

Letter to the Editor

ChatGPT's Influence on Dental Education: Methodological Challenges and Ethical Considerations



Dear Editor,—We read with interest the recent article titled Familiarity with ChatGPT Features Modifies Expectations and Learning Outcomes of Dental Students.¹ The study sheds light on a timely and important topic – how exposure to artificial intelligence (AI) tools, particularly ChatGPT, influences the learning experience of dental students. While we appreciate the authors' efforts in addressing this novel area, we would like to highlight certain methodological limitations and interpretative issues that warrant further discussion.

Firstly, the small sample size, particularly in the ChatGPT group (YG), presents challenges in drawing robust conclusions. Only 13 participants used ChatGPT, which significantly limits the generalizability of the findings. While the authors acknowledge this as a limitation, it is important to emphasize that small group sizes, especially in experimental designs involving new technologies, can amplify biases and reduce statistical power.² The reported differences in quiz performance between groups might therefore be more reflective of sampling variability rather than a true effect of ChatGPT usage or the influence of its description.

Moreover, the study appears to conflate correlations with causation, particularly in its interpretation of how reading the ChatGPT description influenced quiz performance in the NG group (not use ChatGPT but read its description). The authors suggest that altered expectations resulting from reading the description could account for improved quiz scores, yet this claim lacks empirical evidence to isolate the description's effect from other potential confounders. For instance, it is plausible that students who opted to read the description were inherently more motivated or had better baseline learning capacities, which could independently enhance their performance. The lack of random assignment to conditions further complicates the interpretation, as pre-existing differences between groups might have influenced the outcomes.³

The high multicollinearity observed in the YG group's regression analysis is another critical issue. While the authors acknowledge this, the implications are underexplored. Multicollinearity undermines the reliability of regression coefficients, making it difficult to disentangle the unique contributions of expectations on quiz performance.⁴ This limitation significantly weakens the study's conclusion that expectations were unrelated to learning performance in the YG group. A more nuanced statistical approach, such as principal component analysis, could have helped mitigate this issue and provide clearer insights.

Additionally, the study design leaves unanswered questions about the actual utility of ChatGPT in enhancing learning outcomes. The quiz questions were derived entirely from recommended literature, yet the extent to which ChatGPT provided comparable or superior information remains unclear. Without

assessing the alignment between ChatGPT's content and the quiz material, it is difficult to evaluate whether improved performance in the YG group truly reflects the efficacy of AI assistance or external factors like chance or prior knowledge. Similarly, the NG group's improved performance might stem from cognitive biases induced by the description rather than an objective enhancement in learning outcomes.

From an ethical standpoint, the study highlights an important concern regarding cognitive biases potentially introduced by AI system descriptions.^{5,6} While the authors discuss the implications of these biases for clinical and educational settings, their recommendations lack specificity. For instance, the suggestion that AI system descriptions should be standardized and verified by regulatory bodies is valuable but underexplored. What specific criteria or processes should guide this verification? How might these descriptions be adapted to different educational or clinical contexts without exacerbating placebo effects or overestimations of AI capabilities?

In conclusion, while this study provides a preliminary exploration of the interplay between AI descriptions and learning outcomes, its limitations necessitate caution in interpreting the findings. Larger, randomized studies with more robust statistical methods are required to confirm the role of ChatGPT in dental education. We encourage the authors to consider these points in future research to provide a clearer understanding of how AI tools can be ethically and effectively integrated into education.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Funding

None.

Author contributions

The author contributed to the conception, analysis, interpretation of data, and drafting of the manuscript.

REFERENCES

1. Roganović J. Familiarity with ChatGPT features modifies expectations and learning outcomes of dental students. *Int Dent J* 2024;74(6):1456–62. doi: [10.1016/j.identj.2024.04.012](https://doi.org/10.1016/j.identj.2024.04.012).

2. Ledolter J, Kardon RH. Focus on data: statistical design of experiments and sample size selection using power analysis. *Invest Ophthalmol Vis Sci* 2020;61(8):11. doi: [10.1167/iov.s.61.8.11](https://doi.org/10.1167/iov.s.61.8.11).
3. Macias C, Gold PB, Hargreaves WA, et al. Preference in random assignment: implications for the interpretation of randomized trials. *Adm Policy Ment Health* 2009;36(5):331–42. doi: [10.1007/s10488-009-0224-0](https://doi.org/10.1007/s10488-009-0224-0).
4. Kim JH. Multicollinearity and misleading statistical results. *Korean J Anesthesiol* 2019;72(6):558–69. doi: [10.4097/kja.19087](https://doi.org/10.4097/kja.19087).
5. Cross JL, Choma MA, Onofrey JA. Bias in medical AI: implications for clinical decision-making. *PLOS Digit Health* 2024;3(11):e0000651. doi: [10.1371/journal.pdig.0000651](https://doi.org/10.1371/journal.pdig.0000651).
6. Yadalam PK, Aneundi RV, Ardila CM. Integrating artificial intelligence into orthodontic education and practice. *Int Dent J* 2024;74(6):1463. doi: [10.1016/j.identj.2024.08.011](https://doi.org/10.1016/j.identj.2024.08.011).

Carlos M. Ardila*

Department of Basic Sciences, Biomedical Stomatology Research Group, Universidad de Antioquia U de A, Medellín, Colombia

Pradeep Kumar Yadalam

Department of Periodontics, Saveetha Dental College, SIMATS, Saveetha University, Chennai, Tamil Nadu, India

*Corresponding author. Calle 70 No. 52-21, Medellín 050010, Colombia.

E-mail address: martin.ardila@udea.edu.co (C.M. Ardila).

0020-6539/© 2024 The Authors. Published by Elsevier Inc. on behalf of FDI World Dental Federation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>) <https://doi.org/10.1016/j.identj.2024.11.014>