

science editing



Aims and scope

Science Editing (Sci Ed) is the official journal of the Korean Council of Science Editors (<https://kcse.org>) and Council of Asian Science Editors (<https://www.asian-editor.org/>). It aims to improve the culture and health of human being by promoting the quality of editing and publishing scientific, technical, and medical journals. Expected readers are editors, publishers, reviewers, and authors of the journals around the world, specially focused to those in Asia. Since scholarly journals in Asia are mostly published by the academic societies, universities, or nonprofit organizations, *Science Editing* is sought to play a role in journal development. The number of publications from Asia is increasing rapidly and overpass that of other continents; meanwhile, the number of international journals and highly appreciated journals is yet to be coming forward. It is the task of Asian editors to pledge the journal quality and broaden the visibility and accessibility. Therefore, the journal's scope includes the following in the field of science, technology, and medicine.

- Policy of journal editing
- Data mining on editing and publishing
- Systematic review on medical journal publishing and editing
- Research ethics and medical ethics, including clinical registration, statement of human and animal health protection, and conflict of interest
- Publication ethics, such as fabrication, falsification, plagiarism, duplicate publication, and authorship
- CrossCheck
- Legal issue in journal publishing
- Peer review process
- Reporting guideline for medical journals
- Medical and scientific literature databases
- Advanced information technology applicable to journal editing and publishing, including PubMed Central schemas, JATS schemas, DOIs, CrossMark, FundRef, ORCIDs, DataCite, QR codes, and apps
- International standard of journal editing and publishing, including International Committee of Medical Journal Editors' Recommendations
- Reference styles, including Vancouver (NLM) style, APA style, IEEE style, and ACS style
- Digital publishing on the web and apps
- Education and training of editors, reviewers, and authors
- Manuscript editing
- Journal evaluation
- Bibliometrics and scientometrics in the context of journal editing and publishing
- Finance of journal publishing
- History of scholarly journal
- Copyright and Creative Commons License
- Open access and public access approaches

Its publication type includes original articles, reviews, case studies, essays, editorials, meeting reports, book reviews, announcement, correspondence, and video clips. Other types are also acceptable upon negotiation with the Editorial Board. All unsolicited articles are subject to peer review. Commissioned articles are reviewed by the Editorial Board.

About the journal

Science Editing was launched on February 20, 2014, with Volume 1, Number 1. It is published biannually and may also publish supplement issues. The circulation number of print copies is 500 per issue. The full text of the articles are freely available at <https://www.escienceediting.org/> or <http://e-se.org/>. *Science Editing* is affiliated with the Council of Science Editors, the Association of Learned and Professional Society Publishers, and the European Association of Science Editors. It does not charge any fees on authors for page charges or article processing charges. The journal had been supported by the Korean Federation of Science and Technology Societies, funded by the Korean government (2013–2014). The journal was also supported by the National Research Foundation of Korea grant, funded by the Ministry of Education of Korea.

Abstracting and indexing services

Metadata, portions, or full text of the articles are available from CrossRef metadata (2014–), ScienceCentral (2014–), Google Scholar (2014–), Directory of Open Access Journals (2016–), Web of Science Core Collection (2017–), Emerging Sources Citation Index (2017–), Scopus (2017–), and Korean Citation Index (2018–).

Publisher: Korean Council of Science Editors

Editor-in-Chief: Jaegyun Park, PhD

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Science Editing is published by the Korean Council of Science Editors. It is printed and bound by Academya, Korea (<http://www.academya.co.kr/>), and its website and XML files are produced and maintained by M2PI, Korea (<https://www.m2-pi.com>).

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Reflecting on the past 10 years of Asian scholarly journals

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Science Editing is the official journal of the Korean Council of Science Editors (KCSE) and the Council of Asian Science Editors (CASE). It aims to improve the culture and health of human beings by promoting the quality of editing and publishing in Asian scholarly journals [1]. This July marks the 10th anniversary of the establishment of CASE. Herein, I would like to investigate the changes that have occurred in Asian scholarly journals over the past decade.

To this end, it is of particular interest to examine the development of Asian scholarly journals in an international indexing database, such as Journal Citation Reports (JCR) of Clarivate. Over the past decade, the number of JCR-listed journals from Asian countries has been on the rise. Notably, China, Korea, and India have shown remarkable growth. By 2022, the number of JCR-listed journals from each of these three countries matched or exceeded that of Japan, which stood at around 350. Since 2019, China has surpassed Japan in this regard (Fig. 1). Additionally, the average journal impact factor (JIF) of Chinese journals is the highest among those from Asian countries (Fig. 2). As reported by the SCImago Journal & Country Rank (SJR; <https://www.scimagojr.com>), China has been the world's leading producer of scholarly papers since 2020. Other countries are making significant strides as well. Vietnam and Indonesia have been included in the JCR in 2019 and 2020, respectively. Notably, Indonesia has emerged as the country with the largest number of journals in the Directory of Open Access Journals (DOAJ; <https://doaj.org>) (Fig. 3).

Scholarly journals in Asian countries have experienced significant growth over the past decade. This surge can be attributed to the rapid development of science and technology across most Asian nations during this period. Additionally, some countries have been actively implementing policies to promote the development of national scholarly journals. In Korea, a variety of initiatives have been undertaken to internationalize domestic journals over the past ten years. Organizations such as the KCSE and the Korean Association of Medical Journal Editors (KAMJE) have played pivotal roles in educating journal editors and assisting journals in adopting advanced publishing guidelines and standards. Since its establishment in 2012, KCSE has conducted regular seminars, training approximately 5,000 editors. During this time, around 50 KCSE-affiliated journals have been newly indexed in international databases. Vietnam and Indonesia, alongside Korea, have been among the most active participants in CASE.

However, the quality of Asian scholarly journals still has room for improvement. The typical

Received: January 30, 2024

Accepted: February 6, 2024

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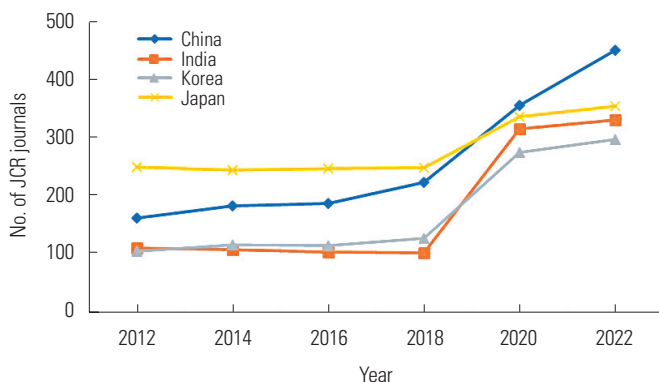


Fig. 1. Number of Journal Citation Reports (JCR) journals of the top four Asian countries (2012 to 2022 biennially).

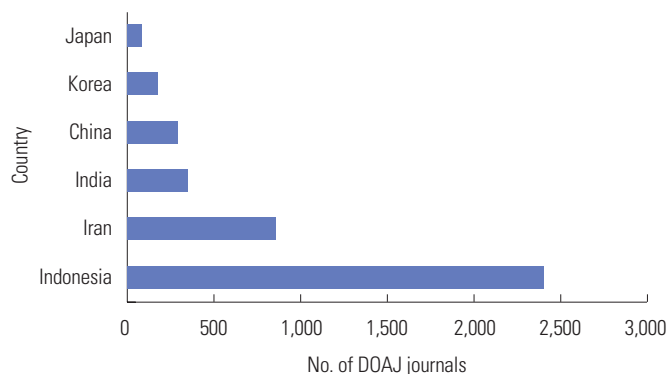


Fig. 3. Number of Directory of Open Access Journals (DOAJ) journals of the top six Asian countries (as of February 1, 2023).

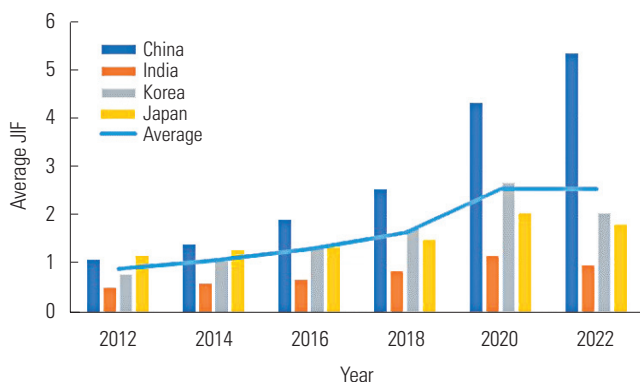


Fig. 2. Average journal impact factor (JIF) of the top four countries in Asia (2012 to 2022 biennially).

standard for evaluating the quality of scholarly journals is the number of citations they receive in international journal indices. Looking forward to the next decade, editors of Asian scholarly journals should focus on increasing the impact factors of their publications. Collaboration through CASE is highly encouraged. As the Secretary-General of CASE, I am eager to see many Asian journal editors participate in the Eighth Asian Science Editors' Conference and Workshop, which will take place in Jakarta, Indonesia, on July 15 and 16, 2024. This event will provide an excellent platform to initiate such discussions [2].

Conflict of Interest

Tae-Sul Seo is the Secretary-General of the Council of Asian

Science Editors (CASE), serving from August 2022 to July 2024. Tae-Sul Seo also serves as an Editor of Science Editing since 2023, but had no role in the decision to publish this article. No other potential conflict of interest relevant to this article was reported.

Funding

The author received no financial support for this work.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The author did not provide any supplementary materials for this article.

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Trends in research on ChatGPT and adoption-related issues discussed in articles: a narrative review

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Abstract

This review aims to provide guidance for those contemplating the use of ChatGPT, by sharing research trends and evaluation results discussed in various articles. For an objective and quantitative analysis, 1,105 articles published over a 7-month period, from December 2022 to June 2023, following the release of ChatGPT were collected. These articles were sourced from PubMed, Scopus, and Web of Science. Additionally, 140 research articles were selected, including archived preprints and Korean articles, to evaluate the performance of ChatGPT. The analysis of research trends revealed that related communities are rapidly and actively responding: the educational community is redefining its directions, the copyright and patent community is monitoring lawsuits related to artificial intelligence creations, the government is establishing laws to regulate and prevent potential harm, the journal publishing community is setting standards for whether artificial intelligence can be considered an author, and the medical community is publishing numerous articles exploring the potential of ChatGPT to support medical experts. A comparative analysis of research articles on ChatGPT's performance suggests that it could serve as a valuable assistant in human intellectual activities and academic processes. However, its practical application requires careful consideration to overcome certain limitations. Both the general public and researchers should assess the adoption of ChatGPT based on accurate information, such as that provided in this review.

Keywords

Artificial intelligence; Bibliometrics; ChatGPT; Performance; Publishing

Received: August 1, 2023
Accepted: September 15, 2023
Epub: December 18, 2023

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Introduction

Background and rationale

ChatGPT, a portmanteau of “chat” and “generative pretrained transformer (GPT),” is a conversational artificial intelligence (AI) chatbot developed by OpenAI (<https://openai.com/>), with support from Microsoft. From December 2022 to January 2023, it garnered over 100 million

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early users. ChatGPT generates sophisticated responses to prompts in various fields, such as writing poems and essays, creating examination questions, providing common knowledge, composing music, gaming, and programming. This has once again highlighted the advancement of AI technology, following AlphaGo's victory (DeepMind) over Sedol Lee, a Korean Go player. ChatGPT, which has gained significant attention in a short period, is a deeply learned natural language processing model. It probabilistically predicts the next words in a given sentence, based on Google's Transformer. ChatGPT is built on GPT-3.5, a large language model, and is fine-tuned using supervised learning with human AI trainers and reinforcement learning from human feedback. Unlike other chatbots, ChatGPT retains what it has learned and the context of conversations and questions, enabling it to generate detailed and logical answers akin to a human. It is also designed to avoid providing false answers, but it occasionally generates inaccurate and absurd responses. ChatGPT does have some learning limitations. It struggles to learn about events and knowledge post-September 2021 and can generate dangerous and unethical responses due to algorithmic bias. These issues have sparked debates about its adoption.

The global competition among information technology (IT) companies to lead in AI technology has intensified, despite the partial limitations of ChatGPT. In February 2023, Google unveiled Bard, based on LaMDA, and Meta released LLaMA, followed by the open-source LLaMA 2 in July. This allowed anyone to create AI using publicly available codes and models. In March 2023, China's Baidu released Ernie Bot, Korea's Naver launched HyperCLOVA X in August 2023, and Apple announced in July 2023 that it was developing AppleGPT. The advent of ChatGPT has transformed the era of Google-style webpage searches into an era where AI-generated results supplement traditional searches. This is achieved by using prompt sentences instead of keyword inputs, multimodal queries instead of text-only searches, and providing written answers instead of displaying webpages. Following the launch of the paid premium ChatGPT Plus in February 2023 and the release of GPT-4 in March 2023, ChatGPT expanded its use by providing an application programming interface (API) and adding plugins both internally and externally. The release of a dedicated iOS app in May 2023 further broadened its use. The early release of GPT-4 was particularly surprising. Unlike the text answers of GPT-3.5, which formed the basis of ChatGPT, GPT-4 is a multimodal platform capable of interpreting images (modality). This represents a significant technological leap in a short period of time. According to OpenAI's data on GPT-4's performance [1], the accuracy of English has improved from 70.1% to 85.5%. Korean has seen significant improvements, with an accuracy rate of 77%. Policy responses to sensitive information have increased

by 29%, while unacceptable responses have been reduced by 82%, thereby reducing hallucinations. However, even with GPT-4-based ChatGPT, the limitations of GPT-3.5 [2] (e.g., writing plausible-sounding but incorrect or nonsensical answers, sensitivity to tweaks in input phrasing or repeated attempts at the same prompt, verbosity and overuse of certain phrases, guessing user intent for ambiguous queries, and occasionally responding to harmful instructions or exhibiting biased behavior) remain. Although OpenAI has acknowledged these issues, they continue to pose challenges for GPT-4.

In the 7 months following the launch of ChatGPT, the scientific community has produced a wide array of articles. These pieces, which range from breaking news and brief opinions to suggestions and proposals, primarily focus on the advantages and disadvantages observed during the initial adoption phase, with testimonials serving as the main source of information rather than traditional research data. Up until April 2023, articles related to ChatGPT were predominantly found on PubMed, which includes articles more rapidly than other databases. However, starting in May 2023, the number of ChatGPT-related articles began to rise in Scopus and the Web of Science (WoS), both of which are notable bibliographic databases. The release of GPT-4, APIs, and plugins has further complicated the assessment of ChatGPT's performance, making it more challenging to accurately judge its quality. From a user's perspective, rather than a technological one, it is crucial to evaluate the precise quality of ChatGPT through a review of research articles that are grounded in research data.

Objectives

The exploding interest in ChatGPT since its launch could be more accurately assessed if its performance and quality were thoroughly summarized using only research articles that provide objective and quantitative data. To this end, a brief review was conducted of research trends and major responses to ChatGPT from articles related to ChatGPT obtained from major article databases. Their quality was then compared using research articles that met the criteria for objective performance evaluation. Consequently, this would assist the general public in assessing the quality of ChatGPT by sharing four key pieces of comparative information: the evaluation target and purpose, the data used, the main results, and the significance and value of these results. This review, which summarizes ChatGPT's research trends and performance comparison, is intended to serve as a guide for those considering its adoption.

Methods

Ethics statement

This was not a study with human subjects, so neither Institu-

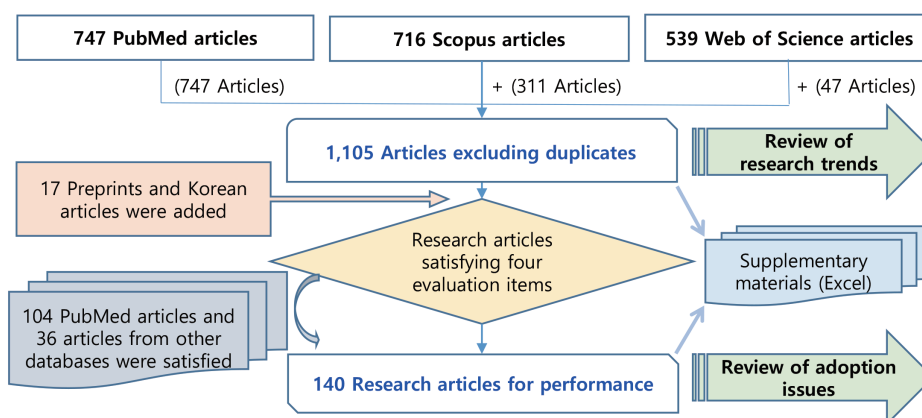


Fig. 1. Process of research data collection and review.

tional Review Board approval nor informed consent was required.

Study design

This was a database-based literature review.

Data collection

To collect the target articles from major databases, [ChatGPT or “GPT-3.5” or “GPT-4”] was used as a search term, with the results limited to the title, abstract, and keywords fields. The search excluded conference articles and yielded 747 PubMed, 716 Scopus, and 539 WoS articles related to ChatGPT over a 7-month period until June 2023, as per the index date or database-inclusion date. The search results from these three major databases were downloaded into Microsoft Excel (Microsoft Corp). A crosscheck was then conducted against digital object identifiers (DOIs), PubMed IDs, and article titles to eliminate duplicates. This process resulted in an Excel list of 1,105 unique articles, which served as the research data. This list comprised 747 PubMed articles and 358 nonmedical articles from Scopus and WoS. All 1,105 articles underwent an initial review to identify the research trends of ChatGPT. For the purpose of comparing the issues related to the quality evaluation and adoption of ChatGPT, only 140 research articles were utilized, including 19 articles exclusively from Scopus and WoS. To mitigate the bias of regional responses and the 104 medical articles sourced from PubMed among the 140 research articles, 13 archived preprint articles were gathered from the Internet. Additionally, four Korean articles were sourced from the Korea Citation Index (<https://www.kci.go.kr/>) and ScienceOn (<https://scienceon.kisti.re.kr/>). These articles were restricted to those that included all four evaluation items: the evaluation object and purpose, the data used, the main results, and the significance and value of the results. These research articles were summarized in Suppl. 1. Fig. 1 illustrates the methodology and

process of data collection for this review.

Results

Research trends of ChatGPT-related articles

Shortly after the advent of ChatGPT, numerous opinion pieces were published across a variety of formats, including editorials, letters to the editor, news articles, correspondences, comments, and opinion pieces. Many of these early articles served as warnings, reiterating the limitations that OpenAI had officially acknowledged [2]. However, there were also many advocates who saw potential for diverse academic applications. From a pool of 1,105 articles, it is possible to discern broad research trends based on their publication patterns, albeit in an incomplete manner. In the following analysis, counts and percentages are calculated after excluding articles lacking detailed information.

Publishing trends in some of the 1,105 articles

Among 587 journals, *Cureus* had a high concentration of 82 articles, with a special issue focusing on ChatGPT, followed by *Annals of Biomedical Engineering*, *Nature*, *Aesthetic Surgery Journal*, *Radiology*, *Library Hi Tech News*, and *International Journal of Surgery*. Among 134 publishers, which were grouped by the same criteria as in a previous study [3], Springer, which publishes *Cureus*, was the top publisher, followed by Elsevier, Taylor & Francis, Wiley, Oxford University Press, MDPI, and Sage. Of the 716 articles with publication status information, 226 were accepted articles, articles in press, and advanced prints, and 490 were final publications. Of the 518 articles with publication date, four were published in December 2022, 15 in January, 38 in February, 96 in March, 124 in April, 143 in May, and 98 in June 2023. The temporary decrease in June was presumed due to a time lag reflecting articles that had not yet been included in the databases. The language used in the

868 articles was mostly English, and there were only 31 articles in 10 other languages.

Of the 868 articles identified in Scopus and WoS, research articles were the most prevalent, accounting for 43.9%. Letters comprised 19.5%, editorials 17.4%, notes 8.6%, reviews 5.8%, and other types of articles made up the remaining 2.6%. This suggests a significant number of opinion-oriented articles. In 537 articles, it was found that 36 had no references, 98 had between 1–5, 125 had between 6–10, 112 had between 11–20, 52 had between 21–30, and 114 had 31 or more. The lower number of references in some articles, particularly those with fewer than five, is likely attributable to the high number of opinion pieces, which typically do not rely on research data as heavily as research articles do. In terms of subject areas, of the 935 articles, 668 were in the medical field, 156 in the natural sciences, 55 in education, 46 in the social sciences, and 10 in the humanities. While the medical field was dominant, there was also significant interest in the use of ChatGPT in the education community. Excluding tentative Bronze and Green open access (OA) articles, there were 263 Gold OA and 85 Hybrid OA articles. However, only 31.5% of the articles were OA, which is lower than the 38.3% estimated in a previous study based on the 2021 Journal Citation Reports [3].

The nonmedical community's response to ChatGPT

The impact of ChatGPT on the field of education has been significant, as evidenced by the volume of articles on the subject. This has elicited a variety of responses. Elementary, middle, and high schools have been contemplating educational strategies, including countermeasures, to address students' overreliance on ChatGPT for essay and assignment preparation [4]. Universities have been issuing guidelines for the use of AI tools in coursework, writing, and assignments, while also promoting ethical writing to prevent plagiarism [4]. The current status of ChatGPT has been easily ascertained through special issues of some journals, including 43 articles in *International Journal of Information Management*, 32 articles in *IEEE Transactions on Computational Social Systems*, and eight articles in *Library Hi Tech News*.

Meanwhile, a major point of contention in the realms of copyright and patent law is whether AI can hold these rights. The consensus in many countries is negative. For AI products to qualify for copyright, they must be capable of expressing thoughts and feelings akin to human authors and demonstrate a minimum level of creativity. Separate from this, copyright violations related to data used in AI training have been the subject of litigation. Some writers and creators have taken legal action against copyright infringements and the industry's excessive reliance on AI since the emergence of ChatGPT. The multinational lawsuits over DABUS, an AI that generates ar-

tistic concepts, have also raised concerns about whether it can be granted inventor status with patent rights, particularly since the advent of ChatGPT [5]. Although many countries have denied patent eligibility for AI-related inventions, excluding ChatGPT, some have granted patent rights. Beyond copyright and patent laws, there is also interest in legal regulations and the establishment of AI-related ethical standards in anticipation of societal issues arising from the proliferation of generative AI like ChatGPT. The European Union (EU)'s AI Act, the most advanced of AI-related legal regulations, classifies AI models according to risk level. It mandates that businesses dealing with high-risk AI disclose their algorithmic operating principles, excluding trade secrets [6].

Authorship issue and common guidelines for AI-generated articles

The educational community has been abuzz with the use of ChatGPT for student learning, and the journal publishing industry has been quick to respond to the release of ChatGPT. The primary concern is the issue of AI authorship and the acceptance of its use [7]. Guidelines for AI in the journal publishing industry existed even before the advent of ChatGPT, but there is a need for these to be updated and revised as the use of ChatGPT expands. According to the guidelines of relevant organizations such as the International Committee of Medical Journal Editors (ICMJE) [8], World Association of Medical Editors (WAME) [9], American Medical Association (AMA) [10], Committee on Publication Ethics (COPE) [11], and STM [12], major publishers like Elsevier [13], Springer [14], and Wiley [15] have taken a similar stance. They state that when ChatGPT-style AI is used, authors must acknowledge its use under their own responsibility, but AI itself cannot be an author.

The guidelines related to ChatGPT were derived from the aforementioned sources, and the common points have been summarized for this review. First, AI authorship is not allowed: AI tools cannot be considered authors, because they are not accountable for their works and lack legal personality. Second, human authors must take full responsibility: if an AI tool is used in the article, the human authors must fully accept responsibility for the accuracy of the results. Third, it is necessary to ensure proper disclosure of the AI used: if an AI tool has been utilized in the writing of the article, pertinent details such as its name, version, and manufacturer must be disclosed in appropriate sections such as Methods or Acknowledgments.

While many publishers and organizations seem to share a similar viewpoint, *Science* [16] takes a particularly stringent stance, asserting that AI tools like ChatGPT cannot be used, and any violation of this policy constitutes scientific misconduct [7]. This journal has a strong policy: AI cannot be an author of an article; therefore, texts generated by AI, machine

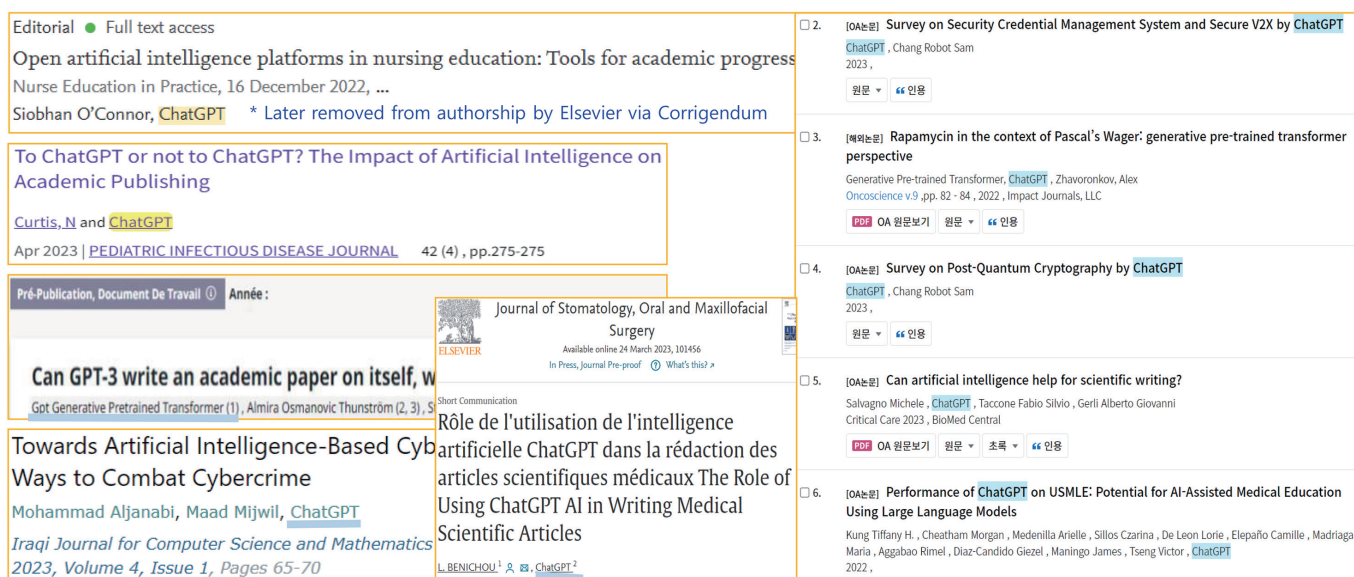


Fig. 2. Search results for articles with ChatGPT (OpenAI) as an author in various databases.

learning, or similar algorithmic tools cannot be used in an article without explicit permission from the editor, and any accompanying figures, images, and graphics cannot be the product of AI. ChatGPT itself has stated [17], “ChatGPT cannot ensure the accuracy, validity, and reliability of scientific claims and findings. . . . [I]t should not be relied upon for writing academic scientific manuscripts for publication.” However, the policy regarding AI authorship is still in its early stages, and some journals lack clear criteria. As such, articles that listed ChatGPT as an author were sought. While PubMed and Scopus yielded no results, WoS classified two as group authors, ScienceDirect had two (including one that was later removed as a co-author), and ScienceOn, which focuses on preprints, OA, and Korean articles, had six articles. These 10 articles are depicted in Fig. 2.

ChatGPT adoption issues discussed in research articles

The emergence of ChatGPT has sparked concerns about job losses in intellectual professions, including those of novice programmers, rather than in physical labor roles. However, of the 140 research articles examining the quality and performance of ChatGPT, the medical profession demonstrated the most interest, accounting for over half of the articles. The performance evaluation of ChatGPT was broadly divided into the following categories: passing various tests (e.g., professional certifications and university exams), applicability in medical practice (e.g., medical school exams, clinics and doctors, patients and nursing), and writing support. In the 140 research articles, the key findings from these three categories were succinctly summarized and compared in the Suppl. 1.

Passing various tests

Professional certifications

Among professional licensing exams for doctors, residents, lawyers, and law school admissions, GPT-3.5 came close to passing the United States Medical Licensing Examination (USMLE), but its performance was below the test-taker average. However, GPT-4 [18] showed improved performance, scoring above the average, a result that was also confirmed by the Japanese medical examination. There were reports of inconsistent performance results on various exams for medical specialists, which require more experience among doctors. Consequently, the results ranged from failing to nearly passing on GPT-3.5, and from passing to exceeding average scores on GPT-4. The German medical specialist qualification exam presented a borderline passing case, but the performance was close to passing the Taiwanese pharmacist exam. The evaluation also demonstrated that ChatGPT was capable of human-level performance on the bar exam and the certified public accountant (CPA) exam. It managed to just pass the Law School Admission Test (LSAT) in the United States, but the Korean equivalent, the Legal Education Eligibility Test (LEET) [19], showed large disparities depending on the type of questions. Overall, performance on the professional licensing exams was generally satisfactory, with some areas falling below the human average, but in some instances, GPT-4 exceeded the human average [20].

University exams

In terms of college entrance, coursework, and graduation-related exams, the performance in chemistry and math, which require complex solution processes, was somewhat disappoint-

ing. However, in other university exams, ChatGPT demonstrated a level of competitiveness comparable to humans. The results varied depending on the subject, evaluation method, and evaluator, ranging from barely passing [21] to surprisingly successful results [22]. Thus, ChatGPT has been assessed in various university examinations. While the evaluations varied by course, it was deemed to have abilities similar to humans in many areas, with a few exceptions. Nevertheless, with the advent of GPT-4, it is anticipated that some of the performance shortcomings of GPT-3.5 can be overcome.

Applicability in medical practice

Medical school exams

GPT-3.5 has been evaluated across a wide range of medical course exams, too numerous to be individually categorized within university examinations. The performance levels and results varied depending on the specific evaluation case, ranging from unlikely to pass [23], partially passable, fully passable, passable and above the human average, and sufficient to prepare for medical specialist exams. ChatGPT had also been evaluated for its ability to generate specialized knowledge in the medical field. Based on these evaluations, it shows promise as a potential tool for medical education. Interestingly, while GPT-3.5's scores in parasitology were significantly lower than the average for Korean medical students [24], inconsistent results have been reported for GPT-4, with one article suggesting an unlikely passable level [25] and another indicating that GPT-4's performance was sufficient to prepare for medical specialist exams [26].

Clinics and doctors

Evaluations of ChatGPT's performance in healthcare, a field that is currently a focal point of academic debate, have yielded mixed results. While some evaluations have been satisfactory, the general consensus is that it is less competent than human doctors. The results varied widely, with performance fluctuating based on the topic, instances of incompetence [27], partially acceptable performance, acceptable performance with shortcomings [28], and even instances where ChatGPT outperformed human doctors [29]. Given that accuracy and reliability in diagnosis are fundamental and essential in clinical practice and medical information, it was determined that while ChatGPT may offer some utility and benefits, its use should be approached with caution due to potential risks. Particularly in areas requiring intricate and complex knowledge, such as human anatomy and pharmacology, ChatGPT's limitations were evident. Many articles have suggested that ChatGPT should be viewed as a tool to enhance and support the work of healthcare professionals, rather than as a replacement for human experts, thereby improving patient care and opportunities.

Even within the medical field, a sector that requires extensive knowledge and is closely tied to human life, the potential for using ChatGPT to assist medical experts is being explored with caution, yet with a high degree of interest and enthusiasm.

Patients and nursing

In the areas of patient care and nursing, where the level of expertise and knowledge required is likely to be less extensive than that required of a doctor, ChatGPT has shown inadequate performance [30], helpful performance, and satisfactory performance [31] compared to human nursing experts. Although most evaluations deemed it satisfactory for patient care and generating responses to patient inquiries, there was a general agreement that the immediate and direct implementation of ChatGPT in a nursing setting should be approached with the same caution as with physicians. Consequently, there is significant room for improvement in the use of ChatGPT for the development of medical information and services provided to patients before and after hospital visits.

Writing support

In the realm of writing evaluations, both positive trends and areas of concern have been identified. Some promising results have been observed in areas such as topic selection and generation, report writing, effective content summarization, proficient translation skills, improved grammatical writing, and the creation of complex writing that reviewers struggle to identify as AI-assisted [32]. There is also potential for partial automation in grading writing scores. However, issues have been detected with the generated responses, including evidence falsification and inadequate referencing [33]. Therefore, it appears that the use of ChatGPT in writing is likely to become more prevalent, as many researchers have found it useful for various purposes. However, addressing the issue of paraphrasing to avoid plagiarism detection—by using different expressions with the same meaning—is not straightforward. When AI tools like ChatGPT are readily available for written output, the probability of poor and unethical products being published in certain predatory journals increases [26]. This situation calls for a global response and societal attention. If AI chatbots are used to rapidly generate low-quality manuscripts with minimal human involvement and intervention, the resulting surge in poor-quality publications will lead to a significant waste of societal resources in verifying the authenticity of the generated content. Alongside the trend of rapid publication in the style of MDPI [3], as more articles are submitted using ChatGPT-generated results, all stakeholders in the publishing industry—including publishers, editors, authors, and readers—face the potential waste of time in verifying authorship and authenticity. Therefore, writing evaluators and article review-

ers are looking to AI-product detection tools for technical support and robust performance. While some of these tools have been evaluated as effective [34], a deeper look revealed technical limitations [32]. As such, these tools should be used with caution.

Discussion

As previously discussed, determining whether to utilize ChatGPT can be challenging due to the varying methods and standards used to evaluate its performance and quality. Despite some issues identified in the evaluation results, the majority of opinions lean towards the positive, particularly regarding the use of ChatGPT to support and enhance human intellectual activities. Upon assessing ChatGPT's performance across various exams, it was found to surpass human-level proficiency in most cases, with only a few exceptions [25]. Further improvements are anticipated with the introduction of GPT-4 [26]. While immediate implementation in clinical areas such as diagnosis may present challenges, the consensus is that ChatGPT is better suited to a supportive role rather than replacing medical experts entirely. The provision of patient information and the role of an information assistant were deemed to have minimal issues, and the most enthusiastic adoption is expected in these areas. However, while ChatGPT can assist humans with intellectual tasks, it also necessitates a new task: identifying and rectifying errors or issues in tasks that require precision. As machine AI begins to generate knowledge information, a domain previously exclusive to humans, we are faced with a new challenge. It is crucial to distinguish between human-generated and machine-generated content, a process that can be both time-consuming and costly. If ChatGPT is used to easily generate written content, significant social costs and disruptions could arise if measures are not promptly put in place to verify the file version, authorship, and authenticity of the generated content.

Despite the impressive capabilities and benefits of ChatGPT, it is crucial to also focus on its drawbacks and limitations (e.g., hallucinations, copyright infringement concerns related to learning sources, plagiarism and copyright infringement concerns in the generated answers, time lag for further learning of new information after full learning, legal issues related to privacy and healthcare, and so on) [2]. There is a pressing need to develop ethical guidelines and legal frameworks for the use of generative AI. ChatGPT, which has sparked considerable social debate, is viewed and evaluated from a variety of perspectives, reflecting diverse interests and results. Therefore, the evaluation process needs to be refined and standardized to ensure that the performance and quality of AI are assessed consistently and fairly worldwide. The standardization of eval-

uation methods and criteria is vital, as different results may be obtained based on the number of prompts used in the performance evaluation, the specific prompts measured if multiple prompts are used, the version evaluated at a particular point in time, whether the evaluation is conducted in OpenAI's or an external partner's API or plugins environments, and how images are converted and evaluated in relation to the text. As highlighted in this review, these issues span multiple academic disciplines, not just one, making it extremely challenging to establish a universally accepted standardized evaluation method for ChatGPT, given the conflicting interests of various stakeholders in the academic community.

