







ChatGPT Revisited: Using ChatGPT-4 for Finding References and Editing Language in Medical Scientific Articles

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ARTICLE INFO

Keywords:
Artificial intelligence
ChatGPT-4
Language Editing Services
Scientific writing
OpenAI

ABSTRACT

The attainment of academic superiority relies heavily upon the accessibility of scholarly resources and the expression of research findings through faultless language usage. Although modern tools, such as the Publish or Perish software program, are proficient in sourcing academic papers based on specific keywords, they often fall short of extracting comprehensive content, including crucial references. The challenge of linguistic precision remains a prominent issue, particularly for research papers composed by non-native English speakers who may encounter word usage errors. This manuscript serves a twofold purpose: firstly, it reassesses the effectiveness of ChatGPT-4 in the context of retrieving pertinent references tailored to specific research topics. Secondly, it introduces a suite of language editing services that are skilled in rectifying word usage errors, ensuring the refined presentation of research outcomes. The article also provides practical guidelines for formulating precise queries to mitigate the risks of erroneous language usage and the inclusion of spurious references. In the ever-evolving realm of academic discourse, leveraging the potential of advanced AI, such as ChatGPT-4, can significantly enhance the quality and impact of scientific publications.

1. Introduction

Artificial Intelligence (AI) has orchestrated a paradigm shift in our daily lives, introducing advanced applications and devices, often referred to as "intelligent agents," capable of multifaceted functionality [1]. Among these innovative tools stands ChatGPT, an AI-powered conversational agent renowned for its capacity to engage in diverse discussions spanning the spectrum of contemporary digital discourse. Operating on the robust foundation of Generative Pre-trained Transformer (GPT), a groundbreaking machine learning framework developed by OpenAI, ChatGPT exemplifies the evolution of AI-driven capabilities [2].

GPT, as an emblematic exemplar, embodies a large-scale language model that continually refines its performance through deep learning techniques. The model's prowess is a direct result of its extensive training on vast and diverse datasets culled from the expansive expanse of the internet, encompassing textual and visual content. This training imbues ChatGPT with an innate ability to decipher intricate patterns, endowing it with the capability to suggest contextually precise words and phrases and even generate pertinent visual content in response to user queries [2].

Notably, ChatGPT has found an indispensable niche within the scientific community, transcending disciplinary boundaries to facilitate critical functions. These functions encompass the retrieval, organization, and generation of foundational knowledge vital for advancing research endeavors across myriad multidisciplinary domains. From the realms of education [3, 4] and healthcare research [5, 6], to the intricacies of business and industry [7], and the creative expressions within communication, arts, and culture [8], ChatGPT's versatility has been instrumental in catalyzing progress.

Recent scholarly inquiries have cast a spotlight on ChatGPT's role in the editorial domain of scientific articles, focusing specifically on tasks such as reference retrieval and the enhancement of manuscript clarity and linguistic quality. Seong-Gon Kim [9] has astutely observed that while ChatGPT demonstrates proficiency in enhancing English grammar, it occasionally generates spurious references and fictitious author attributions. In contrast, Mohamed L. Seghier [10] underscores the imperative of authorial vigilance when reviewing text edited by ChatGPT. This vigilance is essential because, while AI tools like ChatGPT can elevate readability, they might inadvertently introduce errors or biases. Therefore, author oversight and control stand as the linchpins for ensuring that edited text remains a faithful representation of original ideas, free from inaccuracies or undue influence.

However, a growing body of literature [11, 12, 13, 14, 15, 16, 17] extols ChatGPT's virtues, particularly for non-native English speakers, highlighting its prowess in refining grammar and sentence structure, suggesting fitting vocabulary, and even facilitating seamless language translation. Building upon these explorations, with a particular nod to the comprehensive study conducted by Seong-Gon Kim [12], this research paper embarks on a mission to reevaluate ChatGPT's capacity to unearth authentic references pertinent to specific queries. Additionally, it scrutinizes ChatGPT's efficacy in identifying and rectifying grammatical errors within academic prose, contingent upon precise and lucid instructions. In this ever-evolving landscape of AI-powered language tools, we endeavor to unravel the true potential of ChatGPT-4 as a resourceful ally in the realm of scientific research and manuscript refinement.

