

The Role of Preprints in Scholarly Communication and Their Application Patterns

Authors: Wei Dongqi, Cong Yiming, Wei Dongqi

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Abstract

[Objective] To systematically investigate the role and practical value of preprint platforms in constructing a healthy academic communication ecosystem. [Methods] This study systematically reviews the recent developments in preprints over the past five years, both domestically and internationally, as well as the roles preprints can play in academic communication and their practical application modalities, through literature review and field interviews. [Results] The results indicate that preprints have exhibited favorable development trends both domestically and internationally. The communication function of preprints has played a crucial role in academic development, demonstrating diverse forms in practical applications that align with researchers' practical needs. [Conclusion] Preprints will inevitably become an essential component in fostering free, open, diverse, and shared academic communication platforms in the future, forming part of China's high-level communication platforms.

Full Text

The Role of Preprints in Academic Communication and Their Applications

Wei Dongqi¹, Cong Yiming¹

¹Pan Shu Library, Institute of Psychology, Chinese Academy of Sciences, Beijing 100101

Abstract

[Objective] This study systematically investigates the role and practical value of preprint platforms in fostering a healthy academic communication ecosystem. [Methods] Through literature review and field interviews, this paper examines the recent development of preprints over the past five years, both domestically

and internationally, and analyzes the functions preprints can serve in academic communication as well as their practical application patterns. **[Results]** The findings indicate that preprints are developing robustly worldwide, with their communication functions playing a crucial role in academic advancement. In practice, preprints demonstrate diverse and rich application forms that align with researchers' actual needs. **[Conclusion]** Preprints will undoubtedly become an essential component of future free, open, and pluralistic academic communication platforms, forming an integral part of China's high-end communication infrastructure.

Keywords: preprint, academic communication, open sharing

A preprint is defined as “a manuscript of a scientific research paper that has not yet been formally published in a peer-reviewed academic journal, uploaded by the author to a public digital repository for open exchange among academic communities and scholars.” The digital repository services that accept preprint deposits and provide open exchange are called preprint platforms [1].

From this definition, several key terms emerge that reflect the essential attributes of preprints and are critical to understanding them. The first keyword is “scientific paper.” Preprint papers must be research manuscripts. Political commentaries, literary works, or science fiction drafts cannot be called preprints even if publicly shared in advance. All mainstream preprint platforms accept submissions exclusively in scientific fields, typically requiring content to meet basic scientific paper standards and research ethics, with a complete scientific paper structure. The second keyword is “manuscript,” and specifically a complete manuscript. One cannot split a paper into multiple parts or simply report experimental results with one or two tables and submit it to a preprint platform. Because these are manuscripts, copyright belongs to the authors themselves, who can freely make them public on preprint platforms. This makes browsing and downloading any paper on preprint platforms free of charge, giving preprints the public welfare attribute of open access and establishing them as an important implementation form of open science. The third keyword is “not yet.” Although preprints have not been formally published in peer-reviewed journals, their ultimate destination remains peer-reviewed journals. They are simply made public in advance for exchange. Therefore, preprints are not synonymous with “sloppy work” or “low quality”; they should be scientific papers that meet journal quality standards. Comparative studies between bioRxiv preprints and PubMed journal articles show that while journal articles are superior in various aspects of publishing quality, the difference is minimal [2]. The fourth keyword is “peer review.” Preprints are non-peer-reviewed, or more accurately, they adopt a non-journal-style peer review model. This represents their most significant difference from traditional academic journals and consequently gives preprints an incomparable advantage over traditional journals: rapid publication. At the same time, it is important to recognize that non-journal peer review does not mean absence of quality control. Mainstream preprint platforms employ different levels of quality control schemes targeting different aspects of manuscripts [3]. The fifth

keyword is “public.” Preprint platforms are public repository systems, not privately built websites. This ensures the validity of preprint priority claims. The sixth keyword is “communication.” The primary purpose of preprints is academic exchange, not academic evaluation. All preprint platforms lack impact factors and cannot be linked to achievement certification.

Preprints are not a novel means of academic communication. Scholars discussing ideas and research findings via mail or distributing manuscripts through postal services have always been important forms of academic exchange in the development of science. In the 1960s, the “Information Exchange Groups” (IEG) were established at the U.S. National Institutes of Health (NIH). IEG members sent their manuscripts to NIH, which photocopied and distributed them to other group members. Over the following five years, NIH established seven IEG paper exchange groups involving more than 3,600 scientists from the United States and abroad, exchanging a total of 2,561 paper manuscripts. These papers were typically restricted to internal group exchange but could be shared with non-members with the author’s permission [4]. This early preprint history has only become known in recent years. The most successful and influential digital preprint platform system, arXiv, was established in 1991, but until around 2010, its influence remained limited to a few fields such as high-energy physics and mathematics. The preprint wave that has truly swept the scientific community emerged only in recent years.

1.1 Flourishing Development of International Scientific Preprint Repositories

Internationally, the development of scientific preprint repositories over the past decade has demonstrated two prominent characteristics. First, the number of preprint platforms has grown rapidly, particularly through expanding disciplinary coverage and increasing regional and multilingual platforms. After SSRN was acquired by Elsevier in 2016, its disciplinary coverage expanded rapidly [5]. arXiv also broadened the range of disciplines it accepts [6]. Since 2016, preprint platforms have experienced a new wave of establishment, with the number of new platforms each year exceeding the total of the previous five years [7]. The biology preprint platform bioRxiv, created in 2013, saw significant growth in 2016 [6]. medRxiv, which performed outstandingly during the COVID-19 pandemic, was founded in 2019 and, like bioRxiv, is operated by Cold Spring Harbor Laboratory. In the relatively conservative field of open access, chemistry saw the establishment of ChemRxiv in 2016, led by the American Chemical Society. During this period, newly created national and regional general disciplinary preprint platforms included ChinaXiv, launched in 2016 by the Chinese Academy of Sciences; INA-Rxiv, Indonesia’s preprint platform established in 2017; SciELO Preprints, founded in 2017, serving Latin America, South Africa, and the Iberian Peninsula; and ArabiXiv, Frenxi, and AfricArxiv, all established in 2018 for Arabic, French, and African regions respectively. IndiaRxiv, India’s preprint platform, went online in 2019.

The Center for Open Science (COS) is a third-party organization participating in open science services [8]. Its Open Science Framework (OSF) provides a series of services for open science practice, with preprint services being one of the most important. Starting in 2016, OSF intensively established preprint platforms in multiple disciplinary fields, including PsyArXiv, founded in 2016 as a specialized psychology preprint repository that established a partnership with the American Psychological Association in 2017 [9]. SocArXiv, also established in 2016, focuses on sociology and is now operated by the University of Maryland Libraries. Similar platforms include LISSA for library and information science, AgriXiv for agriculture, PaleorXiv for archaeology, SportRxiv for sports science, and LawArXiv for law, all launched in subsequent years.