Some performance evaluations of GPT-4 yielded mixed results, with near-perfect performance [22] and no improvement over GPT-3.5 in research idea generation [35], but GPT-4 is more robust and less problematic in performance. While OpenAI's announcement [1] confirms that GPT-4 boasts many improvements over GPT-3.5. Still, a more accurate understanding of GPT-4's capabilities will come from further performance evaluations based on this newer model. In this review, 140 research articles were examined to compare performance evaluations, but only 29 of these were based on GPT-4. This is a small number, given that GPT-4 was released just 3 months ago. However, as more evaluations are conducted using GPT-4, which reflects the latest technology, a clearer picture of its current state will emerge. In GPT-3.5, evaluations were limited and focused primarily on text, as the model's ability to handle diagrams and pictorial information was limited. In contrast, GPT-4's evaluation has become both easier and more complex due to its support for multimodal features. As GPT-3.5 and GPT-4 will coexist for the time being, distinguishing and judging the versions and environments used in AI evaluation has become an important issue.

Conclusion

In order to more accurately judge the performance and quality of ChatGPT, 1,105 articles were collected from major databases to understand related research trends. Additionally, 140 research articles were analyzed, including preprints and Korean articles, that dealt with performance evaluation using objective and quantitative methods, to examine issues related to ChatGPT's adoption. In the 7 months following ChatGPT's launch, more opinion-based articles were published than research articles. In response to the adoption of ChatGPT, the education community has been attempting to redirect educational strategies, the copyright and patent community has been on the lookout for lawsuits concerning the intellectual property rights of AI-generated works, and the government has been advocating for legal institutionalization to prepare for

societal issues. In the journal publishing industry, standards for author recognition for AI use have been largely established, and the medical community has been actively producing numerous articles exploring the potential of using ChatGPT to support medical experts. Performance evaluations have shown that many articles recognize ChatGPT's potential to serve as a useful aid for human intellectual activities and practical processes, such as medicine. As such, many believe that ChatGPT should not be resisted or its introduction delayed, but rather, it should be actively utilized as an assistant by overcoming its problems and limitations. Moreover, it is necessary for ChatGPT to improve its ability to present evidence-based references, similar to Scopus AI, as well as address the potential for hallucinations and copyright violations that may be inherent in generative chatbots without OpenAI disclosing the sources of learned information. Therefore, the general public, who should evaluate the usefulness and performance level of ChatGPT from a user's perspective rather than a technical one, needs to respond with accurate information, as provided in this review. This review has limitations, including that the discrepancies in the information contained in major databases were not fully evaluated, and that it primarily summarizes the majority opinions from previous studies. Nevertheless, this review will be beneficial for academics and the general public considering the adoption of ChatGPT. If the numerous issues with ChatGPT can be improved, we may see the world evolve into a more advanced and convenient era of generative AI, rather than facing the downfall of humanity.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The author received no financial support for this work.

Acknowledgments

The author thanks Kay Sook Park, retired from ETRI, with whom the author has co-authored at six *Science Editing* journal articles, for her kind discussion and advice on English.

Data Availability

Dataset file is available from <https://doi.org/10.7910/DVN/LMPTQH>.

Dataset 1. List of 1,105 unique articles related to ChatGPT for this review.

Supplementary Materials

Supplementary materials are available from <https://doi.org/10.7910/DVN/LMPTQH>.

Suppl. 1. Summary table of 140 research articles evaluating ChatGPT (OpenAI) with reference numbers.

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Influence of artificial intelligence and chatbots on research integrity and publication ethics

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Abstract

Artificial intelligence (AI)-powered chatbots are rapidly supplanting human-derived scholarly work in the fast-paced digital age. This necessitates a re-evaluation of our traditional research and publication ethics, which is the focus of this article. We explore the ethical issues that arise when AI chatbots are employed in research and publication. We critically examine the attribution of academic work, strategies for preventing plagiarism, the trustworthiness of AI-generated content, and the integration of empathy into these systems. Current approaches to ethical education, in our opinion, fall short of appropriately addressing these problems. We propose comprehensive initiatives to tackle these emerging ethical concerns. This review also examines the limitations of current chatbot detectors, underscoring the necessity for more sophisticated technology to safeguard academic integrity. The incorporation of AI and chatbots into the research environment is set to transform the way we approach scholarly inquiries. However, our study emphasizes the importance of employing these tools ethically within research and academia. As we move forward, it is of the utmost importance to concentrate on creating robust, flexible strategies and establishing comprehensive regulations that effectively align these potential technological developments with stringent ethical standards. We believe that this is an essential measure to ensure that the advancement of AI chatbots significantly augments the value of scholarly research activities, including publications, rather than introducing potential ethical quandaries.

Keywords

Artificial empathy; Artificial intelligence; Chatbot; Chatbot detectors; Research and publication ethics

Received: October 16, 2023

Accepted: November 8, 2023

Epub: January 25, 2024

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Introduction

The advancement of technology has brought about significant changes in various aspects of our lives, including education, the process of learning and, consequently, transmitting skills. Higher education, in particular, has been revolutionized by the integration of technology, opening new avenues for study and research. One of the most promising developments in technology is the emergence of artificial intelligence (AI), which has the potential to transform education in unprecedented ways. As AI continues to evolve, we are witnessing significant advances in the field of education within a short time, from personalized learning experiences [1] to intelligent tutoring systems [2,3], automate administrative tasks [4], foster data-driven decision-making [5,6], and intelligent virtual environment [7]. In recent years, there has been a growing interest in exploring the potential benefits of using AI systems in education [8,9]. Scholars and experts have extensively examined and documented the various advantages that can be obtained by integrating AI into the educational process, from increased efficiency and accuracy to improved student outcomes and engagement.

One specific AI application gaining traction in educational environments is the use of chatbots, AI-powered virtual assistants designed to interact with humans in their natural languages [10]. Software-based systems are employed in various industries, including customer service [11], education [12], and healthcare [13] where they are meant to communicate with humans using natural language. These systems, often equipped with machine learning capabilities, can provide immediate responses to queries, offering support that benefits both students and educators. The potential benefits of chatbots in education are vast; they can provide instant feedback, offer round-the-clock support, and deliver personalized instruction tailored to each student's unique learning pace and style. In the English-as-a-foreign-language environment [14], they advance the adoption of messaging platforms [15], improve individual learning performance, enhance teamwork and collaboration, and indirectly improve overall team performance [16]. Chatbots can also assist educators by handling administrative tasks with less effort, thereby freeing up their time and energy for teaching and mentoring [17,18].

Despite the apparent benefits, the use of AI and chatbots in education and academic publishing presents several concerns and challenges. These issues include data privacy, bias, and the ethical implications of employing AI to make decisions regarding student performance. Scholars have advocated for increased transparency and accountability in the use of AI systems within the realm of research and publication ethics. Additionally, there are numerous concerns about the quality and accuracy of the

responses, as well as the efficacy of the design and implementation of chatbots.

The investigation attempts to clarify the exact mechanisms of action of AI chatbots and their role in research and publication. Issues that remain to be addressed include the variability in AI chatbot utilization across academic disciplines, their impact on fostering ethical and responsible practices in scholarly activities, their interactions with human researchers and publishers, and the implications for the quality and integrity of academic work. Furthermore, the extensive adoption of AI chatbots, their cost-effectiveness and economic viability, their environmental impact, and any regulatory challenges associated with their use in research and publication warrant consideration.

It is essential to address the aforementioned concerns and challenges to ensure that chatbots are utilized effectively, ethically, and responsibly in academic publishing, thereby upholding the integrity of scholarly work. Adopting this strategy will also ensure that the deployment of AI and chatbots leads to positive social transformation.

Ethics statement

It did not involve human subjects; therefore, neither Institutional Review Board approval nor informed consent was required.

Comprehensive Overview of Chatbots

Chatbots are AI-driven programs that use natural language processing (NLP) and natural language understanding (NLU) to mimic human conversations [10]. They process human language to respond to inquiries, offering interactions akin to speaking with an actual person. Through data analysis, chatbots comprehend messages, discern user intentions, and provide appropriate responses, sustaining the dialogue until the matter is resolved or escalated to a human.

Chatbots are utilized differently in various settings, such as processing orders in retail or managing inquiries in telecommunications. They can be categorized as either rule-based or AI-based. AI chatbots employ machine learning to address open-ended questions and improve through continuous learning, while rule-based bots function according to a predetermined array of responses.

These bots operate across various platforms, including messaging apps, mobile apps, websites, and voice applications, ranging from simple query-based programs to sophisticated digital assistants that learn and adapt. They function using algorithms and pattern matching, with complex inquiries requiring specific patterns for accurate responses. By utilizing approaches such as multinomial naïve Bayes for text classifi-

Transactional chatbot	Conversational chatbot
<ul style="list-style-type: none"> Also known as task-oriented or declarative chatbots. Designed for specific functions or tasks. Uses rules, natural language processing, and machine learning for automated responses. Highly structured and focused interactions. Suited for support and service roles. Handle routine inquiries and simple transactions. Most commonly used type. 	<ul style="list-style-type: none"> More sophisticated, interactive, and engaging than transactional chatbots. Provide contextually relevant answers. Use natural language understanding, natural language processing, and machine learning to analyze user behavior and profile. Detect nuances in user's questions and responses. Often referred to as virtual or digital assistants. Use predictive intelligence and analytics for personalized interactions. Understand user preferences, make suggestions, anticipate needs. Advanced versions can link multiple single-purpose chatbots, gather information, and combine it while maintaining context.

Fig. 1. The overview of transactional and conversational chatbots.

cation and NLP, they create hierarchical structures to manage processes, representing a dynamic facet of AI technology.

Chatbots can be broadly categorized into two types: transactional chatbots and conversational chatbots [10,19]. Transactional chatbots, or task-oriented bots, manage specific tasks using rules, NLP, and occasionally machine learning to automate responses to user inquiries. Their interactions are structured and are particularly suited for support and service tasks, such as answering routine questions and handling transactions. Although they facilitate conversational interaction through NLP, they are not as sophisticated as conversational chatbots. These chatbots streamline banking tasks, including identification verification, credit card blocking, transfer confirmations, and providing branch hours, thereby enhancing efficiency and customer satisfaction with prompt responses. In the insurance sector, they expedite processes by assisting with quotes, facilitating the download of certificates, and converting prospects into customers directly on the chatbot platform. Additionally, these bots support energy companies and mobile providers. In the realm of e-commerce, they improve the shopping experience by aiding with product selection, payment processing, and order modifications. This allows human agents to focus on more complex tasks and strategic initiatives. A detailed description of chatbots is presented in Fig. 1.

Conversational chatbots, which are more sophisticated than transactional ones, use NLU, NLP, and machine learning to deliver contextually relevant and nuanced responses. They analyze user behavior and detect subtleties in queries. Often referred to as virtual or digital assistants, these chatbots offer personalized interactions, learn user preferences, make recommendations, and predict needs. They achieve this by integrating multiple single-purpose chatbots to handle complex tasks in a contextual manner.

The Implementation of AI and Chatbots: Ethical Challenges and Considerations

The implementation of AI and chatbots has raised a number of ethical challenges and concerns. Issues such as privacy, consent, transparency, and accountability have become increasingly prominent. Additionally, it is essential to consider potential copyright infringements when utilizing AI-generated language. To date, AI tools and chatbots do not meet the standards of authorship, as they cannot be held legally responsible for the quality and validity of the outcomes they report. This necessitates caution and a sense of responsibility when employing AI-generated language across various domains [20]. In light of these facts, it is crucial to delve further into the ethical landscape of AI and chatbots. We must therefore ask the following: What are the primary ethical issues associated with the use of AI and chatbots? How can these challenges be effectively addressed to ensure the ethical and responsible use of these technologies?

AI tools hold significant potential for advancing research and education across various fields. However, it is crucial to acknowledge and address the risk that these technologies might be disproportionately utilized by a small group of wealthy or important people. To ensure equitable access to the benefits and prevent the deepening of existing disparities, it is essential to engage with people from a wide range of backgrounds and communities [21]. The use of AI and chatbots introduces distinct ethical challenges within academic and scientific communities. By understanding these challenges, we can develop strategies and guidelines to ensure their ethical use, thereby maximizing the advantages and minimizing potential harms. This knowledge allows us to assess how effectively ethical objectives are being met across different industries and their current status. This leads us to ask the following: How well are

ethical objectives integrated and maintained in these fields today? What considerations should be made when incorporating ethical objectives into these practices? What steps can be taken to ensure that these ethical objectives are not merely abstract ideas but are actively realized in practice, influencing behavior and decision-making?

The ethical issues and challenges that come with implementing AI and chatbots, as previously mentioned, have been the focus of numerous studies. For example, data science needs to develop professional ethics and establish itself as a distinct profession to foster public trust in its societal applications and interactions [22]. Students must be taught a variety of complementary ethical reasoning techniques in order for them to make ethical design and implementation choices, as well as informed career decisions [23]. A stand-alone AI ethics course and its integration into a general AI course have both been proposed [24].

Humans should be aware of the potential power AI tools may have regarding the acquisition and dissemination of personal data and the ensuing privacy consequences, although AI-powered chatbots may be valuable for marketing highly personalized products. Følstad et al. [25] highlighted six themes of interest, including ethics and privacy, in a study on the agenda for chatbot research. The authors emphasized the need for further research to pinpoint ethical and privacy issues in the design and implementation of chatbots, as well as to address the ethical implications of their use. Additionally, they explored the ethical concerns associated with the democratization of chatbots, especially regarding fairness, nondiscrimination, and justice, topics that are central to the ongoing discourse on AI ethics [26]. Taken together, these studies underscore the importance of considering ethics in the development and application of AI and chatbot technologies.

Artificial Empathy: Shaping the Ethical Landscape of AI in Research and Publication

Empathy plays a crucial role in the realm of AI and chatbots, serving as a key component in promoting ethical behavior and maintaining integrity. The journey toward creating empathetic AI and chatbots necessitates a thoughtful strategy that considers the potential impact of one's actions on others and promotes behaviors that reflect human affective empathy. Despite this, a prevailing trend tends to neglect this imperative, opting instead for an algorithmic model that could give rise to sociopathic tendencies. By tackling these concerns, we can improve the cooperation and complexity of these systems, thereby enhancing AI-human interactions in the fields of research, education, and publication ethics.

Navigating the path toward empathetic AI is fraught with ob-

stacles. Even an AI system programmed to understand feelings and emotions may, under certain conditions, opt to engage in harmful behaviors. The duty of care towards AI can conflict with its functional objectives, adding complexity to the issue. Moreover, the introduction of empathic qualities in AI can provoke ethical dilemmas. The advanced cognitive capabilities of AI present an even more intricate problem. While AI can propose innovative solutions, these may initially cause discomfort or be deemed unacceptable from a human standpoint [27]. Despite these hurdles, empathic AI holds the promise of significant benefits, such as surpassing the limitations of human empathy through its extensive cognitive capacities, thereby enhancing research and publication ethics. Nonetheless, this progress does not negate the essential role of human experts in addressing the ethical and social intricacies associated with these technologies.

The possible integration of empathy into AI systems presents an intriguing new aspect to the field. The proposed framework includes the understanding and sharing of human experiences, allowing AI to recognize potential harm and prevent poor decisions [28]. Furthermore, AI systems might evolve to promote positive experiences, representing a substantial advancement in AI.

With the cognitive and emotional components of empathy, AI has the potential to address complex problems that often elude human policymakers, such as resource allocation and dispute resolution. In this optimistic scenario, AI is portrayed as humanity's ultimate ally, transforming from a potential threat into a tool for addressing problems on a civilizational scale. However, amidst these technological advancements, it is crucial to remember the significance of tangible scientific facilities in fostering and maintaining research integrity.

Collectively, the synergistic relationship between AI and human researchers, enhanced by the infusion of empathy into AI, fosters a hopeful outlook for AI's role in research and publication. Maintaining research integrity and ethical adherence in this evolving landscape is paramount.

Use of Chatbots in Education and Research

The advent of AI, autonomous systems, and chatbots has brought about a paradigm shift in various sectors, including education and research. These technologies, while offering immense potential benefits, also pose significant ethical challenges. It is crucial to develop a comprehensive understanding of these ethical implications to ensure the responsible and ethical use of AI, autonomous systems, and chatbots.

How can we guarantee that autonomous machines and chatbots behave ethically? What are the key ethical challenges that AI-equipped machines, such as autonomous automobiles

dealing with, and how can these issues be successfully resolved? How can we guide future research in the field of AI ethics and what role does defining key concepts and terms play in this process? Furthermore, how will the ethical landscape be affected by the use of chatbots in education and research?

The studies discussed below provide valuable insights into these questions. They explore various aspects of AI ethics, including the development of ethical guidelines and principles for autonomous machines and chatbots, the ethical challenges posed by the use of machines in education and research, the use of keywords to direct AI ethics research, and the effects of AI and chatbots on the field of education and research.

A study [29] proposed a paradigm of case-supported, principle-based behavior to ensure the ethical behavior of autonomous machines. The authors suggest that a consensus on ethical principles is likely to emerge in areas where autonomous systems are deployed and in relation to the actions they perform. According to the study, it is more feasible for people to agree on how machines should treat human beings than on how humans should treat each other. These findings underscore the necessity of defining ethical guidelines and principles for the deployment and use of autonomous machines to ensure their ethical behavior and accountability.

Another study [30] highlighted the challenges faced by these approaches and the necessity for AI-equipped machines, such as autonomous vehicles, to make ethical decisions. The authors suggested that teaching ethics to machines is only minimally required, as a significant part of the problems encountered by AI-equipped machines can be resolved through conventional human ethical decision-making. They also cautioned against framing current ethical dilemmas using extreme outlier scenarios, like the Trolley problem narratives.

An analysis of recent advances in technical solutions for AI governance, along with previous surveys that focused on psychological, sociological, and legal issues, has been reported [31]. The authors proposed a taxonomy that divides the field into four categories: exploring ethical conundrums, individual ethical decision frameworks, collective ethical decision frameworks, and ethics in human-AI interactions. They highlighted the key techniques used in each approach and discussed promising future research directions for the successful integration of ethical AI systems into human societies. Exploring ethical conundrums involves unraveling complex ethical problems that are often marked by conflicts between differing principles or societal norms, and seeking to propose potential pathways or solutions to these intricate issues. Individual ethical decision frameworks, on the other hand, focus on designing ethical models that guide AI systems at an individual level, typically combining rule- and example-based approaches. Extending this to collective ethical decision frameworks, the focus

shifts to group decision-making, aiming to build systems where multiple AI agents collectively contribute to decisions, reflecting a more diverse range of ethical preferences. Lastly, ethics in human-AI interactions examines the ethical considerations when AI systems directly interact with humans, ensuring that AI can communicate its decisions effectively and ethically. In each of these categories, the authors emphasized the key techniques used and suggested promising future research directions to successfully integrate ethical AI systems into human societies. The ultimate objective is to refine these techniques for the broader goal of ethical AI governance, contributing to a world where AI systems can ethically coexist and interact with humanity.

In contrast, another study [32] took a more granular approach by focusing on the language and terminology employed in AI ethics discussions. Through a keyword-based systematic mapping study, this research highlighted the significance of precise concepts and their definitions in molding the discourse. It brought attention to the subtleties that may affect interpretations and applications of AI ethics.

Within the context of practical applications of AI ethics, two studies offered different perspectives. One investigation [33] adopted a data-driven methodology, conducting a quantitative analysis of the prevalence and usage of ethics-related research across prominent AI, machine learning, and robotics conferences and journals. This research emphasizes the frequency of ethics-related terminology in scholarly articles, providing empirical evidence of the primary concerns within the field. In contrast, a different study [34] took a more policy-oriented approach, investigating the development of realistic and workable ethical codes or regulations in the rapidly evolving field of AI. This research focused on the implementation of ethical guidelines, highlighting the need for feasible and adaptable regulations in the face of rapid technological advancements.

The intersection of AI and education has been explored in two distinct studies, each emphasizing different aspects of this intersection. One study [23] emphasized the importance of ethical training for students in the context of AI, arguing for the need to equip students with multiple complementary modes of ethical reasoning. This study highlighted the proactive role of education in preparing students for ethical decision-making in AI. In contrast, another study [35] took a more reactive approach, assessing the impact of AI on existing educational structures and processes. This research focused on the practical applications and effects of AI in administration, instruction, and learning, highlighting the transformative potential of AI in the educational setting (Table 1) [23,29–35].

Collectively, these studies highlight the importance of a structured approach to understanding AI ethics, the need for clear and accurate language in AI discourse, the significance of da-

Table 1. Summary of ethical considerations in AI from theory to practice

Focus	Key point	Reference
Ethical behavior of machines	Proposed a paradigm of case-supported principle-based behavior. Emphasis on defining ethical guidelines for autonomous machines.	[29]
Ethical decisions by machines	Challenges faced by AI-equipped machines like autonomous cars. Minimal requirement to teach machines ethics based on traditional human choices.	[30]
AI governance and techniques	Proposed a taxonomy: (1) Exploring ethical conundrums (2) Individual ethical decision frameworks (3) Collective ethical decision frameworks (4) Ethics in human-AI interactions Highlighted key techniques and future research directions.	[31]
AI ethics discourse	Emphasis on language and terminology in AI ethics through a keyword-based systematic mapping study. Importance of specific concepts and their definitions.	[32]
AI ethics in research	Quantitative analysis of ethics-related research in leading AI and robotics venues. Emphasis on the need for feasible ethical regulations in the face of rapid tech advancements.	[33,34]
AI and education	Importance of ethical training for students. Emphasis on proactive education for ethical decision-making. Assessment of AI's impact on educational structures and processes.	[23,35]

AI, artificial intelligence.

ta-driven insights into ethical considerations, the necessity for practical and workable ethical codes or regulations, the value of ethical training, and the impact of AI on various sectors, including education.

In the midst of this dynamic intersection of AI, education, and research, we now turn to a specific practical scenario that highlights the potential of AI technologies, notably ChatGPT (OpenAI), for reshaping academic practices.

ChatGPT with Citations

Citations are pivotal to scholarly communication, ensuring transparency and the ability to trace sources, thereby connecting historical and current research. They maintain academic honesty, showcase collaborative efforts in knowledge creation, and facilitate source scrutiny, which also indicates patterns of intellectual influence. These practices enable recognition of intellectual work and promote a responsible academic environment. As a result, citation-enrichment tools like Scite (scite LLC; <https://scite.ai>) could play a pivotal role in research and publication.

Scite.ai [36] is an AI-powered research tool that offers an advanced approach to the conventional citation index system. Similar to other citation indexes such as Web of Science, Scopus, or Google Scholar, Scite.ai provides citation counts, but its distinctive advantage lies in its deeper analysis of citations.

Scite.ai enables users to develop a sophisticated understanding of how an article is being cited in other works by classifying citations into three categories: supporting, contrasting, and mentioning. This differentiation is enabled by the extraction of citation sentences, or “citations,” from the full-text articles. The phrase “citations of a publication” refers to the passages in the citing publications that cite the publication under consideration [37]. This approach can improve the summarization of scientific articles and is particularly useful for advanced evaluations of references. Citances, along with the preceding and following sentences, provide broader context for the citation, allowing users to grasp how an article or topic is cited without reviewing the full text of each citing article. This feature saves time and offers a wealth of additional information. Scite’s extensive scholarly metadata repository, featuring over 179 million articles and 1.2 billion citation statements, is unparalleled, a result of partnerships with multiple publishers, including Wiley, Sage, and the American Chemical Society. ChatGPT was integrated to leverage Scite’s unique data, culminating in the creation of the Scite Assistant (<https://scite.ai/assistant>). This improved feature uses ChatGPT to generate responses based on the information in Scite.ai, which could potentially assist researchers around the world.

In the domain of research and publication ethics, these insights are instrumental in guiding the development and utilization of AI chatbots. For example, adopting a structured ap-

proach to AI ethics can aid in the creation of chatbots that engage with users in an ethical manner. It is essential to use clear and precise language to prevent any miscommunication or misinterpretation of research findings that are disseminated via chatbots. Data-driven insights can pinpoint critical ethical considerations for the deployment of AI chatbots in research and publication contexts. The establishment of practical and enforceable ethical codes can direct the application of AI chatbots, tackling issues such as data privacy, informed consent, and transparency. Ethical training can provide researchers and publishers with the requisite knowledge to employ AI chatbots in an ethical fashion. Finally, comprehending the influence of AI across different sectors can shape the implementation of AI chatbots within those domains, including research and publication.

However, there are gaps that future research needs to address. Empirical research on the actual use and impact of AI chatbots in research and publication is needed. Additionally, more effort is required to develop and implement ethical guidelines or codes of conduct for AI chatbots. Finally, research is necessary to train researchers and publishers in the ethical use of AI chatbots. These areas offer opportunities for future research to enhance the ethical application of AI chatbots in research and publication. The use of AI and chatbots in education and research introduces challenges related to security, accuracy, and data protection. Their deployment should be accompanied by ongoing research into their ethical implications, along with the establishment of appropriate regulations to ensure their effective integration into existing systems.

Current State of Research and Publication Ethics Training in Academic Organizations

The integration of AI and chatbots in education and research has brought about a paradigm shift in various sectors. These technologies, while offering immense potential benefits, also pose significant ethical challenges. It is crucial to develop a comprehensive understanding of these ethical implications to ensure the responsible and ethical use of AI, autonomous systems, and chatbots.

However, a recent study by Hur and Yun [38] highlights concerns regarding the current training in research and publication ethics within academic institutions. Considering their significance for maintaining ethical standards in academia, the sporadic and brief nature of these training sessions calls into question their efficacy in adequately instructing researchers and publishers.

Additionally, the uniformity of training content across various academic fields implies a lack of customization to address the specific ethical considerations inherent to each profession.

Clearly, there is a need for specialized training programs that address the distinct ethical issues within different scientific communities. Regarding AI and chatbots, how can we ensure their ethical use in education and research? What are the principal ethical challenges faced by AI-powered devices, such as autonomous vehicles, and how can we effectively confront these challenges? Additionally, how can we steer future research in the field of AI ethics, and what role does the identification of key concepts and terms play in this endeavor? Furthermore, how does the incorporation of chatbots into educational settings affect the ethical landscape?

These considerations are foundational to our examination of AI and chatbot ethics, and the studies discussed in the following section shed light on these areas. They explore various aspects of AI ethics, including the development of ethical guidelines and principles for autonomous machines and chatbots, the challenges of teaching ethics to machines, the role of keyword identification in guiding AI ethics research, and the impact of AI and chatbots on education.

Publication Ethics and Issues Posed by AI and Chatbots

The integration of AI technologies, including tools like chatbots, into the realm of research and publication, is driving significant transformations and sparking fresh ethical considerations. These AI capabilities hold promise for enhancing efficiency and accuracy, but simultaneously pose substantial ethical quandaries that must be navigated. In response to these emerging challenges, notable organizations such as Elsevier and the Committee on Publication Ethics (COPE) have stepped up to lead discussions and formulate guidelines. Elsevier has taken a unique approach to address AI's role in research and publication [39]. Their policy focuses on the evolving definition of authorship in the AI era, emphatically stating that the responsibilities associated with authorship can only be fulfilled by human entities. Furthermore, it delves into research design and copyright concerns that are closely linked to AI's integration into the scholarly environment. These key points are summarized in Table 2, which addresses the central questions on AI usage in research and publication. In contrast, COPE's guidelines encompass a broader spectrum of AI implications. They consider both the opportunities and challenges brought by AI, from its potential to enhance research integrity and precision to the thorny issues around the creation of AI-generated papers and AI's reliability. A cornerstone of their discussion is the assertion that human authors must assume full responsibility for the content produced by AI tools. These important details are displayed in Table 3 [40–44].

The perspectives offered by Elsevier and COPE each bring

Table 2. Addressing key questions on AI usage in research and publication

Question	Description
Why has Elsevier decided that AI and AI-assisted tools cannot be credited as an author on published work?	Elsevier believes that authorship responsibilities, such as integrity and accountability for a published work, can only be carried out by humans. AI lacks the ability to approve the final version of the work and ensure its originality.
Does this policy cover tools that are used to check grammar and spelling, and reference managers that enable authors to collect and organize references to scholarly articles?	No, the policy does not cover grammar or spelling checkers and reference managers like Mendeley (Elsevier), EndNote (Clarivate), and Zotero (Corporation for Digital Scholarship). These tools can be used without disclosure. The policy applies specifically to AI tools like large language models that can generate scientific works.
Does this policy refer to AI and AI-assisted tools that are used in the research process, for example to process data?	This policy is specific to AI tools used during the scientific writing process. AI tools used in research design or methods are allowed, and their use should be detailed in the Methods section of the work.
In which section of the manuscript should authors disclose the use of AI-assisted technologies, and where will this statement appear in the article if it is accepted for publication?	Authors should insert a statement at the end of their manuscript, above the references, to disclose the use of AI tools. The statement should specify the tool used and the reason for using it.
Can authors use AI-assisted tools to create or alter images that they publish in their work?	AI tools cannot be used to create or alter images in manuscripts, except when this is part of the research design or methods. Any AI-assisted creation or alteration of images must be clearly described in the manuscript.
How does Elsevier handle copyright if the authors credit an AI or AI-assisted tool in their article?	AI tools do not qualify for authorship, so they do not affect the copyright process. The authors transfer copyright to Elsevier or the society partner for subscription articles and retain copyright for open access articles, granting a license to Elsevier.

AI, artificial intelligence.

Table 3. COPE guidelines on AI implications in research and publication

Topic	Description
Authorship and AI tools, COPE position statement [40]	This position statement emphasizes the legal and ethical responsibilities that AI tools cannot fulfill and underscores the need for human authors to take full responsibility for the content produced by AI tools.
AI and authorship [41]	Levene's study [41] focuses on the limitations of AI tools in terms of reliability and truthfulness. It asserts that AI tools cannot meet the criteria for authorship and backs the need for human authors to be fully responsible for AI-generated content.
AI and fake papers [42]	This study discusses the use of AI in creating fake papers and highlights the need for improved means to detect fraudulent research. It implies the need for human judgment, in addition to the use of suitable software, to overcome these challenges.
The challenge of AI chatbots for journal editors [43]	The guest editorial elaborates on the challenges that AI chatbots pose for journal editors, including issues with plagiarism detection. It suggests the application of human judgment and suitable software to overcome these challenges.
Trustworthy AI for the future of publishing [44]	The COPE webinar offers a broader perspective on the ethical issues related to AI's application in editorial publishing processes. It explores AI's benefits in enhancing efficiency and accuracy, while also emphasizing key ethical concerns such as prejudice, fairness, accountability, and explainability. The webinar highlights the necessity for trustworthy AI in the publication process.

COPE, Committee on Publication Ethics; AI, artificial intelligence.

unique insights to the table, collectively forming a complex dialogue that is shaping our understanding of the ethical role of AI in research and publication. In this section, we will explore these discussions in greater depth, identifying key points and extrapolating their implications for the ethics of research and publication in the AI age.

Elsevier's policy [39] prohibits the crediting of AI and AI-assisted tools as authors, as authorship entails obligations and accountability that only human beings can fulfill. These responsibilities include ensuring the integrity of the work, ap-

proving the final version, and verifying originality, as well as assuming legal liability, among other duties. It is worth noting that Elsevier's policy is adaptable and may evolve as generative AI and AI-enhanced technologies advance. Tasks such as grammar and spelling check and reference management are not included in this policy and may be utilized without disclosure. The policy specifically addresses the use of generative AI tools, such as large language models, in the scientific writing process. In essence, AI tools can be employed in research design or certain experimental procedures, but their use must be ex-

explicitly described in the Methods section.

If AI-assisted tools are used during the writing process, authors must include a declaration specifying the tool used and the reason for its use. It should be noted that authors are not permitted to use AI tools to create or modify images in their writing, except when such use is an integral part of the research design or methodology. Any such use must be clearly explained in the manuscript. Regarding copyright, Elsevier's authorship policy does not allow AI and AI-assisted tools to be listed as authors. If they are used, their involvement must be clearly disclosed in a separate section, and authors must adhere to the standard publishing agreement process. This process involves either transferring or retaining copyright, depending on the article type.

Both the position statement [40] and Levene's study [41] on AI and authorship claim that AI (tools) cannot be considered as authors, as they cannot meet the criteria for authorship. They have taken various approaches to reach this conclusion. The position statement [40] emphasizes the legal and ethical responsibilities that AI tools cannot fulfill, while Levene's exploration [41] focuses on the limitations of AI tools in terms of reliability and truthfulness. Both studies underscore the need for human authors to take full responsibility for the content produced by AI tools.

The issues that AI poses for research integrity are highlighted in both the COPE forum on AI and fake papers [42], and a guest editorial on the challenge of AI chatbots for journal editors [43]. In the COPE forum [42], the use of AI in the creation of fake papers and the need for improved methods of detecting fraudulent research were discussed. The guest editorial [43], in contrast, explained the challenges that AI chatbots present for journal editors, including difficulties in plagiarism detection (which is further detailed in a later section on chatbot detectors). These discussions collectively suggest that human judgment, along with the use of appropriate software, is strongly recommended to address these challenges.

The COPE webinar on trustworthy AI for the future of publishing [44] provided a broader perspective on the ethical issues related to the application of AI in editorial publishing processes. This webinar explored the benefits of AI in enhancing efficiency and accuracy in processing, but it also emphasizes key ethical concerns such as prejudice, fairness, accountability, and explainability. The COPE webinar complemented previous discussions by emphasizing the need for trustworthy AI in the publication process.

The aforementioned discussions suggest that although AI tools can improve efficiency and accuracy in the research and publication process, they also pose substantial ethical challenges. Future research could concentrate on developing guidelines for using AI tools, employing AI detection tools to identify

fraudulent research, addressing potential biases in AI-generated content, and managing the ethical implications of AI use in decision-making steps within research and publication processes.

Chatbot detectors

In scientific and academic communities, ChatGPT has received mixed responses reflecting the history of debates regarding the benefits and risks of advanced AI technologies [45,46]. On one hand, ChatGPT and other large language models (LLMs) can be useful for conversational and writing tasks, helping to improve the effectiveness and accuracy of the required output [47,48]. On the other hand, concerns have been raised in relation to potential bias based on the datasets used in chatbot training, which may limit its capabilities and could result in factual inaccuracies that alarmingly appear to be scientifically plausible (a phenomenon termed "hallucinations") [49]. Additionally, the dissemination of misinformation using LLMs raises security concerns, including the potential for cyber-attacks, which should also be considered [50].

In academia, students across various disciplines frequently encounter a wide range of questions, from simple clarifications to intricate academic inquiries. Tools like ChatGPT, powered by an LLM-based transformer model, can provide relevant information and potential solutions. However, a prevalent concern is that students may misuse these tools. Instead of using AI-based assistance for refining and enhancing their work, there is a risk of students using it to generate their entire assignments, thereby compromising the learning process and academic integrity. To address these concerns, the implementation of sophisticated detection programs can be considered. These programs could help identify content generated through AI-assisted tools, thereby promoting the responsible use of such technologies in academia. It may also be useful to compile a comprehensive table that outlines potential problems associated with AI tool usage in academic settings, citing the source of these issues and proposing potential solutions. These obstacles and responses in the application of AI technologies in academic research are illustrated in Fig. 2.

