Primenjena psihologija
Vol. 16, No. 4, pp. 437-445, 2023

Editorial

DOI: 10.19090/pp.v16i4.2512

Promoting Open Science Principles and Primenjena psihologija (Applied Psychology)

David Mellor, PhD[✉] and Dejan Pajić[2]

[1] *Director of Policy, Center for Open Science*

[2] *Department of Psychology, Faculty of Philosophy, University of Novi Sad, Serbia*

The benefits of open science

At its heart, "open science" is a simple matter of sharing key parts of the research process that are traditionally not shared. These include detailed methods, protocols, and other materials needed to conduct the work: detailed analytical steps or code used for data analysis, the raw data collected during an investigation, and preliminary drafts of the manuscript.

A default towards not sharing may be for many reasons, but for many years, the largest one is that it was simply not possible to share raw data before online publication became the standard. That status quo became embedded in lab culture, and simply changing the status quo in a community as decentralized as the scientific community is always going to be a slow process. The fact that sharing more details about the process of scientific research represents a possible risk for the researcher, in a system where only statistically significant findings are publishable (Dickersin 1990; Komukai, Sugita, and Fujimoto 2023) and where others are not required to share their materials, making it all the more challenging to move beyond the current state.

However, this process is necessary for several reasons. Lack of access to primary research materials makes confirming or building upon earlier findings too challenging, as demonstrated by the fact that too many empirical research

[✉] Corresponding emails: mellor.david@gmail.com; david@cos.io

papers cannot be replicated. This issue has been well documented in the psychological sciences through projects such as the *Reproducibility Project: Psychology* (Nosek et. al., 2015) and the various *Many Labs* projects (Ebersole et al., 2016; Klein et al., 2014, 2018), but is also seen in pre-clinical cancer biology (Errington et. al. 2021, Begley & Ellis, 2012), experimental philosophy (Cova et. al., 2021), and other fields. This inability to replicate research findings wastes money (Freedman et. al., 2015) and time.

There are several key benefits that these practices have on the process of science and on the individual researcher. First, it is more efficient and practical to keep materials associated with their papers for individual researcher ease. It makes managing a lab more efficient and practical and allows for easier conduct as students come and go. Second, it increases trust in the process of science (Funk et al., 2019). Third, it increases the impact and citations for individual researchers (Christensen et al., 2019; Colavizza et al., 2019; Dorch, 2012; Henneken et al., 2011; Piwowar & Vision, 2007; Piwowar et al., 2013). These benefits should be widely known and shared, as they speak to individual rewards that align and support collective well-being, instead of individual sacrifice for the collective well-being, which can be a tough sell!

Opening science: Experiences from the Center for Open Science

Addressing the problems with embracing open science principles requires a thorough and holistic approach. Too often, solutions are too simple, too authoritarian, or too naive to be successful. Therefore, it is important to make new behaviors involved in open science supported in multiple ways. This philosophy is the cornerstone of the activities of the *Center for Open Science (COS)* (Nosek et al., 2015). Below is a summary of this plan, with links to key resources or examples of it being implemented.

This plan outlines five important steps for culture change. First, open science practices have to be possible. If we are to advocate for practices such as data sharing or preregistration, there has to be a means to do so. COS builds and maintains the open-source platform for sharing data, registering studies,

posting preprints, and managing research projects, the *Open Science Framework (OSF)*. Building a registry and project management tool enables the behaviors to happen, but unless they are easy to use, then only the most devoted users would adopt them. Considerable effort has been put into making the OSF more user friendly, so that practices such as posting a dataset or registering a study are much easier to accomplish. This work on improving user experience is the second step, "Making it Easy." This also includes comprehensive user-guides and documentation, which is included in the help section.

Once open science practices are possible and relatively easy to accomplish, they must become normalized. This process is perhaps the most important, as researchers simply learn from each other what is expected behavior. But it is also perhaps one of the most difficult to implement. There is no shortcut to normalizing new practices, it takes time and experience to learn from peers and to see more and more examples of such practices taking place. One way to make these practices more visible is through *Open Science Badges*, which recognize when behaviors take place. Such visibility is associated with increased adoption of new behaviors (Kidwell et al., 2016), but importantly this process takes time- simply offering a badge is not sufficient to incentivize new behaviors (Rowhani-Farid, 2019), they have to be visible for a period of time in order to normalize the practice.

Fourth, it is important to reward ideal behaviors with specific actions. *Registered Reports* is a publishing model that directly rewards open science practices through the promise to publish final results if the preregistered and pre-approved plan is conducted as specified. This publishing model moves peer review to before the study is conducted and incentivizes open science practices such as data sharing, conducting replications, and preregistration by granting in-principle acceptance for articles based on that early peer review.