The second characteristic of preprint development over the past decade is that academic publishers have actively deployed preprint services [10]. In addition to Elsevier's acquisition of SSRN in 2016, Research Square, closely associated with Springer Nature, launched a preprint service called In Review in 2020. During submission to over 200 journals, authors can opt for this service to publicly share their manuscripts as preprints on the Research Square platform while under review, receiving more detailed updates on peer review progress. According to data released by Sowmya Swaminathan in August 2020, 40% of Chinese authors choose to use In Review during submission—a remarkably high proportion compared to the second-place United States at only 6% [11]. Research Square has become one of the fastest-growing preprint platforms due to the In Review service [12]. Publishers taking similar approaches include Wiley and Taylor & Francis. The former launched Under Review on Authorea, very similar to Research Square's In Review, while the latter completed its preprint business layout by acquiring F1000 Research. In addition to these major academic publishers, SAGE's Advance, MDPI's preprints.org, IEEE's TechRxiv, the American Chemical Society's ChemRxiv, and Emerald's Emerald Open Research, despite different approaches, all reflect publishers' substantial investment in preprints.

Publishers' involvement in preprint services reveals that future competition in academic publishing will focus not on competing for revenue from readers and libraries, but on competing for authors and papers [13]. In recent years, publishers have actively advocated for Read & Publish agreements as a manifestation of this competition [14], while their deployment in preprint services represents another form of the same competitive strategy—two sides of the same coin. Publishers increasingly hope to build complete research workflow systems, intervening from the earliest stages of the research lifecycle through the entire publishing process and even extending to post-publication services, thereby ensuring continuous injection of excellent academic achievements [15]. In this context, intervening earlier in the workflow of outstanding outputs and establishing close connections with elite scholars becomes increasingly important. Preprints can thus be viewed as a component and key entry point of a complete set of publisher author services. Publishers' co-optation of the open access movement, their active promotion of transformative agreements with libraries, and their vigorous deployment in preprint services all stem from the need to compete for

high-quality authors and content.

Publishers' layout in the preprint business is also closely related to disruptive changes in the publishing landscape. More and more publishers realize that content distribution no longer follows the traditional journal model, and the typical publishing form of academic journals from the print media era has declined. The so-called "journal" is merely a collection of papers with similar content in the same field. The concept of "issue," representing fixed-time publication, no longer exists. In the internet era, content distribution occurs constantly, with the main channel being online academic exchange platforms [16]. China's "Proposal of the Central Committee of the Communist Party of China on Formulating the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through the Year 2035" explicitly states the need to "build a high-end exchange platform for national research papers and scientific and technological information" [17], rather than focusing on individual journals. As a future-oriented academic publishing form, publishers must seize the initiative in preprints.

1.2 Increasing Acceptance of Preprints in the Scientific Community

The flourishing development of preprint platforms is essentially inseparable from the scientific community's growing recognition of preprints as a form of academic exchange. It is precisely researchers from different disciplines gradually recognizing and accepting preprints that has led to the sharp increase in preprint platforms and active publisher investment. Academic acceptance of preprints is reflected both in support from academic journals and funding agencies and in the increasing volume of preprint submissions.

Since 2016, many research funding agencies have issued policies encouraging researchers to share manuscripts through preprint platforms or recognizing citations of preprint papers in grant applications or final reports. For example, in 2017, the UK Medical Research Council announced, "We now actively encourage researchers to share pre-peer review manuscripts through preprints, and we allow researchers to cite preprints in project and fellowship applications" [18]. NIH supports using preprints in project applications and progress reports, listing them as major achievements. The Simon Foundation, Wellcome Trust, and other funding organizations hold similar positions [19]. In these funders' view, preprints hold the same value as formal journal publications.

The vast majority of academic journals and mainstream academic publishers also support preprint archiving. While some journals have not explicitly released their preprint policies, those that explicitly reject preprints are rare exceptions. Springer Nature, Elsevier, SAGE, Wiley, Taylor & Francis, and the American Psychological Association (APA) are all publishers that support preprints [20]. ChinaXiv, the Chinese Academy of Sciences' scientific paper preprint platform, has also established partnerships with nearly 30 domestic journals [21]. These journals have all released explicit preprint policies, encouraging and support-

ing their authors to submit manuscripts to preprint platforms and to openly archive accepted manuscripts on ChinaXiv. Some journals have gone further in supporting preprint exchange. The renowned academic journal eLife, at the forefront of open access philosophy, announced a new publishing policy in December 2020: the “Preprint first publishing model,” declaring that eLife will only review papers that have already been made public on preprint platforms. If a submitted manuscript has not been posted on a preprint platform, eLife will make it public on bioRxiv or medRxiv [22].

1.2.2 Researchers’ Support for Preprint Platforms Researchers’ acceptance of preprint platforms has gradually increased, with more and more researchers beginning to use them. Taking bioRxiv as an example, studies show that the platform’s paper submissions have grown exponentially each year, with submissions in 2018 exceeding the total of the previous five years, representing the work of over 160,000 researchers from more than 100 countries [23]. Top research institutions and researchers worldwide have published papers on bioRxiv [24]. The rapid increase in bioRxiv submissions and its broad recognition led Science to name it one of the top ten breakthroughs of 2017 [25]. Established preprint platforms like arXiv are widely accepted by researchers. Hou Zhijiang sampled four high-level artificial intelligence journals, counting the proportion of preprints in papers since 2012, and found that the proportion of preprint submissions is increasing [26]. Today, arXiv welcomed its 2 millionth paper on January 3, 2022. It took arXiv 23 years to reach 1 million papers but only 7 years to reach 2 million [27], fully reflecting researchers’ support for preprint platforms.

