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Editorial

Instead of "playing the game" it is time to change the rules: Registered Reports at *AIMS Neuroscience* and beyond

Christopher D. Chambers [1,*], Eva Feredoes [2], Suresh D. Muthukumaraswamy [1], Peter J. Etchells [3]

[1] Cardiff University Brain Research Imaging Centre, School of Psychology, Cardiff University
[2] School of Psychology and Clinical Language Sciences, University of Reading
[3] School of Society, Enterprise and Environment, Bath Spa University

*** Correspondence:** Email: chambersc1@cardiff.ac.uk; Tel: +44 (0) 2920-870331.

The last ten years have witnessed increasing awareness of questionable research practices (QRPs) in the life sciences [1,2], including p-hacking [3], HARKing [4], lack of replication [5], publication bias [6], low statistical power [7] and lack of data sharing ([8]; see Figure 1). Concerns about such behaviours have been raised repeatedly for over half a century [9–11] but the incentive structure of academia has not changed to address them.

Despite the complex motivations that drive academia, many QRPs stem from the simple fact that the incentives which offer success to individual scientists conflict with what is best for science [12]. On the one hand are a set of gold standards that centuries of the scientific method have proven to be crucial for discovery: rigour, reproducibility, and transparency. On the other hand are a set of opposing principles born out of the academic career model: the drive to produce novel and striking results, the importance of confirming prior expectations, and the need to protect research interests from competitors. Within a culture that pressures scientists to produce rather than discover, the outcome is a biased and impoverished science in which most published results are either unconfirmed genuine discoveries or unchallenged fallacies [13]. This observation implies no moral judgement of scientists, who are as much victims of this system as they are perpetrators.

While there is no single answer to QRPs, we believe that a key part of the solution is to reform academic publishing. For too long the life sciences have been dominated by an incentive structure in which success depends on presenting results that are impressive, novel, clear, and groundbreaking. Many journals warn authors that falling short of these benchmarks will lead to manuscripts being rejected, often before peer review even takes place. Such policies are born from the hubristic ambition—and commercial imperative—of each journal to be regarded as the outlet of choice for the most important discoveries in its particular field, with the highest-impact journals setting the standard for such policies.

