

To help inform the special education research community, these briefs feature information on prominent open science practices. Content comes from our series of short articles in the DR newsletter, *Focus on Research*, as well as additional content developed by DR members.

## REGISTERED REPORTS

Open science is an umbrella term that encompasses varied practices aiming to make science more open and transparent. Although some have argued that open science can make research more trustworthy, impactful, and efficient in special education (Cook et al., 2018), there is a lack of clarity in the field about what open-science practices are, their primary benefits and potential obstacles, and how to access resources for implementing them. To help inform the special education research community, we are featuring a series of articles in the Division for Research newsletter on prominent open-science practices. In this article, we discuss **registered reports**.

### What Are Registered Reports?

Registered reports are empirical studies in which the Introduction and Method sections (i.e., stage-1 manuscript) are peer reviewed prior to the collection of data (Chambers, 2019; Kiyonaga, & Scimeca, 2019). After one or more rounds of peer review, if reviewers and journal editor agree that a stage-1 manuscript asks important questions and plans to apply rigorous methods to evaluate those questions, the manuscript is granted in-principle acceptance. In-principle acceptance means the editor agrees to publish the complete manuscript, after the study is

conducted, so long as researchers (a) do not deviate from the accepted research plan, or any deviations are clearly identified and justified; and (b) results are appropriately reported and discussed. Stage-2 review occurs after the completion of the study, and involves reviewers evaluating adherence to the original research plan. Importantly, the paper cannot be rejected in stage-2 review because of the direction, magnitude, or perceived importance of the findings (see Figure 1; Center for Open Science, n.d.a).

**Figure 1**

*Main steps in registered reports*



## Primary Benefits of Registered Reports

Primary benefits of registered reports include reducing the likelihood of questionable research practices (QRPs), enabling reviewers to provide constructive input to improve studies before they are conducted, and reducing publication bias. QRPs, such as selective reporting of results, hypothesizing after results are known (HARKing), and collecting additional data after checking to see if results are significant (data peeking), negatively impact the quality and credibility of research (Makel et al., 2019; Simmons et al., 2011). Registered reports may mitigate QRPs, and thus improve the quality and credibility of research, by ensuring researchers delineate all variables, procedures, planned analyses, and hypotheses before conducting their study. As a result, researcher flexibility is limited and decisions in the research process that have not traditionally been transparent are unmasked (Nosek et al., 2018). For example, under the traditional approach to publishing, researchers may explore multiple approaches to analyzing data (*p*-hacking) and retroactively hypothesize those results (HARKing), but report the study such that it appears hypotheses were made in advance and only one set of analyses was conducted. Under registered reports, such practices would be discoverable and would result in rejection of the manuscript in stage-2 review (see Figure 2; Center for Open Science, n.d.b). Importantly, registered reports remove the incentive to engage in these types of QRPs to obtain positive findings to improve the likelihood that a study will be accepted for publication. Indeed, one of the only ways for a paper to be rejected at stage-2 review is to unjustifiably deviate from accepted research plans.