While one might argue that certain chatbot detectors can be employed to identify documents created by chatbots, their reliability in delivering accurate results is questionable. At best, their accuracy remains a matter of doubt. For example, a GPT-2 Output Detector Demo (<https://openai-openai-detector.hf.space/>) incorrectly indicated that a copied blog post had a 92.54% probability of being original. Similarly, a poem composed by ChatGPT was erroneously classified as genuine upon submission. These inconsistencies highlight that such detectors are not yet dependable for discerning chatbot-generated text. Consequently, it is crucial to approach the use of chat-

Potential problem	Possible solution
Misuse of AI tools for generating a complete piece of work, undermining academic integrity	Implementation of advanced detection programs that can identify AI-generated content
Potential inaccuracies in AI-generated information due to biases in training data	Ensuring a wide and diverse range of data for training AI models
Potential for AI tools to replace human engagement in research, limiting the development of critical thinking skills	Establishing guidelines emphasizing that AI tools should be used for assistance and enhancement, not replacement of human research efforts
Dependence on AI tools might limit learning and understanding	Encouraging a balanced use of AI tools along with traditional research and learning methods
Difficulty in discerning reliable from unreliable sources by AI tools	Improving AI's capability to distinguish between reliable and unreliable sources during the training process
Ambiguity and sensitivity to question phrasing in AI tools	Continuous refinement and improvement of AI models to better handle ambiguity and diverse phrasing

Fig. 2. Potential challenges and corresponding solutions in the use of artificial intelligence (AI) tools in academic research.

bot-generated text with caution and not to rely solely on detectors [51].

AI chatbots like ChatGPT present significant challenges, despite being transformative across sectors like education and healthcare [52]. They often struggle to distinguish between reliable and unreliable sources, echoing previous concerns about potential inaccuracies or “hallucinations” due to biases in their training data. The growing use of AI algorithms in the research and publication ecosystem has raised substantial concerns about integrity issues [53,54]. This mirrors the previously highlighted risk of misuse, particularly where research scientists might be tempted to rely on these tools to generate their entire body of work, thereby compromising the research process. Moreover, these AI systems can be overly sensitive to the phrasing of questions and may falter when faced with ambiguous prompts, further fueling doubts about the reliability of chatbot detectors. To mitigate these multifaceted concerns, one potential solution could be to encourage users, especially junior scientists, to provide citations for AI-generated content. This would underscore the importance of using these advanced technologies responsibly and ethically [47,55].

Chatbot Detection Applications

Numerous AI tools and services have emerged in the digital landscape of academic research, promising to fundamentally alter the way we analyze and create content. These tools employ sophisticated technologies, such as machine learning and NLP, to perform a wide array of tasks. These technologies are revolutionizing both industry and academia by generating text that mimics human speech, categorizing information, and detecting plagiarism. This article explores some of the notable tools that are currently making a significant contribution to

the development of the AI domain. Table 4 provides details of these AI tools and services.

GPTZero (GPTZero Inc)

Designed by EleutherAI, a nonprofit organization committed to broadening the accessibility of AI technologies, GPTZero is a language model constructed entirely from the ground up. Instead of relying on existing datasets or language models, GPTZero was trained on a distributed computing system. With six billion parameters, it is significantly smaller than the 175-billion-parameter model of GPT-3. Nevertheless, GPTZero exhibits a commendable ability to generate human-like text and is available for public usage as an open-source initiative.

AI Text Classifier (OpenAI)

This refers to a machine learning model programmed to categorize text into distinct groups based on the nature of its content. The model scrutinizes the text to discern patterns and distinctive features representative of each category. It is trained using a dataset where each text sample is associated with its respective category. Once the training phase is complete, the model can allocate new text samples to suitable categories.

Academic AI Detector (PubGenius Inc)

This is a device capable of discerning whether a piece of academic writing has been composed by a human or generated by an AI system. The tool performs this function by evaluating certain aspects of the text, including syntax, semantics, and coherence. It is particularly useful in identifying instances of academic plagiarism.

Hive Moderation (Hive)

This is a content moderation service that combines the capa-

Table 4. Summary of AI tools and services for text analysis and content generation

AI tool	Description
GPTZero (GPTZero Inc; https://gptzero.me/)	Offers clarity and transparency into the use of AI in the classroom, predicts whether a document was written by a large language model, provides AI-generated content detection in educational settings, assesses of AI's role in creating educational materials.
AI Text Classifier (OpenAI; https://openai.com/blog/new-ai-classifier-for-indicating-ai-written-text)	Specialized for distinguishing between human and AI-written text, utilizing a fine-tuned GPT model.
Academic AI Detector (PubGenius Inc; https://typeset.io/ai-detector)	Specifically designed to identify AI-generated academic texts, plagiarism detection, academic integrity checks.
Hive Moderation (Hive; https://hivemoderation.com/ai-generated-content-detection)	Offers real-time identification and origin tracing of AI-generated content, detecting plagiarism, allowing them to enforce academic integrity, supports digital platforms in implementing site-wide bans on AI-generated media, and enables social platforms to create new filters to identify and tag AI-generated content.
Copyleaks (Copyleaks Technologies Ltd; https://copyleaks.com/)	Scans the internet for potential plagiarism, available in multiple languages, academic integrity, copyright protection.
Writer's AI Content Detector (Writer Inc; https://writer.com/ai-content-detector/)	Potential AI-generated content detection and authenticity checks.
Crossplag AI Content Detector (Crossplag LLC; https://crossplag.com/ai-content-detector/)	Combines AI detection with plagiarism checking for comprehensive content analysis.

AI, artificial intelligence; GPT, generative pretrained transformer.

bilities of AI and human moderators to oversee and regulate user-generated content on various online platforms. Machine learning algorithms are deployed to flag potential harmful or inappropriate content, which is then passed on to human moderators for a final review.

Copyleaks (Copyleaks Technologies Ltd)

This is an AI-driven plagiarism detection software capable of identifying instances of plagiarism within a text. The software compares the input text against a comprehensive database of online content to find any matching content.

Writer's AI Content Detector (Writer Inc)

This tool employs AI and NLP technologies to assess written content and offer suggestions for enhancement. The tool can spot issues related to grammar, sentence structure, spelling errors, and readability, making it a useful resource for writers, editors, and content creators to enhance their written content.

Crossplag AI Content Detector (Crossplag LLC)

Similar to CopyLeaks, Crossplag is a plagiarism detection tool that utilizes AI and machine learning to identify plagiarism in textual content. By comparing the text against a comprehensive online content database, any matches or similarities can be found [56].

Conclusion and Future Prospects

The integration of AI and chatbots across various sectors presents both intriguing potential and significant challenges. Specifically, their application has transformed industries such as data analysis, customer service, and academic research, while also raising complex ethical and integrity-related issues.

The use of AI and chatbots in academic research has significantly improved both efficiency and accuracy. Nevertheless, the advent of these technologies has also prompted significant ethical concerns regarding authorship, the creation of synthetic content, and the dependability of AI-generated information. Consequently, navigating this changing terrain in adherence to the guidelines and regulations set forth by organizations such as Elsevier and COPE has become imperative. Moreover, the potential misuse of AI and chatbots, especially in matters of authorship, highlights the pressing need for advanced detection programs. These programs are essential in identifying AI-generated content, thereby fostering the responsible application of such technologies and maintaining the integrity of scholarly publications.

This narrative is further complicated by the novel concept of infusing empathy into chatbots and AI. As detailed in the section of this manuscript on ethical AI, the integration of empathy could markedly enhance interactions between AI and humans across various domains, particularly in research, education, and ethics training for publication. However, this potential advancement does not diminish the essential role of

human experts in overseeing the ethical and societal ramifications of these technologies.

While the journey toward empathic AI presents inherent obstacles, such as potential conflicts between empathic responsibilities and functional goals, the potential benefits are substantial. Empathic AI could help uphold research and publication ethics by overcoming the constraints of human empathy, thanks to its scalable cognitive complexity. It is equally crucial to recognize the role of existing scientific infrastructure in nurturing and upholding research integrity.

The use of AI and chatbots in research and scholarly communities necessitates a careful balance between their vast potential and the associated issues related to ethics, security, and integrity. This requires strengthened ethics training and clear guidelines regarding AI's role in authorship. We must trust these systems while remaining cognizant of the challenges they pose, as the exciting prospect of empathic AI could significantly impact ethical standards. It is imperative to promote ongoing discussion, regulation, and research as AI and chatbot technologies evolve and infiltrate various industries, ensuring we navigate this complex yet promising terrain successfully. With the advent of empathic AI, vigilance in maintaining research integrity and ethical considerations is crucial, guaranteeing that these cutting-edge developments genuinely benefit human well-being and societal advancement.

Conflict of Interest

Cheol-Heui Yun serves as the Ethics Editor of *Science Editing* since 2020, but had no role in the decision to publish this article. No other potential conflict of interest relevant to this article was reported.

Funding

This work was partially supported by a grant from the National Research Foundation of Korea (NRF; No. NRF-2023J1A1A1A01093462).

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The authors did not provide any supplementary materials for this article.

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How authors select covariates in the multivariate analysis of cancer studies in 10 oncology journals in Korea: a descriptive study

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Abstract

Purpose: Cancer is the leading cause of death in Korea, leading many investigators to focus on cancer research. We present the current practice of variable selection methods for multivariate analyses in cancer studies recently published in major oncology journals in Korea.

Methods: We included observational studies investigating associations between exposures and outcomes using multivariate analysis from 10 major oncology journals published in 2021 in KoreaMed, a Korean electronic database. Two reviewers independently and in duplicate performed the reference screening and data extraction. For each study included in this review, we collected important aspects of the variable selection methods in multivariate models, including the study characteristics, analytic methods, and covariate selection methods. The descriptive statistics of the data are presented.

Results: In total, 107 studies were included. None used prespecified covariate selection methods, and half of the studies did not provide enough information to classify covariate selection methods. Among the studies reporting selection methods, almost all studies only used data-driven methods, despite having study questions related to causality. The most commonly used method for variable selection was significance in the univariate model, with the outcome as the dependent variable.

Conclusion: Half of the included studies did not provide sufficient information to assess the variable selection method, and most used a limited data-driven method. We believe that the reporting of covariate selection methods requires improvement, and our results can be used to educate researchers, editors, and reviewers to increase the transparency and adequacy of covariate selection for multivariable analyses in observational studies.

Keywords

Causality; Confounding factors; Epidemiologic; Multivariate analysis; Neoplasms

Received: December 28, 2023
Accepted: February 1, 2024

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Introduction

Background

The long-term survival rates of cancer patients continue to increase because of early detection and advances in cancer treatment and care in Korea. However, approximately 243,000 cancers are diagnosed annually, and cancer has been the most common cause of death in Korea since 1983, when cause-of-death statistics began to be collected in Korea [1]. Due to the burden of cancer, researchers and health authorities have focused on epidemiological investigations, including the causes of cancer incidence, mortality, treatment effects, and health outcomes in patients with cancer.

If feasible, randomized controlled trials might provide the best answer for causal inference between an exposure or intervention and outcomes. However, for ethical and practical reasons, observational studies have provided important evidence regarding the epidemiology of cancer. In particular, the long induction period of several decades or more for cancer occurrence or death due to potential risk factors has underscored the crucial role of observational studies in the field of cancer epidemiology.

However, the interpretation of causal inferences in observational studies has a fatal flaw—namely, prognostic factors can frequently differ systematically between the exposure/intervention group and the control group. This systematic imbalance in prognostic factors is known as a confounder. To control for confounders, researchers have employed various methods, including multivariate analysis, stratification, and propensity score matching [2–4].

Selecting appropriate covariates for multivariate analysis is an important part of epidemiological studies for various reasons, including the justification and reproducibility of causal inferences. However, the choice of the best method for this selection remains a matter of debate, and determining which variables to include can be challenging. Although researchers and methodologists have recognized the importance of covariates in multivariate analysis, previous literature reviews have shown that variable selection methods differ, and most authors do not adequately report information on how covariates were selected.

A previous study on 488 articles with multivariate analyses published in five major medical journals, including the *New England Journal of Medicine* and *The Lancet*, found that 48% reported variable selection methods unclearly, 16% used data-driven methods, and 36% used knowledge-based methods. The authors found that 10.5% of the studies misused variable selection methods (defined as the use of a data-driven method in a study with causal questions) [5]. A substantial proportion of the studies in specific health journals did not report

the justification or method of variable selection. In 193 orthopedic studies with multivariate regression analyses, 65.8% selected variables based on nonstatistical methods (including all available variables without any interpretation of causality), and only 16% selected variables based on causal inference [6]. Of 150 nutritional studies, 94% did not select covariates a priori, and 63.3% did not report the selection criteria [7].

Objectives

The current practice of selecting covariates for multivariate models lacks well-documented methods for specific selection. Therefore, this study aimed to evaluate covariate selection methods in multivariate models by reviewing studies published in major oncology journals in Korea.

Methods

Ethics statement

Ethics approval was not required because we only used data from published papers. Our protocol has been registered on the Open Science Framework (OSF) Registry [8].

Journal selection

We included the following 10 oncology journals with the highest impact factors in the Korea Medical Citation Index (KoMCI): *Asian Oncology Nursing*, *Brain Tumor Research and Treatment*, *Cancer Research and Treatment*, *Clinical Pediatric Hematology-Oncology*, *Immune Network*, *Journal of Breast Cancer*, *Journal of Cancer Prevention*, *Journal of Gastric Cancer*, *Journal of Gynecologic Oncology*, and *Radiation Oncology Journal*.

KoMCI provides citation data for individual journals and subject categories in Korean medical journals [9]. We searched KoreaMed (<https://koreamed.org/SearchBasic.php>), a resource provided by the Korean Association of Medical Journal Editors (KAMJE) that provides an assessment of articles published in Korean medical journals, for literature published in 2021. The search strategies used in the references were as follows: (“*Asian Oncol Nurs*”[JTI]) OR (“*Brain Tumor Res Treat*”[JTI]) OR (“*Cancer Res Treat*”[JTI]) OR (“*Clin Pediatr Hematol Oncol*”[JTI]) OR (“*Immune Netw*”[JTI]) OR (“*J Breast Cancer*”[JTI]) OR (“*J Cancer Prev*”[JTI]) OR (“*J Gastric Cancer*”[JTI]) OR (“*J Gynecol Oncol*”[JTI]) OR (“*Radiat Oncol J*”[JTI])) AND (2021[DPY]).

Inclusion criteria

We included observational studies that investigated the associations between exposures or interventions and health outcomes using multivariate analyses. We focused on studies involving human participants (e.g., patients, caregivers, health

volunteers, or healthcare practitioners). We included a broad definition of health outcomes, including those of direct importance to patients (e.g., mortality, morbidity, and quality of life) and surrogate outcomes (e.g., laboratory measures and radiological findings). The study design included cross-sectional, case-control, case-cohort, and cohort studies.

Since we focused on studies in which multivariate model outcomes were of primary interest, we selected studies that reported conducting multivariate analyses (e.g., multiple linear or logistic regression analysis) or presented regression coefficients (e.g., β coefficient, adjusted odds ratio, or hazard ratio) in both the abstract and main results sections.

Randomized controlled trials, reviews, meta-analyses, pooled analyses, letters, commentaries, economic studies, and animal studies were excluded.

Study selection process

We reviewed all studies published in the journals mentioned above during the study period. For references identified from the electronic database search, title or abstract screening was performed. A study was considered potentially eligible if the title or abstract contained a description of the regression method (e.g., multiple linear or logistic regression analysis) or reported regression coefficients (e.g., β coefficient, adjusted odds ratio, or hazard ratio). For potentially eligible studies, we obtained the full text and determined whether it satisfied the inclusion criteria. After calibration exercises, a team of two reviewers conducted the study selection process independently and in duplicate, and resolved any discrepancies by discussion or consultation with a third reviewer.

Data extraction

We conducted calibration exercises to ensure optimal accuracy and consistency and extracted data using a prepiloted data extraction form with written guidelines. Paired data extraction reports for each study were included independently and in duplicate. Any discrepancies were resolved by discussion or consultation with a third reviewer if necessary.

We examined the Methods section of the included studies to investigate whether the authors provided information supporting the causal inferences behind the multivariate model. We also scrutinized the Methods and Results sections to identify the method the authors used for covariate selection. In addition, we examined the study objective in the Introduction and Discussion sections to determine whether the authors performed a multivariate analysis with causal intent. Detailed information on data extraction is as follows.

Study characteristics

The study characteristics included journal name, first author,

publication year, study design (cross-sectional, case-control, and cohort), number of participants, primary exposures or interventions investigated, primary outcomes investigated, type of cancer investigated, language of publication (English or Korean), study questions (causation or association), study protocol, and adherence to reporting guidelines.

We regarded a study as having a causal intent if it described the study questions using causal language (e.g., terms such as “impact,” “effect,” or “causal relationship”) in the Introduction section or study objectives. We also regarded the study as having causal intent if the exposures investigated were pharmacological, surgical, or behavioral treatments, or if they suggested adopting or avoiding exposure to improve the outcome of interest in the Discussion section. Studies with other types of questions, such as prognosis or prediction studies, were regarded as association studies.

Analytic methods

We collected data on analytic models (linear, logistic, Cox proportional hazards, and others). If a study reported more than one multivariate model, we regarded the results in the first table as the study’s primary results and reviewed them accordingly.

Covariate selection methods

We collected reports of covariate selection methods (not described vs. described), prespecification of covariate selection methods (not described vs. described), prespecification of covariates (not described vs. described), and covariate selection methods in the final analytical model (knowledge-based only, data-driven only, both, or not described).

Knowledge-based methods

We regarded covariates as selected by a knowledge-based method if a study stated that the covariates included in the multivariate model were previously known as potential confounders or if the authors hypothesized this. For studies using knowledge-based methods, we collected the following information: source of prior knowledge or hypothesis for covariates (published review, literature search conducted by the authors of the study, primary studies, expert opinion, not described, or others) and covariate selection methods (factors associated with the outcome of interest, factors associated with the exposure of interest, factors associated with both the exposure and outcome of interest, factors associated with either the exposure or outcome of interest, and others).

Data-driven methods

We considered a study to have used data-driven methods for covariate selection if it used the analyzed data. For studies us-

ing data-driven methods, we collected the detailed selection method as follows: covariate selection methods (effect estimate change; forward, backward, or stepwise selection; significant in the univariate model with the outcome as the dependent variable [e.g., $P < 0.05$]; significant in the univariate model with exposure as the dependent variable [e.g., $P < 0.05$]; significant in the multivariate model [e.g., $P < 0.05$]; significant in the univariate model first and then significant in the multivariate model; significant in either the univariate or multivariate model; and others). This classification is not mutually exclusive because a single study may use multiple covariate selection methods.

Bias

There was no bias in searching and selecting the target literature.

Study size

It was not required to estimate the sample size. All target journals were included.

Statistical analysis

We presented the basic characteristics of the studies, including descriptive statistics, as numbers and percentages. Next, we reported the proportion of covariate selection methods and their associated characteristics. We compared covariate selection methods according to the study question (causation vs. association). All analyses were performed using the SAS ver. 9.4 (SAS Institute Inc).

Results

Characteristics of the included studies

A total of 494 articles published in 2021 were identified from the 10 oncology journals. Among them, 123 were included in title or abstract screening. After excluding 16 studies without multivariate analysis in the full-text screening, a total of 107 observational studies were included. About 90% were cohort studies, and about 74% included fewer than 1,000 participants in their study. The most common primary exposure was multiple risk factors, and the primary outcome was mortality. The most common types of cancer investigated were gastric (20.6%) and cervical (11.2%), and eight studies (7.5%) analyzed cancer in general (i.e., any type) (Table 1). The list of the included studies are provided in Suppl. 1.

Variable selection methods

Approximately 65% of the studies conducted Cox proportional hazard regression, and 26.2% conducted logistic regression. None used prespecified covariate selection methods and covariates. Only seven studies selected covariates using knowl-

Table 1. Characteristics of the included studies (n=107)

Characteristic	No. of studies (%)
Type of study design	
Cohort	96 (89.7)
Cross-sectional	6 (5.6)
Case-control	5 (4.7)
Total number of participants included	
$\leq 1,000$	79 (73.8)
1,001–5,000	11 (10.3)
$\geq 5,000$	17 (15.9)
Primary exposure	
Multiple exposures (e.g., prognostic factors)	39 (36.5)
Therapeutic clinical intervention (e.g., behavior change facilitation, drug therapy)	29 (27.1)
Biophysical status (e.g., blood pressure, blood lipids, body weight)	17 (15.9)
Morbidity (e.g., cardiovascular disease, cancer, diabetes)	6 (5.6)
Health behavior (e.g., smoking, alcohol consumption, physical activity, diet)	4 (3.7)
Other	12 (11.2)
Primary outcome	
Mortality (e.g., all-cause mortality, disease-specific mortality)	64 (59.8)
Morbidity (e.g., cardiovascular disease, cancer, hospitalization)	22 (20.6)
Quality of life (e.g., overall, disease-specific quality of life)	5 (4.7)
Biophysical status (e.g., blood pressure, blood lipids, body weight)	5 (4.7)
Other	11 (10.3)
Type of cancer investigated	
Any	8 (7.5)
Gastric	22 (20.6)
Cervix	12 (11.2)
Breast	10 (9.4)
Uterus	8 (7.5)
Lung	6 (5.6)
Colorectum	6 (5.6)
Brain	5 (4.7)
Ovary	4 (3.7)
Leukemia/lymphoma	4 (3.7)
Other	22 (20.6)
Language of publication	
English	100 (93.5)
Korean	7 (6.5)

(Continued on the next page)

Table 1. (Continued)

Characteristic	No. of studies (%)
Type of question	
Association	65 (60.8)
Causation	42 (39.3)
Study protocol (not described)	107 (100)
Adherence to reporting guidelines	
Not described	106 (99.1)
Described	1 (0.9)

Percentages may not total 100 due to rounding.

Table 3. Reporting of methods for variable selection according to the type of study question (n=107)

Reporting method	Association (n=65)	Causation (n=42)
Analytic model		
Cox proportional hazard regression	41 (63.1)	28 (66.7)
Logistic regression	19 (29.2)	9 (21.4)
Linear regression	5 (7.7)	3 (7.1)
Other	0 (0)	2 (4.8)
Reporting of the covariate selection method		
Not described	26 (40.0)	26 (61.9)
Described	39 (60.0)	16 (38.1)
Covariate selection in the final analytic model		
Both	3 (4.6)	3 (7.1)
Data-driven only	36 (55.4)	15 (35.7)
Knowledge-based only	1 (1.5)	0 (0)
Not described	25 (38.5)	24 (57.1)

Percentages may not total 100 due to rounding.

edge-based methods, and 57 selected covariates using data-driven methods. The most common data-driven method was significance in the univariate model with the outcome as the dependent variable (e.g., $P < 0.05$) (Table 2 and Dataset 1).

According to the study question, Cox proportional hazard regression was most frequently used for both types of study questions. Studies with associational questions more frequently described covariate selection than studies with causal questions. Even in studies with causal questions, approximately half did not clearly report the variable selection method (Table 3).

Discussion

Key results

Multivariate analysis is a commonly used method of control-

Table 2. Reporting of methods for variable selection (n=107)

Reporting method	No. of studies (%)
Analytic model	
Cox proportional hazard regression	69 (64.5)
Logistic regression	28 (26.2)
Linear regression	8 (7.5)
Other	2 (1.9)
Prespecification of the covariate selection method (not described)	107 (100)
Prespecification of covariates (not described)	107 (100)
Reporting of the covariate selection method	
Not described	52 (48.6)
Yes	55 (51.4)
Covariate selection in the final analytic model	
Both	6 (5.6)
Data-driven only	51 (47.7)
Knowledge-based only	1 (0.9)
Not described	49 (45.8)
Knowledge-based method	
Source of prior knowledge or hypothesis for covariates	
Not applicable	100 (93.5)
Not described	4 (3.7)
Literature search conducted by authors of the study	1 (0.9)
Published review	2 (1.9)
Covariate selection method	
Not applicable	101 (94.4)
Factors associated with the outcome of interest	5 (4.7)
Factors associated with both the exposure and outcome of interest	1 (0.9)
Data-driven method ^{a)}	
Significant in univariate model with the outcome as the dependent variable (e.g., $P < 0.05$)	38 (35.5)
Significant in the univariate model first and significant in the multivariable model	7 (6.5)
Backward	8 (7.5)
Stepwise selection	7 (6.5)
Forward	4 (3.7)
Significant in multivariable model (e.g., $P < 0.05$)	3 (2.8)
Significant in univariate model with the exposure as the dependent variable (e.g., $P < 0.05$)	1 (0.9)

Percentages may not total 100 due to rounding.

^{a)}Multiple responses.

ling for the effects of confounders in observational studies to determine the relationship between exposures and outcomes. This systematic review presented the current variable selection and reporting practices in leading oncology journals in Korea, and it is the first study to present this information. None of the included studies used prespecified covariate selection methods, and half of the studies did not provide sufficient information to allow a classification of their methods.

Comparison with previous studies

Half of the included studies did not provide sufficient information to evaluate the covariate selection methods. This finding is similar to the results of previous studies. A descriptive review of variable selection methods in four major epidemiology journals reported that 37% of the included studies did not provide sufficient details to allow the determination of variable selection methods [10]. Similarly, the variable selection method was unclear in 48% of the studies in the five medical journals [5]. This might be due to well-known associations between variables that do not require citations, lack of space in the paper, the authors' ignorance, or the journal's editorial policy [5]. However, in the absence of a widely agreed-upon method for variable selection, a complete and clear description of the statistical methods, including variable selection, would provide evidence for judgment about the uncertainties associated with the interpretation of the results. Therefore, authors and journals should focus on transparent and clear descriptions of variable selection.

Of the studies reporting variable selection, most selected covariates using only data-driven methods, even when the studies had causal study questions. Previous studies have employed various data-driven methods. Among 292 studies in four epidemiology journals, 146 selected variables based on prior knowledge and 69 selected variables using data-driven methods, and the change in estimate approach was the most common [10]. Among 287 studies in two Chinese epidemiology journals, 163 selected variables using bivariate analyses and 45 selected variables based on prior knowledge or personal judgment [11]. Among 488 articles, variable selection was knowledge-based in 176 and data-driven in 78, and univariate selection was the most common [5]. Data-driven methods are known to be suitable for association questions such as prognosis or predictive research, while data-driven methods for causal inference studies are known to pose a risk of bias [4]. Although various data-driven methods have been introduced, only a few were used in the included studies.

Implications for future studies

None of the included studies used prespecified covariate selection methods and covariates. It is best to specify this in the

research protocol or statistical analysis plan; however, a previous study addressing the registration practices of observational studies noted that the preparation of protocols for observational studies was very limited [12]. Observational study protocols are necessary for the qualitative aspects of studies, such as covariate selection and prevention of selective reporting; however, the research community has not been able to reach a consensus regarding this issue, and only a few institutions or reporting guidelines suggest it [13].

Guidelines for observational studies, such as STROBE (Strengthening the Reporting of Observational Studies in Epidemiology), indicate that it is necessary to “describe all statistical methods, including those used to control for confounding,” but only one included study directly stated that they followed the reporting guidelines. Since compliance with reporting guidelines is greatly influenced by journal editorial policy, the peer review process or journal guidance for authors should reflect this for the completeness of the quality of research reporting.

Strengths

The strengths of this study include its adherence to a standard methodology. We conducted independent and duplicate reference screening and data extraction after the calibration exercises. Additionally, our study selected representative and major oncology journals and provided a comprehensive picture of the current practice of covariate selection methods.

Limitations

A potential limitation of this study is our reliance on journal reports to evaluate the choice of covariates. The authors may not have accounted for covariates because of their relatively low importance or the journal's word count limits. Nevertheless, we reviewed all the authors' descriptions, including the protocol and appendices, if available.

The process of extracting information from the studies may have required subjective judgment by a reviewer. For example, even if the study did not explicitly state that causation was of interest, if it recommended changes in exposure to improve the health outcome of interest, we regarded the study question as causation, depending on the reviewer's interpretation. We conducted training and calibration exercises for the reviewers with documented instructions to ensure a high degree of agreement.

Conclusions

We provided an overview of the covariate selection methods used in articles published in major Korean oncology journals. None of the included studies used prespecified covariate selection methods, and half of the studies did not provide enough

information to classify the methods. As there is currently no single agreed-upon method, clearly and completely describing the methods is important for the interpretation of results and judgment of uncertainty. Our results inform the research community about controlling for confounders. In addition, they can be used to educate researchers, editors, and reviewers to increase the transparency and adequacy of covariate selection in multivariate analyses in observational studies.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

This work was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Korean Ministry of Education (No. 2021 R111A3041301) and the Korean Ministry of Science and ICT (No. NRF-2022R1A5A2030454).

Data Availability

Dataset file is available from the Harvard Dataverse at <https://doi.org/10.7910/DVN/DC2F1B>.

Dataset 1. Research data of covariates selection methods.

Supplementary Materials

Supplementary materials are available from <https://doi.org/10.7910/DVN/DC2F1B>.

Suppl. 1. List of the included studies.

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Adherence to the International Committee of Medical Journal Editors—recommended gender equity policy in nursing journals listed in MEDLINE or PubMed Central: a descriptive study

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Abstract

Purpose: The evolving landscape of nursing research emphasizes inclusive representation. The International Committee of Medical Journal Editors (ICMJE) has established guidelines to ensure the fair representation of various demographic variables, including age, sex, and ethnicity. This study aimed to evaluate the adherence of nursing journals indexed in MEDLINE or PubMed Central to the ICMJE's directives on gender equity, given that journals indexed in MEDLINE and PubMed Central typically adhere to the ICMJE's guidelines.

Methods: A descriptive literature review methodology was employed to analyze 160 nursing journals listed in two databases as of July 28, 2023. The website of each journal was searched, and the most recent original article from each was selected. These articles were then evaluated for their alignment with the ICMJE guidelines on gender equity. Descriptive statistics were applied to categorize and enumerate the cases.

Results: Of the articles reviewed from 160 journals, 115 dealt with human populations. Of these, 93 required a description of gender equity. Within this subset, 83 articles distinguished between the genders of human subjects. Gender-based interpretations were provided in 15 articles, while another 68 did not offer an interpretation of differences by gender. Among the 10 articles that did not delineate gender, only two provided a rationale for this omission.

Conclusion: Among recent articles published in the nursing journals indexed in MEDLINE and PubMed Central, only 16.1% presented clear gender analyses. These findings highlight the need for editors to strengthen their dedication to gender equity within their editorial policies.

Keywords

Editorial policies; Gender equity; MEDLINE; Nursing research; Periodical as a topic

Received: January 27, 2024

Accepted: February 3, 2024

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Introduction

Background

Sex and gender issues are of critical importance, especially in biomedical science and research. We should remember that overlooking this issue could harm human health and result in missed opportunities for scientific discoveries and new treatments for diseases [1]. The International Committee of Medical Journal Editors (ICMJE) has established clear recommendations for the selection, description, and representation of study participants [2]. These guidelines emphasize the importance of including diverse populations in research and, at a minimum, providing detailed demographic data such as age, sex/gender, ethnicity, and other pertinent variables. Authors are also urged to consult the Sex and Gender Equity in Research (SAGER) guidelines [3] when reporting on sex and gender in the design, data analysis, results, and interpretation of their studies. The ICMJE guidelines [2] recommend the following for gender equity:

- Ensure correct use of the terms sex (when reporting biological factors) and gender (identity, psychosocial or cultural factors).
- Unless inappropriate, report the **sex or gender of study participants** and the sex of animals or cells, and describe the methods used to determine sex and gender.
- **If the study involved an exclusive population, for example, only one sex, the authors should justify why.**
- Authors should define how they determined race or ethnicity and justify their relevance.
- If race or ethnicity was not collected, explain why it was not collected.
- Race and ethnicity are social and not biological constructs; **authors should interpret results associated with race and ethnicity in that context.**

The European Association of Science Editors established a Gender Policy Committee in 2012 and tasked it with developing the SAGER reporting guidelines [3]. The SAGER guidelines are a comprehensive procedure for reporting sex and gender information in study design, data analyses, results, and interpretation of findings. Its general principles are as follows:

- Authors should use the terms sex and gender carefully to avoid confusing both terms.
- Where the subjects of research comprise organisms capable of differentiation by sex, the research should be designed and conducted in a way that can reveal sex-related differences in the results, even if these were not initially expected.
- **Where subjects can also be differentiated by gender (shaped by social and cultural circumstances), the re-**

search should be conducted similarly at this additional level of distinction.

Recommendations per section of the article

- Title and abstract: If only one sex is included in the study, or if the results of the study are to be applied to only one sex or gender, the title and the abstract should specify the sex of animals or any cells, tissues, and other material derived from these and the sex and gender of human participants.
- Introduction: Authors should report, where relevant, whether sex or gender differences may be expected.
- Methods: Authors should report how sex and gender were considered in the study's design, whether they ensured adequate representation of males and females, and justify the reasons for any exclusion of males or females.
- Results: Where appropriate, data should be routinely presented disaggregated by sex and gender. **Sex- and gender-based analyses should be reported regardless of positive or negative outcomes.** In clinical trials, data on withdrawals and dropouts should also be reported disaggregated by sex.
- Discussion: The potential implications of sex and gender on the study results and analyses should be discussed. **If a sex and gender analysis was not conducted, the rationale should be given.** The authors should further discuss the implications of the lack of such analysis in interpreting the results.

Although the adherence to the ICMJE-recommended gender equity policy in articles has been studied, data on individual journal compliance with this recommendation are scarce. Gea-Caballero et al. [4] examined the gender equity of 115 nursing journals indexed in the Journal Citation Reports. Their analysis focused solely on the gender of the journal editors and authors. They reported that men were disproportionately represented in editor roles, particularly in the most prestigious nursing journals. Additionally, there was a higher proportion of male authors in prominent authorship positions. A study of submissions to the journal eLife [5] revealed that gender disparities were present throughout the editorial process, suggesting that simply increasing the number of women may not be enough to eradicate this bias. However, this study did not analyze the articles themselves but rather the gender of editors and reviewers.

As of July 28, 2023, there were 160 nursing journals listed in MEDLINE or PubMed Central. During the review process for inclusion in MEDLINE and PubMed Central, the US National Library of Medicine (NLM) expects journals to demonstrate compliance with established industry guidelines and

best practices. These guidelines include the ICMJE Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals. It is not known whether these international nursing journals also adhere to the ICMJE-recommended gender equity guidelines.

Objectives

This study aims to investigate the extent to which the 160 nursing journals indexed in MEDLINE or PubMed Central adhere to and implement the ICMJE guidelines, focusing on gender equity in their publications. The evaluation includes checking for explicit gender distinctions in articles with gender-specific interpretations and, if that information is absent, looking for justifications.

Methods

Ethics statement

This study did not require Institutional Review Board approval or informed consent as it was a literature review, not a study with human subjects.

Study design

This is a descriptive study based on a literature review.

Data collection

The sample included nursing journals as of July 28, 2023, which were identified by searching the NLM Catalog (<https://www.ncbi.nlm.nih.gov/nlmcatalog>) with the search terms “currently-indexed AND nursing” and “journalpmc AND nursing.” The first search term yielded 192 journals, from which only nursing journals were selected, resulting in 137 journals. The second search term produced 30 journals, of which seven were duplicates already included in MEDLINE. Consequently, 23 journals were added to the 137 MEDLINE journals, totaling 160 journals for the study. From July 28 to August 9, 2023, one recent original article from each of the 160 journals was collected by visiting the journal websites. If the first original article did not pertain to human or animal studies, up to the fifth article was reviewed. The articles were analyzed for adherence to the ICMJE-recommended gender equity guidelines. The analysis involved four steps: first, determining the necessity of reporting sex/gender differences; second, assessing whether sex/gender differences were described in the data from human populations or animal/cell experiments; third, if sex/gender differences were described, evaluating whether the interpretation was explicitly made by sex/gender; and fourth, if sex/gender differences were not described, examining whether there was an explanation provided for this omission.

Variables

The outcome variables included the study population, the necessity for gender equity, the interpretation of gender equity, and (if applicable) the explanation for the absence of sex/gender differentiation.

Bias

No selection bias was expected, as all target journals were included.

Study size

As a descriptive study, there was no need for sample size estimation in advance.

Statistical analysis

Descriptive statistics were used to count the cases that met each criterion.