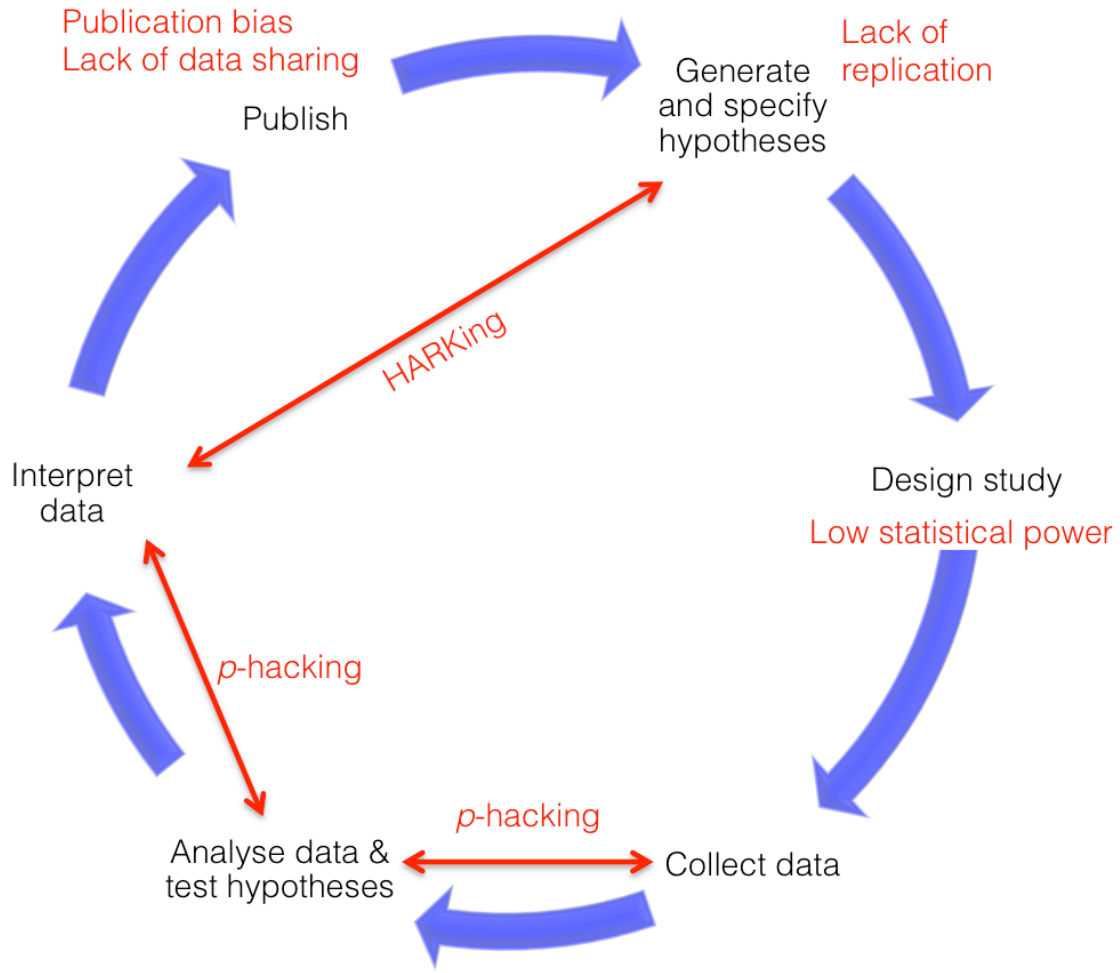

Figure 1. The hypothetico-deductive model of the scientific method is compromised by a range of questionable research practices (QRPs; red). Lack of replication impedes the elimination of false discoveries and weakens the evidence base underpinning theory. Low statistical power increases the chances of missing true discoveries and reduces the likelihood that obtained positive effects are real. Exploiting researcher degrees of freedom (*p*-hacking) manifests in two general forms: collecting data until analyses return statistically significant effects, and selectively reporting analyses that reveal desirable outcomes. HARKing, or hypothesizing after results are known, involves generating a hypothesis from the data and then presenting it as *a priori*. Publication bias occurs when journals reject manuscripts on the basis that they report negative or undesirable findings. Finally, lack of data sharing prevents detailed meta-analysis and hinders the detection of data fabrication.

These incentives do great harm to both science and scientists. By selecting which papers to publish based on the results of experiments, we motivate scientists to engage in dishonesty and delusion, burying negative findings in the file drawer and spinning cherry picked data into "publishable" packages.

Reforming this system will require us to apply the rigour of the scientific method to the editorial process itself. Fortunately we already have a precedent for such a mechanism. In clinical drug trials it

is standard practice for researchers to be initially blinded as to whether individual patients are receiving the treatment or the placebo—this prevents the desires of the researchers from biasing the study outcome. We believe this logic should also apply to scientific publishing: in reaching editorial decisions, journal editors should remain blind to the results in order to minimize the effect of their own bias on the scientific record.

Registered Reports

The most secure way to prevent publication bias, *p*-hacking, and HARKing is for authors to pre-register their hypotheses and planned analyses before the collection of data. In return, if the rationale and methods are sound then the journal should agree to publish the final paper regardless of the specific outcome. This format of publishing has become known as the Registered Reports (RR) model and was first introduced in 2013 by the journal *Cortex* [14] together with a related format at *Perspectives on Psychological Science*.[1] Since then, RRs have been taken up and launched by several other journals, including *Attention, Perception & Psychophysics* [15], *Experimental Psychology* [16], *Drug and Alcohol Dependence* [17], *Social Psychology* [18], and now *AIMS Neuroscience*.