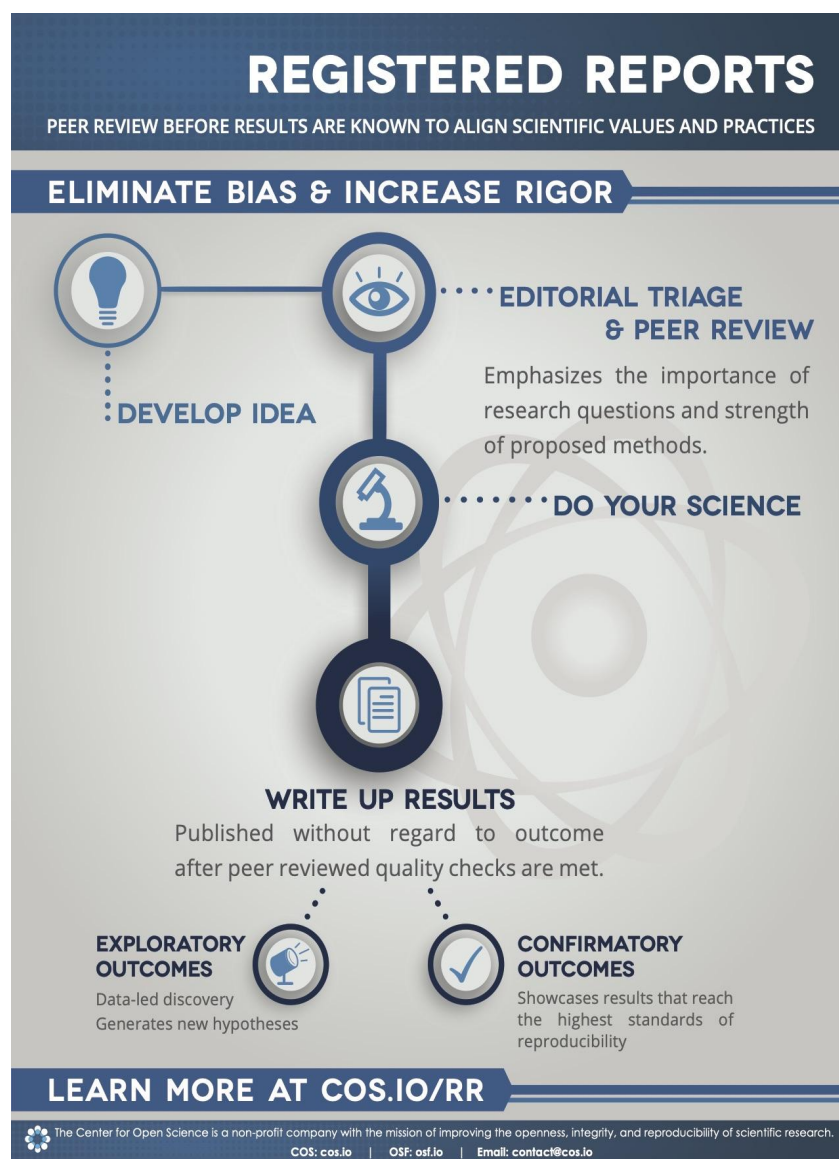
Registered reports also present peer reviewers with the opportunity to provide constructive feedback and refine the study's theoretical basis, research questions, and methodological rigor before the study is conducted (in stage-1 review). In contrast with traditional peer review, which involves reviewers critiquing a completed study, reviewers of registered reports can be directly involved in improving research studies.



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Another benefit of registered reports is the reduction of publication bias. Publication bias negatively impacts the field of special education as reported intervention effects for students with disabilities may be inflated due to the lack of null and negative results in the published literature (Gage et al., 2017). Publication bias is due, at least in part, because (a) some reviewers and editors may be less likely to accept studies with null findings for publication, and (b) researchers perceive that studies with null findings are unlikely to be accepted for publication. Registered reports combat publication bias because in-principle acceptance occurs before study results are known. Not surprisingly, registered reports are associated with significantly higher rates of studies with null findings than traditional publications (Allen & Mehler, 2019; Scheel et al., 2020).

**Figure 2**  
Center for Open Science's registered reports infographic



### RESOURCES for REGISTERED REPORTS

- Center for Open Science resources for registered reports  
<https://www.cos.io/rr>
- 7 Easy Steps to Publishing a registered reports  
<https://authorservices.wiley.com/asset/Registered-Reports-Seven-Easy-Steps-to-Publish.pdf>
- Overview of Registered Reports by Kiyonaga and Scimeca  
[https://www.cell.com/trends/neurosciences/fulltext/S0166-2236\(19\)30124-9](https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(19)30124-9)
- List of published registered reports  
<https://www.zotero.org/groups/479248/osf/collections/KEJP68G9>
- Registered reports submission checklist  
<https://mfr.osf.io/render?url=https://osf.io/93znh/?direct%26mode=render%26action=download%26mode=render>

## Potential Obstacles to Registered Reports

It is important to recognize that not all research can or should be published as registered reports (Chambers, 2019). Registered reports are appropriate for a range of research designs when studies examine one or more hypotheses using methods determined before the study is conducted. Purely exploratory studies and studies that may develop in unpredictable ways are likely not appropriate as registered reports. In

these types of studies, authors are not able to clearly describe study methods in advance such that reviewers can meaningfully evaluate study quality. Additionally, the stage-1 review process entails a lag between when the study is fully conceptualized and when it can be implemented. Because the review process may involve multiple rounds of review, this lag can be many months and is difficult

to predict. As such, time-sensitive studies (e.g., studies addressing dangerous student behavior, examining perceptions of a topical issue, needing to be implemented quickly to meet a funder's requirements) may not be appropriate as registered reports.

The time and change in workflow associated with registered reports also pose important challenges for researchers. Although researchers often plan many study elements before collecting data, they traditionally do not plan and document all study methods in advance. Accordingly, for most researchers, the workflow required for registered reports is different and may, at least initially, be challenging. However, the extra work devoted to planning before data collection is likely to reduce the workload during and after the study is conducted, as researchers will have a clear blueprint to follow for major study decisions. Nonetheless, registered reports involve two stages of review – one before and one after the study is conducted, which requires greater time and work from

authors, reviewers, and editors.