1.3 Preprints Played a Crucial Role in Combating COVID-19

Traditional journal publishing models could not meet the need for rapid dissemination of new academic knowledge during global public health emergencies [28]. In the past, less than 5% of public health journal papers were first released as preprints. Researchers sometimes shelved their findings until accepted by prestigious journals, and even when willing to share results early, lacked appropriate platforms. Preprints changed this situation [29]. Since the outbreak of COVID-19, preprint platforms have become important channels for pandemic response, enabling rapid academic exchange, quickly accumulating knowledge and experience about the disease and virus, and accelerating research and development processes. In the early stages of the pandemic (the first 22 weeks), the number of COVID-related preprint papers exceeded that of journal papers, with growth continuing to outpace journal publications [30]. Meanwhile, pandemic-related papers received the most enthusiastic attention from researchers. A statistical study in April 2020 showed that the top ten most-viewed pandemic-related preprint papers on medRxiv and bioRxiv each had average views exceeding 110,000, with the highest reaching 660,000. It can be said that preprint platforms played an irreplaceable role in combating COVID-19 by rapidly disclosing the latest research progress, exchanging new academic findings, promoting rapid

knowledge sharing and collaboration, and avoiding duplicate research [31]. Recognizing this role, under the advocacy of the Global Preparedness Monitoring Board and the World Health Organization, over 150 institutions jointly signed the “Statement on Sharing Research Data and Findings Related to the Novel Coronavirus Outbreak,” advocating that all pandemic-related research results be prioritized for release through preprint platforms or other “publish first, peer review later” platforms before journal publication, and that authors be made aware that posting preprints before submission will not affect their manuscripts’ acceptance by journals [32]. Under such policy guidance, an increasing number of pandemic-related research papers have been prioritized for public release on preprint platforms. Recognizing the tremendous role of preprint exchange in public health emergencies, the Institute of Medical Information of the Chinese Academy of Medical Sciences [text appears truncated in original].

2. The Role of Preprints in Academic Communication

Preprints have received widespread attention and become a trend in recent years precisely because they serve as a supplement to the existing academic communication system, effectively filling gaps and meeting the communication needs of the academic community and scholars. They hold indispensable value in shaping a better academic communication ecology. Through literature review, this paper summarizes thirteen significant values and functions that preprints serve in current academic communication.

2.1 Reducing Publication Delay and Improving Research Efficiency

Peer review, as the foundational mechanism for academic evaluation and quality control, has irreplaceable advantages and serves as the cornerstone and “gold standard” for normal academic exchange [33]. However, peer review is not perfect. Its biggest problem is slow review speed. The resulting “publication delay” seriously affects timely exchange and rapid dissemination of research results, which often lack timeliness and cutting-edge relevance by the time they appear in journals. Readers may encounter research results completed two or three years earlier. In situations with urgent practical needs, publication delays can cause serious social and public health problems, which is one reason why preprints shone so brightly during global public health events like COVID-19. Publication delays also hinder scholars’ ability to track and grasp the latest research developments in real time. Preprints actually accelerate the iteration of scientific knowledge. If we view the cycle from paper publication to being read by peers to being cited as an academic communication loop, preprints undoubtedly accelerate this cycle, thereby speeding up scientific knowledge iteration. It is common in the preprint world for a preprint paper to inspire new research results that are already posted on preprint platforms before the original paper is formally published in a journal.

For journals, publication delays also affect their impact factors. Among the 296,500 papers published in 2005 on CNKI, the average publication delay was

248 days, with 44,200 papers experiencing delays exceeding 397 days. Given that the average time to receive citations is 1,127 days, citations for these papers with delays over 397 days would not be counted in impact factor calculations [34]. For young scholars, lengthy journal publication times negatively affect their ability to secure project support, promotion, and employment [23]. Preprints partially compensate for communication delays caused by the strict quality control of formal publishing processes.

2.2 Avoiding Priority Disputes

Science is a public good. The only reward scientists receive for announcing their discoveries is being recognized as the first discoverer—that is, priority. All other rewards for scientists are based on priority. Therefore, priority has always been a primary concern for researchers. Another important function often mentioned for preprints is their ability to substantiate priority claims. The peer review process may result in research being completed before others but published after them. As third-party public platforms, preprint platforms can provide public timestamps and unique identifiers to establish discovery time earlier, reducing interference from other factors in priority recognition. Because preprints play such an important role in substantiating priority, most preprint platforms do not support retraction. When authors need to update paper content, they must upload revised versions, creating a multi-version record, rather than deleting the original version. This has become one of the important characteristics of preprint platforms.

2.3 Promoting Open Access

Since the publication of the “Budapest Open Access Initiative” in December 2001 [35], the open access movement and its further development into the “open science” concept have gained widespread recognition and support from relevant entities and individuals in the international academic community, triggering multiple waves including open access journals, open research data, and open knowledge repositories. However, as open access journals have been co-opted by publishers [36] charging exorbitant article processing fees, and open knowledge repository construction has become normalized [37] with development in China increasingly deviating from open access principles, preprints—as completely open academic exchange platforms—have become one of the most important implementation forms of open access. Preprints undoubtedly enable scholars at all levels globally to engage in open access at extremely low cost to disseminate their research results, representing a very equitable form of open access.

Meanwhile, when analyzing stakeholders in open access, members of research institutions and university consortia are often discussed, while practitioners in enterprises, social organizations, and public institutions are overlooked. They also have strong needs for academic literature, but because scientific research is not their core business, they cannot invest sufficient R&D funds to subscribe to scientific literature and are thus blocked by high paywalls. This creates a

situation where, on the one hand, some research with direct practical value and practical guidance significance cannot be accessed by practitioners, forming a deep information gap between academic research and practical activities. For example, numerous reading research papers in educational psychology cannot be seen by primary and secondary school teachers, and the latest conclusions on drug adverse reactions are difficult for some doctors to obtain. On the other hand, this seriously hinders R&D and innovation in small and medium-sized enterprises, general social organizations, and public institutions, 不利于多元创新主体格局的形成. Therefore, as an important form of open access, preprint platforms are greatly beneficial for breaking knowledge gaps and stimulating technological innovation vitality.

2.4 Facilitating Academic Autonomy and Free Exchange

Academic communication has been monopolized by giant commercial publishers. The initiative in academic communication is no longer in the hands of researchers but has become a cash cow for commercial publishers. Currently, however, many mainstream preprint platforms are built by libraries, universities, national research institutions, or non-profit organizations. For example, bioRxiv and medRxiv are operated by Cold Spring Harbor Laboratory, ChinaXiv is run by the National Science Library of the Chinese Academy of Sciences, and arXiv was originally maintained by Cornell University Library and has recently transitioned to Cornell's Department of Computer Science. With academic institutions operating preprint platforms and scholars freely publishing their results without commercial publisher involvement, an internally coherent information dissemination loop within academia is formed. To some extent, this pattern can be seen as making preprint platforms “academic enclaves” that provide a certain check on the monopoly of the academic publishing industry.

