

# Exploring the Current Dynamics of Preprints

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## Abstract

Preprints are non-peer-reviewed and publicly available articles for open and transparent research communication. Preprint repositories or servers often facilitate the submission of such manuscripts, and despite the presence of established preprint servers, their numbers have continued to rise in recent times. A steep increasing tendency in posted preprints and their accommodating repositories has been seen in the last decade. In this article, we explored the current dynamics of global trends and development in the growing preprint landscape and its involvement in promoting open and transparent research findings across various domains. We further emphasized the relevance of preprinting, highlighting its significant impact during the pandemic through effective information sharing, and advocate for its wider adoption in scholarly communication.

**Keywords:** preprint, preprint repositories, preprint servers, open research, research community, research communication

## Introduction

Preprints, in a context-dependent manner, are considered complete manuscripts or articles published online in publicly accessible servers or repositories, such as bioRxiv, medRxiv, and arXiv (Bourne et al., 2017; Moshontz et al., 2021). Preprints are freely available on their respective repositories after their submission, either immediately or shortly after a given time frame (in most of the cases, up to 48 hours), in accordance with the repository's policies (Moshontz et al., 2021). In the majority of cases, articles published as preprints, are then submitted to a journal either simultaneously or afterward for a peer-review process.

It is, now, well-established that preprints facilitate quick and free access to the latest research outcomes or ideas to the research community, in a timeline much shorter than that for standard peer-reviewed publications, which can take up to a year and sometimes more (Kalcioğlu et al., 2015). In recent years, both the number of preprints and of preprint repositories have increased tremendously (Hoy, 2020). It is noticeable that, preprint repositories have recently been set up in China, India, and Japan, possibly to promote research content relevant to their local settings (Irawan et al., 2022). However, the number of submitted preprints on these servers are still not significant as compared to other disciplinary preprint servers that predate those repositories. It is still surprising to many, that a fair number of preprint repositories already exist, and yet these numbers are still increasing (Hoy, 2020).

In this article, we highlighted recent developments and insights into rising trends of preprints and repositories and their role in supporting open and transparent research.

This phenomenon has subsequently increased during the pandemic due to the urgent needs and quick dissemination of researchers' findings to address COVID-19. Furthermore, we emphasized the benefits of preprints for collaborative efforts within the research community.

## **Preprints in the last decade**

Before establishing the need for preprints, we must discuss how preprint servers have evolved recently in large numbers, and their importance in the context of open science and the efforts undertaken to make research more accessible. We also followed the reason why preprint servers are becoming popular lately and experiencing a sudden boost. Owing to the limited nature of this article, we, therefore, discussed and highlighted the insights into recent trends in the development of preprints and preprint servers or repositories, with a focus only on the last decade. The developmental trends in preprint repositories in the last decade (2013-2023), compared to overall established repositories since the beginning, indicate a significant increase in comparison to previously established repositories. This might show an increased awareness about preprints within the research community (Hoy, 2020).

One of the reasons for the popularity of preprints among researchers in the biological sciences in recent times was probably the launch of bioRxiv, a server dedicated in this research field, by the Cold Spring Harbor Laboratory (CSHL) in 2013. This preprint server thrived in the domain of preprints, probably because CSHL has established a good reputation in the research community, which then welcomed the bioRxiv preprints as a

community effort in good faith (Sever et al., 2019). In addition to bioRxiv, to promote prompt and accessible research findings in medicine, the CSHL then launched another preprint server specifically dedicated to medical sciences in collaboration with Yale University and BMJ, named medRxiv in 2019 (Petersen, 2022).

In the past decade, along with bioRxiv and medRxiv, a number of other preprint servers have emerged in various academic fields, including Psychology, Earth sciences, Ecology and Engineering. Additionally, these newly launched preprint repositories expanded to regional-based repositories, such as AfricaArXiv and SciELO (Irawan et al., 2022). In the humanities, SocArXiv and PsyArXiv in 2016, along with engrXiv in the engineering field (Riegelman, 2018), are among the other repositories. Furthermore, in 2017, ChemRxiv was established for Chemistry (Kiessling et al., 2016), EarthArXiv for Earth Sciences and OSF preprints (Riegelman, 2018), among other servers.