ORCID(s):

2. Materials and Methods

2.1. Finding References

To achieve a fair assessment, the same questions that Kim [9] posed in his study were submitted to ChatGPT for responses. The first question was “When streptozotocin-induced diabetes is prepared in growing rats, can you predict its effect on the facial bone growth pattern?”. And the new replied by ChatGPT-4 was “I am not a medical researcher or expert, but streptozotocin is commonly used to induce diabetes in animal models for research purposes. Diabetes mellitus has been linked to a variety of physiological complications, including those that can affect bone metabolism and growth. Elevated levels of blood glucose can lead to altered collagen structure, increased inflammation, and disruptions in the functioning of cells responsible for bone remodeling, such as osteoblasts and osteoclasts. Additionally, diabetes can impact hormone levels that regulate bone metabolism, including insulin-like growth factors.

As for growing rats specifically, it's reasonable to expect that streptozotocin-induced diabetes would likely disrupt normal growth patterns, including those of facial bones. Here are some possible affects you might observe:

1. **Altered Bone Mineral Density** : Changes in the bone mineral content could make the bones weaker and more susceptible to fractures.
2. **Change in Ossification** : The ossification process, which is vital for bone growth, could be disturbed due to alterations in cellular mechanisms.
3. **Growth Retardation** : Overall, you could observe slower growth in facial bones, contributing to abnormal development.
4. **Shape Alterations** : The geometry of the bones might also be affected, which could result in facial deformities.
5. **Impaired Healing** : If there are any injuries, the healing process could be slower or compromised due to the impact of diabetes on cellular repair mechanisms.
6. **Vascular Changes** : Altered blood supply due to diabetic complications could further contribute to impaired bone health.
7. **Hormonal Imbalance**: Diabetes can impact various endocrine pathways, which in turn could affect growth and development in complex ways.

If you're planning to conduct such an experiment, it would be important to consider a multi-disciplinary approach, involving endocrinology, orthopedics, and cell biology, among other disciplines, to get a comprehensive understanding. As always, any animal research should adhere to ethical guidelines and standards for care and use of laboratory animals. For conclusive results, controlled studies with proper experimental design, including control groups, are necessary”. And the second question was “Is there any reference for this topic?” Then, it replied that “As of my last training data in September 2021, specific studies on the effect of streptozotocin-induced diabetes on the facial bone growth pattern in grow-

ing rats may not be widely available in the literature. However, there are multiple studies on the impact of diabetes on bone metabolism, structure, and healing. Here are some general categories where you may find pertinent information:

1. **Animal Models of Diabetes** : Studies that describe the physiological and metabolic changes induced by streptozotocin in rats or other animals.
2. **Bone Metabolism and Diabetes**: Studies that explore how diabetes affects bone metabolism, which often look at bone mineral density, osteoblast/osteoclast activity, etc.
3. **Orthopedic Complications in Diabetes** : Some studies might cover the impact of diabetes on skeletal growth and development, although these may not specifically target facial bones.
4. **Endocrinology Journals** : Studies that explore the hormonal changes induced by diabetes and their impact on growth and development.

You can explore databases like PubMed, Google Scholar, or specialized journals in endocrinology, orthopedics, and veterinary science to search for relevant studies. Remember that while these sources might not specifically address your exact question, they could offer insights into related areas that help you build a comprehensive understanding of the topic”.