2.5 Separating Academic Evaluation from Academic Communication to Return to the Essence of Exchange

The famous “San Francisco Declaration on Research Assessment” emphasizes that the value of scientific research should be evaluated based on the research results themselves, not on the publications in which they appear. Whether academic journals or conferences, their essence is merely channels for academic exchange. However, due to academic management needs, publication-based academic evaluation cannot be completely changed in the short term. Because of this evaluation mechanism, an academic exchange environment that should be simple, free, pluralistic, and open is difficult to achieve. To pursue greater rewards, researchers often attempt to target higher-impact journals after completing a paper, potentially experiencing multiple rejections and revisions that further delay disclosure of research results. While preprints cannot fully realize the ideals of the San Francisco Declaration, they can to some extent help separate academic evaluation from academic communication. By having preprint platforms assume more communication functions, they help researchers quickly

publicize results and help other researchers rapidly obtain the latest progress in their fields of interest. Meanwhile, manuscripts can still seek publication in higher-quality journals or conferences for better evaluation. Preprints can promote a certain degree of separation between academic evaluation and academic communication, allowing academic exchange to return to its original essence and bringing us closer to the ideals of the San Francisco Declaration.

2.6 A Means to Address the Reproducibility Crisis

The reproducibility crisis has become a serious issue damaging scientific development in recent years, troubling multiple fields of scientific research [38-39]. A Nature survey of over 1,500 scientists showed that 70% reported being unable to reproduce others' research results, and more than half could not reproduce their own results [40]. Peer review adopted by academic journals has certain difficulties in identifying defects in research papers. Even the best peer reviewers cannot guarantee to detect all problems in a study. The ideal would be for reviewers to be proficient in the specific topics involved in a study, but the reality is that as disciplinary themes proliferate and sub-disciplines become increasingly specialized, reviewers are often asked to review papers that deviate somewhat from their most proficient research directions. Moreover, editors often struggle to find experts willing to take time to conduct free peer reviews, making actual peer review even further from the ideal state. Preprints employ open community review before or alongside traditional peer review, allowing more eyes to examine papers and better identifying various problems in a study, thereby maintaining journals as repositories of trustworthy scientific results [41].

2.7 Assisting in Detecting Academic Misconduct

Academic misconduct causes serious negative impacts on the research credibility and academic development of individuals and organizations. Every stage before formal publication harbors potential risks of academic misconduct. As a completely open academic exchange platform, preprints can to some extent expose academic misconduct earlier, minimizing losses for all parties before the situation becomes more serious. Michele Avissar-Whiting, editor-in-chief of the multidisciplinary preprint platform Research Square, has mentioned encountering multiple cases of academic misconduct on preprint platforms. Taking plagiarized figures as an example, while textual duplication sometimes escapes editors' attention, many plagiarism cases are discovered by the original authors of the plagiarized papers. Posting research manuscripts on preprint platforms exposes them to all platform readers, and compared to the limited capacity of journal editorial offices, the numerous eyes on preprint platforms undoubtedly increase the likelihood of detecting academic misconduct. Moreover, many subtle anomalies in papers can only be spotted by the original plagiarized authors. Early detection of these issues not only saves editors' and reviewers' time but also protects the rights of original authors. The openness and transparency of preprint platforms to some extent curb the occurrence of academic misconduct.

As Michele Avissar-Whiting metaphorically puts it, preprints are like a 10,000-watt spotlight that can illuminate potential academic misconduct lurking in the dark [42].

2.8 Rapidly Establishing Academic Influence

Several key factors determine paper impact: research quality, publication time, and openness. Papers with excellent research quality receive more citations; longer publication time leads to higher citations; and openness reflects the availability of full texts to some extent, with more accessible papers tending to have greater impact [43]. Preprints cannot improve research quality, but preprint platforms can increase the discoverability of research work and advance the time of results disclosure, which is extremely helpful for establishing personal academic influence, especially for early-career researchers. A study of preprints on bioRxiv found that journal papers with preprint versions received higher Altmetric scores and more citations than those without preprints [44].

2.9 Popularizing Scientific Knowledge and Engaging the Public

Science moving beyond elite circles to engage the public is a future trend. Open science manifests not only in the open sharing of scientific information, such as open access to scientific literature and open scientific data, but also in the openness of participants in scientific endeavors. Altmetrics reflect public participation in scientific evaluation [45], while research crowdsourcing reflects public participation in the research process [46]. The paradigm shift in research organizations from academies to crowdsourcing platforms represents a major trend. Preprints to some extent promote the dissemination of scientific knowledge, help the public better understand scientific processes, and reflect public participation in academic exchange. An important topic in “science education” is teaching audiences that science is not composed of immutable theorems but is an evolving process. Preprints make the public aware that different approaches to the same scientific question can lead to completely different answers. The multi-version records of preprints also reflect the evolution of a single study. All these present the public with the most direct and authentic face of scientific research processes.

Additionally, preprint platforms are important channels for the public to obtain reliable scientific knowledge. For example, searching for “mental health” on Baidu often yields mixed results with advertisements, and entertainment content often gets algorithmically ranked higher because it appeals to broad audiences. The information chaos brought by internet development poses information governance challenges for countries worldwide. Even when the public intentionally seeks mainstream scientific views, paywalls create many difficulties for ordinary citizens to access formal scientific papers. Although preprint platforms lack rigorous peer review, their quality control methods typically filter out most unscientific and entertainment content, ensuring scientific reliability and quality. Searching for “mental health” on internationally standardized preprint

platforms like ChinaXiv can yield the latest research results published by authoritative domestic psychologists. Such platforms can serve as key primary channels for the public to access the latest scientific advances.

2.10 Providing Possibilities for Publishing More Negative Results and Non-Mainstream Views

Publication bias is a widespread phenomenon. Publication bias refers to the tendency for statistically significant results (positive results) to be published faster, more frequently, and in higher-impact journals compared to non-significant results (negative results) [47]. Publication bias is generally related to journal preferences, the stringency of review processes, researchers' mindsets, and project funding. The editorial and publishing process is also a selection process, with academic journal editors tending to prefer positive results, considering that publishing negative results might reduce journal impact or delay publication even when negative results have value. Researchers' incorrect mindsets also contribute to publication bias; when authors find non-significant results, they often terminate experiments or believe negative results lack scientific value and are not publishable, thus ceasing to write papers [48]. Additionally, whether research project funders can accept negative results also affects publication. A psychology study showed that only 44% of research hypotheses proposed in Registered Reports were verified as true by final experimental results, while traditional journal empirical reports had as high as 96% of initial hypotheses verified by final results [49].