The RR model integrates pre-registration into scientific publishing through a two-stage peer review process, summarised in Figure 2. Authors initially submit a Stage 1 manuscript that includes an Introduction, Methods, and the results of any pilot experiments that motivate the research proposal.

Following assessment of the protocol by editors and reviewers, the manuscript can then be offered in principle acceptance (IPA), which means that the journal virtually guarantees publication if the authors conduct the experiment in accordance with their approved protocol. With IPA in hand, the researchers can then implement the experiment. Following data collection, they resubmit a Stage 2 manuscript that includes the Introduction and Methods from the original submission plus the Results and Discussion. The Results section includes the outcome of the pre-registered analyses together with any additional unregistered analyses in a separate section titled “Exploratory Analyses”. Authors must also share their data on a public and freely accessible archive such as Figshare and are encouraged to release data analysis scripts. The final article is published only after this process is complete. A published Registered Report will thus appear very similar to a standard research report but will give readers confidence that the hypotheses and main analyses are free of QRPs. Detailed author and reviewer guidelines to RRs are available on the *AIMS Neuroscience* website at http://www.aimspress.com/reviewers.pdf.

The RR model at *AIMS Neuroscience* will also incorporate the Badges initiative maintained by the Center for Open Science, which recognises adherence to transparent research practices. All RRs will automatically qualify for the *Preregistration* and *Open Data* badges. Authors who additionally share data analysis scripts will be awarded an *Open Materials* badge. The badges will be printed in the title bar of published articles. For more information on badges, authors are referred to https://osf.io/tvyxz/wiki/home/ or invited to contact the *AIMS Neuroscience* editorial board at Neuroscience@aimspress.com.