Given the increasing trends in the number of preprint servers, it has been a long-debated question: Why do we not have a centralized system for preprints? Why do we need to navigate ourselves through various domain-specific, country-specific, or region-specific repositories? However, it is interesting to highlight that most of the repositories accept the submissions across a wide range of disciplines and article types (Teixeira Da Silva & Nazarovets, 2023). In our opinion, having a decentralized system for preprint repositories may help to promote the research in certain ways, for example, Jxiv accepts the submissions in both English and Japanese, and regional repositories like AfricaArXiv, can help to promote the collaboration between local and international research community.

## Preprints are accelerating research communication

The pandemic situation has taught us to live, work and think differently than it used to be for all of us. In the context of this global crisis, preprints received unprecedented attention as they provided immediate access to the latest findings relevant to the pandemic. In this section, we highlighted the role of preprints in disseminating information, at a faster rate, during the pandemic. It was interesting to see the steep positive growth of preprints about COVID-19 since it was declared a pandemic by the World Health Organization (Älgå et al., 2021; Betthäuser et al., 2023; Fraser et al., 2021).

The pandemic provided a major boost to preprints as hundreds of preprint articles and overwhelming information related to COVID-19, were posted daily on these repositories. Owing to this massive usage of preprints, in some cases, therefore, bioRxiv and medRxiv have been cautious enough to issue labels on preprints as non-peer-reviewed articles (Añazco et al., 2021; Strcic et al., 2022). However, it is often argued that the peer-review process acts as a quality control mechanism in the publication pipeline.

Some specific communities, such as PreLights and Review Commons, are dedicated to communicating preprint highlights and preprint reviews, respectively. In the later part of 2022, still in the pandemic era, eLife implemented this publishing model ‘publish, then review’, which then became effective from early 2023 (Eisen et al., 2022). Though, it is worth noting that, such ideas as a concept have been proposed before (Stern & O’shea, 2019). In this model, eLife no longer makes accept or reject decisions. Instead, each manuscript that is peer-reviewed is published on their website as reviewed preprints, accompanied with an eLife assessment and public reviews. Further, the authors have the

choice to revise and resubmit the manuscript after addressing the reviewer's comments, or consider the reviewed preprint as the final version of their manuscript. Thus, eLife's new publishing model caters to the immediacy of preprints while incorporating peer-review evaluations for the benefit of the readership.

## Conclusion

Preprints, undoubtedly, are excellent resources for researchers worldwide in every domain. We also positively emphasize that the research community should adopt preprints as a standard practice, despite the fact that they lack the critical component of peer review. Among other things, preprints not only provide a faster way to introduce the research findings but also offer open and accessible communication to everyone everywhere (Bourne et al., 2017; Puebla et al., 2022; Sarabipour et al., 2019). They allow for review, comments, and contact with authors if any discrepancies are found. Interestingly, major research funding agencies such as the National Institute of Health in the US, the Wellcome Trust and the European Research Council accept preprints as part of the grant applications and reports (Fry et al., 2019). Therefore, preprints are getting validation from leading research funders and institutions. This suggests a positive change in the perception of funding agencies and research institutions towards preprints. The trends of scientific publication are rapidly revolving globally, however, it is quite unpredictable to foresee the direction of changes in the next couple of decades. It could drastically alter the interest of authors towards publishing articles in preprint servers.

Therefore, in the future, it will be interesting to observe the growing effect of preprints on traditional publishing and research outcomes.

## **Author Contributions**

**Conceptualization:** RRM, DM

**Project administration:** RRM

**Writing – original draft:** RRM, DM, RB

**Writing – review and editing:** RRM, DM, RB, AK

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## **Conflict of interests statement**

The authors declare no conflict of interests.