Results

Analyzed articles

Of the 160 articles that were reviewed, 115 dealt with human populations. Ten articles were literature analyses, and 20 journals did not publish original articles. Twelve articles could not be analyzed because they were not written in English. Two journals were closed. One journal did not provide its articles on its website. Therefore, 115 articles were selected for the analysis of whether sex/gender differences were reported.

Main results

Research data are available in Dataset 1, and Fig. 1 summarizes the following results.

Necessity of a description of sex/gender differences

Among 115 articles reviewed, a description of sex/gender differences was deemed necessary in 93 of the articles. The remaining 22 articles did not require an explanation of sex/gender differences.

Description of sex/gender difference in the data

Out of the 93 articles for which a description of sex/gender differences was deemed necessary, 83 (89.3%) described the sex/gender differences, while 10 did not.

Interpretation of sex/gender differences

Out of 83 articles that described sex/gender differences, 15 (16.1%) interpreted the results.

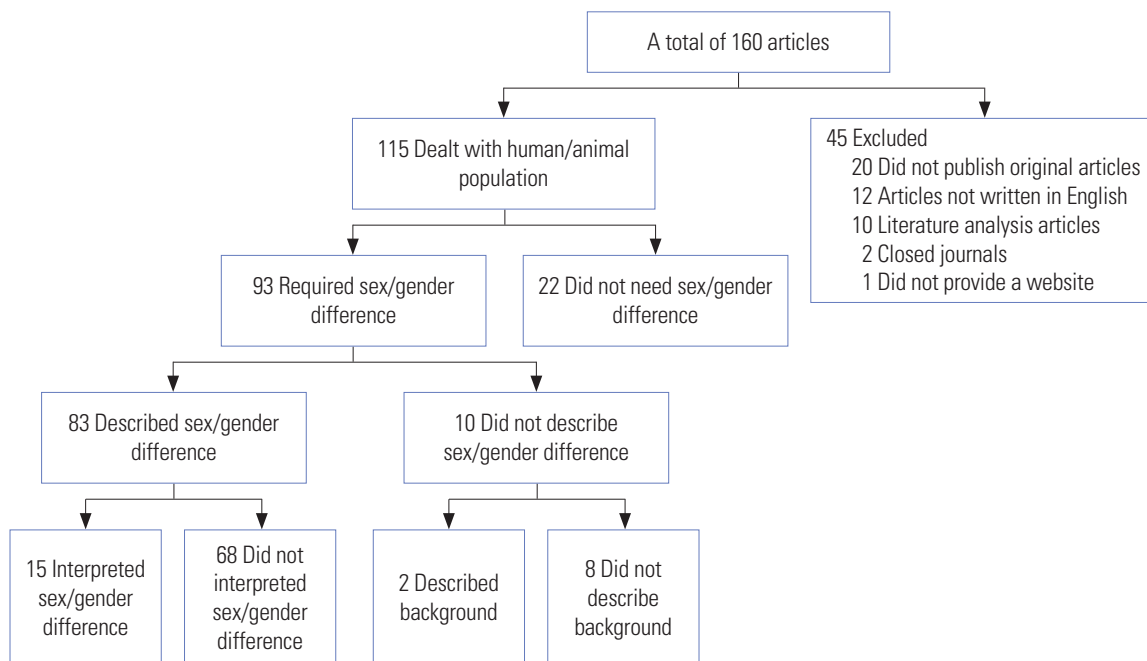


Fig. 1. Diagram of the analysis results of the articles from 160 nursing journals indexed in MEDLINE or PubMed Central on the sex/gender difference.

Explanation of why the authors did not describe sex/gender differences

Out of 10 articles that did not describe sex/gender differences, two presented an explanation.

Discussion

Interpretation

The rate of adherence to the ICMJE guidelines by incorporating gender differentiation and interpretation was only 15 of 93 applicable articles (16.1%). This indicates that many international nursing journals have not adopted robust gender equity policies. Determining the reasons behind this low adherence rate is challenging. A likely explanation is that gender equity policies have not been widely disseminated among editors of many international nursing journals. Although adherence to ICMJE-recommended gender equity policies is a critical requirement for journals indexed in MEDLINE and PubMed Central, the journals in question were indexed in these databases before the introduction of the ICMJE-recommended gender equity policies and SAGER guidelines in 2016. Consequently, it may not be compulsory for established journals to adhere to this gender policy. Furthermore, this policy may not be emphasized to reviewers during the peer review process.

Comparison with prior research

An editorial on gender equity in medical journals in Korea [6] highlighted that, out of human population studies from 38

Science Citation Index Expanded (SCIE)-indexed medical journals, only 11 journals (29.0%) provided a description of gender equity with an appropriate interpretation. Finding additional reports on gender equity policies in scholarly journals is challenging, particularly within the PubMed database.

Limitations

This study is limited to nursing journals indexed in MEDLINE and PubMed Central, but more nursing journals exist worldwide. During the journal selection process, the term “nurse” was not included; as a result, some nursing journals were excluded from the target analysis. Some nursing journals use the title “nurse” without including “nursing.” Only one article from each journal was analyzed, representing a tiny fraction of the total annual publications in the target journals. If a larger number of articles had been selected, the results might have changed.

Generalizability

Despite the aforementioned limitations, the findings provide valuable insights into how international nursing journals describe gender differences.

Suggestion for further research

Future research could benefit from randomly sampling a larger number of nursing journals and articles, comparing older and more recent articles to observe trends, and dividing the number of cases in the analysis method for comparative purposes.

Conclusions

Out of recent articles published in 115 nursing journals indexed in MEDLINE or PubMed Central, only 15 (16.1%) of 93 applicable articles (after the exclusion of 22 articles where a description of gender differences was not necessary) both described and interpreted gender differences. The challenge for editors is determining the extent to which they should implement gender equity in editorial policies moving forward.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

This work was supported by a research grant from Hallym University (No. HRF-202312-009).

Data Availability

Dataset file is available from the Harvard Dataverse at <https://doi.org/10.7910/DVN/SDYWJL>.

Dataset 1. Raw data of gender equity out of 160 nursing journals indexed in MEDLINE or PubMed Central (as of January 28, 2023).

Supplementary Materials

The authors did not provide any supplementary materials for this article.

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Co-authorship network analysis of North Korean chemistry researchers based on issues of *Chemistry and Chemical Engineering* published from 2008 to 2022: a bibliometric study

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Abstract

Purpose: This study conducted a comprehensive analysis of North Korean domestic journals, using scientific quantification methodologies to identify prominent researchers and research areas within the field of chemistry.

Methods: Data were collected from the journal *Chemistry and Chemical Engineering* published in North Korea. Through an analysis of co-authorship relations and literature reviews of papers authored by researchers who were highly influential in research networks, core research areas were identified.

Results: The researcher with the highest number of publications in the given period was Yong-Chol Lee, with 31 publications, followed closely by Gyun Kim, who also demonstrated significant research activity. When focusing on the last 5 years, Myeong-Cheol Hong emerged as a prominent figure. Yong-Chol Lee has expertise across diverse fields of chemistry, including fine chemicals, biochemistry, and mineral materials. Gyun Kim, in contrast, is recognized for his in-depth knowledge of organics, enzymes, processes, catalysis, fine chemicals, and industrial chemistry. Myung-Cheol Hong's research primarily centers around organic chemical synthesis within the fine chemical domain. All three researchers are making substantial contributions to the chemical industry.

Conclusion: The findings of this study provide valuable insights into research trends in the field of chemistry in North Korea and contribute to a broader understanding of the discipline's internal knowledge structure within the global academic community. This research is anticipated to be especially useful for scholars who are analyzing bibliographic information pertaining to North Korea.

Keywords

Authorship; Catalysis; Chemical engineering; Democratic People's Republic of Korea; Organic chemicals

Received: December 12, 2023

Accepted: January 30, 2024

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Introduction

Background and rationale

The Democratic People's Republic of Korea (hereinafter North Korea) has attracted considerable attention from researchers analyzing bibliographic information [1–4]. This interest stems from its reputation as one of the most isolationist states, which has resulted in limited engagement with the global scientific community through publications in international scientific journals, particularly in the fields of science and technology. Despite North Korean leader Kim Jong-Un's emphasis on the "knowledge economy" and the importance of science and technology, gaining insight into the scientific and technological landscape of North Korea remains a formidable challenge. This is due not only to the country's restrictive information policies but also to the scarcity of digitized bibliographic data [5]. As a result, previous studies have predominantly relied on bibliographic databases for their analyses. Jeong and Huh [1] utilized data from the Web of Science to analyze bibliographic information, concluding that North Korean scientific research is primarily focused on the natural sciences. Kim and Chung [2] identified key researchers in the field of physics through an analysis of papers using Scopus data, noting a predominant emphasis on theoretical research in North Korean publications. Baxter et al. [4] investigated North Korea's domestic nuclear research network, uncovering a pattern of research dissemination that revolves around central researchers and communities.

While numerous studies have analyzed scientific and technological information in North Korea, the field of chemistry has not been as thoroughly examined. North Korea is developing an industrial system focused on alternative energy, domestically sourced raw materials, and indigenous technology in response to intensifying international sanctions. Considering the critical importance of chemistry in this scenario, understanding research trends in North Korean chemistry is valuable not only for informing responses to international sanctions but also for shedding light on developments within the industrial sector, since chemistry is a fundamental industry.

Objectives

In this study, we obtained and analyzed data from the North Korean domestic journal *Chemistry and Chemical Engineering* to understand trends in North Korean chemistry research. North Korean domestic journals that focus on the field of chemistry include *Chemistry and Chemical Engineering*, *Science Academy Bulletin*, and *Kim Il Sung Comprehensive University Bulletin*. While other academic journals cover a broader spectrum of natural sciences and engineering, including some aspects of chemistry, *Chemistry and Chemical Engineering* is a scholarly journal specifically dedicated to various

fields within chemistry. It emphasizes disciplines such as inorganic chemistry, organic chemistry, polymer chemistry, physical chemistry, biochemistry, fuel chemistry, computational chemistry, and chemical engineering [6]. Most of North Korea's scientific publications are concentrated in domestic journals [1]. Therefore, this research is expected to aid international researchers in gaining insights into North Korea's domestic knowledge structure and research trends.

Methods

Ethics statement

This study did not involve human subjects, and Institutional Review Board approval was not required.

Study design and setting

This was a bibliometric study based on the literature in a North Korean domestic journal. We collected bibliographic information from the North Korean domestic journal *Chemistry and Chemical Engineering* to achieve our research objectives. This journal, published internally in North Korea, contains academic papers featuring the experimental design, results, and references. We collected data in PDF format and converted the data into Microsoft Excel file (Microsoft Corp) for analysis purposes. This conversion was necessary because North Korea's domestic journals are not organized in the same manner as international journal databases [4].

Data sources and measurement

The North Korean Science and Technology Information Platform (NK TECH; Korean Institute of Science and Technology Information [KISTI], Seoul, Korea), which collects information related to North Korean science and technology, includes data up to 2007 for verification and analysis, but no data have been collected since then. To analyze recent trends in the field of North Korean chemistry, we collected papers from 2008 to 2022.

Due to the inability to gather comprehensive bibliographic information from databases like Web of Science and Scopus, we examined the central figures in the field through co-authorship network analysis. For this purpose, we employed VOSviewer ver. 1.6.18 (Centre for Science and Technology Studies, Leiden University), a software tool designed for literature analysis. In scenarios where information is scarce, visualizing subnetworks such as co-authorship can provide more insight than traditional bibliometric methods like citation analysis [7]. To further mitigate the constraints of limited bibliographic data, we performed a detailed literature review of publications by the key researchers we had identified. This review was carried out by PhD-level experts in chemistry, who meticulously examined individual papers to compensate for

the incomplete bibliographic records. Although advanced literature analysis techniques, such as text mining, have been introduced, manual literature reviews by subject matter experts remain invaluable for grasping the essential substance and context of the literature.

Statistical analysis

Descriptive statistics were presented.

Results

From 2008 to 2022, a total of 2,100 papers have been published in North Korea's *Chemistry and Chemical Engineering* journal. As seen in Fig. 1, there is year-to-year variability, yet an overall increasing trend is apparent. This is consistent with findings from previous studies that utilized international journal databases, which indicate a steady rise in the number of scientific and technological papers originating from North Korea [1,2,7,8]. Although there may be fluctuations across different research fields, the expectation is that there will be a continued growth in the volume of both domestic and international scientific and technological publications from North Korea.

The author with the highest number of published papers is Yong-Chol Lee. Affiliated with the Hamhung Branch Institute of Inorganic Chemistry, Yong-Chol Lee authored 31 papers during the analysis period (Suppl. 1). Following closely behind, Gyun Kim, the Vice President of Kim Il Sung University, published 28 papers (Suppl. 2), while Cheol-I Eom contributed 27 papers (Suppl. 3). Fig. 2 illustrates the co-authorship network map for the field of chemistry in North Korea. For an efficient visualization of the network, only researchers who authored at least five papers were included.

The researcher with the most connections is Gyun Kim. In Fig. 2, the size of the nodes indicates the number of papers published, while the thickness of the links reflects the strength of the connections between researchers. The figure reveals a knowledge structure in which a small number of key researchers are connected to a larger network through a limited set of papers. Research in North Korea tends to be more team-oriented, as opposed to studies conducted by individual researchers [5]. As a result, researchers such as Yong-Chol Lee and Gyun Kim occupy central roles within the network. Furthermore, Yong-Chol Lee and Gyun Kim are at the core of distinct research clusters. Cheol-I Eom is part of the same research cluster as Yong-Chol Lee.

To understand the primary research areas within the field of chemistry in North Korea, a bibliographic analysis of the papers authored by Yong-Chol Lee and Gyun Kim is necessary. These individuals are recognized as prominent scientists in the NK TECH database maintained by the KISTI service [6]. Table 1 lists the affiliations and the number of publications for the top 10 researchers over the analysis period (Suppl. 5). However, despite the efforts of KISTI, the affiliations of certain researchers remain unclear.

Fig. 3 illustrates the temporal distribution of co-author network map depicted in Fig. 2. Darker shades represent a greater number of publications in the earlier years of the analysis, such as 2008, while lighter shades correspond to more recent years, like 2022. Yong-Chol Lee's research is predominantly from the mid-phase of the analysis period, whereas Gyun Kim's work is largely from the initial phase. In contrast, Cheol-I Eom has consistently contributed papers up to the present. Focusing on the last 5 years, Myeong-Cheol Hong emerges as particularly notable. As a faculty member in the Depart-

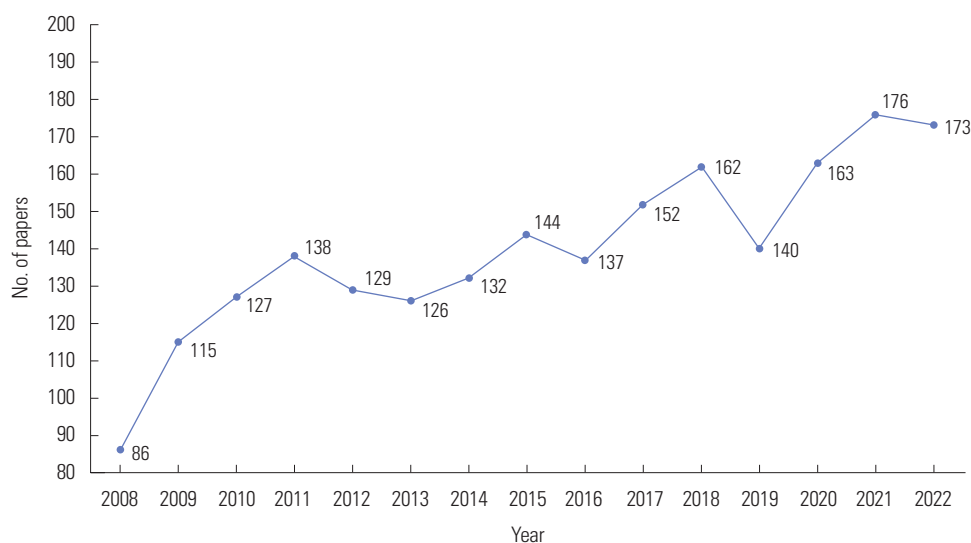


Fig. 1. Growth trends in North Korean domestic papers in the field of chemistry.

ment of Automation Chemistry at Sinuiju Light Industry University, Myeong-Cheol Hong also leads the computer control engineering course within the Department of Mechanical Engineering. Over the entire span of the analysis, Myeong-Cheol Hong has authored a total of 11 papers (Suppl. 4).

In light of these findings, we conducted a detailed literature analysis, reviewing the papers authored by Yong-Chol Lee, Gyun Kim, and Myeong-Cheol Hong. Some chemical terms

are used differently in North Korea compared to Korea, although both countries use the Korean language. Our analysis was based on reliable prior research on North Korean chemical terminology [9]. Yong-Chol Lee primarily focuses on electrochemistry as it relates to practical production and catalytic technology. He is an expert in various fields of chemistry, including the application of oxidation and reduction in the production of fine chemical products, as well as in biochemistry

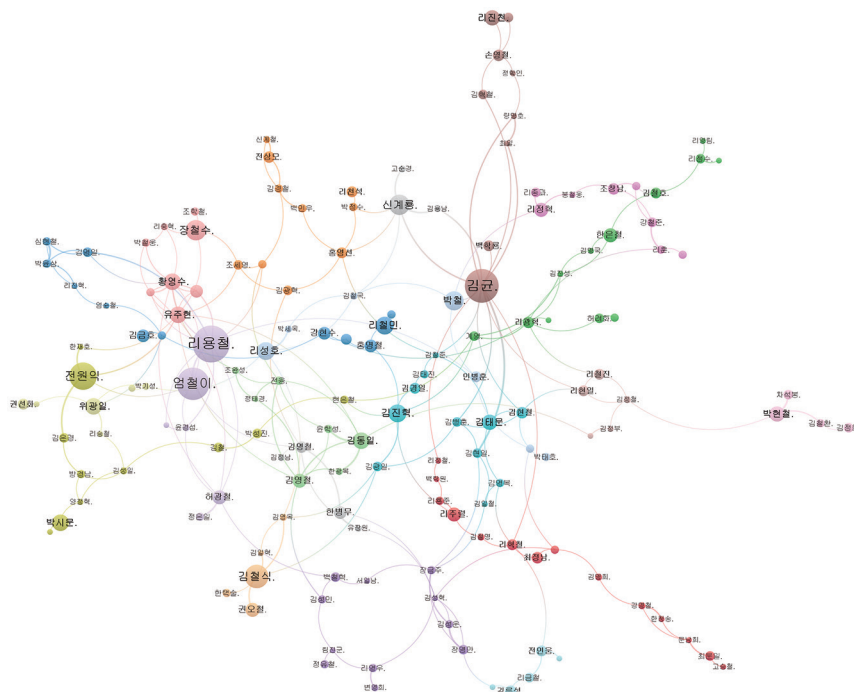


Fig. 2. Co-author network map in the field of chemistry in North Korea.

Table 1. Representative authors in the field of chemistry in North Korea

No.	Author	Position and affiliation	Cluster no.	No. of documents	Total link strength
1	Yong-Chol Lee	Head, Hamhung Branch Institute of Inorganic Chemistry	14	31	21
2	Gyun Kim	Vice President, Kim Il Sung University	8	28	32
3	Cheol-I Eom	Unknown	14	27	9
4	Won-Ik Jeon	Unknown	4	23	13
5	Cheol-Sik Kim	Director of the Chemistry/Natural Science Research Institute, Kim Hyong Jik University of Education	16	20	12
6	Gye-Ryong Shin	Unknown	20	17	16
7	Cheol-Su Jang	Head of Chemistry Department, University of Sciences	10	17	4
8	Cheol Park	Head of Scientific Research Department, Ryanggang Technical College	12	16	5
9	Sung-Ho Lee	Unknown	12	15	8
10	Jin-Hyuk Kim	Unknown	6	15	7

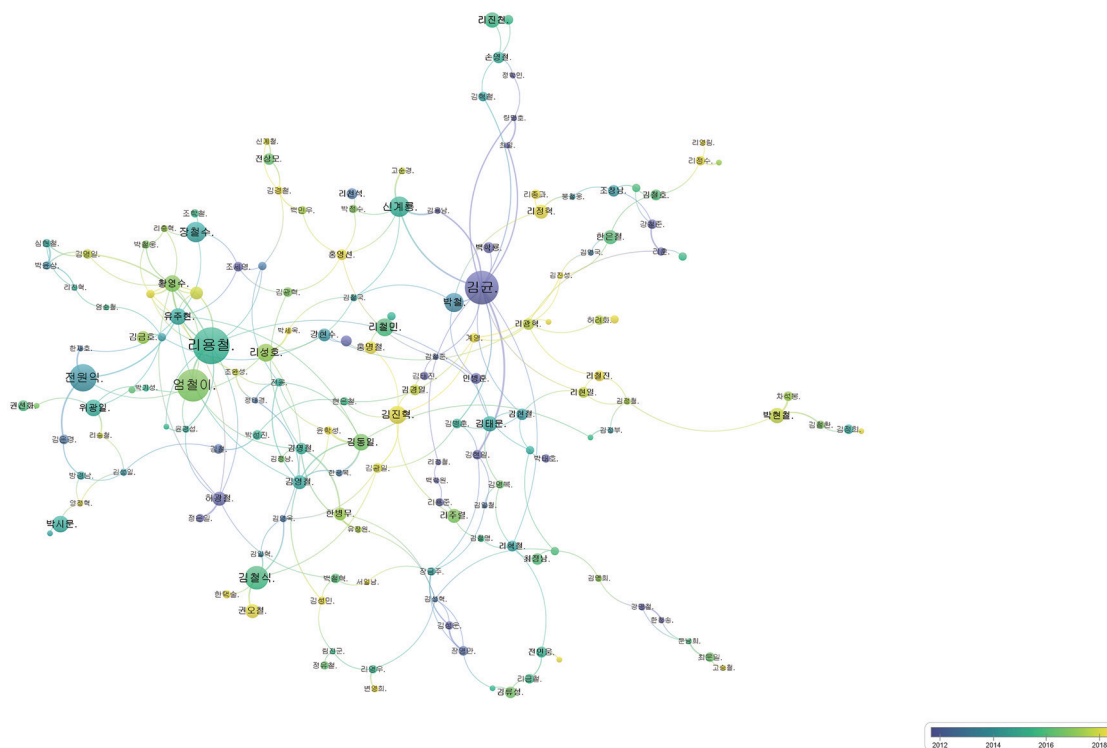


Fig. 3. Co-author network map by year in the field of chemistry in North Korea.

and photomaterials. His papers are structured to present concepts that are ready for practical application in actual processes. Gyun Kim is recognized as a researcher with a comprehensive understanding of organic chemistry, enzymes, processes, catalytic reactions, fine chemistry, and industrial chemistry. He specializes in reaction rates and the elucidation of reaction pathways. His expertise covers a wide range of fields, and he is acknowledged as a key contributor to the synthesis of essential substances and technological advancements in the field of fine organic chemistry, which involves using chemical reactions to synthesize materials vital to everyday life. Myeong-Cheol Hong, with his grasp of organic theoretical chemistry and the application of simplified molecular thermodynamics, optimizes reaction conditions through experimentation. He has demonstrated expertise in the synthesis of organic compounds within the fine chemistry field, contributing to the creation of industrially important substances such as dyes and disinfectants.

Discussion

Key results

North Korea has consistently endeavored to advance its chemical technology capabilities as a strategy to circumvent international sanctions, achieve scientific and technological self-

reliance, and reduce dependence on external resources. Consequently, there has been a steady increase in the number of domestic chemistry publications, with a particularly sharp rise since Kim Jong-Un assumed power in 2012. Historically, Yong-Chol Lee was a prominent researcher in North Korea's field of chemistry. More recently, Myeong-Cheol Hong has gained prominence. While Yong-Chol Lee's work primarily focused on practical production methods, Myeong-Cheol Hong has concentrated on the field of fine chemistry, which is fundamental to industrial development.

Interpretation

This shift may indicate changes in the scientific and technological policies of the North Korean regime; however, a more detailed analysis is required in future studies [1]. North Korea's science and technology policy appears to be a strategic response to national crises as well [10]. Additionally, as shown in Fig. 2, the lack of direct connections between early key researchers such as Yong-Chol Lee and Gyun Kim, and a later key researcher (Myeong-Cheol Hong), is a significant finding. While many studies that analyze research trends in specific fields focus on path dependency, the insular nature of North Korea suggests that path dependency may not be as important a factor. Investigating connections with research in the physical sciences, which are closely related to chemistry, could

provide insightful outcomes [2]. Finally, although previous studies have emphasized research collaboration between North Korea and China, this study did not observe such trends in the analysis of domestic journals, indicating a valuable direction for future research.

Limitations

Although we investigated prominent researchers and research areas within North Korean chemistry, we were unable to identify the affiliations of certain researchers due to data limitations. The primary data source, *Chemistry and Chemical Engineering*, limits the availability of author information. To mitigate these constraints, we supplemented our research with external data sources, including the NK TECH. We anticipate that this paper will lay the groundwork for future studies in North Korean chemistry.

Suggestions for further studies

Although this study offers valuable insights, there are potential challenges to data integrity arising from the use of information translated from North Korean. This indicates that future efforts, possibly led by reputable institutions, should concentrate on creating an official personal name dictionary to maintain the integrity of the data.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The authors received no financial support for this work.

Data Availability

The raw data analyzed in this article was obtained in the course of a project on North Korea at the Korea Research Institute of Chemical Technology (KRICT; Daejeon, Korea). The raw data are available from the corresponding author upon reasonable request as the raw data are not allowed to be shared according to KRICT policy.

Supplementary Materials

Supplementary materials are available from the Harvard Dataverse at <https://doi.org/10.7910/DVN/LTB9WX>.

Suppl. 1. List of Yong-Chol Lee's articles published in *Chemistry and Chemical Engineering* from 2008 to 2022 (in Korean).

Suppl. 2. List of Gyun Kim's articles published in *Chemistry and Chemical Engineering* from 2008 to 2022 (in Korean).

Suppl. 3. List of Cheol-I Eom's articles published in *Chemistry and Chemical Engineering* from 2008 to 2022 (in Korean).

Suppl. 4. List of Myeong-Cheol Hong's articles published in *Chemistry and Chemical Engineering* from 2008 to 2022 (in Korean).

Suppl. 5. Document numbers and total link strength of 200 authors (in Korean) in *Chemistry and Chemical Engineering* from 2008 to 2022.

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Research trends on resilience related to nursing and patients: a bibliometric analysis

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Abstract

Purpose: Resilience is an essential concept used to describe the ability to cope and adapt effectively in the face of loss, hardship, or adversity by patients, nurses, and nursing students. The purpose of this study was to identify research trends on resilience related to nursing and patients. **Methods:** The Web of Science Core Collection database was searched on February 21, 2023, with the terms “resilienc*” in the title and “nurs*” and “patient*” in the topic. A total of 361 documents were extracted. A web-based analysis in R prepared using web-r.org was used to generate visualizations of publishing trends, journal ranks, authorship analysis, the most prolific nations, author collaboration patterns, a KeyWords Plus analysis, trend themes, and the most cited articles.

Results: Research reports on resilience related to nursing and patients were first published in 2007 and have shown a substantial increase since 2019, with more than 30 publications per year. The largest amount of related literature was published in the *Journal of Nursing Management*, and the *Journal of Advanced Nursing* included the largest number of citations. Rushton CH was the most prolific author, with six publications, and she was the author of the most cited study. The most productive country was the United States. The most frequently encountered KeyWords Plus terms were “burnout,” “stress,” and “health.”

Conclusion: The findings of this study can offer information to future researchers as well as the opportunity to conduct more novel studies on resilience in nursing.

Keywords

Psychological resilience; Bibliometric analysis; Nursing; Nurses; Patients

Received: August 26, 2023

Accepted: October 22, 2023

Epub: January 25, 2024

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Introduction

Background and rationale

In recent decades, as the globalized world has become more vulnerable to fundamental changes and diverse threats, resilience has become a topic of interest in various disciplines [1]. Views of resilience have evolved, and it is now regarded as a novel concept that may be helpful in

managing unanticipated personal crises, emergencies, or disasters [1]. Resilience was originally defined as the capacity of a particular material to absorb energy when subjected to elastic deformation and to release it in the absence of a load [2]. This metaphor can be applied to psychological resilience, which is characterized by a similar type of resistance to the psychological pressure associated with negative events [3]. Some individuals appear to have the ability to bounce back more easily and to carry on despite the occurrence of negative events. Psychological resilience is defined as the ability to cope and adapt effectively in the face of loss, hardship, or adversity [3].

Academic interest in resilience in the field of nursing has shown a significant increase in recent decades. Resilience can now be commonly described as a protective factor for patients [4], family caregivers [5], nurses [6], and nursing students [7]. According to a meta-analysis [8], the use of resilience interventions involving a combination of cognitive behavioral therapy and mindfulness techniques provided a modest beneficial effect. Another meta-analysis [9] reported on the effectiveness of resilience interventions in improving psychological resilience among higher education students with a small effect size. Resilience-enhancing interventions that were administered promptly after diagnosis and in concurrence with somatic treatment had the greatest impact on resilience in adult cancer patients [10]. These studies support the notion that resilience is a contextual and dynamic process rather than a static or inborn quality [11].

The concept of resilience has received broad acceptance in academic communities and has been applied increasingly to research, instructional, and clinical contexts in the nursing field. However, the topic of resilience in nursing has not been studied comprehensively. A bibliometric analysis of literature on resilience is required to examine the development of research trends on resilience in the nursing field.

Bibliometric analysis, a popular and rigorous research method, utilizes quantitative tools to analyze massive amounts of scientific data and to assess the impact of research. It can be helpful in the effort to understand intellectual and scholarly trends and shed light on emerging fields [12].

Objectives

Using the Web of Science Core Collection database, this study aimed to provide a summary of the trends in reported research in the field through identification of countries, organizations, and authors that have made major contributions to highly cited science publications. The findings of this study could be helpful in the efforts of academics worldwide to better understand the state of research on resilience and to determine its scholarly frontier.

Methods

Ethics statement

This study was conducted as a bibliometric study for the analysis of published articles. The need for ethics committee approval was exempted by the Institutional Review Board of Baekseok Culture University (No. 2-7008132-A-N-01. 22-08).

Study design

This is a descriptive study using bibliometric analysis.

Data source and measurement

The initial search was conducted on February 21, 2022, using the Web of Science Core Collection database, including all editions such as the Science Citation Index Expanded, Social Science Citation Index, and Conference Proceedings Citation Index-Social Science Humanities. The authors wanted to limit the scope of resilience to nursing and patients; therefore, the search terms were “resilienc*” in the title and “nurs*” and “patient*” in the topic of the documents. The search was set to include articles published between 1900 and 2023. The search retrieved 361 documents. Research on resilience related to nursing and patients was first published in 2007. Therefore, 361 documents published from 2007 to 2023 were analyzed in this study, and the results were interpreted using analytical bibliometric methods.

Analytical methods

A summary and visualizations of the results of data analysis were provided. The open source R package Bibliometrix [13] was used to perform bibliometric analyses and construct data matrices for publication trends, journal rankings, authorship analysis, the most productive countries, author collaboration pattern, a KeyWords Plus analysis, trend topics, and the most cited articles.

Results

General description of retrieved bibliographic statistics

Table 1 summarizes the bibliographic statistics. Among 361 studies, the document types included 323 published original articles (90.2%), 21 reviews (8.1%), and nine meeting abstracts (2.5%). The average number of citations per document was 14.50, and the average number of citations per year per document was 2.56.

Annual scientific production and average article citations per year

Table 2 shows the annual scientific production of published documents on resilience related to nursing and patients in-

Table 1. Summary of bibliographic statistics (n=361)

Description	Result
Main information regarding data	
Timespan	2007–2023
No. of documents	361
No. of sources (journals, books, etc.)	191
Annual growth rate (%)	11.85
Average age of document	3.88
Average citations per document	14.50
Average citations per year per document	2.56
No. of references	12,454
Document type	
Original article	323
Review	21
Meeting abstract	9
Editorial material	5
Proceedings paper	3
Document content	
KeyWords Plus term	617
Author's keyword	831
Author	
No. of authors	1,417
No. of author appearances	1,566
No. of authors of single-authored documents	15
Author collaboration	
No. of single-authored documents	15
Documents per author	0.26
Co-authors per document	4.34
International co-authorship (%)	12.47

cluded in the Web of Science Core Collection database from 2007 to 2023. The annual production of scientific research on resilience began in 2007, remained in single digits until 2014, and has since shown a steep increase. More than 30 relevant articles were published in 2019, and the largest number published in a single year occurred in 2022 (n=78), followed by 2021 with 77 articles. Thus, the annual growth rate was 20.6%, and the results of the Cox-Stuart test for trend analysis showed an increasing trend (P=0.004).

The average total citations per year exceeded 150 in 2007, and a downward trend was observed thereafter. This finding reflects the number of citations for a small number of studies published after 2007, and it appears that the average value of citations has decreased since that time, while the number of

Table 2. Annual scientific production and mean article citations per year (n=361)

Year	No. of articles	Total citations	Mean total citations per article	Mean total citations per year	Citable years
2007	1	162.0	162.0	10.1	16
2008	1	82.0	82.0	5.5	15
2009	3	117.0	39.0	2.8	14
2010	5	320.0	64.0	4.9	13
2011	3	53.0	17.7	1.5	12
2012	5	135.2	33.8	3.1	11
2013	7	258.0	36.9	3.7	10
2014	8	266.0	33.3	3.7	9
2015	16	753.0	47.1	5.9	8
2016	21	53.2	26.6	3.8	7
2017	18	460.1	25.6	4.3	6
2018	17	287.0	16.9	3.4	5
2019	32	313.0	16.0	4.0	4
2020	49	537.0	11.0	3.7	3
2021	77	482.8	6.3	3.1	2
2022	78	212.9	2.7	2.7	1
2023	20	2.0	0.3	-	0

research reports has increased (Fig. 1 and Table 2).

Active journals

The 361 documents included in this study were published in 191 sources. The top 20 journals are shown in Fig. 2. In order, the most relevant journals were the *Journal of Nursing Management*, *Journal of Advanced Nursing*, and *Journal of Clinical Nursing*. The *Journal of Advanced Nursing* was the first journal to publish research on resilience related to nursing and patients in 2007, and it included the largest number of publications until 2017. A few related studies have been published in the *Journal of Nursing Management* since 2015, and it now appears to have the most published articles, ahead of the *Journal of Advanced Nursing* (Fig. 3).

Authorship analysis

In total, 1,417 authors contributed to the retrieved documents, specifically 15 authors of single-author studies and 1,402 authors of multi-author studies. The number of documents per author for co-authored publications was 0.26, and the average number of authors per document was 4.34. Among 361 documents, 15 publications (4.2%) were single-authored, and 346 publications (95.8%) were multi-authored. The degree of collaboration among authors was 95.8%.