One common concern with registered reports is that they are perceived as stifling researchers' creativity by disallowing exploration of data sets beyond analyses specified in stage-1 manuscripts. This would be a major limitation, as many important scientific advances occurred through happenstance and exploration of data collected for other purposes (Winters, 2016). Fortunately, registered reports in no way prohibit or even discourage exploration of one's data (Chambers, 2019). Rather, registered reports provide a clear distinction between confirmatory (planned) and exploratory (unplanned) procedures and analyses (see Figure 2; Center for Open Science, n.d.b). Exploratory analyses can and should be included in stage-2 manuscripts, they just need to be clearly identified as exploratory so that research consumers do not confuse them with confirmatory analyses.

## How to Submit a Registered Report

Registered reports are submitted to journals in two stages. While specific requirements vary by journal, stage-1 submissions typically entail an Introduction and Method sections, including study rationale, research hypotheses, sampling plan, full description of independent and dependent variables, power analysis (if appropriate for proposed design), data analysis plan, and a brief discussion on how results will be interpreted if hypotheses are confirmed or rejected. Journal reviewers, in turn, evaluate the importance and salience of the research proposed to the overall aims of the particular journal, and the suitability of the proposed methods and analysis plans for answering the research questions. Core to reviewers' evaluation of stage-1 manuscripts is the authors making a case that the study will be valuable regardless of the results (Kiyonaga & Scimeca, 2019).

The phases of stage-1 review follow a similar pattern as typical journal manuscript submissions: manuscripts can be rejected or revisions can be requested with additional rounds of review conducted as necessary. However, because the study has yet to occur, reviewers of stage-1 manuscripts have the opportunity to propose changes to the design and conduct of the study, instead of merely pointing out flaws in a study that has already

been completed. Once the study is complete, authors update their Method section if and as needed, highlighting and providing rationales for any changes to the originally submitted protocol; write up the Results; and add a Discussion section. This paper is then resubmitted to the journal as a stage-2 registered report. The review process in stage 2 centers on whether the authors conduct the study as proposed, or justified any consequential deviations, and reported and discussed findings appropriately. If the answer is yes, the manuscript is accepted for final publication in the journal regardless of whether the authors' hypotheses were confirmed.

At this time, we know of only two special education journals that have adopted registered reports as a regular submission option: *Exceptional Children* and *Gifted Child Quarterly*. However, other journals in the field (e.g., *Learning Disability Quarterly*, *Remedial and Special Education*) have special issues slated on the topic. We encourage authors to submit registered reports to these journals, as well as to reach out to editors of other journals to see if they are willing to entertain a registered report submission.



## REFERENCES

- Allen, C., & Mehler, D. M. (2019). Open science challenges, benefits and tips in early career and beyond. *PLoS Biology*, *17*(5), e3000246. <https://doi.org/10.1371/journal.pbio.3000246>
- Chambers, C. (2019). What's next for registered reports? *Nature*, *573*, 187-189. <https://doi.org/10.1038/d41586-019-02674-6>
- Center for Open Science. (n.d.a) *Registered reports*. Retrieved from <https://www.cos.io/our-services/registered-reports>
- Center for Open Science. (n.d.b) *Registered reports: Peer review before results are known to align scientific values and practices*. Retrieved from <https://mfr.osf.io/render?url=https://osf.io/es5vu/?direct%26mode=render%26action=download%26mode=render>
- Cook, B. G., Lloyd, J. W., Mellor, D., Nosek, B. A., & Therrien, W. J. (2018). Promoting open science to increase the trustworthiness of evidence in special education. *Exceptional Children*, *85*(1), 104–118. <https://doi.org/10.1177/0014402918793138>
- Gage, N. A., Cook, B. G., & Reichow, B. (2017). Publication bias in special education meta-analyses. *Exceptional Children*, *83*(4), 428-445. <https://doi.org/10.1177/0014402917691016>
- Kiyonaga, A., & Scimeca, J. M. (2019). Practical considerations for navigating registered reports. *Trends in Neurosciences*, *42*(9), 568-572. <https://doi.org/10.1016/j.tins.2019.07.003>
- Makel, M. C., Hodges, J., Cook, B. G., & Plucker, J. (2019, October 31). Questionable and Open Research Practices in Education Research. <https://doi.org/10.35542/osf.io/f7srb>
- Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. *Proceedings of the National Academy of Sciences*, *115*, 2600–2606. doi:10.1073/pnas.1708274114
- Scheel, A. M., Schijen, M., & Lakens, D. (2020, February 5). An excess of positive results: Comparing the standard psychology literature with Registered Reports. <https://doi.org/10.31234/osf.io/p6e9c>
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological science*, *22*(11), 1359-1366.
- Winters, R. W. (2016). *Accidental medical discoveries: How tenacity and pure dumb luck changed the world*. Simon and Schuster.



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