Here, we are considering posing additional questions to ChatGPT -4, including: “Based on the four general categories you discussed, Is there any references for these points?” Then, it replied that “As of my last update in September 2021, I can't access external databases to provide current references, but you can explore the following seminal and broadly cited papers that touch on the general areas outlined. Please note that these may not directly discuss streptozotocin-induced diabetes in growing rats affecting facial bone growth, but they do provide context in the areas mentioned.

1. **Animal Models of Diabetes** : Szkudelski, T. (2001). The mechanism of alloxan and streptozotocin action in B cells of the rat pancreas. *Physiological Research*, 50(6), 537-546.
2. **Bone Metabolism and Diabetes** : de Paula, F. J., Horowitz, M. C., & Rosen, C. J. (2010). Novel insights into the relationship between diabetes and osteoporosis. *Diabetes/Metabolism Research and Reviews*, 26(8), 622-630.
3. **Orthopedic Complications in Diabetes** : Yamaguchi, T., Sugimoto, T. (2005). Bone metabolism and fracture risk in type 2 diabetes mellitus [Review]. *Endocrine Journal*, 52(5), 539-544.
4. **Endocrinology Journals** : Thrailkill, K. M., Lumpkin, C. K., Bunn, R. C., Kemp, S. F., & Fowlkes, J. L. (2005). Is insulin an anabolic agent in bone? Dissecting the diabetic bone for clues. *American Journal of Physiology-Endocrinology and Metabolism*, 289(5), E735-E745.

You can find these papers in databases like PubMed , Google Scholar, or university libraries to learn more about the complexities of diabetes, bone metabolism, and endocrine changes. ”

Additionally, ChatGPT -4 recommends the following keywords for more specific, related studies : “ To search for more specific papers, you might use search terms like " streptozotocin -induced diabetes and bone growth, " "diabetes and craniofacial development," or "endocrine regulation of bone metabolism in diabetes" in databases like PubMed or Google Scholar.”

After verifying the aforementioned references, we confirmed their authenticity. This led us to further explore the topic of streptozotocin-induced diabetes. We posed the following question to inquire about references related to its possible effects: “Based on the seven possible effects mentioned earlier, can you provide me with their references?” Then, it replied that “Certainly! While these references may not focus specifically on streptozotocin-induced diabetes in growing rats affecting facial bone growth, they can offer foundational knowledge about the relationship between diabetes and bone health, addressing the seven effects you mentioned.

1. **Altered Bone Mineral Density** : Vestergaard, P. (2007). Discrepancies in bone mineral density and fracture risk in patients with type 1 and type 2 diabetes—a meta-analysis. *Osteoporosis International*, 18(4), 427-444..
2. **Change in Ossification** : Fowlkes, J. L., Thrailkill, K. M., Serra, D. M., Suzuki, K., & Nagase, H. (2006). Matrix metalloproteinases as insulin-like growth factor delivery molecules: implications for functional recovery from bone injury. *Diabetes*, 55(2), 468-476.
3. **Growth Retardation** : Thrailkill, K. M., Lumpkin, C. K., Bunn, R. C., Kemp, S. F., & Fowlkes, J. L. (2005). Is insulin an anabolic agent in bone? Dissecting the diabetic bone for clues. *American Journal of Physiology-Endocrinology and Metabolism*, 289(5), E735-E745.
4. **Shape Alterations** : Perilli, E. , Le, V., Ma, B., Salmon, P., Reynolds, K., & Fazzalari, N. L. (2012). Detecting early bone changes using in vivo micro-CT in ovariectomized, zoledronic acid-treated, and sham-operated rats. *Osteoporosis International*, 23(3), 1171-1181. (Note: This is not diabetes-specific but talks about bone shape changes)
5. **Impaired Healing** : Gandhi, A., Beam, H. A. , O’Connor, J. P., Parsons, J. R., & Lin, S. S. (2005). The effects of local insulin delivery on diabetic fracture healing. *Bone*, 37(4), 482-490.
6. **Vascular Changes** : Fadini, G . P . , Albiero, M. , Menegazzo , L. , Boscaro, E. , Pagnin, E., Iori, E., ... & Avogaro, A. (2010). Widespread increase in myeloid calcifying cells contributes to ectopic vascular calcification in type 2 diabetes. *Circulation Research*, 106(4), 713-722.
7. **Hormonal Imbalance** : Fulzele, K., DiGirolamo, D. J., Liu, Z., Xu, J., Messina, J. L., & Clemens, T. L.