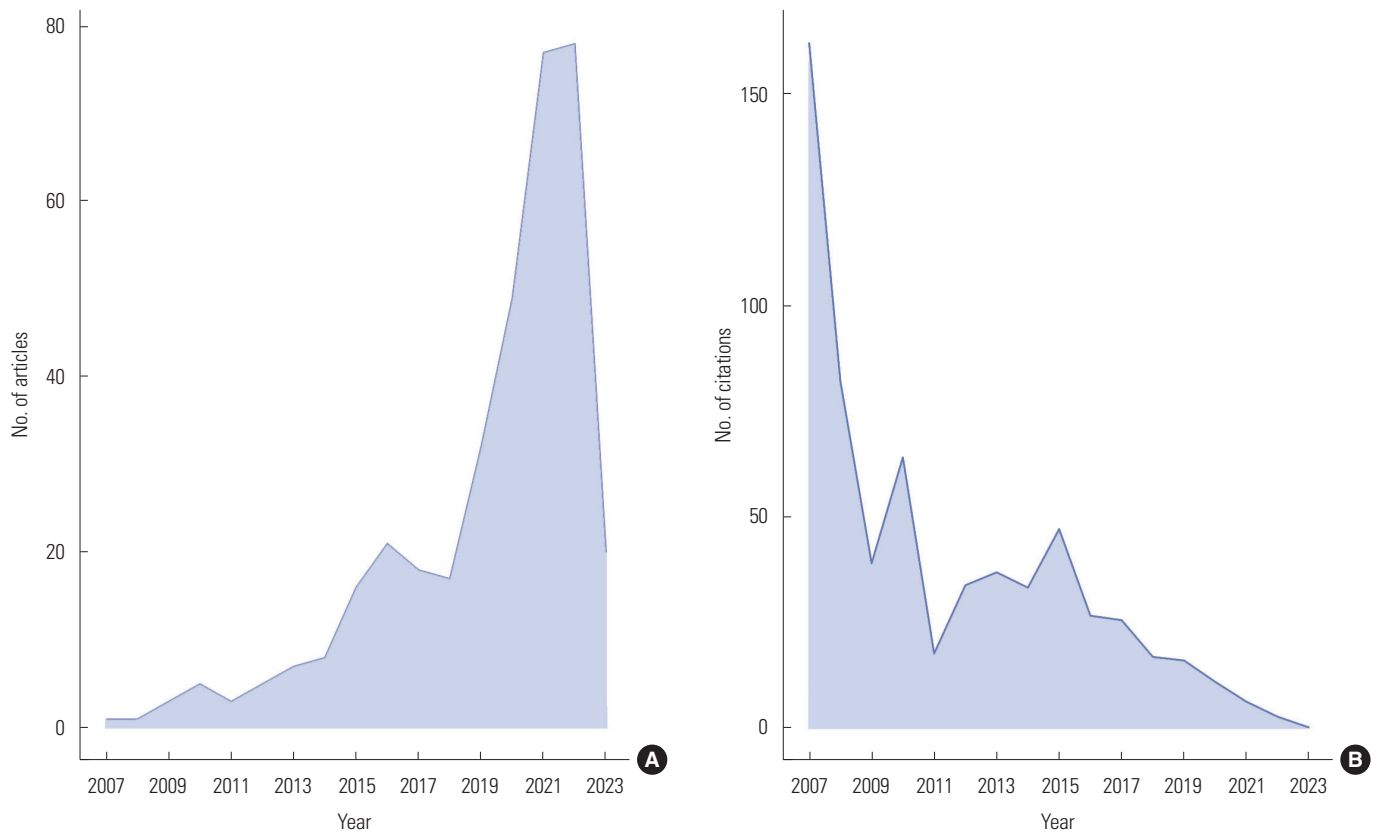


Fig. 1. Publication output. (A) Annual scientific production. (B) Average article citations per year.

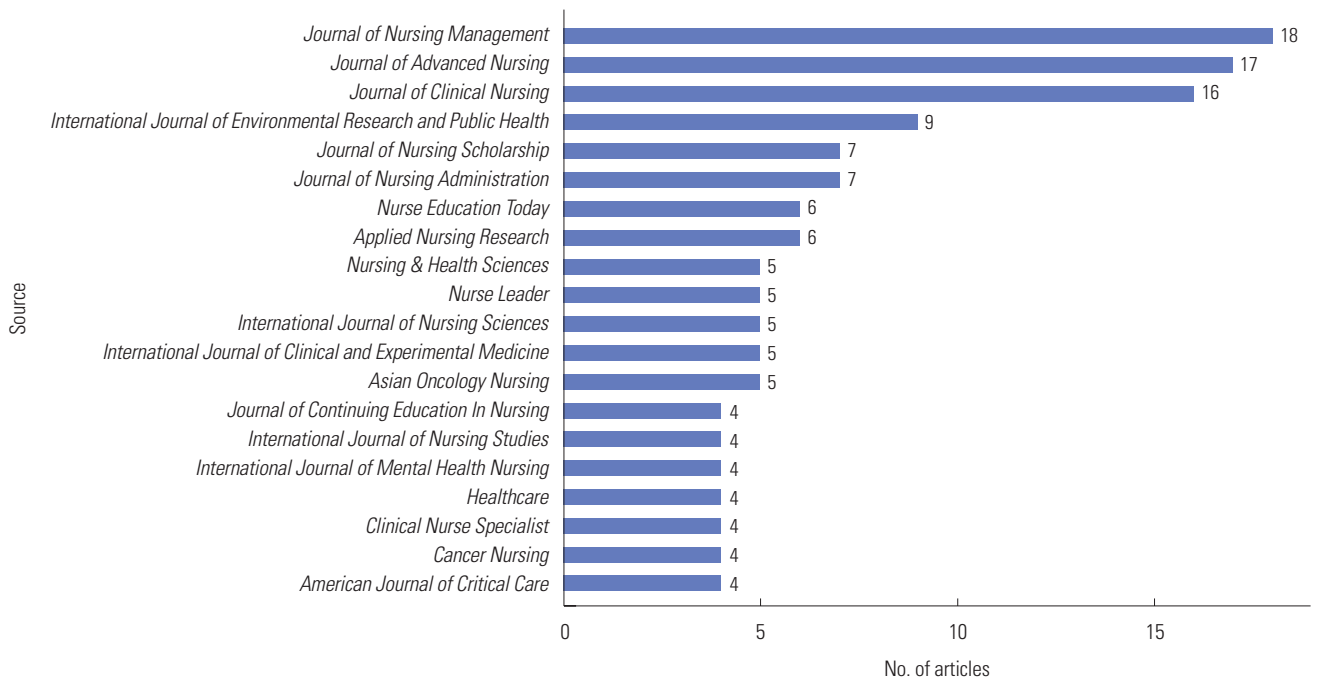


Fig. 2. Most relevant sources.

The top 20 productive authors are shown in Fig. 4. Among the 1,417 authors, each of the top 20 authors generated three or more documents. Rushton CH of Johns Hopkins University was the most prolific author with six articles (out of 361, 1.7%). She began publishing related studies in 2015, conducted the most studies in 2021, and had the largest number of citations per document (total citations, 381). The next most prolific researchers were Bijani M, Kim S, and Lee J with four articles each. Lee J began conducting research the earliest among these top authors, in 2012, and has continued steadily to 2022. The remaining authors in the top 20 list wrote three articles apiece.

The United States (103 articles), China (55 articles), Korea (31 articles), Turkey (22 articles), and Australia (21 articles) were the top five countries that produced the most literature on the resilience of nursing and patients (Fig. 5). The United

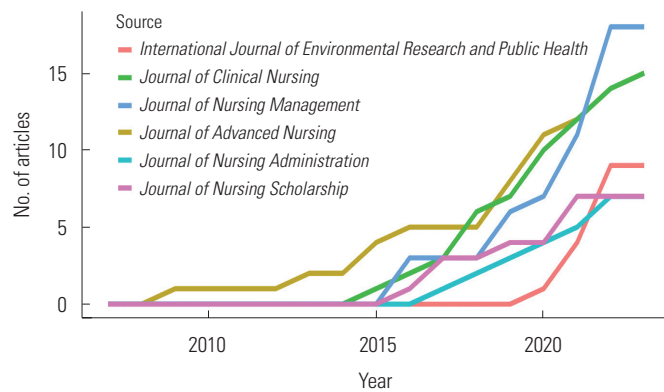


Fig. 3. Source growth plot.

States accounted for 28.5% of total publications (103 of 361). Together, the top five countries accounted for 64.3% of all published documents (232 of 361).

Author collaboration

A co-authorship analysis was performed in order to identify connections between authors. A total of 31 authors, organized into 10 groups, were identified within the network of co-authors. These groups of five authors (n = 1), four authors (n = 3),

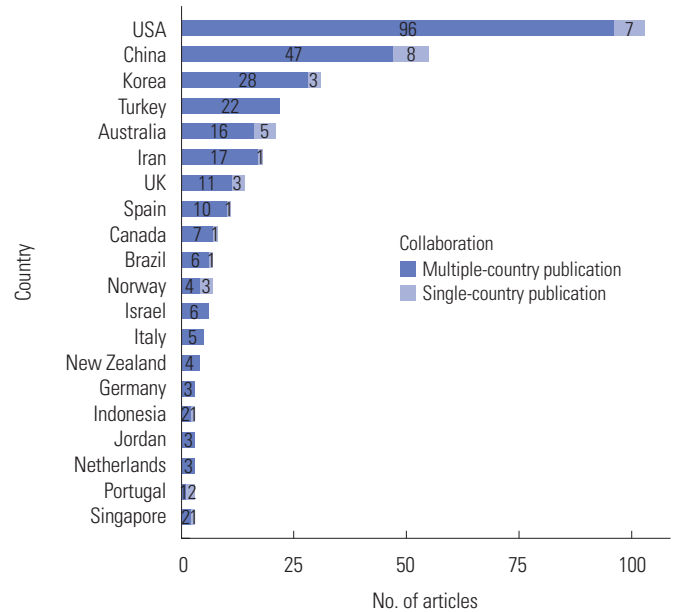


Fig. 5. Most productive countries.

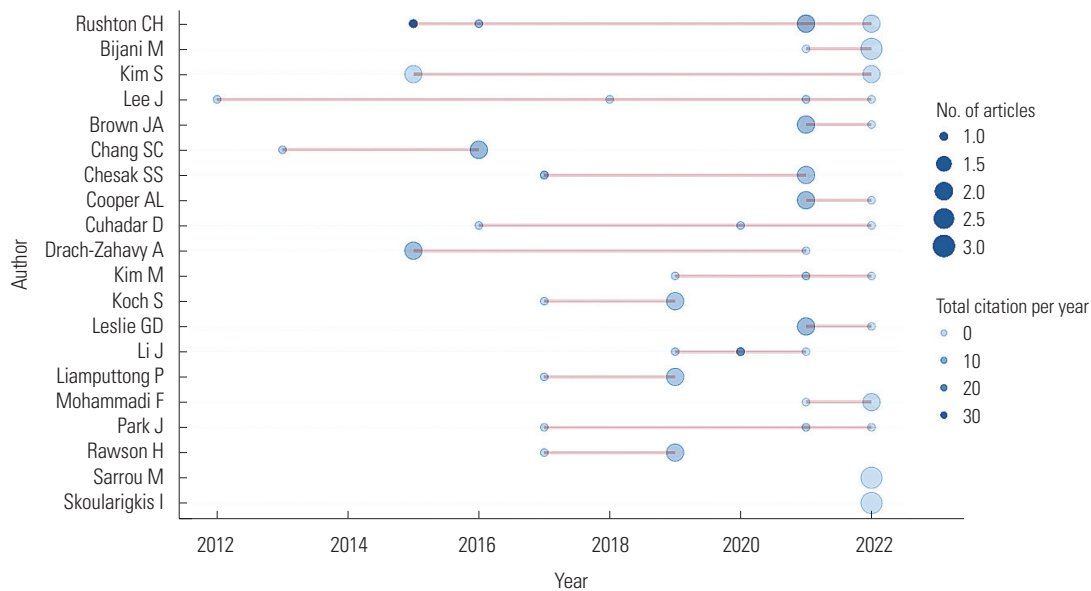


Fig. 4. Top 20 authors and their production over time.

three authors ($n=2$), and two authors ($n=4$) are shown in Fig. 6. Of the 31 authors, 15 authors were among the top 20 authors. However, their network is poor and is limited to collaboration with two or more subnetworks. In other words, identifying authors with links between research groups with subnetworks was difficult.

KeyWords Plus analysis

While keywords are determined by authors and presented in the title, KeyWords Plus terms are derived using a special algorithm from the words that appear frequently in the titles of an article's references but not in the article's title. The KeyWords Plus analysis was performed using 617 KeyWords Plus terms. An overlay visualization map of the top 20 most frequent KeyWords Plus terms is shown in Fig. 7A. The most frequently encountered terms were "burnout" ($n=53$), "stress" ($n=51$), "health" ($n=47$), "scale" ($n=46$), and "nurses" ($n=44$). A KeyWords Plus word cloud for the publications is shown in Fig. 7B. The common terms highlighted in the word cloud are "burnout," "stress," and "health." A multivariate co-occurrence analysis classified the KeyWords Plus co-occurrence network into five specific clusters as shown in Fig. 7C. Regarding KeyWords Plus co-occurrences, the weight of the link between two keywords was determined by the number of co-occurrences of a pair of words. The use of keyword frequencies alone is

insufficient to determine the relationships among various terms. Each KeyWords Plus term is represented as a node in a KeyWords Plus co-occurrence network, and each co-occurrence of a pair of words is represented as a link. The weight of the link between these two KeyWords Plus terms is determined by the number of times a pair of terms co-occurs in numerous articles. The network created in this manner is a weighted network. The number of links represents the weights, and the thickness of the links is proportionate to their weight [14].

The main KeyWords Plus terms for each of the five clusters are as follows. The terms "burnout," "stress," and "nurse" appeared with the highest frequency in relation to resilience and were situated close to each other. The cluster where the central term was "health," which was the largest concept, overlapped with "care" and partially overlapped with "burnout." In the cluster where "scale" was the central term, "job satisfaction" was the largest subconcept. In the "depression" cluster, "quality of life" was the closest, with the second highest frequency, and "survivors" and "distress" were concepts that belonged to the top 20. In the "mental health" cluster, "impact" was the next most frequent concept, followed by several terms in the order of "satisfaction," "risk," "outcomes," and "anxiety."

Trends in topics

Trends in topics by year are shown in Fig. 8. In 2022, the trend

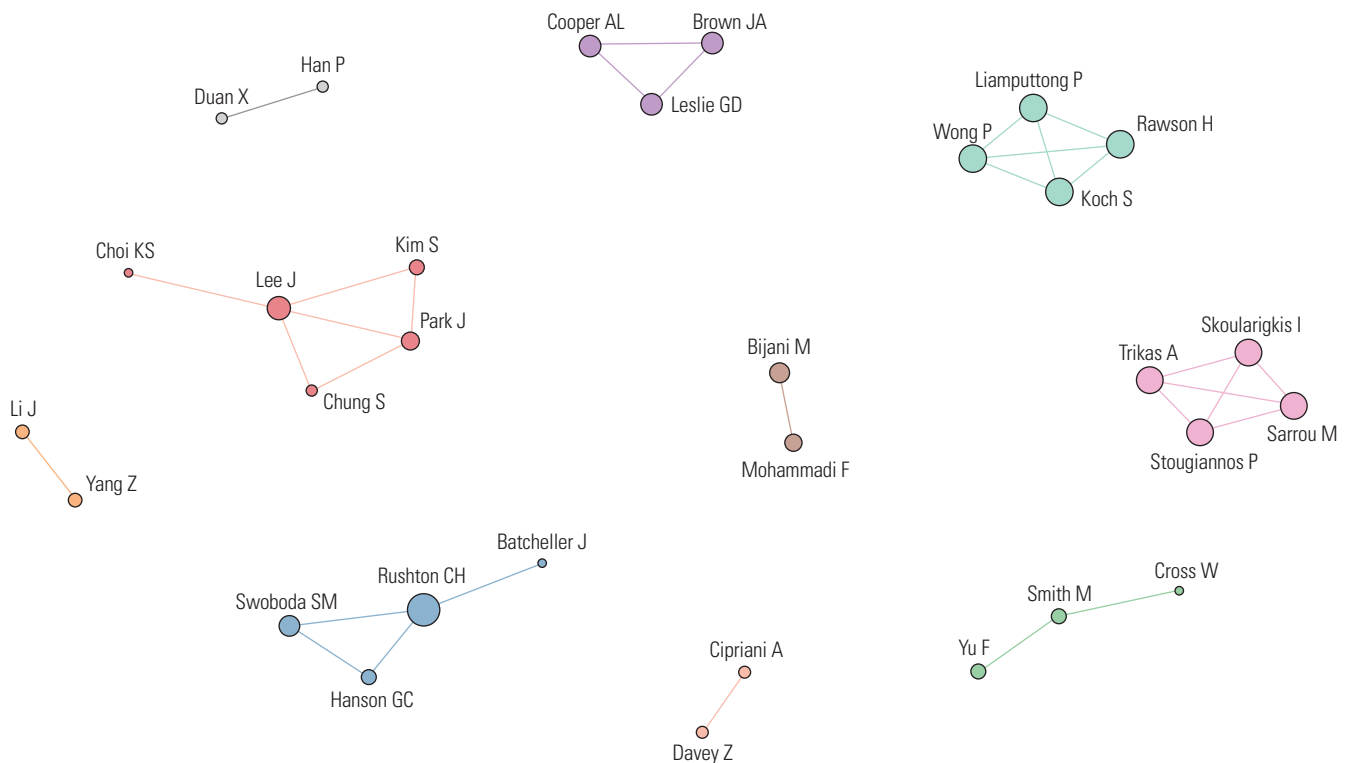


Fig. 6. Author collaboration network.

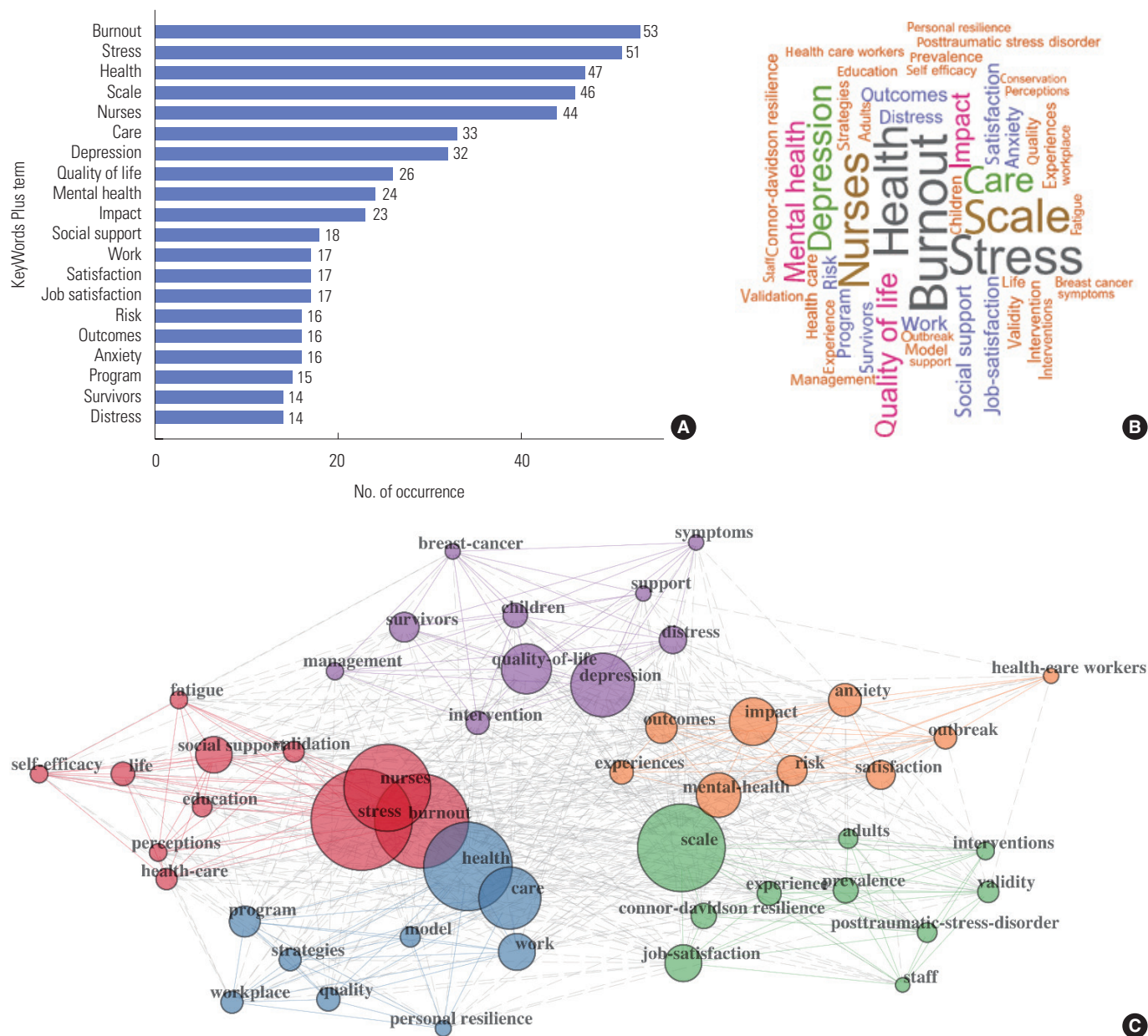


Fig. 7. KeyWords Plus analysis. (A) KeyWords Plus frequency. (B) Word cloud. (C) KeyWords Plus co-occurrence network.

topics included “support,” “personality,” “professionals,” “conservation,” and “resources,” while “scale,” “impact,” “outcomes,” “anxiety,” and “distress” were trend topics in 2021. In 2020, “burnout,” “stress,” “health,” “nurses,” and “care” were reported as trend topics, and the term frequency that year was the highest observed throughout the entire period.

Most globally cited documents

The top 10 globally cited documents are shown in Table 3 [15–24]. The most cited article was titled “Burnout and resil-

ience among nurses practicing in high-intensity settings” and published in 2015 in the *American Journal of Critical Care* by Rushton et al. [15]. This article was cited 282 times. The most recently published study by Yildirim et al. [19] in 2022 was titled “Perceived risk and mental health problems among health-care professionals during COVID-19 pandemic: exploring the mediating effects of resilience and coronavirus fear.” That study was cited 141 times over a period of 2 years and 4 months, from online publication in November 2020 to the search date of this study, making it the most cited study within the shortest period.

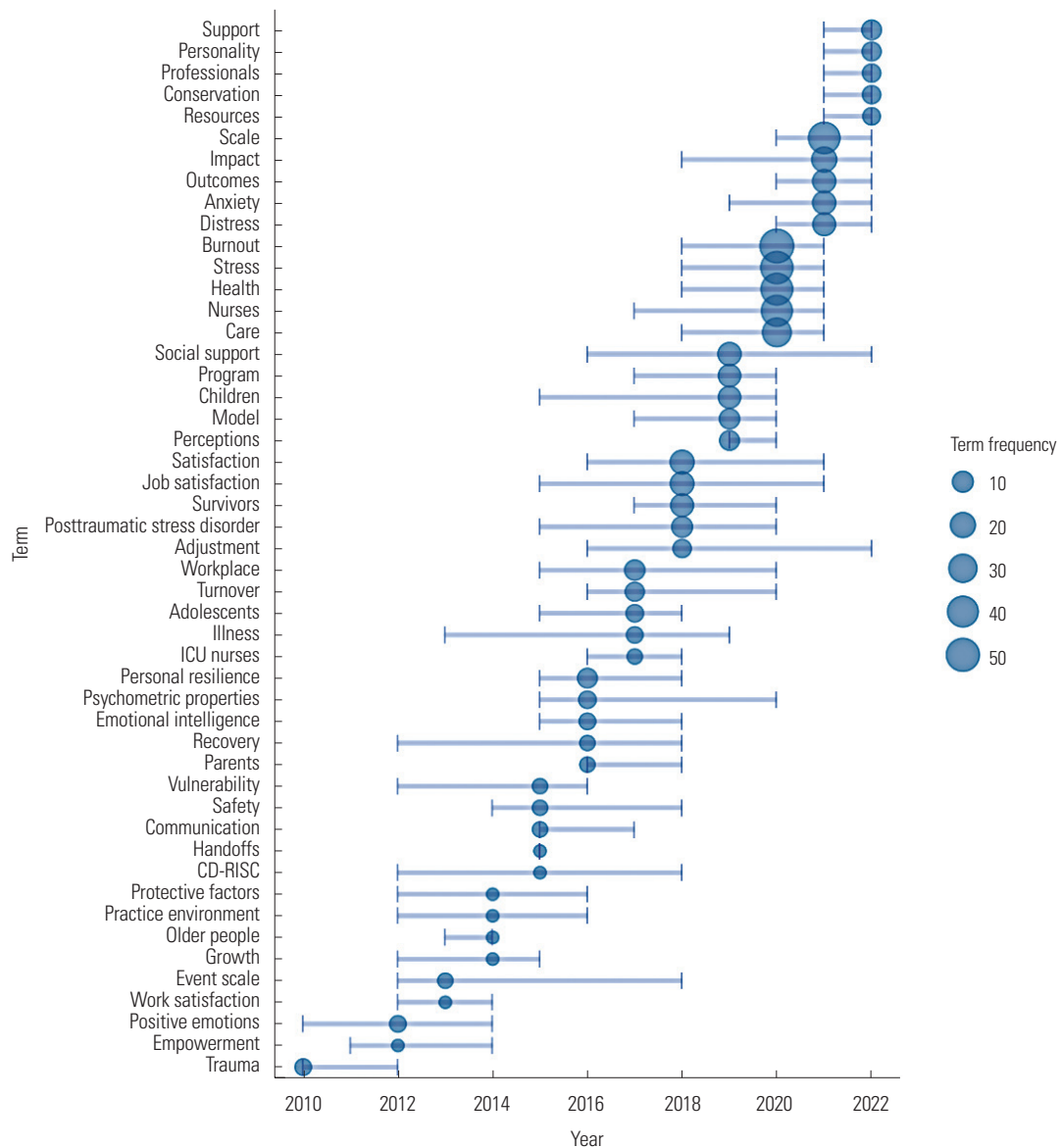


Fig. 8. Trends in topics. ICU, intensive care unit; CD-RISC, Connor-Davidson Resilience Scale.

Discussion

Interpretation

This study examined the academic progress and emerging trends regarding publication of research on resilience related to nursing and patients. A bibliometric analysis was used to examine fundamental influences, including authors, journals, nations, citation ranks, and KeyWords Plus terms.

Research conducted on resilience related to nursing and patients has shown a rapid increase since 2019, and the largest number of articles was published in 2022. The most related research was published in the *Journal of Nursing Management*, and Rushton CH was the most prolific author, with the high-

est number of citations. The most productive countries were the United States, China, and Korea. The terms most often encountered in the KeyWords Plus analysis were “burnout,” “stress,” and “health.”

In the KeyWords Plus co-occurrence network analysis, “burnout,” “stress,” and “nurse” had the largest circles located close together. These terms seemed to co-occur most often in studies related to nurses’ resilience; they were also found among the trend topics in 2020. Therefore, interest in nurses’ resilience appears to have increased further with the development of the COVID-19 pandemic. Resilience refers to the ability to respond effectively despite facing adversity [3], so it is natural that research intensified regarding the resilience of nurses who fought

Table 3. Most globally cited documents

Rank	Bibliographic information	No. of total citations	Reference
1	Rushton CH, Batcheller J, Schroeder K, Donohue P. Burnout and resilience among nurses practicing in high-intensity settings. <i>Am J Crit Care</i> 2015;24:412–20. https://doi.org/10.4037/ajcc2015291	282	[15]
2	Delgado C, Upton D, Ranse K, Furness T, Foster K. Nurses’ resilience and the emotional labour of nursing work: an integrative review of empirical literature. <i>Int J Nurs Stud</i> 2017;70:71–88. https://doi.org/10.1016/j.ijnurstu.2017.02.008	184	[16]
3	Ablett JR, Jones RS. Resilience and well-being in palliative care staff: a qualitative study of hospice nurses’ experience of work. <i>Psychooncology</i> 2007;16:733–40. https://doi.org/10.1002/pon.1130	162	[17]
4	Baek HS, Lee KU, Joo EJ, Lee MY, Choi KS. Reliability and validity of the Korean version of the Connor-Davidson resilience scale. <i>Psychiatry Investig</i> 2010;7:109–15. https://doi.org/10.4306/pi.2010.7.2.109	146	[18]
5	Yıldırım M, Arslan G, Özaslan A. Perceived risk and mental health problems among healthcare professionals during COVID-19 pandemic: exploring the mediating effects of resilience and coronavirus fear. <i>Int J Ment Health Addict</i> 2022;20:1035–45. https://doi.org/10.1007/s11469-020-00424-8	141	[19]
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8	Kemper KJ, Mo X, Khayat R. Are mindfulness and self-compassion associated with sleep and resilience in health professionals? <i>J Altern Complement Med</i> 2015;21:496–503. https://doi.org/10.1089/acm.2014.0281	112	[22]
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against COVID-19 on the pandemic’s front lines. More research should be conducted to improve nurses’ resilience at both the organizational and personal levels to improve the provision of nursing care in difficult situations. The cluster of “health,” “care,” and “work” is closest to nurses’ resilience-related KeyWords Plus cluster. These three terms seemed to co-occur most frequently in resilience studies related to nursing care. Additionally, clusters of “depression,” “quality of life,” “survivors,” and “children” seemed to co-occur most often in research on resilience related to patients. Our study’s result suggests that most of the resilience research related to nursing and patients tended to focus more on nurses than patients, so resilience research related to patients needs to be revitalized in the future.

Since resilience may be developed at any stage of life, regardless of age or disease, it is necessary to establish educational programs to assist patients in building resilience. The promotion of resilience in patients should be a critical component of care. The development of diverse interventions that enhance resilience for various groups of patients is essential to recover from illness and to improve quality of life.

Suggestion for further studies

The number of publications on nursing-related resilience showed

a more rapid increase in 2021 and 2022 compared to the natural increase observed before the year 2020. Conducting additional research is recommended to determine whether a concurrent expansion of research on resilience has occurred in other disciplines, such as medicine or pharmacy, not only nursing.

Limitations

Despite the usefulness of bibliometric analysis as a scientific tool for evaluating the progress of research in the field, we wish to point out that due to database bias and language bias, the publications included in this study do not represent the entire body of literature on resilience. However, our findings provide comprehensive information on research trends on resilience in relation to nursing and patients.

Conclusions

Interest in research on resilience has shown a recent increase. The critical need for the resilience of nurses and patients has increased recently in the nursing field, which supports the importance of this study in examining the general research and publishing patterns of studies related to resilience.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The authors received no financial support for this work.

Data Availability

Data analyzed in this article are available from the corresponding author upon reasonable request as Clarivate does not allow researchers to share the data retrieved from the Web of Science.

Supplementary Materials

The authors did not provide any supplementary materials for this article.

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Impact factor surge in Korean medical journals during the COVID-19 era: a bibliometric study

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Abstract

Purpose: The multiyear COVID-19 pandemic has affected the volume and speed of publications in scientific journals. This study evaluated trends in the impact measures of international medical journals published in Korea, including the journal impact factor (JIF).

Methods: We selected Science Citation Index Expanded journals with the country/region set to Korea and the academic category classified as “clinical medicine” in Journal Citation Reports. Trends in indicators such as the JIF and Journal Citation Indicator (JCI) were assessed for journals with JIF information from 2018 to 2022. Ratios and differences between the measures were calculated to determine the extent of the change.

Results: We identified 43 journals, and the average JIF of those journals increased from 2.33 in 2018 and 2.50 in 2019 to 3.45 in 2020 and 3.86 in 2021. Other measures, such as the 5-year JIF and JCI, steadily increased, and the proportion of gold open access journals also increased significantly. However, the JCI and Eigenfactor scores remained steady or showed relatively small increases. Furthermore, impact measures declined in 2022, including a JIF decrease to 3.55.

Conclusion: We presented trends in quantitative measurements for international medical journals in Korea, and found an overall increase. Journals need to maintain a rigorous publication process to improve the quality of their research and the research community needs to exercise caution when using quantitative measures to evaluate journals. Further research is required to examine the quantitative indicators of journals, including their publication policies, research topics, and long-term trends.

Keywords

COVID-19; Journal article; Journal impact factor; Open access publishing; Publications

Received: August 29, 2023
Accepted: September 21, 2023
Epub: December 18, 2023

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Introduction

Background

The journal impact factor (JIF), a representative indicator for measuring the influence of journals, provides insights into whether a journal is influential in the relevant academic subject area and can be used to compare and analyze the importance of journals by subject area. However, in situations where a large number of papers are published in a short period, such as during the COVID-19 pandemic, the JIF value may change significantly and be overestimated due to self-citation. Several indicators have been proposed to overcome the JIF's limitations. JIF without self-citations is an indicator used to solve the problem of exaggerating the JIF value through self-citation [1]. The 5-year JIF is an indicator that calculates the paper citation period as 5 years, evaluates the impact of the journal in the long term, and provides information on a journal's impact in a field where the paper publication period is long [2].

Because the JIF varies greatly by discipline and can be affected substantially by events occurring during the measurement period, a new parameter, the Journal Citation indicator (JCI), has been used since 2020. The JCI focuses on the category-normalized citation impact, making it suitable for comparing the impacts of journals in different fields. While the JIF evaluates the impact of papers using citations from the past 2 years, the JCI takes a longer period (3 years) for the evaluation. The JIF can be significantly affected by special circumstances in which a large number of papers in the same field are published in a short period, but the JCI is relatively free from this risk [3].

The outbreak of COVID-19, a new infectious disease necessitated the rapid dissemination of new information, including clinical characteristics, treatment, prognosis, and impact on the community. This has led to an increase in the volume of academic publications and the speed of publication [4]. The impact of this on journals' quantitative indicators has been previously reported. For instance, the JIF of pediatric journals surged significantly in 2020 after the COVID-19 outbreak, which was related to the sudden increase in total publication volume at that time [5]. A rising JIF trend was also observed for journals in other fields such as pulmonology, where both open access (OA) and subscription journals significantly increased their publication volumes in 2020; however, OA journals showed much higher growth than subscription journals [5].

Similarly, in six highly influential medical journals (*Annals of Internal Medicine*, *British Medical Journal*, *Journal of the American Medical Association*, *Lancet*, *Nature Medicine*, and *New England Journal of Medicine*), the JIFs increased significantly compared with the pre-COVID-19 era; from 2019 to 2020, increases of 283%, 199%, 208%, 392%, 111%, and 196%

were observed, and in 2021 the JIFs further increased by 41%, 90%, 6%, 22%, 53%, and 72%, respectively. The number of publications increased annually during the study period, and JIFs tended to increase. Among them, papers not related to COVID-19 showed a gradual increase, like in previous years, whereas the number of papers related to COVID-19 increased relatively steeply [4]. Therefore, the JIF should be used carefully when evaluating journals.

According to the 2021 Journal Citation Reports (JCR), clinical medicine is the academic area in Korea with the most publications, accounting for 18% of the total. The number of clinical medicine papers published in Korea was 15,137, ranking 11th globally (3.68%). The number of citations per paper in clinical medicine area was 1.65 worldwide and 1.51 in Korea [6].

The JIF is an indicator that evaluates the scientific impact of a journal. Owing to the COVID-19 pandemic, the number of publications has increased rapidly, and quantitative evaluation indices of journals, such as the JIF, have also increased. In Korea, COVID-19 broke out in January 2020 and several outbreaks have since occurred. The quantity of publications and citations of medical papers in Korea indicates that it is a country with high publication influence.

Objectives

This study compared the changes in the quantitative indicators of Korean medical journals, including JIF, during the 2020 COVID-19 epidemic and thereafter.

Methods

Ethics statement

This study did not involve human subjects, so neither approval by the Institutional Review Board nor obtainment of informed consent was required.

Study design

This was a bibliometric study based on a literature metrics database.

Study setting

The JCR database was searched on July 10, 2023.

Data sources and measurement

JCR analyzes the citation information of the world's most influential journals, including the Science Citation Index Expanded (SCIE), Social Sciences Citation Index, Arts and Humanities Citation Index, and Emerging Sources Citation Index. The JCR provides data needed to understand the components used to index each journal's value and impact. The key metrics provided include the JIF and JCI [7].