Meanwhile, the scientific community also has divisions between mainstream and non-mainstream views. Non-mainstream perspectives and methods are more difficult to publish than mainstream ones. For example, in psychology, influenced by positivism, basic science and natural science research directions occupy mainstream positions. Due to the relative objectivity of quantitative research and its obvious advantages, it has long been dominant. Quantitative research papers are relatively easier to publish than qualitative research. Qualitative research faces greater difficulty in gaining recognition and publishing in high-quality journals, and for a long time, qualitative research methods in psychology bore the label of being unscientific and were neglected [50]. However, psychology is not a purely experimental discipline; many problems rely on observation and interviews, especially for deeper exploration of the "quality" of phenomena, where qualitative research has irreplaceable value. Yet this non-mainstream research orientation has not received journal attention [51].

Paper publication has always faced various preferences and boundaries that limit academic development and exchange. The absence of negative results and suppression of non-mainstream views damage the accumulation and diversification of scientific knowledge. As an open and pluralistic academic platform, preprints demonstrate advantages that traditional journals lack [52], providing space for publishing negative results and non-mainstream views. Their academic exchange function breaks through the barriers of traditional journal

publication, eliminating rejection based on disadvantaged research orientations, making academia more pluralistic and inclusive, exploring the potential of different research methods in problem discovery and idea exchange, and promoting integration and improvement in academic research.

2.11 Safeguarding the Mental Health of Researchers

Many studies have reported poor mental health conditions among researchers in the current era [53], particularly in early career stages [54-55]. One important factor is the excessively long feedback cycle for research achievements. The long interval from initiating a research paper to its formal publication makes it difficult to provide researchers with timely positive feedback, while feelings of frustration are continuous. While preprints cannot reduce current pressure to publish, they to some extent enable researchers' work to be quickly made public and understood by more peers, somewhat alleviating the psychological burden of "publish or perish."

2.12 Multi-Version Records Ensure Completeness While Documenting Research Development

Because preprints cannot be deleted and can only be updated, they preserve different versions of a paper through multiple revisions until the final published version. This creates a complete record of research results, allowing readers to see not only the final presented paper but also each revision process the author made. This represents the most complete documentation form of a research work.

2.13 Promoting Open Peer Review

Open peer review or public review of open pre-review manuscripts are emerging forms of peer review [56]. Mainstream preprint platforms such as bioRxiv and ChinaXiv have established functions for public paper commentary. Readers can register accounts to ask questions, rate articles, and post comments. Authors can revise their papers based on these questions and comments, helping improve paper quality. This open review format shapes diverse understandings of research conclusions, breaking through potential cognitive biases that might arise from small groups composed of editors-in-chief, editors, and a few reviewers, representing a more fair and transparent peer review process [57].

3. Practical Applications of Preprints in Academic Communication

The above sections reviewed the roles preprints can play in academic communication. In reality, have preprints truly fulfilled these roles and met researchers' needs? The author of this paper serves as the director of a Chinese-language preprint platform. Through interviews with preprint authors during actual operations, this paper summarizes specific scenarios of current Chinese authors'

practical use of preprints, offering a glimpse into how contemporary researchers utilize them. Researchers' actual use of preprint platforms is far more complex than imagined.

3.1 Meeting Journal Policy Requirements

Some academic journals are very open, supporting and encouraging preprints as a form of academic exchange. In their preprint policies, they not only explicitly state that they accept preprint papers and do not consider them duplicate publications, but also encourage submitters to publicly share manuscripts on preprint platforms early for peer exchange, and require accepted paper authors to upload their accepted manuscripts to designated preprint platforms. For example, *Acta Psychologica Sinica* and *Advances in Psychological Science* have both established such cooperative relationships with the Chinese psychology preprint platform PsyChinaXiv [58-59]. Authors of these journals therefore submit papers to the preprint platform according to journal requirements. This currently represents the main source of preprint papers on the PsyChinaXiv platform. Additionally, because journals like eLife have introduced "preprint first" policies [60], some scholars also post manuscripts on PsyChinaXiv before submission to meet such journal policies.

3.2 Promoting Personal Research Results

Because preprints have the advantage of increasing paper impact and are easy to submit and publish without taking too much time and effort, many researchers proactively submit accepted journal manuscripts to increase the discoverability and accessibility of their research results, thereby enhancing personal influence. Analysis of bioRxiv shows that scholars primarily use it for results promotion [61].

3.3 Addressing Timeliness and Practical Significance

Some researchers' work has strong practical significance or applicability. They hope their conclusions can quickly achieve social impact and positively promote specific practices, and therefore choose to publicly share their research conclusions on preprint platforms as quickly as possible, either at submission or before. For example, papers on the impact of COVID-19 on mental health, changes in psychological conditions during the pandemic, or vaccine anxiety published on the PsyChinaXiv preprint platform all fall into this category.

3.4 Feedback to Domestic Readers

Top domestic researchers actively participate in international academic exchange, which is primarily conducted in English. This results in most top Chinese scholars' research being written in English, hindering most Chinese citizens from perceiving and benefiting from China's top research work. On PsyChinaXiv, some scholars choose to translate English papers published in

foreign journals into Chinese to give back to domestic readers. Forty years ago, academic journals often required authors to provide abstracts in three or four languages, but today, only English is recognized as the language of international academic exchange, creating English-language academic hegemony. Language diversity in academia has positive benefits for academic development. However, publishing different language versions of the same paper in journals poses research ethics risks. Chinese translations of English papers cannot be republished in domestic Chinese journals. Similarly, to respond to the call to “write papers on the motherland’s land,” some scholars first publish important results in Chinese domestically and then post English versions on preprint platforms. To avoid duplicate submission, preprint platforms become a suitable destination for such different language versions.

3.5 Protecting Research Results

An increasing number of researchers realize that rapid public disclosure is the best way to protect their ideas and results, rather than keeping their teams closed off. As research competition intensifies, the possibility of research ideas and development approaches being completed and published first by competitors is increasing. The “Fu Xiangdong reporting Yang Hui incident” is one such case, while many undisclosed cases exist. The possibility of research progress being learned by competitors in informal exchange settings is universal, yet informal academic exchange cannot be completely avoided. Therefore, the best way to obtain exclusive rights to research findings is rapid public disclosure. Preprints are undoubtedly the lowest-cost, fastest platform for results disclosure and priority recognition.

3.6 Publishing Unabridged and Longer Papers

Authors often reluctantly comply with reviewers’ and editors’ opinions, revising or abridging papers against their wishes to secure publication. In such cases, some authors upload initial drafts to preprint platforms to preserve their papers’ original form and retain the content they truly want to express. Some authors also feel that due to journal length restrictions, their formally published papers cannot thoroughly elaborate their core viewpoints, or that flow and completeness are severely damaged during abridgment due to length limits. This is very common in social science research, and authors are willing to upload a preprint manuscript to fully present their ideas.