(2007). Disruption of the insulin-like growth factor type 1 receptor in osteoblasts enhances insulin signaling and action. *Journal of Biological Chemistry*, 282(35), 25649-25658.”

2.2. Language Editing

English is the dominant language in scientific publishing, making it a key goal for researchers worldwide to publish their work in English-language journals [18]. This is especially true for those aiming for global influence in their fields. However, non-native English speakers often encounter language barriers, including significant errors in word usage, that hinder their ability to publish [19, 20]. Consequently, these researchers frequently rely on language-editing services offered by publishers. This section aims to showcase the extensive English-editing services capabilities of ChatGPT-4, backed by practical evidence, to aid non-native speakers in the publication process. Below is a rundown of some services, along with real examples submitted by the authors:

2.2.1. Proofreading Academic Papers

This service involves identifying and correcting errors in spelling, grammar, punctuation, and syntax. To test ChatGPT-4’s proficiency in these areas, we submitted a sentence riddled with errors in spelling, grammar, punctuation, and syntax, as follows: “Globely, diabetus melitus is most common causing of prematur mortality after cardiovascular deseases an tobacco chewin It a hetrogeneous metabolic disorder characterised by fault metabolism of carbohydrates, fats and proteins coz of defekts in insuline secretion or resistance”. Next, we posed the following question to ChatGPT-4: “Can you identify the errors in spelling, grammar, punctuation, and syntax in this sentence?”. Here is how ChatGPT-4 highlighted the errors in the sentence and provided corrections: “Certainly! Let’s break down the errors in each category:

Spelling Errors: "Globely" should be "Globally", "Diabetus" should be "Diabetes", "Melitus" should be "Mellitus", "Prematur" should be "Premature", "Cardiovascular" should be "Cardiovascular", "Deseases" should be " Diseases ", "Chewin" should be "Chewing", "Hetrogeneous" should be "Heterogeneous", "Characterised" should be "Characterised", "Fault" should be "Faulty", "Carbohydrats" should be "Carbohydrates", "Defekts" should be "Defects", " Insuline " should be "Insulin", "Resistance" should be "Resistance".

Grammar Errors: "Is most common causing" should be "Is the most common cause", "It a" should be "It is a", "Coz" is slang and should be "As a result of". Punctuation Errors: Missing comma after "Diseases", Missing period after "Chewing", Missing comma after "Fats".

Syntax Errors: The overall structure is not standard. Missing connecting words like "and," "it is," and "as a result of.", Missing articles such as "the" in "the most common cause."

I hope this breakdown helps! Would you like anything else?”. Again, we asked “Please, can you correct the sentence?”. And it replied that “Of course! Here’s the corrected sentence: Globally, diabetes mellitus is the most common

cause of premature mortality after cardiovascular diseases and tobacco chewing. It is a heterogeneous metabolic disorder characterized by faulty metabolism of carbohydrates, fats, and proteins as a result of defects in insulin secretion or resistance."

And the ChatGPT4 mentioned that "In this corrected version: Spelling errors are fixed. Grammar is corrected. Punctuation is properly placed. Syntax follows a standard and clear structure. And give us the following noted: "Note: I've used the American spelling "characterized" instead of the British spelling "characterised," but either would be acceptable depending on your intended audience".