Finally, open science behaviors can and should eventually be required. There is a guide for doing so in the *Transparency and Openness Promotion (TOP) Guidelines* (Nosek et al. 2015), which provides specific policy recommendations for journals and funders implementing open science practices. Importantly, TOP

is both modular (covering eight policies that can be independently implemented) and tiered (with levels 1-3). These features enable adoption of specific practices when a community is ready, while also enabling progressive policies to exist while some other policies are being tried out. For example, a level 1 policy for data transparency simply requires disclosure of whether or not datasets are available. This encourages adoption, as specifying "no" to that should become less and less desirable over time. Other polices may be level 2 (for example, requiring analytic code sharing) or even level 3 (requiring computational reproducibility checks). This format also enables comparison of journals on the degree to which they have been implemented. This results in a journal's *TOP Factor* and is an easy way for journals to compare policies and to adopt more stringent policies when it is reasonable to do so.

As a takeaway, below are a few primers and resources to encourage adoption of some or all of these practices.

Data Sharing

- How to make a data dictionary: https://help.osf.io/article/217-how-to-make-a-data-dictionary This guide gives some simple best practices for a data dictionary or codebook that will help future readers (even yourself!) understand the meanings behind each variable.
- Practical Tips for Ethical Data Sharing (Meyer, 2018). This tutorial provides practical steps for sharing data.
- Data Sharing: a Primer from UKRN (Towse, et al., 2020). This includes considerations of human data, consent, anonymisation, and protected access.
- Recommended language for informed consent with data sharing in mind (https://osf.io/g4jfv/wiki/Consent%20Forms/).

Data Analysis and Coding

- Good enough practices in scientific computing (Wilson et al., 2017). In this paper, the authors provide a basic set of best practices for storing data and conducting basic analyses that are useful for many researchers.
- Open Code and Software: a Primer from UKRN (Turner et al., 2020)

- Getting Started with Git (https://towardsdatascience.com/getting-started-with-git-and-github-6fcd0f2d4ac6) GitHub is a great way to work on version controlled code or projects in a way that lets you keep track of issues as they arise.

Online Courses for Statistical Tools

- Improving your statistical inferences (Coursera, Lakens: https://www.coursera.org/learn/statistical-inferences)
- Statistics with R Specialization (Coursera, Duke: https://www.coursera.org/specializations/statistics)
- Data Scientist with R (Datacamp: https://www.datacamp.com/tracks/data-scientist-with-r)
- Statistics and R (Harvard: https://pll.harvard.edu/course/statistics-and-r)
- Learn R (CodeAcademy: https://www.codecademy.com/learn/learn-r)

Preregistration and Registered Reports

- The Preregistration Revolution (Nosek et al., 2018). An introduction to preregistration along with examples of how and when to preregister.
- The UK Reproducibility Network's (UKRN) primer on pre-registration and registered reports (Stewart et al., 2020).
- Practical considerations for navigating Registered Reports (Kiyonaga & Sciemca, 2019) (with accompanying OA materials here: https://osf.io/5gazv/wiki/home/).

About this special issue

We entitled this special issue "Promoting Open Science Principles in Psychology". Our intention was to promote the principles of open science and encourage psychologists to implement these principles in their research. The first three articles in the issue are excellent examples of various open science practices. In the first, Milovanović, Sadiković, Krstić, and Stojadinović have demonstrated benefits of using citizen science approach in psychological research. A total of 26 citizens were engaged in collecting data and

disseminating results on family transmission of executive functions deficits (working memory and inhibitory control) from parents to children. In the second, Čolović, Bojanić, Žunić, and de Souza Peres have explored personality structure based on the contents of data from the open-access „Tweet-sr" Serbian Twitter linguistic corpus. The third article, authored by Radević, Milošević, Milosavljević, and Dinić, illustrates the use of open methodology approach to research. The authors have analyzed the structure an correlates of 12 freely available instruments aimed at measuring the newly emerged concept of coronaphobia. Finally, the two last articles are more conceptual in its nature and offer a wider perspective of open science research practice. Pajić, Babić, and Jevremov explored the structure, dynamics, and impact of open access articles in personality research, while Smederevac and Stojanović offered a comprehensive overview of the open science landscape in the Western Balkan Countries, providing insights into existing open science policies, infrastructure, and practices in Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia.

