No explicit method was used for this study	ChaGTP can supplement the sports management education	[24]
2.	ChatGPT shows remarkable correct answering on sports science topic	Limited to present information on specific areas	Accuracy regarding the sources of sports science topics can be improved	[22]
3.	Helps in creating clear and coherent writing	Produces biased or inaccurate information	Several ways must not be overlooked to verify the validity and reliability of scientific contents	[26]
4.	ChatGPT has potential in sports medicine such as diagnostic imaging, sports nutrition and surgery treatment	ChatGPT is limited to make doctors obsolete	ChatGPT could make an indispensable assistance for physicians	[9]
5.	ChatGPT has potential to write an academic paper in Sports	Ethical, equity and accuracy concerns remain unaddressed regarding ChatGPT	Manual checks must be enforced in future works	[27]
6.	ChatGPT-4 has potential role in assisting surgeons for joint arthroplasty	Limited role of ChatGPT-4 has been presented	Misuse of data protection, and ethical considerations must be placed	[28]
7.	ChatGPT supports surgeons in spinal surgical practices	Potential risks such as security and privacy are associated with surgical tasks	Correct and responsible use of ChatGPT is essential for handling surgical cases	[29]

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Declarations

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