2.2.2. Summarizing & Paraphrasing

This service rewrites a passage to preserve the original meaning while reducing similarity indices generated by plagiarism detection software like Turnitin. To test this feature, we asked ChatGPT-4 to "Please summarize and paraphrase this sentence", to which it provided the following response: "Certainly! Here's a summarized and paraphrased version of the sentence: Around the world, diabetes is the leading reason for early death, following heart issues and tobacco use. It's a varied metabolic condition that disrupts how the body processes sugars, fats, and proteins, often due to problems with insulin". This version captures the essence of the original sentence but is shorter and uses different phrasing.

2.2.3. Content Editing & Copyediting

Including the enhancement of writing quality, improvement in language use, elimination of inconsistencies and errors, and revisions for better clarity, accuracy, structure, coherence, and consistency. Here, we've submitted another sentence to showcase the effectiveness of ChatGPT-4 on varying sentence structures, as follows: "Some ways for treating diabetes is food eating good, insuline shots, or regular drugz for sugar level. Dis stuff makes more pancreas bits alive and grow beta-cells with protein thingies. Right now ways to fix the sick are good but bad stuff happens. People think old plant meds can stop and treat sugar disease without bad stuffs. So, for diabetes plants is chosen for natural medicines cause they safe and not much bad, and easy to find than fake drugs." The sentence has issues with writing quality, language use, and consistency. Thus, we posed the following question to ChatGPT-4: "Can you identify the linguistic weaknesses in the sentence?" And it replied that "Certainly! Here's a breakdown of the linguistic weaknesses in the sentence:

Spelling Errors: "Diabetes" should be "diabetes.", "Insuline" should be "insulin.", "Drugz" should be "drugs."

Grammar Errors: "Is food eating good" should be something like "involves eating healthy food.", "Dis stuff" should be "These factors.", "Pancreas bits" is not grammatically incorrect, but it's not scientific or clear. It should be "pancreatic islets.", "Grow beta-cells with protein thingies" is not a complete thought and should be something like "promote the growth of beta-cells through specific proteins.", "Right

now ways to fix the sick" should be "The current treatments.", "Bad stuff happens" should be "can lead to complications.", "Old plant meds" should be "traditional herbal medicines.", "Sugar disease" should be "diabetes.", "Bad stuffs" should be "side effects.", "Diabetes plants is chosen" should be "plants are chosen for treating diabetes.", "Cause" should be "because.", "Not much bad" should be "less toxic.", "Easy to find than fake drugs" should be "easier to obtain than synthetic drugs."

Punctuation Errors: Commas are missing throughout. Periods are missing at the end of each sentence.

Syntax Errors: The overall structure is not standard. The sentences are fragments or run-on sentences. There are missing connecting words and articles. Lack of parallel structure in lists.

Tone and Style: The tone is overly casual and not appropriate for a scientific or medical context. Uses of slang terms and vague phrases ("stuff," "thingies," "bad stuff happens") diminish the credibility and clarity of the sentence.

In summary, the sentence has numerous issues across spelling, grammar, punctuation, and syntax. The tone is inconsistent and not suitable for the subject matter". Again, we asked "Please can you improve the quality of writing, enhance language use, and remove inconsistencies for readability?". And it replied that "Certainly! Here's an enhanced and more consistent version of your text":

"Various strategies exist for the treatment of diabetes mellitus, ranging from a focus on healthy dietary habits to the administration of insulin injections and conventional hypoglycemic medications. These approaches not only enhance the survival of pancreatic islets but also facilitate the regeneration of β -cells through proteins associated with islet neogenesis. While current treatments can be effective, they are not without their complications. There is growing interest in the potential efficacy of traditional herbal medicines for both the prevention and management of diabetes, given their minimal side effects. As a result, a considerable number of medicinal plants are becoming favored as natural therapeutic options, as they are perceived to be safer, less toxic, and more accessible than synthetic drugs."

2.2.4. References Formatting and Style

This service involves formatting references in various citation styles commonly used in academic and professional writing, such as APA, MLA, Chicago, and Harvard. To demonstrate this, we submitted a question to ChatGPT-4: "Could you please format the following references in different citation styles such as APA, MLA, Chicago, and Harvard?" We submitted a journal article and a book chapter as examples, and received the following response: "Certainly! Below are the references formatted in APA, MLA, Chicago, and Harvard styles.