3.7 Balancing the Power of Reviewers and Editors

Not to mention citizen scientists, even among mainstream academic researchers, many believe their viewpoints and theories cannot be recognized by mainstream scientists, or that certain research has received unfair treatment and cannot be published. In such situations, preprint platforms become one means of balancing the power of reviewers and editors. Researcher Wu Jiarui believes: “Under publish-or-perish pressure, reviewers and editors acquire excessive academic

power, which creates a series of problems. The emergence of preprints returns the power of academic exchange to authors” [62]. When authors use preprint platforms, they actually master a tool that can balance the power of reviewers and editors. If preprints become widely accepted academic exchange channels and the place where all research results are first announced, perhaps a truly author-centered rather than journal-centered academic environment can be realized.

3.8 Publishing Research Byproducts or Immature Works

Some researchers publish immature works or non-primary conclusions from research as preprint papers. For example, some instructors and students submit research assignments to preprint platforms. These assignments are generally research papers completed by student groups according to course requirements. In other cases, secondary conclusions from research work would require significant time and effort to organize into journal papers, making the cost too high, but abandoning them seems wasteful as the conclusions might have some meaning and could inspire other scientists. Preprints become a low-cost channel for academic exchange. These works should not be overlooked, as some may be the starting points of future original innovations.

3.9 Publishing Back-to-Back Papers for Convenient Citation

Because peer review consumes substantial time, a common phenomenon occurs: the paper forming the research foundation has not yet been formally published, while the paper reflecting the latest progress is already written and ready for submission. In such cases, how to cite the unpublished foundational paper becomes problematic. Therefore, some researchers post foundational papers on preprint platforms to obtain DOIs, facilitating citation in new papers.

4. Problems and Challenges Facing Preprints

Preprints have not yet achieved all the goals hoped for them, and they have also brought many problems. bioRxiv is considered a very successful preprint platform, yet studies still show that most papers are submitted around the time of journal submission, meaning that bioRxiv preprints primarily serve as platforms for authors to promote their research results rather than providing much help for authors to improve paper quality [61]. Only a minority of papers on bioRxiv actually receive comments. The open review of preprints that the academic community greatly hopes for has not yet become common practice. This does not mean that preprints’ roles in academic communication are all imaginary, but rather suggests that preprints still have distance to reach ideal levels, with infinite potential and much room for development.

Additionally, 30% of papers on bioRxiv have not been published in formal journals, and 22% of papers on arXiv remain unpublished [63]. While some unpublished papers are not necessarily inferior or unscientific—for example, the

preprint paper proving the Poincaré conjecture remains unpublished—these papers that have not undergone peer review still raise concerns. For instance, will their extensive exposure to the public, scientists, and industry practitioners pose health and social risks? Will they waste scientists' time and energy? These impacts are temporarily unassessable.

Moreover, while preprints accelerate knowledge iteration, they also accelerate the spread and proliferation of misinformation, leading some to consider unreviewed, rapidly disseminated preprints as “knowledge viruses.” During the COVID-19 pandemic, preprints shone brightly while also generating considerable controversy and confusion. For example, one preprint suggested through various arguments that the novel coronavirus was a product of HIV virus modification [64]. Another claimed that vitamin D could treat COVID-19 patients and reduce severe case incidence [65]. Although these flawed preprint papers were later retracted, after their release they had been viewed by hundreds or thousands of people, influencing government health policies, and many researchers had already conducted new research based on these papers. While journals also cannot prevent flawed research from being published, the characteristics of preprints amplify these defects.

Academic recognition and acceptance of preprints have not been smooth sailing either. In 2021, the Australian Research Council changed its funding policy to disallow citing preprints in grant applications [66]. Although the council abandoned this modification by year-end under pressure from scholars, it still reflects a certain level of distrust toward preprints. Regarding journals, while the vast majority of academic journals still support preprints or at least do not oppose researchers prioritizing preprint disclosure, this does not mean journals are not concerned about the rise of preprints. Particularly when preprint citations are recognized, causing actual citation losses for journals, some journals have become worried and no longer support citing preprint papers in formally published papers. For example, the *British Journal of Pharmacology* issued a new preprint policy statement in 2021 no longer allowing citation of preprints in formally published papers [67]. They found that after the COVID-19 outbreak, submitted manuscripts increasingly cited preprints. Considering that preprints mix research works of various credibility and quality, after surveying over 70 editorial board members, *British Journal of Pharmacology* concluded that more board members did not approve of citing preprints in formally published papers.

Preprint platforms themselves also face many development issues. For example, sustainable development mechanisms for preprint platforms remain unclear. Most preprint platforms either rely on continuous financial support from one or several institutions or depend on sponsorship from public welfare foundations, and have not yet explored a sustainable and stable operational model. Consequently, when OSF ceased to be free, numerous preprint repositories based on the OSF platform stopped operating, including the library and information science preprint platform LIS Scholarship Archive, the law preprint platform LawArXiv, and many regional preprint platforms such as the Indone-

sian preprint platform. Preprint review mechanisms also need improvement to prevent low-quality research from being published through preprints and causing serious harm without affecting publication efficiency. This includes increasing preprint platform accountability and screening transparency, promoting responsible academic exchange, and striving to teach critical research skills to non-academic users [68].

5. Conclusion

As demonstrated above, as a form of academic exchange, an implementation pathway for open access, and a beneficial supplement to existing academic communication methods and traditional peer review models, preprints are gaining increasing acceptance and recognition. Dedicated preprint platforms exist in every disciplinary field. Particularly after the COVID-19 outbreak, more people have seen its benefits and recognized its value, despite preprints' inevitable flaws. The existence of preprints contributes to realizing a simple, fast, free, open, pluralistic, and fair academic communication ecosystem. Preprint exchange has become an academic information exchange method that cannot be ignored and constitutes an element of the contemporary knowledge innovation system. China is striving to build high-end academic exchange platforms [69], and preprint exchange should undoubtedly become an important component.

