We still need more trust in science: the need for broader adoption of Registered Reports

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1 In an open letter¹ more than five years ago, a group of scientists called for adopting
2 **Registered Reports** in all journals of the life sciences. This letter and subsequent efforts
3 have yielded some notable success. At time of writing, 207 journals support the Registered
4 Reports format, with many more currently considering its implementation. However, these
5 numbers are still small in comparison to the many journals that rely exclusively on the
6 traditional way of evaluating scientific quality. We, a group of over 250 scientists, want to
7 emphatically reiterate the importance of accepting studies before the results are in. We call
8 for all empirical journals in the social and life sciences to offer Registered Reports, alongside
9 the traditional publication formats.

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11 In line with the scientific method, researchers formulate a hypothesis, devise a way to test
12 this hypothesis, test it, and decide, based on the results, whether the hypothesis is
13 supported by our observations. This method has yielded many important insights about our
14 world and bettered our everyday lives in countless ways. Unfortunately, there are pressures
15 in the academic system which encourage researchers not to follow this procedure. To get an

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academic job or external funding, researchers need to publish as many articles in prestigious journals as possible. You either "publish or perish"². Journals themselves are incentivised to publish papers describing positive, novel, and sexy discoveries to promote increases in subscriptions, media attention, and impact factor. However, it has the side-effect of biasing the scientific record against negative results and replications of previous studies^{3,4}.

This mixture of incentives for academics and for journals leads to detrimental dynamics for scientific progress. For journals, there is a pressure to reject articles if the results are negative or not novel, creating a systematic disadvantage for studies which have negative results, or which replicate an existing study. This publication bias leads to illusory evidence for effects which in reality, do not exist, and makes true effects appear larger than they actually are. For researchers, the pressure to publish can encourage **questionable research practices** that increase the chances to publish by turning an originally negative result into a positive one^{5,6}. For example, researchers often 'postdict' their results: they formulate hypotheses after having seen the data (a practice known as Hypothesising After Results are Known, or HARKing^{7,8}). It is also common practice to reanalyse data in such a way that it confirms prior beliefs: if after a first analysis one doesn't find an expected effect, one might change the analysis until the expected results are obtained⁹. Mostly, researchers are not aware of doing anything wrong: Often, questionable research practices are a result of unconscious biases and/or a poor understanding of the principles of probability that govern the statistical inference. However, whether it is intentional or not, in the long run, such practices increase the rate at which the literature becomes cluttered with spurious relationships (false positives), because analytical decisions are conditional on the results.

Registered Reports¹⁰ are a powerful tool to reduce publication bias and questionable research practices. This publication format offers benefits both for authors and for journals, and improves the quality of scientific research in the long run. In contrast to the traditional

peer review and publication model, Registered Reports are reviewed before researchers collect their data. If the scientific rationale, the research questions and the method to test these questions are approved by the reviewers, the authors are offered "in-principle acceptance" of their article. Thus, editorial decisions are based solely on the scientific question and its methodological implementation and not on the results. An important benefit to both researchers but also funders is receiving feedback before conducting the study through formal peer-review. This form of improvement of the design of the study makes it less likely that the researcher will invest resources into an experiment only to find out afterwards that they overlooked some critical methodological flaw which makes the results uninterpretable.

Registered Reports are also good for journals and science in general because they decrease the probability of publishing false discoveries (i.e., studies supporting the presence of an effect when none is there). They further reduce publication bias and facilitate publication of negative findings and direct replications. Moreover, the emergence of questionable research practices such as postdiction and exploiting analytical flexibility is reduced because the researchers need to specify in advance which variables they plan to investigate, how they will decide on the sample size, and how they will analyze the data. We believe all of these consequences lead to a more robust and credible scientific record.

Researchers often raise concerns that Registered Reports prevent scientific discovery and exploration. Exploratory analyses are indeed a very important aspect of data analysis and lead to impactful discoveries. Registered Reports allow authors to report unregistered analyses in a separate section labelled "exploratory analyses". Thus, what makes Registered Reports different from the traditional system is that they reinforce drawing a visible line between confirmation of prespecified hypotheses and subsequent exploration.

Journal editors might also be concerned that Registered Reports may create an additional

administrative burden. Encouragingly, experiences at the large number of journals that have adopted the Registered Reports format show that this is not the case. To our knowledge, very few journals have introduced the format and then retracted it after a trial period, suggesting that the option is received well by journals and communities.

In conclusion, we propose that Registered Reports offer an efficient way to combat publication bias and questionable research practices, and to restore the public trust in science following global discussions of the replication crisis in life and social sciences. While top-down changes are required to fix the incentive structure of academia, offering the option to submit Registered Reports is a small step that has large potential gains and small or no potential losses for the scientific community.

We therefore call for all editors and publishers of journals which publish hypothesis-driven studies to consider offering Registered Reports as a publication format.

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