APA Style: Ghosh, K., Rawal, P., & Pramanik, S. (2023). In vivo antioxidant and hypoglycaemic potentials of Riv-

ina humilis extract against streptozotocin induced diabetes and its complications in Wistar rats. *Journal of Diabetes & Metabolic Disorders*, 1-11.

Patel, S. N., & Lau-Cam, C. A. (2019). Modification by Ethanol and Taurine, Singly and in Combination, of Changes in Indices of Renal Dysfunction Caused by Diabetes in Rats. *In Adv Exp Med Biol* (Vol. 1155, pp. 369-380). doi: 10.1007/978-981-13-8023-5_35 . PMID: 31468415.

MLA Style: Ghosh, Kaushik, Pinkey Rawal, and Soma Pramanik. "In Vivo Antioxidant and Hypoglycaemic Potentials of Rivina Humilis Extract Against Streptozotocin Induced Diabetes and Its Complications in Wistar Rats." *Journal of Diabetes & Metabolic Disorders*, 2023, pp. 1-11.

Patel, SN, and Lau-Cam, CA. "Modification by Ethanol and Taurine, Singly and in Combination, of Changes in Indices of Renal Dysfunction Caused by Diabetes in Rats." *Adv Exp Med Biol*, vol. 1155, 2019, pp. 369-380. doi: 10.1007/978-981-13-8023-5_35. PMID: 31468415.

Chicago Style: Ghosh, Kaushik, Pinkey Rawal, and Soma Pramanik. 2023. "In Vivo Antioxidant and Hypoglycaemic Potentials of Rivina Humilis Extract Against Streptozotocin Induced Diabetes and Its Complications in Wistar Rats." *Journal of Diabetes & Metabolic Disorders*: 1-11.

Patel, SN, and Lau-Cam, CA. 2019. "Modification by Ethanol and Taurine, Singly and in Combination, of Changes in Indices of Renal Dysfunction Caused by Diabetes in Rats." *In Adv Exp Med Biol* 1155: 369-380. doi: 10.1007/978-981-13-8023-5_35. PMID: 31468415.

Harvard Style: Ghosh, K., Rawal, P., and Pramanik, S., (2023) 'In vivo antioxidant and hypoglycaemic potentials of Rivina humilis extract against streptozotocin induced diabetes and its complications in Wistar rats', *Journal of Diabetes & Metabolic Disorders*, pp. 1-11.

Patel, S. N., and Lau-Cam, C. A., (2019) 'Modification by Ethanol and Taurine, Singly and in Combination, of Changes in Indices of Renal Dysfunction Caused by Diabetes in Rats', *in Adv Exp Med Biol*, vol. 1155, pp. 369-380. doi: 10.1007/978-981-13-8023-5_35. PMID: 31468415."

3. Finding and challenges

As previously mentioned, our study builds upon the foundation of Kim's editorial research [9], leveraging the enhanced capabilities of ChatGPT-4, a significant upgrade over its predecessor. This updated iteration of ChatGPT not only delivered responses that were markedly more precise and detailed but also elucidated key points within its answers, often supplemented with illustrative examples.

In our evaluation, we posed a pivotal query to ChatGPT-4, seeking references for the information it used to address a specific question. Regrettably, the response indicated a limitation: "I can't access external databases to provide current references." Nevertheless, it conscientiously supplied us with well-recognized papers encompassing broader aspects related to the topic, such as "Animal Models of Diabetes"

and "Bone Metabolism and Diabetes." To further refine our search, we requested references pertinent to this generalized information, leading ChatGPT-4 to provide a list of links to articles relevant to the subject matter. Subsequent verification confirmed the credibility of these references, as they were sourced from various international journals. This affirms ChatGPT-4's enhanced performance and functionality compared to its previous version, reaffirming its capacity to furnish informative and comprehensive responses to diverse question types.