This special issue also marks the end of the current editorial boards' tenure. In the past three years, we put significant efforts into further improving the quality and outreach of research published in *Primenjena psihologija*, building upon the achievements of previous editorial boards. We have adopted several policies related to open science and ethics in research, encouraging authors who publish in our journal to deposit their papers in institutional repositories, share primary datasets, preregister their research designs, and submit preregistered studies. *Primenjena psihologija* became indexed in the Directory of Open Access Journals (DOAJ), signifying our commitment to open access and scholarly excellence. It also officially received Impact Factor for the first time. Instead of farewell, we appeal to our successors to further improve the impact of articles published in our journal and, more importantly, to boost the OSF's Top Factor score for Primenjena psihologija. We also appeal to our readers and fellow researchers to embrace the open science practice and use the examples provided in this issue as a guidance for their future scientific endeavors.

Refrences

Begley, C. G., & Ellis, L. M. (2012). Drug development: Raise standards for preclinical cancer research. *Nature*, *483*(7391), 531–533. https://doi.org/10/gd3xdh

Christensen, G., Dafoe, A., Miguel, E., Moore, D. A., & Rose, A. K. (2019). A study of the impact of data sharing on article citations using journal policies as a natural experiment. PLOS ONE, 14(12), e0225883. https://doi.org/10.1371/journal.pone.0225883

Colavizza, G., Hrynaszkiewicz, I., Staden, I., Whitaker, K., & McGillivray, B. (2019). The citation advantage of linking publications to research data. ArXiv:1907.02565 [Cs]. http://arxiv.org/abs/1907.02565

Collaboration, O. S. (2015). Estimating the reproducibility of psychological science. Science, 349(6251), aac4716. https://doi.org/10/68c

Cova, F., Strickland, B., Abatista, A., Allard, A., Andow, J., Attie, M., Beebe, J., Berniūnas, R., Boudesseul, J., Colombo, M., Cushman, F., Diaz, R., N'Djaye Nikolai van Dongen, N., Dranseika, V., Earp, B. D., Torres, A. G., Hannikainen, I., Hernández-Conde, J. V., Hu, W., … Zhou, X. (2021). Estimating the Reproducibility of Experimental Philosophy. Review of Philosophy and Psychology, 12(1), 9–44. https://doi.org/10.1007/s13164-018-0400-9

Dickersin, K. (1990). The Existence of Publication Bias and Risk Factors for Its Occurrence. JAMA: The Journal of the American Medical Association, 263(10), 1385. https://doi.org/10/d3nqbb

Dorch, B. (2012). On the Citation Advantage of linking to data. https://hal-hprints.archives-ouvertes.fr/hprints-00714715/document

Ebersole, C. R., Atherton, O. E., Belanger, A. L., Skulborstad, H. M., Allen, J. M., Banks, J. B., Baranski, E., Bernstein, M. J., Bonfiglio, D. B. V., Boucher, L., Brown, E. R., Budiman, N. I., Cairo, A. H., Capaldi, C. A., Chartier, C. R., Chung, J. M., Cicero, D. C., Coleman, J. A., Conway, J. G., … Nosek, B. A. (2016). Many Labs 3: Evaluating participant pool quality across the academic semester via replication. *Journal of Experimental Social Psychology*, *67*, 68–82. https://doi.org/10.1016/j.jesp.2015.10.012

Errington, T. M., Mathur, M., Soderberg, C. K., Denis, A., Perfito, N., Iorns, E., & Nosek, B. A. (2021). Investigating the replicability of preclinical cancer biology. ELife, 10, e71601. https://doi.org/10.7554/eLife.71601

Freedman, L. P., Cockburn, I. M., & Simcoe, T. S. (2015). The Economics of Reproducibility in Preclinical Research. PLOS Biology, 13(6), e1002165. https://doi.org/10/gffksc

Funk, Cary, Meg Hefferon, Brian Kennedy, & Courtney Johnson. (2019, August 2). How Americans view research and findings. Pew Research Center Science & Society. https://www.pewresearch.org/science/2019/08/02/americans-say-open-access-to-data-and-independent-review-inspire-more-trust-in-research-findings/

Henneken, E. A., & Accomazzi, A. (2011). Linking to Data—Effect on Citation Rates in Astronomy. ArXiv:1111.3618 [Astro-Ph]. http://arxiv.org/abs/1111.3618

Kidwell, M. C., Lazarević, L. B., Baranski, E., Hardwicke, T. E., Piechowski, S., Falkenberg, L.-S., Kennett, C., Slowik, A., Sonnleitner, C., Hess-Holden, C., Errington, T. M., Fiedler, S., & Nosek, B. A. (2016). Badges to Acknowledge Open Practices: A Simple, Low-Cost, Effective Method for Increasing Transparency. PLOS Biol, 14(5), e1002456. https://doi.org/10/f8pkck

Kiyonaga, A., & Scimeca, J. M. (2019). Practical Considerations for Navigating Registered Reports. Trends in Neurosciences, 42(9), 568–572. https://doi.org/10/gf9c9k