References

- [1] Zhang Zhixiong. Developing an Academically Self-Governed Preprint Exchange Model[J]. Digital Library Forum, 2017(10): 1.
- [2] Carneiro C.F.D., Queiroz, et al. Comparing quality of reporting between preprints and peer-reviewed articles in the biomedical literature[J]. Research Integrity and Peer Review, 2020(5): 16. <https://doi.org/10.1186/s41073-020-00101-3>
- [3] Liu Jingyu, Zhang Zhixiong, Huang Jinxia, et al. Research on Quality Control Methods in Preprint Services[J]. Digital Library Forum, 2017(10): 15-19.
- [4] Wu Jiarui. Preprints: A “Disruptive Innovation” in Academic Exchange[J]. Science, 2019, 71(02): 37-39+4.
- [5] Gordon G. SSRN—the leading social science and humanities repository and online community—joins Elsevier[EB/OL].[2016-05-17]. <https://www.elsevier.com/connect/ssrn-the-leading-social-science-and-humanities-repository-and-online-community-joins-elsevier>.
- [6] Zhang Zhixiong, Huang Jinxia, Wang Ying, et al. Research on Major Development Trends of International Preprint Platforms[J]. Digital Library Forum, 2017(10): 2-7.
- [7] Johnson R, Chiarelli A. The Second Wave of Preprint Servers: How Can Publishers Keep Afloat?[EB/OL].[2019-10-16]. <https://scholarlykitchen.sspnet.org/2019/10/16/the->

second-wave-of-preprint-servers-how-can-publishers-keep-a-float/.

[8] Chen Siyu, Chai Yue. Strategic Suggestions for Academic Journal Publishing in China from the Perspective of Open Science[J]. *Science and Technology Communication*, 2020, 12(20): 10-13+67.

[9] Mills K I. APA Journals Program Collaborates with Center for Open Science to Advance Open Science Practices in Psychological Research[EB/OL].[2017-08-01]. <https://www.apa.org/news/press/releases/2017/08/open-science>.

[10] Schonfeld R C, Rieger O Y. Publishers Invest in Preprints[EB/OL].[2020-05-27]. <https://scholarlykitchen.sspnet.org/2020/05/27/publishers-invest-in-preprints/>.

[11] Swaminathan S. Preprints: Past, present & future. The past, the present, and the future of preprints[EB/OL].[2020-10-19]. By ASAPBio. <https://www.youtube.com/watch?v=3vscxY-4i4A&t=433s>.

[12] Schonfeld R. Preprints and Author Services: An Interview with Rachel Burrely and Eugenie Regan[EB/OL].[2020-10-08]. <https://scholarlykitchen.sspnet.org/2020/10/08/preprints-author-services/>.

[13] Schonfeld R C. Strategy & Integration Among Workflow Providers[EB/OL].[2017-11-07]. <https://scholarlykitchen.sspnet.org/2017/11/07/strategy-integration-workflow-providers/>.

[14] Zhao Kunhua. International Observation and Policy Recommendations on the OA2020 Initiative[J]. *Library and Information Service*, 2019, 63(13).

[15] Schonfeld R C. Workflow Strategy for Those Left Behind: Strategic Context[EB/OL].[2017-12-18]. <https://scholarlykitchen.sspnet.org/2017/12/18/workflow-strategy-left-behind-context/>.

[16] Sang Hai. What Kind of Online Academic Platform Do We Need—Future Vision for the “Chinese University Series of Professional Journals” [J]. *Journal of Nanjing University (Philosophy, Humanities and Social Sciences)*, 2015, 52(03): 55-64+158.

[17] Chen Yue, Wang Zhiqi, Hu Zhigang, et al. Accelerating the Construction of a High-End Exchange Platform for National Research Papers and Scientific and Technological Information[J]. *Innovation Science and Technology*, 2021, 21(05): 8-21.

[18] Preprints[EB/OL].[2021-08-17]. <https://www.ukri.org/councils/mrc/guidance-for-applicants/policies-and-guidance-for-researchers/preprints/>.

[19] Zhang Zhixiong, Huang Jinxia, Chen Xuefei, et al. Policy Trends and Challenges of Scientific Preprint Repositories[J]. *Bulletin of National Natural Science Foundation of China*, 2019, 33(03): 219-228.

[20] Chen Xuefei, Zhang Zhixiong, Huang Jinxia. Analysis of Preprint Policies of International Academic Publishers[J]. *Digital Library Forum*, 2017(10): 8-14.

- [21] Cooperative Journals. <http://chinaxiv.org/journal/browse.htm>.
- [22] Kwon D. Open-access journal eLife announces ‘preprint first’ publishing model[EB/OL].[2020-12-15]. <https://www.nature.com/articles/d41586-020-03541-5>.
- [23] Sarabipour S, Debat HJ, Emmott E, et al. On the value of preprints: An early career researcher perspective[J]. PLOS Biology, 2019, 17(2): e3000151. <https://doi.org/10.1371/journal.pbio.3000151>
- [24] Xie Hejia, Liu Xiaomin, Jing Ran. Empirical Study and Recommendations on the Influence of Preprint Platform bioRxiv[J]. Chinese Journal of Scientific and Technical Periodicals, 2019, 30(11): 1218-1224.
- [25] Kaiser J. Biology preprints take off[EB/OL].[2017-09-29]. <https://vis.sciencemag.org/breakthrough2017/fin-preprints>.
- [26] Hou Zhijiang. Research and Enlightenment on arXiv Preprint Service[J]. Library Work and Study, 2019(02).
- [27] Fromme A. arXiv hits 2M submissions[EB/OL].[2022-01-04]. <https://news.cornell.edu/stories/2022/01/arx-hits-2m-submissions>
- [28] Iwema CL, Ladue J, Zack A, et al. search.bioPreprint: a discovery tool for cutting edge, preprint biomedical research articles[J]. F1000Research, 2016, 5: 1396.
- [29] Kupferschmidt K. Preprints bring ‘firehose’ of outbreak data[J]. Science, 2020, 367(6481): 963-964. <https://science.sciencemag.org/content/367/6481/963>.
- [30] Gianola S., Jesus T. S., Barger S., et al. Characteristics of academic publications, preprints, and registered clinical trials on the COVID-19 pandemic. PLoS One, 2020, 15(10): e0240123-e0240123.
- [31] Cai Miaozhi, Guo Jinjing, Zhao Jiawei, et al. The Role and Enlightenment of Biomedical E-preprint Resources in Public Health Emergencies[J]. Chinese Journal of Medical Library and Information Science, 2020, 29(05): 30-36.
- [32] Chen Yayang, Zhang Zhixiong. Main Development History of International Scientific Research Achievement Open Sharing Under Public Health Emergencies[J]. Library and Information Service, 2020, 64(15): 90-103.
- [33] Wang Fengchan. New Trends in Peer Review[J]. Acta Editologica, 2018, 30(05): 547-550.
- [34] Li Jiang, Wu Junhong. Publication Delay and Priority Digital Publishing[J]. Acta Editologica, 2011, 23(04): 4357-359.
- [35] Machovec GS. Budapest open access initiative[EB/OL].[2002-06-01]. <http://www.budapestopenacesinitiative.org/>
- [36] Jiang Xiaoyuan, Mu Yunqiu. The Nature of the Open Access Movement as Seen from the Response Strategies of International Famous Science Journals[J].