[1] https://www.psychologicalscience.org/index.php/replication

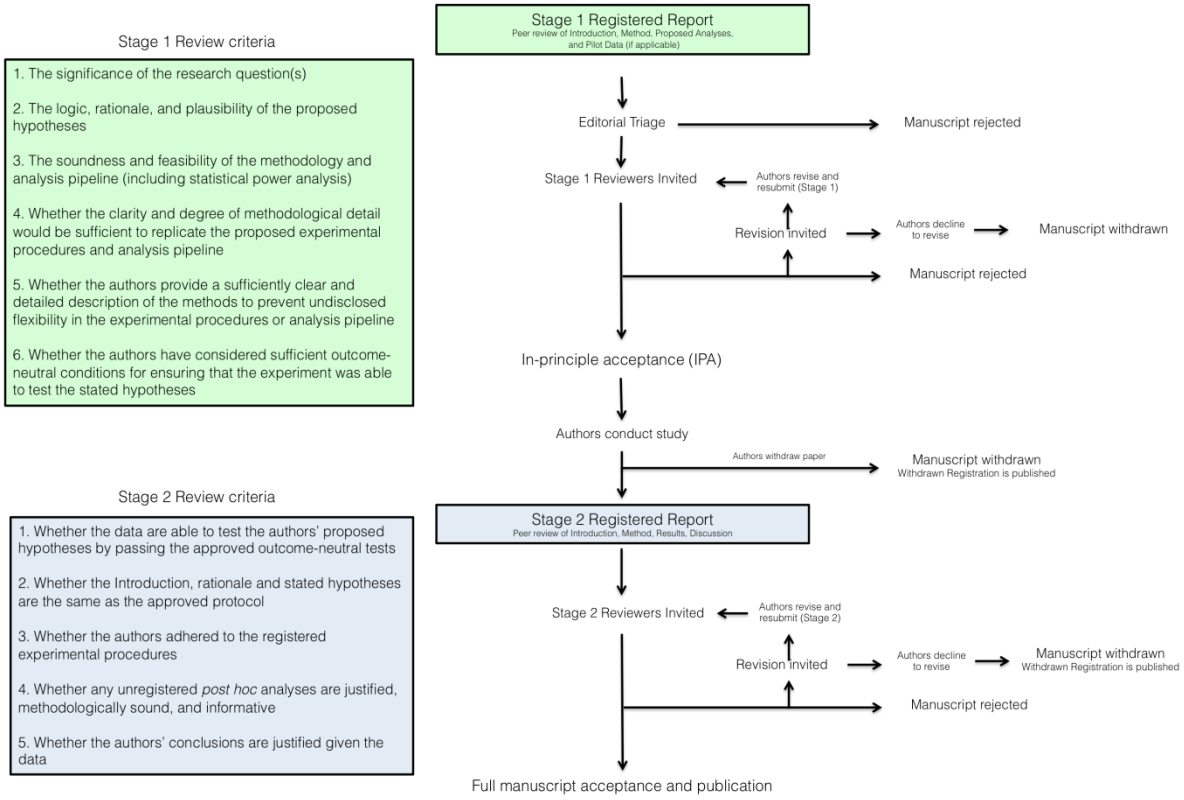

Figure 2. The submission pipeline and review criteria for Registered Reports at AIMS Neuroscience. Further details can be found at http://www.aimspress.com/reviewers.pdf.

Responses to questions and concerns about Registered Reports

In June 2013, a group of more than 80 scientists signed an open letter to the *Guardian* newspaper in the United Kingdom calling for RRs to be introduced across the life sciences [19]. The signatories to this letter included researchers and members of journal editorial boards spanning epidemiology, genetics, clinical and experimental medicine, neuroscience, physiology, pharmacology, psychiatry, and psychology. In response, a number of neuroscientists voiced concerns about the RR model and possible unintended consequences of this new format [20,21]. We respond below to 25 of their most pressing concerns and related FAQs.

1. Can't authors cheat the Registered Reports model by 'pre-registering' a protocol for a study they have already completed?

Under the current RR model this is not possible without committing fraud. When authors submit a Stage 2 manuscript it must be accompanied by a basic laboratory log indicating the range of dates during which data collection took place together with a certification from all authors that no data was collected prior to the date of IPA (other than pilot data included in the Stage 1 submission). Time-stamped raw data files generated by the pre-registered study must also be shared publicly, with the time-stamps post-dating IPA. Submitting a Stage 1 protocol for a completed study would

therefore constitute an act of deliberate misconduct.

Beyond these measures, fraudulent pre-registration would backfire for authors because editors are likely to require revisions to the proposed experimental procedures following Stage 1 review. Even minor changes to the protocol would of course be impossible if the experiment had already been conducted, and would therefore defeat the purpose of pre-registration. Unless authors were willing to engage in further dishonesty about what their experimental procedures involved, "pre-registering" a completed study would be a highly ineffective publication strategy.

It bears mention that no publishing mechanism, least of all the *status quo*, can protect science against complex and premeditated acts of fraud. By requiring certification and data sharing, the RR model closes an obvious loophole that opportunistic researchers might exploit where doing so didn't require the commission of outright fraud. But what RRs achieve, above all, is to incentivise adherence to the scientific method by eliminating the pressure to massage data, reinvent hypotheses, or behave dishonestly in the first place.

2. Won't Registered Reports become a dumping ground for negative or ambiguous findings that have little impact?

For studies that employ null hypothesis significance testing (NHST), adequate statistical power is crucial for interpreting all findings, whether positive or negative. Low power not only increases the chances of missing genuine effects; it also reduces the likelihood that statistically significant effects are genuine [7]. To address both concerns, RRs that include NHST-based analyses must include *a priori* power of $\geq$ 90% for all tests of the proposed hypotheses. Ensuring high statistical power increases the credibility of all findings, regardless of whether they are clearly positive, clearly negative or inconclusive.