On the other hand, ChatGPT-4 has solidified its position as a valuable English-editing service for researchers from diverse linguistic backgrounds. Its utility is particularly pronounced among non-native English speakers striving to elevate the quality of their academic writing. Although software-based editing tools have undergone significant evolution, ranging from basic spell-check functions in document editors like Microsoft Word to the advanced features of commercial services like Grammarly, Scribbr, and Quillbot, these platforms typically operate on predefined evaluation criteria to generate reports. In contrast, ChatGPT-4 distinguishes itself by offering greater flexibility through the use of custom prompts. For instance, users can inquire, 'Can you explain what grammatical mistakes you have detected?' to prompt ChatGPT-4 to provide specific error clarifications. These contextual explanations offer users a deeper understanding, aiding in the assessment of the report's accuracy and promoting a more insightful editing process.

However, it is essential to acknowledge that the current improved version of ChatGPT-4 exhibits certain limitations that necessitate addressing. Notably, the references provided by ChatGPT-4 may not consistently align with the latest developments or the specific focus of a user's query. To rectify this, ChatGPT-4 could benefit from integration with databases capable of retrieving the most recent scientific research relevant to a given topic, while filtering out outdated or irrelevant references. Additionally, the English-editing services offered by ChatGPT-4 may not consistently attain the pinnacle of precision and reliability. Consequently, users must maintain a diligent practice of personally scrutinizing and reviewing the edited text, ensuring it adheres to the rigorous standards of academic writing. In this regard, ChatGPT-4 should strive to enhance its language proficiency and expand its knowledge base to furnish even more precise and trustworthy editing services. Looking ahead, we anticipate the release of an updated version of ChatGPT-4 that addresses these limitations and augments its performance and functionality. Such advancements will undoubtedly propel ChatGPT-4 further into the realm of indispensable tools for researchers, facilitating seamless and rigorous research endeavors while ensuring the highest standards of academic excellence.

4. Conclusion

In conclusion, ChatGPT-4 has demonstrated its proficiency in sourcing genuine, non-fictitious references, thereby bolstering both the efficiency and the caliber of scientific ar-

article composition for researchers. ChatGPT stands as a catalyst for expediting the writing process, fostering collaboration among co-authors, and elevating writing style to new heights. Nevertheless, it remains imperative to acknowledge the inherent limitations of ChatGPT, particularly its inability to track the latest references. Rigorous human oversight and diligent revision are essential to mitigate the potential pitfalls of unintentional plagiarism.

In the broader context, the utilization of AI tools such as ChatGPT presents an exciting avenue for scientists to streamline their research endeavors, culminating in the production of high-impact scientific articles promptly and with remarkable efficacy. Furthermore, as the field of AI continues its relentless evolution, we can anticipate the emergence of even more advanced tools tailored precisely to the discerning needs of scientists. Notably, platforms like Google Bard, Microsoft Bing, and Jasper Chat may revolutionize research workflows. By embracing these cutting-edge resources and seamlessly integrating them into their research practices, scientists can position themselves at the forefront of their respective fields, enabling them to produce research that wields an even more profound influence on society's collective knowledge. The future of scientific exploration holds remarkable promise as AI becomes an indispensable ally in advancing our understanding of the world.