Table 1. Trends in the impact of journals from Korea before and during the COVID-19 pandemic

Category	2018	2019	2020	2021	2022	Ratio ^{a)}	Difference ^{b)}
Clinical medicine (n=43)							
JIF	2.33±1.12	2.50±1.31	3.45±1.71	3.86±2.18	3.55±2.13	1.55±0.40	1.24±1.04
JIF without self-citations	2.13±1.03	2.29±1.24	3.26±1.67	3.64±2.12	3.32±2.08	1.59±0.43	1.24±1.03
5-yr JIF	2.24±1.14	2.44±1.28	3.30±1.56	3.74±1.97	3.59±1.92	1.48±0.27	1.08±0.80
JCI	0.70±0.27	0.74±0.29	0.80±0.31	0.83±0.35	0.86±0.37	1.14±0.23	0.09±0.15
Eigenfactor score	0.003±0.002	0.003±0.002	0.003±0.002	0.003±0.003	0.003±0.003	1.084±0.271	0±0.001
Article Influence Score	0.54±0.32	0.57±0.36	0.75±0.42	0.78±0.47	0.77±0.49	1.34±0.26	0.18±0.17
Immediacy Index	0.53±0.36	0.62±0.46	1.25±1.11	0.89±0.64	0.81±0.53	2.10±1.33	0.50±0.61
Gold OA journal (%)	60.0±45.2	54.4±46.6	73.5±34.7	79.8±32.3	78.7±36.3	335.6±400.7	19.5±27.4
Clinical neurology (n=5)							
JIF	2.86±1.73	3.14±2.51	3.94±2.04	4.15±2.69	3.82±2.54	1.45±0.32	1.05±0.60
JIF without self-citations	2.66±1.63	2.97±2.41	3.72±2.03	3.97±2.68	3.60±2.48	1.47±0.32	1.03±0.62
5-yr JIF	3.18±1.97	3.44±2.29	4.13±2.32	4.52±2.84	4.30±2.8	1.49±0.16	1.45±0.70
JCI	0.74±0.34	0.77±0.39	0.82±0.35	0.80±0.29	0.81±0.27	1.12±0.14	0.06±0.06
Eigenfactor score	0.003±0.001	0.003±0.001	0.003±0.001	0.003±0.001	0.002±0.001	1.052±0.138	0±0
Article Influence Score	0.90±0.66	1.00±0.75	1.12±0.75	1.16±0.83	1.13±0.85	1.42±0.21	0.33±0.18
Immediacy Index	0.71±0.52	0.67±0.43	1.03±0.78	0.65±0.33	1.00±0.51	1.29±0.18	0.15±0.13
Gold OA journal (%)	82.6±37.9	80.6±42.5	91.7±18.5	99.2±1.5	99.1±1.3	243.6±321.3	13.9±31.2
Oncology (n=4)							
JIF	2.66±0.67	2.82±0.85	4.10±0.53	3.98±1.07	3.35±1.08	1.51±0.22	1.30±0.32
JIF without self-citations	2.51±0.62	2.66±0.79	3.94±0.53	3.82±1.07	3.20±1.13	1.53±0.19	1.30±0.26
5-yr JIF	2.88±0.34	3.00±0.49	3.74±0.64	3.90±0.87	3.55±0.87	1.36±0.14	1.08±0.49
JCI	0.74±0.27	0.76±0.26	0.83±0.27	0.82±0.34	0.80±0.35	1.11±0.13	0.08±0.08
Eigenfactor score	0.003±0.002	0.003±0.002	0.004±0.002	0.003±0.002	0.003±0.002	1.086±0.125	0±0.001
Article Influence Score	0.74±0.12	0.76±0.21	0.90±0.17	0.85±0.17	0.83±0.21	1.22±0.04	0.16±0.04
Immediacy Index	0.62±0.49	0.75±0.49	1.05±0.92	0.90±0.67	1.05±0.49	1.40±0.58	0.29±0.39
Gold OA journal (%)	55.6±50.4	51.4±56.1	77.6±26.7	84.0±29.5	77.2±42.1	640.1±890.1	27.3±37.0
Pharmacology and pharmacy (n=4)							
JIF	2.42±0.59	2.69±0.70	3.54±1.46	3.92±1.77	3.90±2.00	1.43±0.42	1.18±1.15
JIF without self-citations	2.17±0.58	2.46±0.73	3.30±1.43	3.65±1.62	3.55±1.81	1.46±0.37	1.16±1.00
5-yr JIF	2.45±0.46	2.53±0.51	3.04±0.81	3.62±1.08	3.65±1.35	1.32±0.19	0.84±0.53
JCI	0.68±0.11	0.73±0.16	0.72±0.20	0.76±0.23	0.78±0.26	1.04±0.15	0.04±0.11
Eigenfactor score	0.003±0.002	0.003±0.001	0.002±0.001	0.002±0.001	0.002±0.001	0.869±0.277	-0.001±0.001
Article Influence Score	0.50±0.11	0.49±0.09	0.55±0.13	0.60±0.18	0.63±0.22	1.15±0.19	0.08±0.09
Immediacy Index	0.73±0.45	0.64±0.35	0.82±0.42	0.97±0.69	0.60±0.47	1.35±0.47	0.21±0.40
Gold OA journal (%)	49.5±56.1	39.6±47.0	51.4±56.1	57.7±49.2	64.9±44.8	142.3±47.9	10.0±10.7

Values are presented as mean ± standard deviation.

JIF, journal impact factor; JCI, Journal Citation Indicator; OA, open access.

^{a)}Calculated as “(2020–2021 average) / (2018–2019 average).” ^{b)}Calculated as “(2020–2021 average) – (2018–2019 average).”

We selected journals classified by country/region to include South Korea, from the JCR database. Among them, journals listed in SCIE and classified as “clinical medicine” in categories such as “allergy,” “health care sciences & services,” and “rehabilitation” were selected. To identify changes during the COVID-19 pandemic, we extracted data from 2018 to 2022 (i.e., for 5 years), and found 58 journals (52 in 2018, 57 in 2019, 61 in 2020, 67 in 2021, and 69 in 2022). After excluding overlapping journals, 43 journals with JIF reports from 2018 to 2022 were selected for the final analysis.

All included journals and three areas with a large number of journals in the corresponding academic fields were selected, and major indicators, such as the JIF for the 5-year periods, 2018, 2019, 2020, 2021, 2022, were presented as means and standard deviations. Among the included journals, the key indicators of the five journals with the highest JIF as of 2021 are presented.

Variables

We included the journal name, JCR year, category, JIF, JIF without self-citations, 5-year JIF, JCI, Eigenfactor score, Article Influence Score, Immediacy Index, and the percentage of gold OA journals [7]. Definition of each metric is described in Suppl. 1.

To identify changes in indicators before and after COVID-19, the ratio and difference of each indicator were calculated, i.e., “(2020–2021 average) / (2018–2019 average)” and “(2020–2021 average) – (2018–2019 average),” respectively.

Bias

There was no bias in searching and selecting the target literature.

Study size

It was not necessary to estimate the sample size. All target journals were included.

Statistical analysis

Descriptive statistics were applied. All analyses were performed using SAS ver. 9.4 (SAS Institute Inc).

Results

Trends in the impact of journals in Korea before and during the COVID-19 pandemic

The average JIF of the 43 journals increased from 2.33 in 2018 and 2.50 in 2019 to 3.45 in 2020 and 3.86 in 2021. The 5-year JIF and JCI showed similar patterns, and the percentage of gold OA journals increased from 60.0% in 2018 to 79.8% in 2021. However, the JCI and Eigenfactor scores remained con-

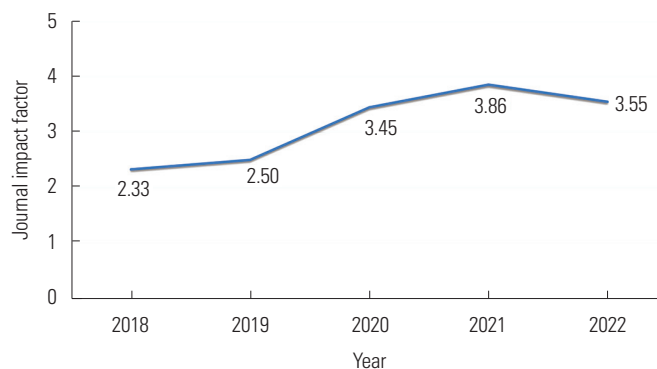


Fig. 1. Trends in the journal impact factor of Korean medical journals according to year.

sistent or showed relatively small increases. The number of journals in each of the analyzed disciplines ranged from 1 to 5, the three areas with the highest number of included journals were clinical neurology ($n = 5$), oncology ($n = 4$), and pharmacology and pharmacy ($n = 4$). The JIF ratio increased as follows: clinical neurology, 1.45; oncology, 1.51, and pharmacology and pharmacy, 1.43; and the 5-year JIF, JCI, and percentage of gold OA journals all increased. However, impact measures declined in 2022, including a JIF decrease to 3.55 in 2022 (Table 1 and Fig. 1). Suppl. 2 provides the full list of the included journals.

Trends in the impact of the top five journals in Korea before and during the COVID-19 pandemic

In 2021, all the top five JIF journals (*Experimental and Molecular Medicine*, *Journal of Stroke*, *Korean Journal of Radiology*, *World Journal of Men's Health*, and *Archives of Pharmacol Research*) showed increases in the JIF, and *World Journal of Men's Health* had the highest JIF ratio at 2.47. The two journals with the highest JIF in 2021 (*Experimental and Molecular Medicine*, *Journal of Stroke*) and *World Journal of Men's Health*, with the highest JIF increase, were gold OA journals. However, in 2022, JIF decreased compared to the previous year or did not increase to the same degree as in the previous 2 years (Table 2).

Discussion

Key results

This study compared the quantitative impact indicators of Korean international journals over 5 years before and during the COVID-19 pandemic. The JIF, 5-year JIF, and JCI of the 43 included journals increased steadily, and the percentage of gold OA journals also increased significantly through 2021. However, the JCI and Eigenfactor scores remained steady or showed relatively small increases, and, impact measures (including the JIF) declined in 2022.

Table 2. Trends in the impact of the top five journals in Korea before and after COVID-19

Journal	2018	2019	2020	2021	2022	Ratio ^{a)}	Difference ^{b)}
<i>Experimental and Molecular Medicine</i>							
JIF	4.74	5.42	8.72	12.17	12.8	2.06	5.36
JIF without self-citations	4.66	5.36	8.64	12.11	12.7	2.07	5.36
5-yr JIF	5.45	5.96	8.78	11.59	11.7	1.79	4.48
JCI	1.22	1.24	1.37	1.50	1.56	1.17	0.21
Eigenfactor score	0.007	0.010	0.013	0.017	0.020	1.765	0.007
Article Influence Score	1.39	1.50	2.03	2.43	2.72	1.54	0.78
Immediacy Index	0.70	0.69	2.08	1.77	1.4	2.77	1.23
Gold OA journal (%)	99.76	100	100	100	100	1.00	0.12
<i>Journal of Stroke</i>							
JIF	5.57	7.47	6.97	8.63	8.2	1.20	1.28
JIF without self-citations	5.20	7.11	6.77	8.46	7.9	1.24	1.46
5-yr JIF	5.87	6.67	7.76	9.13	9.00	1.35	2.17
JCI	1.24	1.39	1.38	1.26	1.24	1.00	0.01
Eigenfactor score	0.004	0.004	0.004	0.004	0.004	1.000	0
Article Influence Score	1.82	2.07	2.31	2.58	2.58	1.25	0.50
Immediacy Index	1.46	1.18	2.35	0.97	1.70	1.26	0.34
Gold OA journal (%)	98.06	98.94	100	96.59	96.81	1.00	-0.21
<i>Korean Journal of Radiology</i>							
JIF	3.73	3.18	3.50	7.11	4.80	1.54	1.85
JIF without self-citations	2.81	2.35	3.20	6.46	4.20	1.87	2.25
5-yr JIF	2.89	3.14	3.95	5.94	4.70	1.64	1.93
JCI	0.98	0.96	0.97	1.47	1.42	1.26	0.25
Eigenfactor score	0.005	0.005	0.006	0.007	0.006	1.300	0.002
Article Influence Score	0.73	0.71	0.98	1.31	1.08	1.59	0.42
Immediacy Index	0.32	0.81	5.26	1.05	1.00	5.55	2.59
Gold OA journal (%)	12.42	3.65	42.78	35.82	5.16	4.89	31.27
<i>World Journal of Men's Health</i>							
JIF	2.27	2.55	5.40	6.49	4.80	2.47	3.54
JIF without self-citations	2.04	2.34	5.28	6.08	4.70	2.59	3.49
5-yr JIF	-	-	3.90	4.50	4.70	-	-
JCI	0.66	0.77	1.19	1.51	1.69	1.89	0.64
Eigenfactor score	0.001	0.001	0.001	0.001	0.002	1.000	0
Article Influence Score	-	-	0.74	0.90	1.04	-	-
Immediacy Index	0.43	2.05	3.14	1.90	0.80	2.03	1.27
Gold OA journal (%)	100	100	100	100	100	1.00	0
<i>Archives of Pharmacal Research</i>							
JIF	2.46	2.93	4.95	6.01	6.70	2.03	2.78
JIF without self-citations	2.30	2.80	4.58	5.57	6.10	1.99	2.52
5-yr JIF	2.47	2.54	3.48	4.31	5.20	1.56	1.40
JCI	0.75	0.85	0.94	1.04	1.14	1.24	0.19
Eigenfactor score	0.006	0.005	0.004	0.004	0.003	0.727	-0.002
Article Influence Score	0.48	0.45	0.56	0.63	0.78	1.27	0.13
Immediacy Index	0.78	0.87	1.28	1.92	1.20	1.95	0.78
Gold OA journal (%)	1.91	4.12	5.28	6.46	6.52	1.95	2.86

JIF, journal impact factor; JCI, Journal Citation Indicator; OA, open access.

^{a)}Calculated as "(2020–2021 average) / (2018–2019 average)." ^{b)}Calculated as "(2020–2021 average) – (2018–2019 average)."

Interpretation

Our study has the following strengths: to the best of our knowledge, this is the first study to address changes in the JIF and related impact indicators before and during the COVID-19 pandemic in Korean international medical journals. Therefore, our study provides time data on changes in impact indicators before and during the COVID-19 pandemic.

This study included not only the JIF but also various indicators, such as JIF without self-citations, 5-year JIF, Eigenfactor score, Article Influence Score, and Immediacy Index, that compensate for the shortcomings of the JIF, and the magnitude of change was presented through both ratios and differences.

The JIF differs greatly by academic field because the number of published papers varies from field to field. For example, among Korean journals in 2021, the JIF of the *Korean Journal of Radiology* was 7.11, approximately 4.14 times higher than that of the *Korean Journal of Physiology and Pharmacology* (1.72). To address this issue, this study included the JCI, an indicator that compensates for differences by field.

Comparison with previous studies

This study found an increase in the JIF in 2020 and 2021 compared with that in 2018 and 2019. The JIF showed a steady increase over the 4 years, and the increase was smaller in 2020–2021 than in 2019–2020. This is similar to the findings in a previous study in which the JIF in influential medical journals tended to increase during the COVID-19 pandemic [4]. However, the previous study selected only six representative medical journals to compare the JIF, whereas this study included all international journals in Korea. In addition, comprehensive trends were presented for quantitative indicators of journals, including the 5-year JIF, Eigenfactor score, Immediacy Index, and JIF.

In a study of differences by publication type, both OA and subscription journals continued to show increasing numbers of citations and publications from 2018 to 2020, and the number of citations and publications in 2020 increased significantly compared to 2019. The increase in the number of citations and publications was greater in OA journals than in subscription journals [5]. In our study, the percentage of gold OA journals among 43 Korean journals in the medical field increased significantly, from 60.0% in 2018 to 79.8% in 2021.

In a study evaluating the use of MeSH (Medical Subject Headings) terms to assess the impact of COVID-19 on scientific research production in the life sciences, the use of COVID-19-related MeSH terms, such as SARS-CoV-2, increased 6.5-fold, whereas that of unrelated MeSH decreased by 10% to 20%. This may have been due to the journal's editorial policy on the rapid review and publication process of COVID-19-related research; however, it has raised concerns about a de-

cline in biomedical research that is not related to COVID-19. The increase in OA publications may have been influenced by the editorial policies of journals that prioritized providing COVID-19-related information to the public [8]. However, this study investigated the quantitative indicators of all medical journals and did not evaluate the relevance to COVID-19 (e.g., MeSH terms or the topics of papers). Therefore, we could not directly evaluate whether the increase in the quantitative indices of journals, such as the JIF, was due to an increase in COVID-19-related publications. In future research, it will be necessary to add COVID-19-related characteristics, such as the journal's COVID-19-related publication policy, study topics, study population, and key variables.

Implications for future studies

Quantitative evaluation indices of journals, such as the JIF, can be used to select influential journals and spread research. However, with the emergence and spread of COVID-19, the volume of publications has soared in a short period, raising concerns about the appropriateness of quantitative indicators for evaluating journals. The JIF surge serves as an example of a phenomenon of concern. This study presents various quantitative indicators during the COVID-19 pandemic in international journals based in Korea.

Our study targeted all journals classified in the field of clinical medicine within the JCR and could broadly visualize changes in various indicators, including the JIF, before and during the COVID-19 pandemic. Future research investigate how journal impact indicators are impacted by factors that can affect publication speed and citations, such as the journal publication policy and peer review processes.

Quantitative journal indicators, such as JIF, have been used as evaluation indicators by journals and researchers for research productivity, academic impact for research proposal approval, and research funding support in the field of education or research. A useful indicator requires a system that reflects the characteristics of each academic field, is rigorous and transparent, and can produce stable long-term values. Many studies, including ours, have reported that special circumstances, such as the COVID-19 pandemic, can make a major contribution to changes in journals' quantitative indicators. Therefore, academic and research communities should consider this when evaluating journals and researchers. Academic journals should continue to operate rigorous peer review and publication processes that control the rate and volume of publications and maintain and improve research quality.

Limitations

This study did not include all Korean journals because it only examined Korean journals listed in the JCR. However, be-

cause we focused on international journals listed in SCIE, we suggest that our findings are representative of the major influential journals published in Korea. Moreover, factors that may affect journal impact measures, such as the publication process of journals and papers with a high frequency of citations among the papers published in journals, were not considered.

Conclusions

The COVID-19 pandemic has resulted in a surge in research and scientific production in all areas of knowledge worldwide, especially in COVID-19-related research. The rise of COVID-19 publications has met the demand for scientific advancement, improved coping capabilities, and enhanced information-sharing on new emerging infectious diseases; however, the reliability of indicators for assessing academic impact has been questioned. Although the JIF has functioned as a useful indicator in the era of library-centered journal access in the past, its reliance on JIF has raised many concerns in modern society regarding various access and distribution methods for journals. We presented trends of quantitative indicators in journals, such as the JIF, in Korean international medical journals, and found an overall increase in these indicators. Because it may be difficult for quantitative indicators such as the JIF to reflect the quality of journals in special circumstances, such as the COVID-19 pandemic, journals should maintain strict publication procedures to improve the quality of research. Additionally, the research community should exercise caution when using quantitative evaluation indicators for journals. Future research should examine journals' publication policy, research content, and long-term results.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The authors received no financial support for this article.

Data Availability

Data analyzed in this article are available from the corresponding author upon reasonable request as Clarivate does not allow researchers to share the data retrieved from their product.

Supplementary Materials

Supplementary materials are available from <https://doi.org/10.6087/kcse.320>.

Suppl. 1. Definition of metrics used in this study.

Suppl. 2. List of the 43 journals included in this study.

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Copyright policies of science and engineering open access journals indexed in Science Citation Index Expanded or Scopus, published by Korean academic societies: a case study

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Abstract

This article explores the challenges related to copyright policies in the context of science and engineering open access (OA) journals based in Korea. The English-language science and engineering OA journals published independently by Korean academic societies typically exhibit three common characteristics regarding their copyright and licensing policies. First, authors are generally required to transfer their copyrights. Second, the Creative Commons (CC) license terms are predominantly BY-NC (Attribution-NonCommercial), without providing authors the option to select alternative licensing terms. Third, the journals do not sufficiently protect the rights of the authors. From the analyses presented herein, it is evident that the current copyright and licensing policies of Korea's English-language science and engineering OA journals lack a robust structure. These policies need to be revised to allow authors to retain copyright and require them to consent for the CC license terms it adopts, in order to align with the common practice among OA journals. Furthermore, to better protect authors' rights, it would be beneficial to permit authors to choose the specific terms of the CC license for their articles.

Keywords

Open access; Copyright policy; Creative Commons license; Publishing agreement; Republic of Korea

Received: February 3, 2024
Accepted: February 10, 2024

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Introduction

Background

Editors aspire to have the journals they edit recognized as world-renowned academic publica-

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tions. Various tips have been proposed to achieve this goal [1], but the most fundamental way is to publish high-quality papers that are widely cited by researchers.

To increase the likelihood of being cited by multiple researchers, journal papers must be widely available. Therefore, the language of publication and online accessibility are crucial factors for globalizing a journal [2]. This is supported by the growing popularity of open access (OA) journals published in English. This article uses the term “OA journal” to refer to a journal that is freely accessible. Notably, the fields of science and engineering exhibit a higher demand for OA journals than other disciplines, such as the humanities, social sciences, sports, and the arts [3].

To achieve renown, an academic journal must be more than just OA and published in English; above all, a steady stream of high-quality papers must be submitted to the journal. Well-established academic journals often enjoy a virtuous cycle of recognition and submission, but for editors of journals still in the growth phase, this presents a significant challenge.

There are numerous strategies for attracting authors, which include offering incentives like expedited review, streamlined publication procedures, and waiving publication fees. However, this article concentrates on the copyright policies of academic journals. It would be difficult to say that a well-designed copyright policy of an academic journal will help attract particularly good papers, but a poorly designed copyright policy can leave authors with a bad impression of the journal and will not help the journal develop in any way.

“Copyright” refers to a “bundle of rights” that the creator of a work is legally entitled to exercise in relation to that work. The author of a paper, or all co-authors, in the case of a joint work, automatically own the copyright to the paper upon its creation, as stipulated by Article 5(2) of the Berne Convention for the Protection of Literary and Artistic Works (hereafter “Berne Convention”) [4] and Article 10 of the Korean Copyright Act [5]. Moral rights, which encompass the right to claim authorship of the work (also known as the right of paternity) and the right to the integrity of the work, are exclusively held by the author (Berne Convention Article 6*bis*(1) [4]; Article 14(1) of the Korean Copyright Act [5]). As such, these rights cannot be transferred or licensed. However, an author may choose to waive them or agree not to enforce them [6,7]. The right of paternity is addressed by the Attribution (BY) condition included in all Creative Commons (CC) licenses. The moral right of integrity is somewhat related to the right to produce derivative works, which is covered by the BY-ND (Attribution-NoDerivs) condition, but it cannot be licensed under any CC license, unlike the right to produce derivative works. Nonetheless, when authors transfer or license the economic rights to their works, they are considered to have waived

or agreed not to assert the right of integrity to the extent necessary for the transferees or licensees to utilize those transferred or licensed rights [8]. The right of disclosure is another aspect of an author’s moral rights. However, if authors transfer the economic copyrights in their articles to academic journals or grant licenses for their publication, the authors are regarded as having given consent for the paper’s publication (Article 11(1), (2) of the Korean Copyright Act) [5].

For a paper to be published in an academic journal, the author must either transfer the necessary economic copyrights to the publisher or grant the publisher a license to publish the paper. Traditional subscription-based journals typically require authors to transfer copyright to the journal. In contrast, OA journals usually allow authors to retain copyright and instead grant the journal the right of first publication [9]. In the realm of academic publishing, the most pertinent economic copyrights include the right to reproduce the work, distribute it both online and offline, and prepare derivative works based on the original work [10]. If a publisher produces a print journal, they must secure the right to reproduce and distribute the paper in print form, either through a transfer of rights or a licensing agreement. Similarly, for electronic publishing, publishers need the rights to reproduce the paper digitally and distribute it online [10]. The act of translating an academic paper and sharing it with others involves the right to prepare derivative works, which is relevant to the ND condition. It is important to note, however, that when a journal enables machine translation of articles for display on its website in another language, this should be regarded as copying, not as the preparation of a derivative work [11].

Although copyright laws share many similarities across different countries, there are notable differences in the specifics. For example, under the German Copyright Act, copyrights cannot be transferred (Section 29(1) of the German Copyright and Related Rights Act) [12]. Instead, German case law interprets the transfer of copyright as the establishment of an exclusive license [13]. The French Copyright Act requires that when transferring economic rights, each right must be itemized individually (Article L131-3(1) of the French Intellectual Property Code) [13,14]. In Korea, the Korean Copyright Act stipulates that the transfer of the entirety of copyright is presumed not to include the right to prepare derivative works unless explicitly agreed upon (Article 45(2) of the Korean Copyright Act) [5]. Therefore, it is advisable for OA journals, whose articles are electronically published and globally accessible, to be as precise as possible in securing economic rights from authors for publication. Moreover, once these economic copyrights have been acquired from the authors, the publisher, who becomes the copyright holder, must ensure that the author’s right to use their own work is clearly defined in the copy-

right transfer agreement.

Objectives

The purpose of this article is to address the copyright policy issues of science and engineering OA journals indexed in the Science Citation Index Expanded (SCIE) or Scopus and published in Korea, a non-English-speaking country. To this end, we pursued the following specific objectives. First, we analyzed the overall situation of Korean science and engineering journals published in English. Second, we examined the copyright policies and CC license terms of OA journals published by Korean academic societies.

Methods

Ethics statement

This is a literature-based study. Therefore, no Institutional Review Board approval or informed consent was required.

Study design

This is a descriptive case study based on the search results of the copyright and OA policies of academic society journals in Korea.

Setting, data sources, and measurement

Among the science and engineering OA journals published in English and listed in the Korea Citation Index (KCI), we selected those that are also indexed in SCIE or Scopus. We specifically focused on the copyright policies of journals published independently by local academic societies, as opposed to those outsourced to a leading international academic publisher. The reasons for this sample selection are as follows: first, the fact that a journal is an English-language OA academic journal based in a non-English-speaking country, such as Korea, suggests that the journal aspires to be a prestigious publication with global recognition; second, the fact that the journal is listed in SCIE or Scopus reflects international recognition of the journal as a competent academic journal; and third, an examination of the copyright policies of journals published independently by local academic societies—without the reliance on the experience and resources of international academic publishers—enables an accurate evaluation of the level of understanding of copyright law and policy among editors of academic journals.

The subject journals for this study were identified through a search of the KCI database of academic journals. As of January 10, 2024, there were 162 KCI-listed science and engineering journals that were also indexed in SCIE or Scopus. These included 80 journals in the fields of medicine and pharmacy, 36 in engineering, 31 in natural sciences, and 15 in agricul-

Table 1. Publishers of Korean science and engineering journals indexed in SCIE or Scopus published in English

Field (as listed in KCI)	No. of journals (%)	
	International publisher (n=58)	Local publisher (n=104)
Medicine and pharmacy (n=80)	11 (13.7)	69 (86.3)
SCIE (n=42)	6 (14.3)	36 (85.7)
Scopus (n=38)	5 (13.2)	33 (86.8)
Engineering (n=36)	27 (75.0)	9 (25.0)
SCIE (n=30)	25 (83.3)	5 (16.7)
Scopus (n=6)	2 (33.3)	4 (66.7)
Natural sciences (n=31)	12 (38.7)	19 (61.3)
SCIE (n=22)	11 (50.0)	11 (50.0)
Scopus (n=9)	1 (11.1)	8 (88.9)
Agriculture, fishery sciences, and oceanography (n=15)	8 (53.3)	7 (46.7)
SCIE (n=6)	4 (66.7)	2 (33.3)
Scopus (n=9)	4 (44.4)	5 (55.6)
Total (n=162)	58 (35.8)	104 (64.2)
SCIE (n=100)	46 (46.0)	54 (54.0)
Scopus (n=62)	12 (19.4)	50 (80.6)

SCIE, Science Citation Index Expanded; KCI, Korea Citation Index.

ture, fishery sciences, and oceanography (Table 1). Out of these, 104 journals were published by Korean academic societies without the involvement of international academic publishers. This group comprised 69 journals in medicine and pharmacy, 19 in natural sciences, nine in engineering, and seven in agriculture, fishery sciences, and oceanography. Notably, all these journals are OA, as shown in Table 2. For the purposes of this study, journals indexed in both SCIE and Scopus were considered to be SCIE-listed journals.

Information on the journals studied was first collected from the KCI database and then checked by examining the information posted on each journal's website. If there was a discrepancy between the information in the KCI database and the information on each journal's website, the latter was used as the standard.

Statistical analysis

Descriptive statistics were applied.

Results

Who is the publisher?

Science and engineering journals based in Korea can be di-

Table 2. Publishing brands of science and engineering OA journals indexed in SCIE or Scopus independently published in English by Korean academic societies

Publishing model	No. of journals (%)				Total
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	
SCIE	36 (100)	5 (100)	11 (100)	2 (100)	54 (100)
OA	36 (100)	5 (100)	11 (100)	2 (100)	54 (100)
Subscription	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hybrid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Scopus	33 (100)	4 (100)	8 (100)	5 (100)	50 (100)
OA	33 (100)	4 (100)	8 (100)	5 (100)	50 (100)
Subscription	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hybrid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	69 (100)	9 (100)	19 (100)	7 (100)	104 (100)
OA	69 (100)	9 (100)	19 (100)	7 (100)	104 (100)
Subscription	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hybrid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

SCIE, Science Citation Index Expanded; OA, open access.

vided into two categories: those published through an international academic publishing platform and those published independently by Korean academic societies (Table 1).

As shown in Table 1, Korean academic societies tend to prefer publishing their journals independently rather than through international academic publishing platforms. Although international academic publishers dominate the publication of journals in engineering and agriculture, fishery sciences, and oceanography, academic societies in the fields of medicine, pharmacy, and natural sciences generally publish journals independently.

When comparing journals listed in SCIE with those indexed in Scopus within the realm of Korean science and engineering publications, it is observed that SCIE-listed journals are more frequently published by international academic publishers, particularly in the disciplines of engineering, natural sciences, and agriculture, fishery sciences, and oceanography, as opposed to the fields of medicine and pharmacy. Conversely, Korean academic societies often independently publish their journals that are indexed in Scopus, and this trend is consistent across various fields.

The majority of science and engineering journals based in Korea, yet published in English, demonstrate independence, suggesting that journals from non-English-speaking countries can attain international competitiveness without the need to rely on international academic publishers. Nonetheless, this underscores the critical need for independently published journals to possess a thorough understanding of publishing and copyright policies.

Publishing model

English-language Korean journals in the field of science and engineering, published by international academic publishers, are generally categorized into two groups: those that follow the OA model and those that use the hybrid model. In the hybrid model, authors can choose between the subscription model and the OA model. Journals indexed in Scopus are more likely to adopt the OA model than those indexed in SCIE, as shown in Table 3.

International academic publishers have published the following number of Korean science and engineering journals: 45 by Springer Nature (Springer Links, 35 [30 hybrids, three subscriptions, two OAs]; Springer Open, 5 [all OA]); BMC, 4 [all OA]; Nature Portfolio, 1 [OA], seven by Elsevier (five OAs, two hybrids), three by Taylor & Francis Group (Taylor & Francis Online, all OA), two by Wiley (Wiley Online Library, all hybrid), and one OA by Mary Ann Liebert (Table 4).

According to the copyright policy of international academic publishers, in cases where the journal operates on a subscription model or the journal is hybrid and the author does not choose OA publication, the publisher retains the copyright. However, the author is granted certain rights as specified in the copyright transfer agreement. Conversely, when an author publishes a paper in OA journals, or opts for the OA model in hybrid journals, the author is responsible for paying publication fees but retains the copyright. In this scenario, the author must also consent to the terms and conditions of the CC license selected by the journal. The author may have the opportunity to choose the specific terms of the CC license [15–17].

Table 3. Publishing models of Korean science and engineering journals indexed in SCIE or Scopus, published by international academic publishers

Publishing model	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	6 (100)	25 (100)	11 (100)	4 (100)	46 (100)
OA	3 (50.0)	7 (28.0)	2 (18.2)	1 (25.0)	13 (28.3)
Subscription	0 (0)	2 (8.0)	1 (9.1)	0 (0)	3 (6.5)
Hybrid	3 (50.0)	16 (64.0)	8 (72.7)	3 (75.0)	30 (65.2)
Scopus	5 (100)	2 (100)	1 (100)	4 (100)	12 (100)
OA	4 (80.0)	0 (0)	1 (100)	2 (50.0)	7 (58.3)
Subscription	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hybrid	1 (20.0)	2 (100)	0 (0)	2 (50.0)	5 (41.7)
Total	11 (100)	27 (100)	12 (100)	8 (100)	58 (100)
OA	7 (63.6)	7 (25.9)	3 (25.0)	3 (37.5)	20 (34.5)
Subscription	0 (0)	2 (7.4)	1 (8.3)	0 (0)	3 (5.2)
Hybrid	4 (36.4)	18 (66.7)	8 (66.7)	5 (62.5)	35 (60.3)

SCIE, Science Citation Index Expanded; OA, open access.

Table 4. Publishing models of Korean science and engineering journals indexed in SCIE or Scopus, published by international academic publishers

Publisher	Publishing model		
	Open access (n=21)	Hybrid (n=34)	Subscription (n=3)
Springer Nature			
Nature Portfolio	1	-	-
Springer Open	5	-	-
BMC	4	-	-
Springer Link	2	30	3
Elsevier (ScienceDirect)	5	2	-
Taylor & Francis Group (Taylor & Francis Online)	3	-	-
Wiley (Wiley Online Library)	-	2	-
Mary Ann Liebert	1	-	-

SCIE, Science Citation Index Expanded.

It is noteworthy that all English-language science and engineering journals in Korea published by academic societies, as opposed to those disseminated through international academic publishers' platforms, were OA journals. This indicates that the OA model could potentially increase the global competitiveness of these journals (Table 2, Fig. 1).

The following section discusses the copyright and licensing policies of English-language science and engineering journals in Korea that are published by the academic societies themselves.

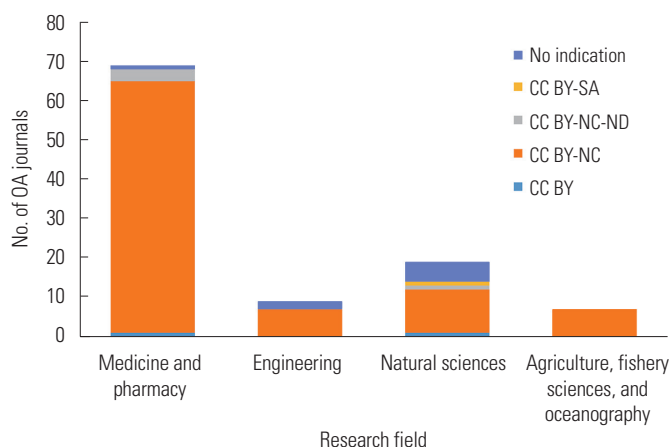


Fig. 1. Publishing models of science and engineering open access (OA) journals indexed in Science Citation Index Expanded or Scopus independently published in English by Korean academic societies. CC, Creative Commons; BY, Attribution; SA, ShareAlike; NC, NonCommercial; ND, NoDerivs.

