Editorial
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Has generative artificial intelligence created a new paradox in science?

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In previous issues of the Journal, from various perspectives, we published several editorials regarding the introduction of generative artificial intelligence into research and scholarly publications. In one of them, we discussed the necessity of declaring the use of generative artificial intelligence to the journal editor (1). In another article, we addressed the limitations of using generative artificial intelligence in writing scientific papers, including the possibility of generating fake references and a tendency toward Western texts (2).

Subsequently, we discussed the issue of authorship and the complex responsibilities that the use of artificial intelligence creates in scientific writing (3) and further noted that the irresponsible use of this tool might lead to the production of low-quality manuscripts (4). Therefore, in our latest article, we introduced the reporting guideline statement for the use of generative artificial intelligence tools in medical research (5).

In the present editorial, we intend to answer three important and interdependent questions. First, do all researchers have equal opportunities to use generative artificial intelligence? If so, the second question is whether they will use these opportunities in the same way. And if the answer to both above questions is negative, the third question arises: what will be the likely consequences of these differences for the future of science?

In response to the first question, we know that not all researchers have access to the same generative artificial intelligence tools. Some use free versions, while others have access to more advanced and costly versions. Some individuals also have access to specialized tools for scientific literature searching, data analysis, coding, image generation, and reference management, whereas others are deprived of such facilities.

However, access is not the only issue. The ability to use the tool is also important, and this is the answer to the second question. Two researchers may have access to the same generative artificial intelligence system, but one of them may know how to define the problem precisely, formulate an appropriate prompt, compare different outputs, identify potential errors, and cross-check the generated answers with reliable sources, while the other merely uses the very first response provided.

Therefore, in answering the third question, we must ask ourselves: what will be the consequence of these differences? If a researcher has access to a better tool, is more skilled in prompt engineering, or can utilize generative artificial intelligence tools more effectively for data analysis, literature searching, and the preliminary preparation of a manuscript, this small difference can probably lead to greater scientific output. Greater scientific output may lead to higher citation rates, greater prestige, and more success in securing research grants; these successive opportunities, in turn, increase the

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possibility of accessing better tools and using generative artificial intelligence tools more effectively. Thus, an initial small difference can probably turn into a much larger difference.

New findings published in *Nature* reveal notable points in this regard. In this study, utilizing a dataset comprising over forty million research articles in the field of natural sciences with a unique methodology, the researchers demonstrated that scientists engaged in AI-driven research publish about three times as many papers, receive nearly five times as many citations, and reach research project leadership positions about a year and a half earlier compared to others (6).

But are these differences good for the future of science? This is where we must complete our answer to the third question. Unfortunately, the results of this same study published in *Nature* also show that the deployment of generative artificial intelligence is likely to reduce the overall volume of studied scientific topics by about five percent and collaboration among scientists by about twenty-two percent. Consequently, the use of generative artificial intelligence in science is likely to be accompanied by a paradox: the expansion of the impact scope of scientists who use generative artificial intelligence alongside the contraction of the scope of science (6). We will address this crucial topic and how to cope with it in future editorials.

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