## References

- Älgå, A., Eriksson, O., & Nordberg, M. (2021). The development of preprints during the COVID-19 pandemic. In *Journal of Internal Medicine* (Vol. 290, Issue 2). <https://doi.org/10.1111/joim.13240>
- Añazco, D., Nicolalde, B., Espinosa, I., Camacho, J., Mushtaq, M., Gimenez, J., & Teran, E. (2021). Publication rate and citation counts for preprints released during the COVID-19 pandemic: The good, the bad and the ugly. *PeerJ*, 9. <https://doi.org/10.7717/peerj.10927>
- Bethhäuser, B. A., Bach-Mortensen, A. M., & Engzell, P. (2023). A systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nature Human Behaviour*, 7(3). <https://doi.org/10.1038/s41562-022-01506-4>
- Bourne, P. E., Polka, J. K., Vale, R. D., & Kiley, R. (2017). Ten simple rules to consider regarding preprint submission. In *PLoS Computational Biology* (Vol. 13, Issue 5). <https://doi.org/10.1371/journal.pcbi.1005473>
- Eisen, M. B., Akhmanova, A., Behrens, T. E., Diedrichsen, J., Harper, D. M., Iordanova, M. D., Weigel, D., & Zaidi, M. (2022). Peer review without gatekeeping. In *eLife* (Vol. 11). <https://doi.org/10.7554/eLife.83889>
- Fraser, N., Brierley, L., Dey, G., Polka, J. K., Pálffy, M., Nanni, F., & Coates, J. A. (2021). The evolving role of preprints in the dissemination of COVID-19 research and their impact on the science communication landscape. *PLoS Biology*, 19(4). <https://doi.org/10.1371/JOURNAL.PBIO.3000959>

- Fry, N. K., Marshal, H., & Mellins-Cohen, T. (2019). In praise of preprints. In *Microbial Genomics* (Vol. 5, Issue 4). <https://doi.org/10.1099/mgen.0.000259>
- Hoy, M. B. (2020). Rise of the Rxivs: How Preprint Servers are Changing the Publishing Process. *Medical Reference Services Quarterly*, 39(1). <https://doi.org/10.1080/02763869.2020.1704597>
- Irawan, D. E., Zahroh, H., & Puebla, I. (2022). Preprints as a driver of open science: Opportunities for Southeast Asia. *Frontiers in Research Metrics and Analytics*, 7. <https://doi.org/10.3389/frma.2022.992942>
- Kalcioglu, M. T., Ileri, Y., Karaca, S., Egilmez, O. K., & Kokten, N. (2015). Research on the submission, acceptance and publication times of articles submitted to international otorhinolaryngology journals. *Acta Informatica Medica*, 23(6). <https://doi.org/10.5455/aim.2015.23.379-384>
- Kiessling, L. L., Fernandez, L. E., Alivisatos, A. P., & Weiss, P. S. (2016). ChemRXiv: A Chemistry Preprint Server. In *ACS Nano* (Vol. 10, Issue 10). <https://doi.org/10.1021/acsnano.6b07008>
- Moshontz, H., Binion, G., Walton, H., Brown, B. T., & Syed, M. (2021). A Guide to Posting and Managing Preprints. *Advances in Methods and Practices in Psychological Science*, 4(2). <https://doi.org/10.1177/25152459211019948>
- Petersen, D. (2022). medRxiv: Navigating the New Frontier of Medical Research and Publishing. *Journal of Electronic Resources in Medical Libraries*, 19(1-2). <https://doi.org/10.1080/15424065.2022.2046229>

- Puebla, I., Polka, J., & Rieger, O. (2022). *Preprints: Their Evolving Role in Science Communication. Against the Grain (Media)*, LLC. <https://doi.org/10.3998/mpub.12412508>
- Riegelman, A. (2018). OSF Preprints. *The Charleston Advisor*, 19(3). <https://doi.org/10.5260/chara.19.3.35>
- Sarabipour, S., Debat, H. J., Emmott, E., Burgess, S. J., Schwessinger, B., & Hensel, Z. (2019). On the value of preprints: An early career researcher perspective. *PLoS Biology*, 17(2). <https://doi.org/10.1371/journal.pbio.3000151>
- Sever, R., Roeder, T., Hindle, S., Sussman, L., Black, K. J., Argentine, J., Manos, W., & Inglis, J. R. (2019). BioRxiv: The preprint server for biology. *bioRxiv*. <https://doi.org/10.1101/833400>
- Stern, B. M., & O'shea, E. K. (2019). A proposal for the future of scientific publishing in the life sciences. *PLoS Biology*, 17(2). <https://doi.org/10.1371/journal.pbio.3000116>
- Strcic, J., Civljak, A., Gloznic, T., Pacheco, R. L., Brkovic, T., & Puljak, L. (2022). Open data and data sharing in articles about COVID-19 published in preprint servers medRxiv and bioRxiv. *Scientometrics*, 127(5). <https://doi.org/10.1007/s11192-022-04346-1>
- Teixeira Da Silva, J. A., & Nazarovets, S. (2023). Most Preprint Servers Allow the Publication of Opinion Papers. *Open Information Science*, 7(1). <https://doi.org/10.1515/opis-2022-0144>