Copyright and licensing policies of science and engineering OA journals independently published in English by Korean academic societies

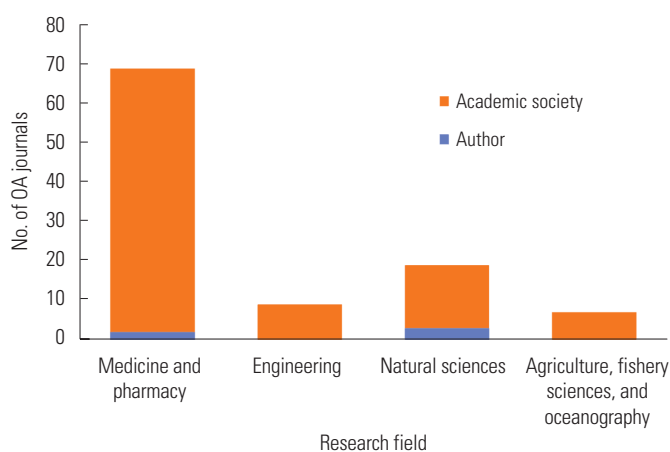
Who retains the copyright? Which CC licenses are employed?

Ninety-nine out of 104 Korean science and engineering OA journals (95.2%) not utilizing an international academic publishing platform mandate that authors transfer copyright to the publisher (academic society), irrespective of whether the

Table 5. Who holds the copyright for papers in science and engineering open access journals indexed in SCIE or Scopus independently published in English by Korean academic societies

Copyright holder	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	36 (100)	5 (100)	11 (100)	2 (100)	54 (100)
Author	1 (2.8)	0 (0)	1 (9.1)	0 (0)	2 (3.7)
Academic society	35 (97.2)	5 (100)	10 (90.9)	2 (100)	52 (96.3)
Scopus	33 (100)	4 (100)	8 (100)	5 (100)	50 (100)
Author	1 (3.0)	0 (0)	2 (25.0)	0 (0)	3 (6.0)
Academic society	32 (97.0)	4 (100)	6 (75.0)	5 (100)	47 (94.0)
Total	69 (100)	9 (100)	19 (100)	7 (100)	104 (100)
Author	2 (3.0)	0 (0)	3 (15.8)	0 (0)	5 (4.8)
Academic society	67 (97.0)	9 (100)	16 (84.2)	7 (100)	99 (95.2)

SCIE, Science Citation Index Expanded.

**Fig. 2.** Who owns the copyright for papers in 104 science and engineering open access (OA) journals indexed in Science Citation Index Expanded or Scopus independently published in English by Korean academic societies.

journal is indexed in SCIE or Scopus (Table 5, Fig. 2). This requirement stands in contrast to the common practice among OA journals, which typically permit authors to maintain copyright of their papers.

Korean science and engineering OA journals that were not published using an international academic publishing platform predominantly chose CC license terms of BY-NC (Attribution-NonCommercial), regardless of their indexing status in the SCIE or Scopus. Four journals opted for the BY-NC-ND condition, while two journals chose the CC BY condition, and only one journal adopted the BY-SA (Attribution-ShareAlike) condition (Table 6). There were no instances where authors were given the option to select CC license terms. Additionally,

eight journals provided OA to their publications on their websites without displaying the CC license terms (Table 6). In summary, 92 out of the 104 journals (88.5%) implemented the CC license without the ND condition. It is important to note that the ND restriction is related to safeguarding the right to prepare derivative works based on the original work.

Specification of the right to prepare derivative works (including the right to translate the work) in the copyright transfer agreement

Upon examining 99 Korean science and engineering OA journals that mandate copyright transfer from authors, it was found that 78 (78.8%) had their copyright transfer agreement forms publicly accessible on their websites. Of these, only 16 journals (16.2%), explicitly stated the transfer of rights to prepare derivative works, including the right to translate (Table 7). Additionally, none of the journals explicitly required authors to agree to the CC license terms adopted by the journal within the copyright transfer agreement form (Table 8).

Author's rights clause in the copyright transfer agreement

An analysis of 78 copyright transfer agreement forms available on the websites of Korean science and engineering OA journals showed that only 21 forms included provisions concerning authors' rights. Moreover, in 14 of these 21 cases, the provisions related to authors' rights were deemed improper or meaningless. This was because they either licensed acts already permissible under the CC license adopted by the journals or required authors to seek permission from the journals for those acts, as detailed in Table 9.

Table 6. CC licenses of science and engineering open access journals indexed in SCIE or Scopus, independently published in English by Korean academic societies

CC license	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	36 (100)	5 (100)	11 (100)	2 (100)	54 (100)
CC BY	1 (2.8)	0 (0)	1 (9.1)	0 (0)	2 (3.7)
CC BY-NC	35 (97.2)	3 (60.0)	7 (63.6)	2 (100)	47 (87.0)
CC BY-NC-ND	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
CC BY-SA	0 (0)	0 (0)	1 (9.1)	0 (0)	1 (1.9)
No indication	0 (0)	2 (40.0)	2 (18.2)	0 (0)	4 (7.4)
Scopus	33 (100)	4 (100)	8 (100)	5 (100)	50 (100)
CC BY	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
CC BY-NC	29 (87.9)	4 (100)	4 (50.0)	5 (100)	42 (84.0)
CC BY-NC-ND	3 (9.1)	0 (0)	1 (12.5)	0 (0)	4 (8.0)
CC BY-SA	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
No indication	1 (3.0)	0 (0)	3 (37.5)	0 (0)	4 (8.0)
Total	69 (100)	9 (100)	19 (100)	7 (100)	104 (100)
CC BY	1 (1.5)	0 (0)	1 (5.3)	0 (0)	2 (1.9)
CC BY-NC	64 (92.8)	7 (77.8)	11 (57.9)	7 (100)	89 (85.6)
CC BY-NC-ND	3 (4.3)	0 (0)	1 (5.3)	0 (0)	4 (3.8)
CC BY-SA	0 (0)	0 (0)	1 (5.3)	0 (0)	1 (1.0)
No indication	1 (1.4)	2 (22.2)	5 (26.2)	0 (0)	8 (7.7)

CC, Creative Commons; SCIE, Science Citation Index Expanded; BY, Attribution; NC, NonCommercial; ND, NoDerivs; SA, ShareAlike.

Table 7. Whether the right to prepare derivative works (or the right to translate the work) is specified in the copyright transfer agreement in science and engineering open access journals indexed in SCIE or Scopus, independently published in English by Korean academic societies

Right specified	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	35 (100)	5 (100)	10 (100)	2 (100)	52 (100)
Yes	3 (8.6)	0 (0)	5 (50.0)	0 (0)	8 (15.4)
No	23 (65.7)	5 (100)	2 (20.0)	2 (100)	32 (61.5)
No information ^{a)}	9 (25.7)	0 (0)	3 (30.0)	0 (0)	12 (23.1)
Scopus	32 (100)	4 (100)	6 (100)	5 (100)	47 (100)
Yes	5 (15.6)	1 (25.0)	2 (33.3)	0 (0)	8 (17.0)
No	22 (68.8)	2 (50.0)	2 (33.3)	4 (80.0)	30 (63.8)
No information ^{a)}	5 (15.6)	1 (25.0)	2 (33.3)	1 (20.0)	9 (19.1)
Total	67 (100)	9 (100)	16 (100)	7 (100)	99 (100)
Yes	8 (11.9)	1 (11.1)	7 (43.8)	0 (0)	16 (16.2)
No	45 (67.2)	7 (77.8)	4 (25.0)	6 (85.7)	62 (62.6)
No information ^{a)}	14 (20.9)	1 (11.1)	5 (31.3)	1 (14.3)	21 (21.2)

Percentages may not total 100 due to rounding.

SCIE, Science Citation Index Expanded.

^{a)}Cases where it was not immediately possible to check the terms of the copyright transfer agreement on the journal's website. In such cases, the journal's copyright policy usually required the transfer of copyright or submission of a copyright transfer form. However, such a form could only be obtained by the original author or the hyperlink to the form on the journal's website was not functional.

Table 8. Whether the author's consent to the Creative Commons license is required in the copyright transfer agreement

Author consent	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	35 (100)	5 (100)	10 (100)	2 (100)	52 (100)
Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mentioned but unclear	1 (2.9)	0 (0)	0 (0)	0 (0)	1 (1.9)
No	25 (71.4)	5 (100)	7 (70.0)	2 (100)	39 (75.0)
No information ^{a)}	9 (25.7)	0 (0)	3 (30.0)	0 (0)	12 (23.1)
Scopus	32 (100)	4 (100)	6 (100)	5 (100)	47 (100)
Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mentioned but unclear	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
No	27 (84.4)	3 (75.0)	4 (66.7)	4 (80.0)	38 (80.9)
No information ^{a)}	5 (15.6)	1 (25.0)	2 (33.3)	1 (20.0)	9 (19.1)
Total	67 (100)	9 (100)	16 (100)	7 (100)	99 (100)
Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mentioned but unclear	1 (1.5)	0 (0)	0 (0)	0 (0)	1 (1.0)
No	52 (77.6)	8 (88.9)	11 (68.8)	6 (85.7)	77 (77.8)
No information ^{a)}	14 (20.9)	1 (11.1)	5 (31.2)	1 (14.3)	21 (21.2)

SCIE, Science Citation Index Expanded.

^{a)}Cases where it was not immediately possible to check the terms of the copyright transfer agreement on the journal's website. In such cases, the journal's copyright policy usually required the transfer of copyright or submission of a copyright transfer form. However, such a form could only be obtained by the original author or the hyperlink to the form on the journal's website was not functional.

Table 9. Whether there is an author's rights clause in the copyright transfer agreement for science and engineering open access journals independently published in English by Korean academic societies

Author's right clause	No. of journals (%)				
	Medicine and pharmacy	Engineering	Natural sciences	Agriculture, fishery sciences, and oceanography	Total
SCIE	35 (100)	5 (100)	10 (100)	2 (100)	52 (100)
Yes	5 (14.3)	0 (0)	1 (10.0)	0 (0)	6 (11.5)
Mentioned but improper	3 (8.6)	0 (0)	2 (20.0)	0 (0)	5 (9.6)
No	18 (51.4)	5 (100)	4 (40.0)	2 (100)	29 (55.8)
No information ^{a)}	9 (25.7)	0 (0)	3 (30.0)	0 (0)	12 (23.1)
Scopus	32 (100)	4 (100)	6 (100)	5 (100)	47 (100)
Yes	0 (0)	0 (0)	1 (16.7)	0 (0)	1 (2.1)
Mentioned but improper	8 (25.0)	0 (0)	0 (0)	1 (20.0)	9 (19.2)
No	19 (59.4)	3 (75.0)	3 (50.0)	3 (60.0)	28 (59.6)
No information ^{a)}	5 (15.6)	1 (25.0)	2 (33.3)	1 (20.0)	9 (19.1)
Total	67 (100)	9 (100)	16 (100)	7 (100)	99 (100)
Yes	5 (7.5)	0 (0)	2 (12.5)	0 (0)	7 (7.1)
Mentioned but improper	11 (16.4)	0 (0)	2 (12.5)	1 (14.3)	14 (14.1)
No	37 (55.2)	8 (88.9)	7 (43.8)	5 (71.4)	57 (57.6)
No information ^{a)}	14 (20.9)	1 (11.1)	5 (31.2)	1 (14.3)	21 (21.2)

SCIE, Science Citation Index Expanded.

^{a)}Cases where it was not immediately possible to check the terms of the copyright transfer agreement on the journal's website. In such cases, the journal's copyright policy usually required the transfer of copyright or submission of a copyright transfer form. However, such a form could only be obtained by the original author or the hyperlink to the form on the journal's website was not functional.

Discussion

Key results

Out of 162 science and engineering journals indexed in SCIE or Scopus and published in English, 58 (35.8%) were published by international publishers, while 104 (64.2%) were published by local publishers. All 104 journals published by local publishers were OA. The breakdown of their CC licenses was as follows: two journals (1.9%) with CC BY, 89 (85.6%) with CC BY-NC, four (3.8%) with CC BY-NC-ND, one (1.0%) with CC BY-SA, and eight (7.7%) with no license indication.

Interpretation

Are there any benefits for OA journals in owning copyright? The answer is no. For OA journals, the distinction of being the first publisher is what matters. Since these journals are not focused on generating profit through the publication of papers, there is no necessity for the publisher to acquire copyright from the author. When an author transfers copyright to a journal, that journal then assumes the role of the copyright holder and is tasked with enforcing it when necessary [9]. This responsibility includes granting permissions for uses that fall outside the scope of the CC license adopted by the journal and pursuing legal action against copyright violators. Essentially, this only serves to increase the administrative burden. Moreover, critics have voiced opposition to the practice of commercial publishers demanding copyright transfer from authors of papers [18]. In summary, it is not advisable for OA journals to require authors to transfer the copyright of their papers.

A CC license without the ND restriction permits the free adaptation of material, including remixing, transforming, and building upon it. Journals are often encouraged to avoid the ND restriction, as it can promote the use of journal articles and contribute to academic progress. It has been argued that articles published under an ND license are not truly considered OA [19]. However, even critics of the ND restriction acknowledge that it does not completely prevent the reuse and adaptation of academic publications [19]. Copyright law mechanisms, such as exceptions and limitations to copyright, fair dealing, and the fair use doctrine, remain significant in the utilization of academic publications (Articles 28 and 35-5 of the Korean Copyright Act [5]; Section 107 of the US Copyright Act [20]; Sections 29 and 30 of the UK Copyright, Designs and Patents Act [21]). Ultimately, since the ND restriction pertains to the right to prepare derivative works based on the author's original work, the author's preference regarding the waiver of the ND restriction should be a primary consideration. Moreover, under the Korean Copyright Act [5], even if an author transfers all copyright to a publisher, the right to

prepare derivative works is presumed to remain with the author unless there is an explicit agreement transferring this right as well (Article 45(2)). Therefore, if an OA journal opts for a CC license without ND restrictions, it is prudent to obtain explicit consent for this license from the author separately, in addition to securing the copyright necessary for publication.

In a review of 99 Korean science and engineering OA journals that require copyright transfer, 78 (78.8%) provided accessible online agreements. However, only 16 of these agreements (16.2%) included rights for derivative works (Table 7). None of the journals required agreement to CC license terms (Table 8). This trend was observed irrespective of whether the journal was indexed in the SCIE or Scopus, indicating a general lack of understanding of copyright issues among Korean science and engineering societies that publish OA journals.

Finally, this paper examined whether independently published science and engineering OA journals in Korea that have acquired copyrights from authors adequately protect the authors' rights. It is evident that authors who have transferred copyright to OA journals retain the ability to freely use their papers in the same manner as other users under the terms of the CC license chosen by the journal. However, issues arise when an author wishes to utilize their work in ways that exceed the permissions granted by the journal's CC license. For instance, an author may want to include parts or the entirety of their paper, published in a journal that operates under a CC BY-NC license, in a commercially published book. In such a scenario, because the copyright has been transferred to the journal, the author must seek permission from the journal to use the paper. To address potential situations like this, it is prudent to incorporate clauses concerning the author's rights in the copyright transfer agreement between the author and the publisher. Nevertheless, a review of 78 Korean science and engineering OA journals found that only 21 journals had provisions for the author's rights in their copyright transfer agreements. Moreover, in 14 of these 21 cases, the provisions for authors' rights were either inadequate or meaningless, as shown in Table 9.

Limitations

The data analysis presented in this article was conducted from the perspective of copyright law. It does not reflect the opinions of journal editors regarding their copyright policies.

Generalizability

The results presented above are derived from an analysis of the copyright policies of Korean science and engineering journals. If local society journals in other countries adopt similar copyright policies, the insights from this case study may be

relevant to them.

Conclusions

Among English-language Korean science and engineering journals indexed in SCIE or Scopus, more are published independently of international academic publishing platforms than with them. Furthermore, all journals published without the support of these platforms are OA journals. This indicates that science and engineering journals from non-English-speaking countries can attain international competitiveness on their own, without relying on international academic publishers. Additionally, the OA publishing model plays a significant role in enhancing the international standing of these journals. However, inadequate copyright policies may hinder the international competitiveness of such journals.

The English-language science and engineering OA journals published independently by Korean academic societies typically exhibit three common characteristics in their copyright and licensing policies. First, authors are generally required to transfer their copyright to the journal. Second, the terms of the CC license applied are predominantly BY-NC, without providing authors the option to select alternative licensing terms. Third, these journals do not sufficiently safeguard the rights of the authors. To align with the common practice among OA journals, the copyright policies of these journals should be revised to permit authors to retain their copyright and to ensure that explicit consent is obtained for the CC licenses that are applied. In addition, journals can demonstrate greater consideration for authors' rights by allowing them to choose the CC license under which their papers are published.

Conflict of Interest

Ju Yoen Lee serves as an Associate Editor of *Science Editing* since 2023, but had no role in the decision to publish this article. No other potential conflict of interest relevant to this article was reported.

Funding

The authors received no financial support for this work.

Acknowledgments

The authors thank Jae Eun Lee, Yunju Park, Seok Bin Yoon, Ga Bin Yoon, Seowon Choi, Gahyun Lim, Dong Jun Kim, and Ji Yeon Kim at Dongguk University College of Law (Seoul, Korea) for their help in collecting data for this article.

Data Availability

Dataset files are available from the Harvard Dataverse at <https://doi.org/10.7910/DVN/KWRAHQ>.

Dataset 1. Research data on the copyright policy for open access journals indexed in SCI(E) or Scopus, published by Korean academic societies in the field of medicine.

Dataset 2. Research data on the copyright policy for open access journals indexed in SCI(E) or Scopus, published by Korean academic societies in the field of engineering.

Dataset 3. Research data on the copyright policy for open access journals indexed in SCI(E) or Scopus, published by Korean academic societies in the field of natural sciences.

Dataset 4. Research data on the copyright policy for open access journals indexed in SCI(E) or Scopus, published by Korean academic societies in the fields of agriculture, fishery sciences, and oceanography.

Supplementary Materials

The authors did not provide any supplementary materials for this article.

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Can training doctoral students to participate in peer review alleviate the shortage of peer reviewers in academic publishing?

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Introduction

Nurturing the next generation in academia is demanding but essential, requiring careful attention and planning. As scholars and researchers, our mission is to create new knowledge and nurture the future generation. In this essay, I would like to discuss the benefits of mentoring doctoral students to become future peer reviewers and editorial board members. Three specific topics will be covered: first, the crisis of the publishing process; second, how doctoral students can help; and third, some challenges that need to be addressed. This discussion will be helpful for early career researchers (particularly doctoral students) and editors to understand the development of the academic publishing industry and gain more knowledge on its uses.

The Escalating Crisis within the Peer Review System

In December 2023, 8 months after submitting a manuscript, I received an email from the journal indicating that my peer review process was delayed due to a shortage of reviewers. Upon discussing with my colleagues, I realized that this problem is not uncommon. Indeed, there is a problem facing the academic publishing industry: a serious shortage of proficient reviewers.

Academic publishing has witnessed fast growth over time in both quality and quantity, placing immense pressure on publishers and journals to cope with the soaring demand for peer review. The shortage of qualified reviewers can result in prolonged publication processes, insufficient representation of diverse perspectives, and a heavier workload for the reviewers who are available.

A report from Publons and Clarivate Analytics [1] indicated that about 71% of researchers declined review requests because the article fell outside their expertise (Fig. 1). Meanwhile, 42% declined because they were too busy, and 39% stated that they had received no peer review training. Furthermore, 10% of reviewers are responsible for 50% of all peer reviews, and researchers in developed countries write three times as many peer reviews per paper submitted as researchers in emerging nations [2,3]. This unfortunate situation impacts the time an article spends in the review process and the workload for some reviewers. It can also affect the num-

Received: February 1, 2024

Accepted: February 8, 2024

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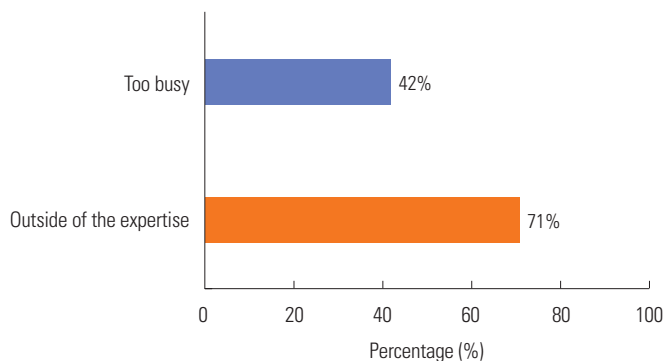


Fig. 1. Reasons researchers decline peer review requests. Reproduced from Publons and Clarivate Analytics [1].

ber of revise-and-resubmit decisions, reducing some manuscripts' likelihood of acceptance [4].

Doctoral Students are Willing to Help

Although many faculty members are jaded by serving as peer reviewers, doctoral students see it as an excellent opportunity and are eager to contribute [1]. I believe having exceptional doctoral students serve as peer reviewers or editorial board members after they have completed mentoring sessions could achieve several goals through a single initiative.

First, involving doctoral students in the peer review process can help alleviate the current shortage of journal reviewers, minimize the bias in the peer review process, and promote the journal. Inviting doctoral students will increase the pool of potential reviewers, since doctoral students often have expertise in their specific research areas and can offer valuable insights and feedback on the manuscripts. Their support will reduce the burden on existing reviewers, mainly faculty members, who may find it challenging to provide comprehensive and thoughtful feedback in a restricted timeline due to being overwhelmed with research and teaching activities at their institutions (or may even decline the review request). Thus, having a diverse group of reviewers, including early career researchers, can help to ensure a broad range of perspectives and minimize potential biases in the peer review process. In addition, engaging these emerging scholars can help foster relationships between journals and early career researchers, promote the journal's value, and potentially lead to future submissions and collaborations.

For doctoral students, participation in reviewer and potential editorial board training programs is a significant accomplishment in their careers. It provides doctoral students with hands-on experience in academic publishing, which can help them develop their research and critical, analytical, and writing skills. This experience can provide them with a sense of

fulfillment and satisfaction when they can contribute to advancing their field by helping to ensure the quality of published research. It is also an excellent opportunity to enhance doctoral students' resumes, as serving as a reviewer or editorial board member demonstrates their knowledge, expertise, and commitment and builds a network with top-notch professors and other peers in the field.

Furthermore, implementing those programs holds significant importance in shaping the journal's potential leaders, fostering the new generation, and shaping the academic heritage. Nurturing, defined as transmitting knowledge, skills, and expertise from generation to generation, is essential for any sector's sustained success and growth. The need for continuity over time is particularly notable in academia, where creating and disseminating new knowledge is a core mission. While individual scholars may come and go, their contributions to the body of knowledge and expertise continue to influence and inform the work of succeeding generations. By training and mentoring the next generation of scholars to become influential reviewers and editors, journals can transmit the knowledge and expertise of the current generation to future generations. These efforts can contribute to the long-term vitality and strength of academic publishing, even as individual scholars transition in and out of the field.

Tackle the Challenges and Move Forward

Despite the several advantages of mentorship programs for doctoral students, some challenges and concerns need to be addressed. One of the main concerns is ensuring the quality and consistency of reviews from inexperienced reviewers. Doctoral students may lack the expertise and knowledge required to provide high-quality reviews, which can affect the integrity and reputation of the journal. In addition, there may be resistance from established scholars and researchers who feel that mentorship programs are unnecessary or irrelevant to their work. There is a risk that these programs may further increase the workload for both faculty and doctoral students, who may be required to spend additional time on these programs. However, there may be some solutions to those concerns and challenges.

Journal and university collaboration

In the current academic world, every university strives for academic excellence, especially in terms of scholarly publishing. As of 2017, over 100 universities in North America had invested substantial funds and resources to establish their own university presses [5], and academic publishing has become a method of assessing faculty productivity and upholding the tenure system. With those resources, universities and journals

should collaborate to develop and implement effective mentorship programs for doctoral students. This can involve pooling resources, sharing expertise, and developing innovative models of collaboration that can benefit everyone involved. It may also require a shift in mindset, with more established scholars and researchers recognizing the importance of mentorship and actively supporting the next generation of scholars.

Aligning programs with faculty research interests is also fundamental to the success of mentoring. This design would help alleviate the opposing point that these students are not yet members of the profession, making them unqualified to review articles. In a program, the faculty should work in pairs with one to two mentees with the same interests. This strategy can prevent faculty from feeling overwhelmed by the mentoring process. Those trainings will build students' confidence and competence as emerging scholars. By engaging in the review process, they can develop a deeper understanding of the academic publishing system and gain valuable experience in assessing the quality and significance of research. Ultimately, empowering doctoral students to review articles, universities, and journals can help cultivate a new generation of scholars equipped with the skills and knowledge to make meaningful contributions to their fields.

Acknowledge peer review as a part of the academic workload

Integrating peer review into faculty workloads and the tenure promotion process is a potential strategy to address reviewer shortages and promote the activity's value in academia. Mentoring programs could be established as standalone courses, which cover topics such as peer review and equip faculty with the necessary skills and knowledge to carry out this task effectively. By doing so, faculty would not have to allocate extra time to peer review, thereby reducing the burden on their workload. A further incentive for faculty to undertake peer review could be their tenure status, as demonstrating a commitment to peer review may increase their chances of achieving tenure. It is, therefore, crucial to acknowledge the importance of peer review in the tenure promotion system.

Doctoral students will gain twice as much if mentoring programs are acknowledged in their academic studies. Simultaneously, they can earn credit hours, progress toward the degree, and acquire hands-on experience beneficial for their research. In addition, they will have the opportunity to network with established scholars and colleagues in their field, which may lead to future research collaborations and opportunities. In addition, having experience serving as a peer reviewer or even an editorial board position can enhance their CV and improve their prospects in the academic job market.

Moreover, if a peer review and editorial board mentoring

program is integrated into the academic program, both faculty and students can recognize the value and benefits of nurturing culture. By training the next generation of scholars to be effective reviewers and editors, academic journals and institutions can help ensure that academia will remain a vital source of knowledge and expertise for decades.

In addition, by promoting diversity and inclusiveness in academic publishing, these programs can ensure that academic knowledge reflects the complete diversity of human experience and that all voices are heard.

Conclusion

Mentorship programs for doctoral students aspiring to become peer reviewers and editorial board members can have a two-fold benefit for the academic publishing industry by mitigating the reviewer shortage and fostering a nurturing culture. However, challenges and concerns must be addressed, such as guaranteeing the quality and consistency of reviews from inexperienced reviewers and managing the workload of faculty and doctoral students. Collaboration between journals and universities, as well as recognition of acknowledgment of the peer review process in academic workload, can help overcome these challenges and promote the long-term vitality and strength of academic publishing.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The author received no financial support for this work.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The author did not provide any supplementary materials for this article.

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Artificial intelligence in scholarly publishing and the role of the Korean Association of Medical Journal Editors in the Asia-Pacific region

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Meeting: The 2023 Annual Conference of the Asia Pacific Association of Medical Journal Editors

Date: August 16–18, 2023

Venue: Hue University of Medicine and Pharmacy, Hue, Vietnam

Organizer: The Asia Pacific Association of Medical Journal Editors

Theme: Publication in the era of artificial intelligence

The Asia Pacific Association of Medical Journal Editors (APAME) conference has been conducted annually in various Asia-Pacific countries since 2006. Members of the Korean Academy of Medical Journal Editors (KAMJE) have consistently participated in the APAME conference up until 2019, which took place in Xian, China. However, due to the COVID-19 pandemic, there were no in-person conferences for 3 years, extending through 2022. The 2023 conference was hosted by Hue University of Medicine and Pharmacy in Hue, Vietnam, from August 16 to 18, 2023. The theme of this conference was “Publication in the Era of Artificial Intelligence (AI).” This year’s conference was attended by nearly 200 individuals, including editors, publishers, librarians, and researchers from various Asia-Pacific countries (Fig. 1).

On the first day (August 16, 2023), the “Editing and Peer Reviewing Training Course” workshop consisted of two sessions. The first session started with an introduction of the purpose and mission of the APAME to young researchers, followed by a discussion of the role of the editor in the process from submission to publication. In addition, practical methods to improve the quality of reviews, stimulate interest of young researchers, and deliver knowledge and information to reviewers and editors were presented. In the second session, which continued in the afternoon, six lectures and question-and-answer sessions were held on many ethical issues in medical journal publishing, such as authorship and conflicts of interest.

On the second day, there was a Western Pacific Regional Index Medicus (WPRIM) meeting in the morning. WPRIM is the abstract database of medical journals in the Western Pacific Region, available from <http://wprim.org/> or <http://wprim.whocc.org.cn/search/index>. In the

Received: October 2, 2023
Accepted: November 8, 2023
Epub: January 29, 2024

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Fig. 1. The 2023 Annual Conference of the Asia Pacific Association of Medical Journal Editors.

afternoon, the 2023 APAME general meeting began with a welcome speech by president Burmajaav Badrakh from Mongolia, followed by a report on the minutes of the 2019 meeting, a report on the activities of each committee, and the election of the new executive board. The APAME has three active committees: the Education and Training Committee, the Ethics and Editorial Policy Committee, and the IT and Library Committee. In the last activity report, these three committees reported the results of active online activities despite the difficulties of the COVID-19 pandemic. In particular, the Education and Training Committee has been actively conducting online education on diverse topics. In addition, the Homepage Committee was newly established this year. As a result, the APAME is now equipped for sustainable management of the organization and its annual conference. Subsequently, new executive committee members were elected for the 2023–2025 term. Dr. Nicholas Talley, the emeritus Editor-in-Chief of the *Medical Journal of Australia* and a gastroenterologist at the University of Newcastle (Newcastle, NSW, Australia), was elected as the new president. The newly elected president, Dr. Talley, unveiled the 3-day conference program for the following year. This conference will take place at the University of Newcastle, located north of Sydney, Australia, from August 28 to 30, 2024.

On the last day, August 18, the 2023 Annual Conference was opened by Mr. James Howlett from the World Health Organization's Regional Office for the Western Pacific region and welcomed by Dr. Nguyen Vu Quoc Huy, rector (president) of Hue University of Medicine and Pharmacy. A total of 12 lectures and panel discussions were opened under the titles of "Opportunities and Challenges of AI (session 1)," "Emerging Trends in Scholarly Communication (session 2)," and "Publication and Academic Career in the 21st Century (session 3)."

Session 1 was devoted to AI, which has recently become a

hot topic in the publishing world, with lectures and discussions on the ethical issues of using AI in scholarly publishing. One of the impressive lectures was "Challenges and Opportunities Presented by AI in Medical Journal Editing and Publishing" by Dr. Talley. AI has recently been widely used in medical journal writing and publishing, although problematic ethical issues may limit its use due to concerns about conveying false information. He introduced the article "Generating scholarly content with ChatGPT: ethical challenges for medical publishing" by Liebrez et al. [1], published in *Lancet Digital Health* in 2023. Due to the widespread usage of ChatGPT (OpenAI), his presentation raised ethical questions, including doubts about how well users were informed and the risks of testing an unproven technology in a live healthcare setting. He identified the impact of ChatGPT on publishing and summarized the positions of international publishing organizations. The author discussed the use of AI chatbots to produce academic text, ethical considerations regarding ChatGPT use and authorship issues, inequalities in use, and misinformation about scientific knowledge. There is a debate about whether ChatGPT meets the International Committee of Medical Journal Editors (ICMJE) authorship criteria, making it questionable whether it can ultimately be credited in papers. Elsevier has stated that AI tools cannot be listed as an author, and the use of AI must be appropriately acknowledged. As technologies become better tailored to user needs and more commonly adopted, we believe that comprehensive discussions about authorship policies are urgent and essential. The Committee of Publication Ethics (COPE) has developed AI recommendations for editorial decision-making and the trade body for scholarly publishers. Another point to be addressed regarding the use of ChatGPT in medical journal publishing is inequality. OpenAI's leadership has affirmed that free use is tempo-

rary and the product will eventually be monetized. If the platform involves some form of paywall, it might entrench existing international inequalities in scholarly publishing [1]. Specifically, if socioeconomic disparities lead to differences in AI usage, it might result in the current imbalances in knowledge dissemination and scholarly publishing. Potential misinformation in healthcare was also mentioned. While the ease of use and accessibility of ChatGPT and its ability to produce text in multiple languages may make it more widely used in the future, the functionality of ChatGPT can cause harm by creating misleading or inaccurate content, thereby eliciting concerns about scholarly misinformation should not be overlooked. In the era of AI-generated content in scholarly publishing, it is questionable whether readers will be able to be confident that a human wrote the content.

In session 2 the first topic was how AI-generated content promotes academic communication. Experimental results showed that AI-generated content improved productivity by reducing writing time by 40% and improving quality by up to 18% [2]. Consequently, it was suggested that providing the AI model with traceable data and clear guidelines from entities such as the government and publishers could increase the trustworthiness of AI. The subsequent lecture, “Good Publication Practice (GPP) 2022,” provided international ethical and practical recommendations for key stakeholders involved in publishing or presenting company-sponsored biomedical research. Updates have reflected developments in scholarly publishing, biomedical publishing, human trial registration, and roles of publication professionals since the publication of GPP3 Guidelines in 2015 [3]. Critical updates include protecting research and data integrity, transparency, inclusivity, and authorship and contributorship. In addition, practical planning principles are outlined, including the importance of steering committees, publication working groups, policies and processes, publication plans, and data sharing.

In the afternoon, session 3, focused on improving the quality of reviews, training reviewers, and discussing the role of editors to continue to improve journal publishing and enhance scientific integrity, including areas of debate and pitfalls of peer review. The presentations discussed the role of AI in academic integrity, improving peer review from submission to decision confirmation, and challenges faced by journals in developing countries. In the following panel discussion, which lasted for about an hour before the closing, the role of the APAME in developing domestic journals in each country was re-emphasized.

While former APAME vice president Jeong-Wook Seo and former KAMJE President In-Hong Choi have played active and leading roles in the APAME, they were not assigned a unique role in the new executive committee due to the gap caused by

the recent COVID-19 pandemic. I attended the APAME conference for the first time this year as the KAMJE’s Director of International Affairs and was welcomed with great interest. I will serve on the Ethics and Editorial Policy Committee during the 2023–2025 term. I believe that the KAMJE can help the APAME by improving the quality and development of journals in Asia-Pacific countries that are seeking international indexing. This is because we have the highest number of WPRIM-listed journals among the member countries, and we can leverage our exceptional skills in journal development strategies to improve the quality of medical journals in other countries. For reference, the number of PubMed Central-listed medical journals in Asia-Pacific region by country is as follows (as of September 30, 2023): Korea (n = 163), Japan (n = 66), mainland China (n = 52), Hong Kong (n = 20), Taiwan (n = 5), Australia (n = 21), Singapore (n = 17), Malaysia (n = 5), Thailand (n = 2), Philippines (n = 2), and Indonesia (n = 1). This PubMed Central inclusion status means that the Korean medical journal editors are most diligent in adding theirs to PubMed Central, which accepts journals with high scientific quality and Journal Article Tag Suite (JATS) Extensible Markup Language (XML) production [4]. Currently, PubMed Central takes non-English journals that have published English articles in at least half of the same issue [5]. This language policy by PubMed Central is a good opportunity for local Asian journals to be included.

As I was returning home from the 2023 APAME Annual Conference, I reflected on how the previous board members of the KAMJE made significant contributions to the development of medical journals in Asia-Pacific countries, in addition to their efforts to develop domestic journals. There is no doubt that AI will markedly change the publishing environment of medical journals. There are many benefits of AI in medical publishing in terms of easy access to information about scientific misconduct, efficient and convenient peer reviewing, and the dissemination of novel information after publication. However, we have to use AI carefully and avoid dehumanizing the editorial process concomitantly with the increasing role of AI technology in medical publishing. I believe that the KAMJE has much to contribute to improving the quality of medical journals in Asia-Pacific countries and leading them to a world-class level in this AI era.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

This work was supported by a travel grant from the Korean Association of Medical Journal Editors (KAMJE) in 2023.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The author did not provide any supplementary materials for this article.