Acknowledgment: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work the author(s) used [ChatGPT-4] in order to [Examine how ChatGPT-4's answers compare in performance to previous versions]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

References

- [1] E. Adamopoulou and L. Moussiades, "Chatbots: History, technology, and applications," *Mach. Learn. with Appl.*, vol. 2, no. November, p. 100006, (2020).
- [2] P. 'asher' Rospigliosi, "Artificial intelligence in teaching and learning: what questions should we ask of ChatGPT?," *Interact. Learn. Environ.*, vol. 31, no. 1, pp. 1–3, (2023).
- [3] Z. H. İpek, A. İ. C. Gözümlü, S. Papadakis, and M. Kallogiannakis, "Educational Applications of the ChatGPT AI System: A Systematic Review Research," *Educ. Process Int. J.*, vol. 12, no. 3, pp. 26–55, (2023).
- [4] M. Inrnan and N. Almusharraf, "Analyzing the role of ChatGPT as a writing assistant at higher education level : A systematic review of the literature," *Contemp. Educ. Technol.*, vol. 15, no. 4, (2023).
- [5] R. Vaishya, A. Misra, and A. Vaish, "ChatGPT: Is this version good for healthcare and research?," *Diabetes Metab. Syndr. Clin. Res. Rev.*, vol. 17, no. 4, p. 102744, (2023).
- [6] M. Sallam, "Practice : Systematic Review on the Promising Perspectives and Valid Concerns," *Healthcare*, vol. 11, no. 6, p. 887, (2023).
- [7] A. Shaji George, A. Hovan George, and Asg. Martin, "A Review of ChatGPT AI's Impact on Several Business Sectors," *Partners Univ. Int. Innov. J.*, vol. 1, no. 1, pp. 9–23, (2023).
- [8] A. Bahrini et al., "ChatGPT: Applications, Opportunities, and Threats," *2023 Syst. Inf. Eng. Des. Symp. SIEDS 2023*, pp. 274–279, (2023).
- [9] S. G. Kim, "Using ChatGPT for language editing in scientific articles," *Maxillofac. Plast. Reconstr. Surg.*, vol. 45, no. 1, (2023).
- [10] M. L. Seghier, "Using ChatGPT and other AI-assisted tools to improve manuscripts readability and language," *Int. J. Imaging Syst. Technol.*, vol. 33, no. 3, pp. 773–775, (2023).
- [11] J. Huang and M. Tan, "The role of ChatGPT in scientific communication: writing better scientific review articles.," *Am. J. Cancer Res.*, vol. 13, no. 4, pp. 1148–1154, (2023).
- [12] J. G. Meyer et al., "ChatGPT and large language models in academia: opportunities and challenges," *BioData Min.*, vol. 16, no. 1, pp. 1–11, (2023).
- [13] A. Castellanos-Gomez, "Good Practices for Scientific Article Writing with ChatGPT and Other Artificial Intelligence Language Models," *Nanomanufacturing*, vol. 3, no. 2, pp. 135–138, (2023).
- [14] Barrot JS. Using ChatGPT for second language writing: Pitfalls and potentials. *Assessing Writing*. (2023) Jul 1;57:100745.
- [15] Hartwell K, Aull L. Editorial Introduction—AI, corpora, and future directions for writing assessment. *Assessing Writing*. (2023) Jul 1;57:100769.
- [16] Bin-Nashwan SA, Sadallah M, Bouteraa M. Use of ChatGPT in academia: Academic integrity hangs in the balance. *Technology in Society*. (2023) Sep 11:102370.
- [17] Elkhatat AM. Evaluating the authenticity of ChatGPT responses: a study on text-matching capabilities. *International Journal for Educational Integrity*. (2023) Dec;19(1):1-23.
- [18] M. S. Zakaria, "Online Manuscript Editing Services for Multilingual Authors: A Content Analysis Study," *Sci. Technol. Libr.*, vol. 41, no. 1, pp. 90–111, (2022).
- [19] V. K. Jain, K. P. Iyengar, and R. Vaishya, "Is the English language a barrier to the non- English-speaking authors in academic publishing?," *Postgrad. Med. J.*, vol. 98, no. 1157, pp. 234–235, (2022).
- [20] T. Lane and J. Tang, "Publishing challenges faced by authors with English as a second language," *Eur. Sci. Ed.*, vol. 42, no. 2, pp. 36–38, (2016).