Klein, R. A., Ratliff, K. A., Vianello, M., Adams, R. B., Bahník, Š., Bernstein, M. J., Bocian, K., Brandt, M. J., Brooks, B., Brumbaugh, C. C., Cemalcilar, Z., Chandler, J., Cheong, W., Davis, W. E., Devos, T., Eisner, M., Frankowska, N., Furrow, D., Galliani, E. M., … Nosek, B. A. (2014). Investigating Variation in Replicability: A "Many Labs" Replication Project. *Social Psychology*, *45*(3), 142–152. https://doi.org/10.1027/1864-9335/a000178

Klein, R. A., Vianello, M., Hasselman, F., Adams, B. G., Adams, R. B., Alper, S., Aveyard, M., Axt, J. R., Babalola, M. T., Bahník, Š., Batra, R., Berkics, M., Bernstein, M. J., Berry, D. R., Bialobrzeska, O., Binan, E. D., Bocian, K., Brandt, M. J., Busching, R., … Nosek, B. A. (2018). Many Labs 2: Investigating Variation in Replicability Across Samples and Settings. *Advances in Methods and Practices in Psychological Science*, *1*(4), 443–490. https://doi.org/10.1177/2515245918810225

Komukai, K., Sugita, S., & Fujimoto, S. (2023). Publication Bias and Selective Outcome Reporting in Randomized Controlled Trials Related to Rehabilitation: A Literature Review. Archives of Physical Medicine and Rehabilitation, 0(0). https://doi.org/10.1016/j.apmr.2023.06.006

Meyer, M. N. (2018). Practical Tips for Ethical Data Sharing. *Advances in Methods and Practices in Psychological Science*, *1*(1), 131–144. https://doi.org/10/gfv87c

Nosek, B. A., Alter, G., Banks, G. C., Borsboom, D., Bowman, S. D., Breckler, S. J., Buck, S., Chambers, C. D., Chin, G., Christensen, G., Contestabile, M., Dafoe, A., Eich, E.,

Freese, J., Glennerster, R., Goroff, D., Green, D. P., Hesse, B., Humphreys, M., ... Yarkoni, T. (2015). Promoting an open research culture. Science, 348(6242), 1422–1425. https://doi.org/10/gcpzwn

Nosek, B. A., Beck, E. D., Campbell, L., Flake, J. K., Hardwicke, T. E., Mellor, D. T., van 't Veer, A. E., & Vazire, S. (2019). Preregistration Is Hard, And Worthwhile. Trends in Cognitive Sciences, 23(10), 815–818. https://doi.org/10.1016/j.tics.2019.07.009

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. Proceedings of the National Academy of Sciences, 115(11), 2600–2606. https://doi.org/10/gc6xk8

Nosek, B. A., Shaw, L. C., Errington, T. M., Pfeiffer, N., Mellor, D. T., Brooks, R. E., III, ... Litherland, D. M. (2017, March 6). Center for Open Science: Strategic Plan. https://doi.org/10.31219/osf.io/x2w9h

Piwowar, H. A., & Vision, T. J. (2013). Data reuse and the open data citation advantage. PeerJ, 1, e175. https://doi.org/10/f3mn68

Piwowar, H. A., Day, R. S., & Fridsma, D. B. (2007). Sharing Detailed Research Data Is Associated with Increased Citation Rate. PLOS ONE, 2(3), e308. https://doi.org/10/apv

Rowhani-Farid, A., Aldcroft, A., & Barnett, A. G. (2020). Did awarding badges increase data sharing in *BMJ Open*? A randomized controlled trial. *Royal Society Open Science*, *7*(3), 191818. https://doi.org/10/gg4dsj

Stewart, S., Rinke, E., McGarrigle, R., Lynott, D., Lunny, C., Lautarescu, A., ... Crook, Z. (2020, October 30). Pre-registration and Registered Reports: A Primer from UKRN. https://doi.org/10.31219/osf.io/8v2n7

Towse, J. N., Rumsey, S., Owen, N., Langford, P., Jaquiery, M., & Bolibaugh, C. (2020, October 30). Data Sharing: a Primer from UKRN. https://doi.org/10.31219/osf.io/wp4zu

Turner, A., Topor, M., Stewart, A. J., Owen, N., Kenny, A. R., Jones, A. L., & Ellis, D. A. (2020, October 30). Open Code and Software: a Primer from UKRN. https://doi.org/10.31219/osf.io/qw9ck

Wilson, G., Bryan, J., Cranston, K., Kitzes, J., Nederbragt, L., & Teal, T. K. (2017). Good enough practices in scientific computing. *PLOS Computational Biology*, *13*(6), e1005510. https://doi.org/10/gbkbwp