Publishing Research, 2019(01): 22-24.

[37] Zhu Zhongming. Normalization Construction and Development of Institutional Repositories. 2020.

[38] Hu Chuanpeng, Wang Fei, Guo Jichengsi, et al. Reproducibility Issues in Psychological Research: From Crisis to Opportunity[J]. *Advances in Psychological Science*, 2016, 24(09): 1504-1518.

[39] Munafò M, Nosek B, Bishop D. et al. A manifesto for reproducible science[J]. *Nature Human Behaviour*, 2017, 1, 0021.

[40] Baker M. 1,500 scientists lift the lid on reproducibility[J]. *Nature*, 2016, 533, 452-454.

[41] Oakden-Rayner L, Andrew L Beam, Lyle J Palmer. Medical journals should embrace preprints to address the reproducibility crisis[J]. *International Journal of Epidemiology*, 2018, 5(47): 1363-1365.

[42] Avissar M. The 10,000-watt Bulb: How Preprints Shine a Light on Misconduct[EB/OL].[2021-06-02]. <https://scholarlykitchen.sspnet.org/2021/06/02/guest-post-the-10000-watt-bulb-how-preprints-shine-a-light-on-misconduct/?informz=1>

[43] Haustein S, Piwowar H A, Priem J, et al. The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles[J]. *Peerj*, 2018, 6(4): e4375.

[44] Serghiou S, Ioannidis J P A. Altmetric Scores, Citations, and Publication of Studies Posted as Preprints[J]. *Jama the Journal of the American Medical Association*, 2018, 319(4): 402.

[45] Wei Dongqi, Tan Zongying. Problems and Challenges in Altmetrics Research at Home and Abroad[J]. *Library and Information Service*, 2015, 59(02): 93-99.

[46] Wei Dongqi, Jiang Tao, Tao Siyu, et al. Research Crowdsourcing—A New Model of Research Collaboration[J]. *Scientific Management Research*, 2015, 33(02): 16-19.

[47] Ying Qian. Current Status, Causes, and Prevention Strategies of Publication Bias in Medical Journals[J]. *Chinese Journal of Scientific and Technical Periodicals*, 2009, 20(06): 1112-1114.

[48] Xia Lingxiang. Several Basic Issues in Meta-Analysis Methods[J]. *Journal of Shanxi Normal University (Social Science Edition)*, 2005(03): 34-38.

[49] Scheel, Anne M., et al. “An Excess of Positive Results: Comparing the Standard Psychology Literature With Registered Reports.” [J]. *Advances in Methods and Practices in Psychological Science*, April, 2021, doi:10.1177/25152459211007467.

[50] Yang Zhihui. Development and Integration of Quantitative and Qualitative Research in Psychological Research Methods[J]. *China Journal of Health*

Psychology, 2011, 19(12): 1531-1533.

[51] He Wuming, Zheng Jianhong. Qualitative Research in Psychology: History, Current Status, and Prospects[J]. Psychological Science, 2019, 42(04): 1017-1023. DOI:10.16719/j.cnki.1671-6981.20190435.

[52] He Hongpeng. Can Preprints Replace Academic Journals?—From the Perspective of Sociology of Science[J]. Studies in Dialectics of Nature, 2021, 37(07): 72-77. DOI:10.19484/j.cnki.1000-8934.2021.07.013.

[53] Levecque K, Anseel F, Beuckelaer A D, et al. Work organization and mental health problems in PhD students[J]. Research Policy, 2017, 46(4): 868-879.

[54] Evans T., Bira L., Gastelum J. et al. Evidence for a mental health crisis in graduate education[J]. Nat Biotechnol, 2018, 36: 282-284.

[55] Time to talk about why so many postgrads have poor mental health[J]. Nature, 2018.

[56] Wang Fengchan. New Trends in Peer Review[J]. Acta Editologica, 2018, 30(05): 547-550.

[57] Du Pingping, Peng Lin. Using Platforms to Innovate Journal Publishing Services—Enlightenment from Preprint Platform Publishing[J]. Science-Technology & Publication, 2021(04): 11-16.

[58] Acta Psychologica Sinica, Preprint Policy Statement of Acta Psychologica Sinica[EB/OL].[2018-03-20]. <http://journal.psych.ac.cn/xlxb/CN/news/news34.shtml>.

[59] Advances in Psychological Science, Preprint Policy Statement of Advances in Psychological Science[EB/OL].[2018-10-26]. <http://journal.psych.ac.cn/xlkxjz/CN/news/news25.shtml>.

[60] Pack P. eLife shifting to exclusively reviewing preprints[EB/OL].[2020-12-02]. <https://elifesciences.org/for-the-press/a4dc2f54/elifeshifting-to-exclusively-reviewing-preprints>.

[61] Anderson K R. bioRxiv: Trends and analysis of five years of preprints[J]. Learned Publishing, 2020, 33.

[62] Wu Jiarui. Preprints: A “Disruptive Innovation” in Academic Exchange[J]. Science, 2019, 71(02): 37-39+4.

[63] Lin J, Yu Y, Zhou Y, et al. How many preprints have actually been printed and why: a case study of computer science preprints on arXiv[J]. Scientometrics, 2020, 124, 555-574.

[64] Oransky I., Marcus A. Quick retraction of a faulty coronavirus paper was a good moment for science[EB/OL].[2020-02-03]. <https://www.statnews.com/2020/02/03/retraction-faulty-coronavirus-paper-good-moment-for-science/>.

[65] Oransky I. Widely shared vitamin D-COVID-19 preprint removed from Lancet server. Retraction Watch[EB/OL].[2021-02-19]. <https://retractionwatch.com/2021/02/19/widely-shared-vitamin-d-covid-19-preprint-removed-from-lancet-server/>.

[66] Sinclair J. Fury mounts over ARC grants[EB/OL].[2021-02-19]. <https://www.researchprofessionalnews.com/rr-news-australia-government-agencies-2021-8-fury-mounts-over-arc-grants/>.

[67] Christopher H. G, Stephen P. H., Alexander, et al. Editorial policy regarding the citation of preprints in the British Journal of Pharmacology (BJP)[EB/OL].[2021-07-30]. <https://bpspubs.onlinelibrary.wiley.com/doi/10.1111/bph.15589>.

[68] Gopalakrishna, G. (2021). Preprint advocates must also fight for research integrity. Nature, <https://doi.org/10.1038/d41586-021-02481-y>

[69] Zhang Zhixiong. High-End Exchange Platform Construction Needs to Grasp the Development Trend of Knowledge Services[J]. Think Tank: Theory & Practice, 2021, 6(01): 5-6+9.

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