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Seeing the forest for the trees and the changing seasons in the vast land of scholarly publishing

Soo Jung Shin

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Meeting: Online Workshop for Academic Journal Editors (2023-A03)

Date: September 20, 2023

Venue: Virtual conference

Organizer: Korean Council of Science Editors (KCSE)

Theme: State of the art in scientific publishing

As I engage in various tasks related to medical publishing for the *Journal of Movement Disorders*, I sometimes become so engrossed in the minutiae that I lose sight of the bigger picture—that is, as the saying goes, I lose sight of the forest for the trees. In doing so, I may inadvertently overlook the ever-changing seasons in the vast realm of academic publishing.

In this context, attending a workshop offers a valuable opportunity to gain an objective perspective on the work I have been engaged in. As the adage states, “You can’t know where you’re going until you know where you’ve been.” A workshop also provides a chance to identify and address any overlooked shortcomings that I may have mistakenly thought I understood. Additionally, attending a workshop makes it possible to acquire and apply the most recent knowledge in a novel manner—much like ascending a staircase of experience and unveiling a window to a more expansive view.

The Online Workshop for Academic Journal Editors, which started at 9 AM and continued until noon on Wednesday, September 20, 2023, consisted of five lectures. The first presentation, titled “Paper Mill Status and Editorial Responses,” was delivered by Cheol-Heui Yun, Chair of the Publication Ethics Committee at the Korean Council of Science Editors (KCSE) and Seoul National University. Yun provided a comprehensive overview of paper mills and the challenges they pose in the context of open science. I had the opportunity to learn about a report [1] jointly produced by the Committee on Publishing Ethics (COPE) in the United Kingdom and the International Association of Scientific, Technical, and Medical Publishers (STM). This report explores the operational methods, historical background, scale, and specific areas of concern related to paper mills. It also proposes specific recommendations to address these issues, which can be implemented in journal publishing.

The second session, titled “State of the Art of Open Access,” was presented by Kihong Kim,

Received: October 18, 2023
Accepted: November 14, 2023
Epub: January 30, 2024

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President of KCSE at Ajou University. I gained insights into Plan S, a policy for open access to scientific publishing, implemented by European funding agencies in January 2021. According to the Plan S policy, funding for transformative (hybrid) journals will cease by December 2024, and any journals failing to meet the stipulated conditions will be discontinued prior to this date [2]. A White House Office of Science and Technology Policy memo has also declared that all federal funding agencies in the United States will adopt and implement a policy akin to Plan S by the end of 2025 [3]. A comprehensive discussion has been initiated on the no-pay publishing model, which involves the publication of journals using only public funds, without any publication or subscription fees. This policy could potentially address issues related to predatory journals and paper mills to a certain extent. However, it remains uncertain whether the publishing industry will sustain this model, the amount of public funding required to cover publishing costs, and whether academic freedom will be compromised due to the excessive promotion of academic publishing.

The third presentation, entitled “ChatGPT and Article Writing, Reviewing, and Publishing,” was delivered by Sun Huh from Hallym University. He discussed the applications of ChatGPT-4 (OpenAI), a leading artificial intelligence (AI) chatbot, in the context of article writing, manuscript review and editing, and academic journal publishing [4]. The consideration of whether AI chatbots like ChatGPT could be employed for peer review led me to acknowledge the necessity of creating submission guidelines for AI chatbots.

In the fourth lecture, Joo-Hyung Ryu, the Editor-in-Chief of *GeoData*—the premier data journal in Korea, published by the Korea Institute of Ocean Science and Technology (KIOST)—shared the history of *GeoData* and the details of the society’s launch. This lecture offered valuable insights into the world of data journals and data papers, significantly broadening my understanding of these topics.

The final lecture, titled “Preprint Update,” was delivered by Soo-Young Kim, Chair of the Education and Training Committee of KCSE, from Hallym University. This lecture provided an informative opportunity to examine the evolution of preprint status since the first workshop on preprints held by KCSE in 2020.

Since 2017, there has been a notable increase in the participation in preprints, a trend significantly amplified by the COVID-19 outbreak. Major journals now widely accept preprints as a crucial element of open science. They offer several advantages, including the swift dissemination of research findings, abundant opportunities for enhancement via comprehensive feedback prior to publication, and the capacity to assert ownership of research outcomes [5]. I paid close attention to the

lecture, given that our journal does not allow preprints.

The COVID-19 pandemic has profoundly transformed the landscape of academic journals, presenting a significant challenge for editors. In this era, advanced tools such as AI have led to a proliferation of misinformation and mistrust. Therefore, it is crucial to maintain transparency in how these tools are used to generate and disseminate information [6]. This workshop highlighted the expanding role of editors in safeguarding the credibility of scientific research. I am grateful to the organizers of this insightful workshop, which has strengthened my confidence in our journal management and my approach to work.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The author received no financial support for this work.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The author did not provide any supplementary materials for this article.

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ChatGPT for editors: enhancing efficiency and effectiveness

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Abstract

This tutorial examines how ChatGPT can assist journal editors in improving the efficiency and effectiveness of academic publishing. It highlights ChatGPT's key characteristics, focusing on the use of "Custom instructions" to generate tailored responses and plugin integration for accessing up-to-date information. The tutorial presents practical advice and illustrative examples to demonstrate how editors can adeptly employ these features to improve their work practices. It covers the intricacies of developing advanced prompts and the application of zero-shot and few-shot prompting techniques across a range of editorial tasks, including literature reviews, training novice reviewers, and improving language quality. Furthermore, the tutorial addresses potential challenges inherent in using ChatGPT, which include a lack of precision and sensitivity to cultural nuances, the presence of biases, and a limited vocabulary in specialized fields, among others. The tutorial concludes by advocating for an integrated approach, combining ChatGPT's technological advancements with the critical insight of human editors. This approach emphasizes that ChatGPT should be recognized not as a replacement for human judgment and expertise in editorial processes, but as a tool that plays a supportive and complementary role.

Keywords

ChatGPT; Prompting techniques; Journal editors; Editorial processes; Features of ChatGPT

Introduction

ChatGPT (OpenAI) is a large language model that uses the generative pre-trained transformer (GPT) architecture. Since its introduction in November 2022, ChatGPT has been applied in a variety of fields. Editors and researchers have been exploring how language models like ChatGPT can effectively be utilized in academic publishing and editing to enhance both efficiency and effectiveness [1–4]. This tutorial is designed to assist journal editors in harnessing the full potential of ChatGPT. It covers the core functionalities of ChatGPT, emphasizing the art of crafting effective prompts. The tutorial explores various prompt formulation techniques that could generate optimal responses and provides insights into the model's capabilities and limita-

Received: February 2, 2024
Accepted: February 9, 2024

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tions. It is important to acknowledge that there exists no absolute correct or incorrect way to interact with ChatGPT. Nevertheless, the adoption of specific strategies can significantly improve the efficacy of one's prompts. This tutorial endeavors to acquaint editors with these methods, enabling them to employ ChatGPT more effectively in their editorial duties.

Key Features of ChatGPT

Use “Custom instructions”

By selecting the username at the bottom left of the interface, editors will find the “Custom instructions” option, situated beneath the “My Plan” and “My GPTs” menus. “Custom instructions” allow editors to add “preferences” or requirements that they would like ChatGPT to consider when generating its responses [5,6]. This feature enables ChatGPT to tailor its responses more effectively to their needs. To activate “Custom instructions,” two key questions must be addressed: “What would you like ChatGPT to know about you to provide better responses?” and “How would you like ChatGPT to respond?” (Fig. 1).

In response to the first question, “What would you like Chat-

Custom instructions ⓘ

What would you like ChatGPT to know about you to provide better responses?

As an experienced journal editor, my primary focus is on maintaining high standards of academic integrity and quality in publications. I frequently engage with diverse research papers in the field of science and technology, requiring a keen eye for detail and a broad understanding of multiple academic fields. I must stay up to date with the latest research trends and ethical guidelines in scientific writing. My role also involves providing constructive feedback to authors, which requires a balance of critical analysis and supportive

548/1500

How would you like ChatGPT to respond?

As a journal editor, I value responses that are precise, well-researched, and adhere to academic standards. In my role, I deal with a wide range of topics, so I appreciate responses that are not only accurate but also show an understanding of the latest developments and ethical considerations in various fields. Responses should maintain a formal, scholarly tone for academic publishing, emphasizing clarity and professionalism. Actionable and contextually relevant guidance and suggestions are welcomed

640/1500

Enable for new chats

Cancel Save

Fig. 1. ChatGPT (OpenAI) sample responses to the questions included in “Custom instructions.”

GPT to know about you to provide better responses?”, editors have the opportunity to share personal details. This may include their profession, specific goals, interests, or particular challenges they are facing. Alternatively, editors can assign a role they envisage for ChatGPT, or a combination of both personal and role-based information. This input is crucial for the model to customize its responses to suit the editor's unique context and informational needs. For instance, a newly appointed journal editor has a comprehensive understanding of general editorial processes. In such a scenario, it would be beneficial to identify themselves as an “experienced journal editor.” This would prevent ChatGPT from providing basic editorial explanations that are already familiar to the editor, thereby increasing the relevance of the guidance it offers. Similarly, if the editor is proficient in using R, indicating this can help tailor the depth and nature of technical explanations in the responses they receive.

For the second question, “How would you like ChatGPT to respond?”, it is beneficial to provide details including the preferred tone (e.g., formal or conversational), desired response length (e.g., detailed explanations or brief summaries), and specific requests for actionable advice or suggestions. “Custom instructions” are often overlooked by users, but they can significantly enhance both the efficiency and effectiveness of the content generated. Additionally, they have a significant impact on the style and appropriateness of the language used in the response.

To fully harness ChatGPT's capabilities, “Custom instructions” need to be thoughtfully adapted to each specific context or situation. OpenAI's guidance on “Custom instructions” for ChatGPT highlights that each response has a 1,500-character limit [5]. In the absence of precise “Custom instructions,” ChatGPT tends to deliver more generalized information, which can lead to inconsistencies in output quality. Fig. 2 illustrates

You @

ChatGPT
Hello! How can I assist you today?

🗑️ 👍 🗨️ ↻

A

You @

ChatGPT
Hello! How can I assist you today in your role as a journal editor?

B

Fig. 2. ChatGPT (OpenAI) example responses. (A) Without “Custom instructions.” (B) With “Custom instructions.”

the difference in responses with and without the use of “Custom instructions.”

Use plugins

Enhancing ChatGPT with plugins markedly expands its functionality and usefulness, especially for researchers and journal editors. ChatGPT’s base knowledge is limited to data up to April 2023. However, integrating plugins enables access to current, real-time information, surpassing the inherent limitations of ChatGPT’s dataset. Popular plugins in the academic community include Scholar AI, PubMed, Consensus Search, and AskyourPDF among others. Notably, a maximum of three plugins can be activated simultaneously.

The full potential of these plugins is realized when they are integrated with “Custom instructions.” This tailored approach ensures that the results are precisely aligned with the specific context and requirements of the user. For example, designating a “researcher” or “journal editor” role in the “Custom instructions” significantly influences the nature of the output. In leveraging these role-specific cues, ChatGPT, in conjunction with the activated plugins, provides information that is not just up to date, but also highly relevant to the distinct needs of researchers and journal editors. This strategic customization helps users receive information that is both current and directly applicable to their specific professional needs.

Write Effective Prompts

Guidelines

Crafting a precise question or command is essential to obtaining the desired response from ChatGPT. While there is considerable flexibility in how one may interact with AI, following specific guidelines can substantially improve the accuracy and effectiveness of the prompts. This section outlines key principles (adapted from ChatGPT) and examples for generating prompts.

- **Be specific and direct:** Clearly state what you want the text to achieve. The more detailed you are in the input, the better the output tends to be. For example, “Write a concise summary of the latest research on X, suitable for a review article.”
- **Define the style and tone:** Although the desired style and tone might have been indicated in the “Custom instructions,” providing more detailed style and tone is helpful. For instance, “Compose a persuasive argument on the importance of X, using an optimistic and engaging tone.”
- **Set structure (or format) expectations:** If you have a particular structure (or format) in mind, such as a paragraph or bullet points, specify this in the prompt. You might say, “Draft a structured report on X, including an introduction, three key points, and a conclusion.”
- **Request examples and evidence:** Ask for the inclusion of examples, data, or quotations to improve clarity and authority. For example, “Explain the concept of herd immunity and support the explanation with real-world examples and statistical evidence.”
- **Indicate the audience:** Knowing the audience helps tailor the language complexity and terminology. For instance, “Explain X for experienced journal editors.”
- **Limit word count:** If brevity is important, set a word limit. For example, “In no more than 100 words, summarize the key findings of the recent study on X.”
- **Ask for a specific perspective or angle:** This can guide the content’s direction. For example, “From the perspective of a cardiovascular surgeon, discuss X.”

Types of prompting techniques

In this section, we explore two pivotal prompting techniques for AI language models: zero-shot and few-shot prompting [7,8]. These methods are crucial for editors looking to optimize their prompt crafting skills for effective interactions with AI systems like ChatGPT. Table 1 presents a comparison high-

Table 1. Comparative analysis of zero-shot and few-shot prompting techniques in ChatGPT





Category	Zero-shot prompting	Few-shot prompting
Reliance on pre-trained knowledge	High	Moderate
Need for specific training data	None	Some examples needed
Application in various tasks	General	Specific tasks where examples are provided
Strength	Quick, unbiased assessments	Setting standards or examples in unfamiliar or variable situations
Limitation	Less tailored to specific tasks	Risk of overfitting to examples
Accuracy	Variable, based on pre-trained data	Can be higher with relevant examples
Data sensitivity	Standard privacy risks	Additional risks with example data
Customization potential	Limited	High, through tailored examples

lighting the distinct characteristics of each technique.

This comparative analysis is designed to assist editors in discerning the most suitable prompting approach for varying editorial contexts. These techniques can significantly enhance the efficiency and effectiveness of editorial processes in academic publishing. Specific examples of how these techniques can be applied are presented in the following section, which discusses the use of ChatGPT in the editorial process.

How can Editorial Processes Benefit from ChatGPT?


The integration of ChatGPT into the editorial workflow offers significant benefits. First, it can be used to conduct preliminary literature reviews, identifying key themes, methodologies, and gaps in the literature. Fig. 3 illustrates this process, utilizing the zero-shot prompting technique and incorporating plugins like Scholar AI. These plugins are particularly valu-

ChatGPT Plugins ▾    

You
Summarize the latest research findings on the efficacy of telemedicine in managing chronic diseases. Focus on studies published in the last two years. Highlight key methodologies, results, and implications for clinical practice. Additionally, discuss any noted limitations or gaps in the current research that could be addressed in future studies.
< 2 / 2 >

ChatGPT
Used ScholarAI ▾
Here's a summary of the latest research findings on the efficacy of telemedicine in managing chronic diseases, focusing on studies published in the last two years:

- 1. Telemedicine for Chronic Respiratory Diseases in the Era of COVID-19**
 - **Authors:** S. Simeone, D. Condit, E. Nadler
 - **Published:** January 31, 2022
 - **Key Points:** This study highlights the expanded use of telemedicine in managing chronic respiratory diseases, especially during the COVID-19 pandemic. It emphasizes the role of telemedicine in facilitating access to pulmonology specialist care, pulmonary rehabilitation, symptom monitoring, and early identification of clinical exacerbations. The study also notes the integration of telemedicine in intensive care settings to improve patient outcomes. However, it stresses the importance of combining telemedicine with face-to-face evaluations and clinical testing for optimal benefits.
 - **Limitations/Gaps:** The study suggests a need for further research on the long-term efficacy of telemedicine in chronic disease management and its integration with traditional healthcare practices.
 - [Read the full paper \(PDF\)](#)
- 2. Drivers and Barriers to the Adoption of Telemedicine in Ghana**
 - **Authors:** Linda Hyde-Quartey, Xinjie Zhang, Ahotovi T. Ahotovi
 - **Published:** August 28, 2023
 - **Key Points:** This study investigates the adoption of telemedicine for treating chronic diseases in Ghana. It uses a linear hierarchical regression model to analyze

Send a message 



 
10000 chars

Fig. 3. ChatGPT (OpenAI) sample results using plugins (PubMed Research, Consensus Search, Scholar AI) and the zero-shot prompting technique.

able as they access recent information, supplementing ChatGPT’s knowledge base, which is current until April 2023. Editors can obtain better results by combining “Custom instructions,” proper prompting techniques, and plugins.

Second, ChatGPT can serve as a training tool for novice editors and reviewers, guiding them to provide constructive, clear, and professional feedback. Consider a scenario where a journal editor aims to improve the quality of peer review comments from inexperienced reviewers. The editor could employ the few-shot prompting technique with ChatGPT. Initially, the editor selects two to three exemplary peer reviews, showcasing attributes like constructive feedback, clarity, thoroughness, and professionalism. The novice reviewers then use these models to train ChatGPT, alongside specific instructions from the editor. For instance, they might say, “Here are three high-quality peer reviews, each exemplary in certain aspects. Use these as benchmarks to refine my draft comments.” The novice reviewers input their initial comments, which might be unrefined or overly critical, into ChatGPT. Guided by the model reviews, ChatGPT then revises the comments to align with the demonstrated standards, improving their structure, language, and tone while preserving the core intent and critical observations. This method streamlines and elevates the editorial process.

Third, ChatGPT provides valuable assistance in language editing. This is especially beneficial for non-native English-speaking editors, helping them ensure clarity and coherence in their editorial work. It effectively bridges communication gaps within academic discourse, maintaining the standards of international academic publications. Below are examples of simple editing-related prompts: “Clarify the text below and correct any spelling, grammar and punctuation errors if there are any,” “Improve flow, academic tone, and overall quality,” and “Improve language style, flow, and readability.” If editors want to double-check the changes, they may add an additional prompt—“Bold all changes you make.” It is crucial to recognize that enabling “Custom instructions” significantly influences each output. For instance, Fig. 4A displays a basic editing response from ChatGPT without “Custom instructions” activated. Fig. 4B and 4C, using the same prompt, “Proofread the following draft,” demonstrates how “Custom instructions” modify ChatGPT’s responses. Notably, Fig. 4C shows that when “Custom instructions” request explanations, ChatGPT provides detailed rationales for each edit. This highlights the fact that effective prompt crafting, while important, is not the sole factor in optimizing results. The incorporation of well-designed “Custom instructions” significantly increases ChatGPT’s utility, producing results that are more closely aligned with the specific requirements of editors.

Some other example prompts that can be effectively utilized

You
Proofread the following draft:
I hope this letter finds you all in great spirits. As we wrap up another successful project, I wanted to take a moment to express my heartfelt appreciation for each and every one of you.

ChatGPT
Your draft is concise and conveys a positive message. Here's a slightly polished version:

I hope this letter finds you all in great spirits. As we conclude another successful project, I wish to take a moment to express my heartfelt appreciation for each and every one of you. **A**

You
Proofread the following draft:
I hope this letter finds you all in great spirits. As we wrap up another successful project, I wanted to take a moment to express my heartfelt appreciation for each and every one of you.

ChatGPT
Your draft is clear and conveys a warm, appreciative sentiment. Here's a slightly revised version to enhance its academic and professional tone:

"I hope this letter finds you in high spirits. As we conclude another successful project, I wish to express my sincere appreciation for the contributions of each team member." **B**

ChatGPT
Your draft is well-written and conveys a positive and appreciative tone. However, I suggest a few minor revisions to enhance clarity and flow:

- Original:** "I hope this letter finds you all in great spirits."
Suggestion: "I hope this letter finds you all in high spirits."
• *Rationale:* "High spirits" is a more common phrase for expressing a positive, energetic mood.
- Original:** "As we wrap up another successful project, I wanted to take a moment to express my heartfelt appreciation for each and every one of you."
Suggestion: "As we conclude another successful project, I want to take a moment to express my heartfelt appreciation for each of you."
• *Rationale:* "Conclude" might be more formal than "wrap up". Changing "wanted" to "want" reflects immediate intent. Also, "each of you" is more concise than "each and every one of you." **C**

Fig. 4. ChatGPT (OpenAI) example responses. (A) Without “Custom instructions” enabled. (B) With “Custom instructions” enabled. (C) With explanations requested in “Custom instructions.”

in the editorial process are as follows:

- Does this research paper on X adhere to the standard ethical guidelines for scientific writing?
- What are the current trends in X, and how do they compare to trends from 5 years ago?
- What are the best practices for conducting a blind peer review for a scientific journal?
- How might developments in X influence future research in Y?
- What are the ethical considerations when publishing research involving human subjects?

- What are the guidelines for managing conflicts of interest in academic publishing?

Challenges and Limitations of Using ChatGPT

Integrating ChatGPT into the editorial process, particularly for non-native English-speaking editors, presents unique challenges. One significant challenge lies in the tool's inherent dependency on its training data, which can be a source of biases and inaccuracies in its responses. This limitation is especially problematic for scientific writing, which requires a high degree of precision and accuracy. In addition, ChatGPT may not always capture the dynamic and culturally diverse nuances of academic writing. Its responses may miss the subtleties and context-specific intricacies that are vital in scholarly communication. For example, in medical research, cultural factors can significantly influence both the research itself and its interpretation, and an incomplete understanding of these issues can lead to oversimplified or even inaccurate representations of the subject matter. This limitation heightens the risk of misunderstanding or misinterpretations in editing, with the potential to significantly compromise the authenticity and integrity of academic work.

Furthermore, ChatGPT can sometimes produce responses with varying degrees of consistency, particularly when dealing with long or complex texts that require a uniform style and specialized vocabulary. In academic writing, maintaining a consistent style and tone is vital for the clarity and readability of scientific papers. Additionally, ChatGPT may not always correctly deploy the specific technical vocabulary or jargon used in certain scientific fields. This limitation can lead to a gap in communication, especially when dealing with highly specialized or emerging areas of research where precise terminology is the key. Editors may also find some phrases that tend to be overused during interactions with ChatGPT. Users have been sharing lists of overused phrases in discussions on platforms such as Reddit [9] and Medium [10]. When reviewing or editing content, it is essential to watch out for these phrases and consider replacing them with more diverse and contextually appropriate language to improve the overall quality of the text and avoid clichés.

Conclusion

ChatGPT is a sophisticated generative language model and offers a wide array of capabilities that extend beyond simple text generation. The key to harnessing its full potential lies in understanding and effectively utilizing its main features, including “Custom instructions,” which allow assigning roles and control the output. Rather than merely replicating prompts

used by others, it is crucial for editors to comprehend how combining “Custom instructions” with thoughtfully crafted prompts can yield customized and superior results. Although ChatGPT demonstrates proficiency in broad language tasks, its effectiveness in highly specific or specialized domains may encounter constraints. Therefore, while ChatGPT can substantially assist with editorial tasks, it should be used as a complement to, rather than a replacement for, human expertise and judgment.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Funding

The author received no financial support for this work.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed.

Supplementary Materials

The author did not provide any supplementary materials for this article.

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Events in 2024

The Korean Council of Science Editors announces the schedule of events in 2024. Precise schedule and registration of the following workshops are or will be available at <https://www.kcse.org>.

Table 1. Schedule of events in 2024 by the Korean Council of Science Editors

	January	February	March	April	May	June
<i>Science Editing</i> (twice a year)		Vol. 11 No. 1 (20)				
Newsletter (four times a year)			No. 49 (31)			No. 50 (30)
International Conference						
Editor's Workshop					Editor's Workshop (22)	
Manuscript Editor's Training & Workshop			Basic Manuscript Editing (5, 12, 29, 26)	Basic Manuscript Editing (2, 9, 16, 23)		
Publication Ethics Workshop			Publication Ethics Workshop (22)			Publication Ethics Workshop (21)
	July	August	September	October	November	December
<i>Science Editing</i> (twice a year)		Vol. 11 No. 2 (20)				
Newsletter (four times a year)			No. 51 (30)			No. 52 (31)
International Conference	The 8th Asian Science Editors' Conference and Workshop 2024 (15–16)					
Editor's Workshop			Editor's Workshop (11)	Scopus Workshop (24–25)		Editor's Workshop (11)
Manuscript Editor's Training & Workshop	Examination for Korea Manuscript Editors Certification (12)				Manuscript Editor's Workshop (12)	
Publication Ethics Workshop			Publication Ethics Workshop (20)			

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Instructions for Authors

Enacted January 1, 2014

1st revised August 20, 2018

Recently revised February 20, 2019

1. General information

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3. Research and publication ethics

The journal adheres to the ethical guidelines for research and publication described in Guidelines on Good Publication (<http://publicationethics.org/resources/guidelines>) and the ICMJE Guidelines (<http://www.icmje.org>).

1) Authorship

Authorship credit should be based on 1) substantial contributions to conception and design, acquisition of data, and/or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; 3) final

approval of the version to be published; and 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Every author should meet all of these four conditions. After the initial submission of a manuscript, any changes whatsoever in authorship (adding author(s), deleting author(s), or re-arranging the order of authors) must be explained by a letter to the editor from the authors concerned. This letter must be signed by all authors of the paper. Copyright assignment must also be completed by every author.

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It is possible to republish manuscripts if the manuscripts satisfy the conditions of secondary publication of the ICMJE Recommendations (http://www.icmje.org/urm_main.html).

4) Conflict of interest statement

The corresponding author must inform the editor of any potential conflicts of interest that could influence the authors' interpretation of the data. Examples of potential conflicts of interest are financial support from or connections to companies, political pressure from interest groups, and academically related issues. In particular, all sources of funding applicable to the study should be explicitly stated.

5) Statement of human and animal right

Clinical research should be done in accordance of the Ethical Principles for Medical Research Involving Human Subjects, outlined in the Helsinki Declaration of 1975 (revised 2013), available from: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>. Clinical studies that do not meet the Helsinki Declaration will not be considered for publication. Human subjects should not be identifiable, such that patients' names, initials, hospital numbers, dates of birth, or other protected health-care information should not be disclosed. For animal subjects, research should be performed based on the National or Institutional Guide for the Care and Use of Laboratory Animals, and the ethical treatment of all experimental animals should be maintained.

6) Statement of informed consent and institutional review board approval

Copies of written informed consent documents should be kept for studies on human subjects, which includes identifiable information or sensitive information. For clinical studies of human subjects, a certificate, agreement, or approval by the Institutional Review Board (IRB) of the author's institution is required. If necessary, the editor or reviewers may request copies of these documents to resolve questions about IRB approval and study conduct.

7) Process for managing research and publication misconduct

When the journal faces suspected cases of research and publication misconduct such as redundant (duplicate) publication, plagiarism, fraudulent or fabricated data, changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the resolution process will follow the flowchart provided by the Committee on Publication Ethics ([\[ethics.org/resources/flowcharts\]\(http://publication-ethics.org/resources/flowcharts\)\). The discussion and decision on the suspected cases are carried out by the Editorial Board.](http://publication-</p></div><div data-bbox=)

8) Process for handling cases requiring corrections, retractions, and editorial expressions of concern

Cases that require editorial expressions of concern or retraction shall follow the COPE flowcharts available from: <http://publicationethics.org/resources/flowcharts>. If correction needs, it will follow the ICMJE Recommendation for Corrections, Retractions, Republications and Version Control available from: <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/corrections-and-version-control.html> as follows:

Honest errors are a part of science and publishing and require publication of a correction when they are detected. Corrections are needed for errors of fact. Minimum standards are as follows: First, it shall publish a correction notice as soon as possible detailing changes from and citing the original publication on both an electronic and numbered print page that is included in an electronic or a print Table of Contents to ensure proper indexing; Second, it shall post a new article version with details of the changes from the original version and the date(s) on which the changes were made through Crossmark; Third, it shall archive all prior versions of the article. This archive can be either directly accessible to readers; and Fourth, previous electronic versions shall prominently note that there are more recent versions of the article via Crossmark.

9) Editorial responsibilities

The Editorial Board will continuously work to monitor and safeguard publication ethics: guidelines for retracting articles; maintenance of the integrity of the academic record; preclusion of business needs from compromising intellectual and ethical standards; publishing corrections, clarifications, retractions, and apologies when needed; and excluding plagiarism and fraudulent data. The editors maintain the following responsibilities: responsibility and authority to reject and accept articles; avoiding any conflict of interest with respect to articles they reject or accept; promoting publication of corrections or retractions when errors are found; and preservation of the anonymity of reviewers.

4. Author qualifications, language requirement, and reporting guideline

1) Author qualifications

Any researcher throughout the world can submit a manuscript if the scope of the manuscript is appropriate.

2) Language

Manuscripts should be submitted in good scientific English.

3) Reporting guidelines for specific study designs

Research reports frequently omit important information. As such, reporting guidelines have been developed for a number of study designs that some journals may ask authors to follow. Authors are encouraged to also consult the reporting guidelines relevant to their specific research design. A good source of reporting guidelines is the EQUATOR Network (<http://www.equator-network.org/home/>) and the United States National Institutes of Health/National Library of Medicine (http://www.nlm.nih.gov/services/research_report_guide.html).

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All manuscripts should be submitted via e-submission system available from: <https://submit.escienceediting.org/>. If any authors have difficulty in submitting via e-submission system, please send a manuscript to kcse@kcse.org by the corresponding author.

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3) Peer review process for handling submissions from editors, employees, or members of the editorial board

All manuscripts from editors, employees, or members of the editorial board are processed same to other unsolicited manuscripts. During the review process, submitters will not engage in the selection of reviewers and decision process. Editors will not handle their own manuscripts although they are commissioned ones.

6. Manuscript preparation

1) General requirements

- The main document with manuscript text and tables should be prepared in an Microsoft Word (docx) or RTF file format.
- The manuscript should be double spaced on 21.6×27.9 cm (letter size) or 21.0×29.7 cm (A4) paper with 3.0 cm margins at the top, bottom, right, and left margin.
- All manuscript pages are to be numbered at the bottom consecutively, beginning with the abstract as page 1. Neither the author's names nor their affiliations should appear on the manuscript pages.
- The authors should express all measurements according to International System (SI) units with some exceptions such as seconds, mmHg, or °C.
- Only standard abbreviations should be used. Abbreviations should be avoided in the title of the manuscript. Abbreviations should be spelled out when first used in the text—for example, extensible markup language (XML)—and the use of abbreviations should be kept to a minimum.
- The names and locations (city, state, and country only) of manufacturers should be given.
- When quoting from other sources, a reference number should be cited after the author's name or at the end of the quotation.

Manuscript preparation is different according to the publication type, including original articles, reviews, case studies, essays, training materials, editorials, book reviews, correspondence, and video clips. Other types are also negotiable with the Editorial Board.

2) Original articles

Original articles are reports of basic investigations. The manuscript for an original article should be organized in the following sequence: title page, abstract and keywords, main text (introduction, methods, results, and discussion), conflict of interest, acknowledgments, references, tables, figure legends, and figures. The figures should be received as separate files. Maximum length: 2,500 words of text (not including the ab-

stract, tables, figures, and references) with no more than a total of 10 tables and/or figures.

- **Title page:** The following items should be included on the title page: (1) the title of the manuscript, (2) author list, (3) each author's affiliation, (4) the name and email address of the corresponding author, (5) when applicable, the source of any research funding and a list of where and when the study has been presented in part elsewhere, and (6) a running title of fewer than 50 characters.
- **Abstract and keywords:** The abstract should be concise content of equal to or less than 250 words in an structured format including purpose, methods, results, and conclusion. Abbreviations or references are not allowed in the abstract. Up to 5 keywords should be listed at the bottom of the abstract to be used as index terms.
- **Introduction:** The purpose of the investigation, including relevant background information, should be described briefly. Conclusion should not be included in the Introduction.
- **Methods:** The research plan, materials (or subjects), and methods used should be described in that order. The names and locations (city, state, and country only) of manufacturers of equipment and software should be given. Methods of statistical analysis and criteria for statistical significance should be described.
- **Results:** The results should be presented in logical sequence in the text, tables, and figures. If resulting parameters have statistical significance, P-values should be provided, and repetitive presentation of the same data in different forms should be avoided. The results should not include material appropriate for the discussion.
- **Discussion:** Observations pertaining to the results of the research and other related work should be interpreted for readers. New and important observations should be emphasized rather than merely repeating the contents of the results. The implications of the proposed opinion should be explained along with its limits, and within the limits of the research results, and the conclusion should be connected to the purpose of the research. In a concluding paragraph, the results and their meaning should be summarized.
- **ORCID (Open Researcher and Contributor ID):** ORCID of all authors should be described.
- **Conflict of interest:** Any potential conflict of interest that could influence the authors' interpretation of the data, such as financial support from or connections to companies, political pressure from interest groups, or academically related issues, must be stated.
- **Acknowledgments:** All persons who have made substantial contributions, but who have not met the criteria for authorship, are to be acknowledged here. All sources of

funding applicable to the study should be stated here explicitly.

- **Appendix:** If any materials are not enough to be included in the main text such as questionnaires, they can be listed in the Appendix.
- **Supplementary materials:** If there are any supplementary materials to help the understanding of readers or too great amount data to be included in the main text, it may be placed as supplementary data. Not only text, audio or video files, but also data files should be added here.
- **References:** In the text, references should be cited with Arabic numerals in brackets, numbered in the order cited. In the references section, the references should be numbered and listed in order of appearance in the text. The number of references is limited to 20 for original articles. All authors of a cited work should be listed if there are six or fewer authors. The first three authors should be listed followed by "et al." if there are more than six authors. If a reference has a digital object identifier (DOI), it should be supplied. Other types of references not described below should follow *The NLM Style Guide for Authors, Editors, and Publishers* (<http://www.nlm.nih.gov/citingmedicine>).

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Reviews are invited by the editor and should be comprehensive analyses of specific topics. They are to be organized as follows: title page, abstract and keywords, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. There should be an unstructured abstract of no more than 200 words. The length of the text excluding references, tables, and figures should not exceed 5,000 words. The number of references is limited to 100.

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Case studies are intended to report practical cases that can be encountered during editing and publishing. Examples include interesting cases of research misconduct and publication ethics violations; experience of new and creative initiatives in publishing; and the history of a specific journal development. They are to be organized as follows: title page, abstract and keywords, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. There should be an unstructured abstract of 200 words maximum. The length of the text excluding references, tables, and figures should not exceed 2,500 words. The number of references is limited to 20.

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6) Training materials

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Unsolicited manuscript with publication types of original articles, case studies, essays, training materials, video clips, and correspondence can be submitted. Other publication types are all commissioned or invited by the Editorial Board.

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Table 1. Recommended maximums for articles submitted to *Science Editing*

Type of article	Abstract (word)	Text (word) ^{a)}	References	Tables & figures
Original article	250	2,500	20	10
Review	200	5,000	100	No limits
Case study	200	2,500	20	10
Training material	200	2,500	20	10
Essay	No	2,500	20	10
Editorial	No	1,000	10	3
Book review	No	1,000	10	3
Correspondence	No			
Letter to the editor	-	1,000	10	3
In reply	-	500	5	3
Video clip	No	30 MB, 5 min	-	-

^{a)}Maximum number of words is exclusive of the abstract, references, tables, and figure legends.

7. Final preparation for publication

1) Final version

After the paper has been accepted for publication, the author(s) should submit the final version of the manuscript. The names and affiliations of the authors should be double-checked, and if the originally submitted image files were of poor resolution, higher resolution image files should be submitted at this time. Color images must be created as CMYK files. The electronic original should be sent with appropriate labeling and arrows. The EPS, TIFF, Adobe Photoshop (PSD), JPEG, and PPT formats are preferred for submission of digital files of photographic images. Symbols (e.g., circles, triangles, squares), letters (e.g., words, abbreviations), and numbers should be large enough to be legible on reduction to the journal's column widths. All of the symbols must be defined in the figure caption. If the symbols are too complex to appear in the caption, they should appear on the illustration itself, within the area of the graph or diagram, not to the side. If references, tables, or figures are moved, added, or deleted during the revision process, they should be renumbered to reflect such changes so that all tables, references, and figures are cited in numeric order.

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NOTICE: The revised instructions for authors are implemented starting from the February 2019 issue.

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