It is of course the case that statistical non-significance, regardless of power, can never be taken as direct support for the null hypothesis. However this reflects a fundamental limitation of NHST rather than a shortcoming of the RR model. Authors wishing to estimate the likelihood of any given hypothesis being true, whether H0 or H1, are welcome to adopt alternative Bayesian inferential methods as part of their RR submissions [22–24].

3. Won't Registered Reports limit data exploration and the reporting of unexpected results?

This is one of the most commonly voiced concerns about RRs and would be a legitimate worry if the RR model limited the reporting of study outcomes to pre-registered analyses only. However, we stress that no such constraint applies at *AIMS Neuroscience* or for RRs launched at any other journal. To be clear, the RR model *places no restrictions on the reporting of unregistered exploratory analyses* — it simply requires that the Results section of the final article distinguishes those analyses that were pre-registered and confirmatory from those that were *post hoc* and exploratory. Ensuring a clear separation between confirmatory hypothesis testing and exploratory analysis is vital for preserving the evidential value of both forms of enquiry [11].

In contrast to what several critics have suggested [20,21], RRs will not hinder the reporting of unexpected or serendipitous findings. On the contrary the RR model will protect such observations from publication bias. Editorial decisions for RRs are made independently of whether the results support the pre-registered hypotheses; therefore Stage 2 manuscripts cannot be rejected because editors or reviewers find the outcomes of hypothesis testing to be surprising, counterintuitive, or unappealing. This stands in contrast to conventional peer review, where editorial decisions are

routinely based on the extent to which results conform to prior expectations or desires.

4. How are Registered Reports different from clinical trial registration?

Some scientists have criticised the RR model on the grounds that is apparently reinventing the existing pre-registration mechanism used in medical research and attempting to apply it to basic science. This argument overlooks the three key features that advance RRs beyond clinical trial registration. First, RRs enjoy continuity of the review process from the initial Stage 1 submission to the final publication, thus ensuring that authors remain true to their registered protocol. This is particularly salient given that only 1 in 3 peer reviewers of clinical research compare authors' protocols to their final submitted manuscripts [25]. Second, in contrast to RRs, most forms of clinical trial registration (e.g. clinicaltrials.gov) do not peer review study protocols, which provides the opportunity for authors to (even unconsciously) include sufficient "wiggle room" in the methods or proposed analyses to allow later *p*-hacking or HARKing [2,4,26]. Third, even in the limited cases where journals do review and publish trial protocols (e.g. *Lancet Protocol Reviews*, *BMC Protocols*, *Trials*), none of these formats provides any guarantee that the journal will publish the final outcome. These features of the RR model ensure that it represents a substantial innovation over and above existing systems of study pre-registration.

5. Why are Registered Reports needed for grant-funded research? Isn't the process of grant assessment in itself a form of pre-registration?

There are many differences between these types of review. The level of detail in the assessment of RRs differs at a scalar level from grants — a funding application typically includes only a general or approximate description of the methods to be employed, whereas a Stage 1 RR includes a step-by-step account of the experimental procedures and analysis plan. Furthermore, since researchers frequently deviate from their funded protocols, which themselves are rarely published, the suitability of successful funding applications as registered protocols is extremely limited. Finally, RRs are intended to provide an option that is suitable for all applicable research, not only studies that are supported by grant funding.

6. Where authors are unable to predict the likely effect size for an experiment, how can they report a power analysis as part of a Stage 1 submission?

Statistical power analysis requires prior estimation of expected effect sizes. Because our research culture emphasizes the need for novelty of both methods and results, it is understandable that researchers may sometimes feel there is no appropriate precedent for their particular choice of methodology. In such cases, however, a plausible effect size can usually be gleaned from related prior work. After all, very few experimental designs are truly unique and exist in isolation. Even when the expected effect size is inestimable, the RR model welcomes the inclusion of pilot results in Stage 1 submissions to establish probable effect sizes for subsequent pre-registered experimentation.

Where expected effect sizes cannot be estimated and authors have no pilot data, a minimal effect size of theoretical interest can be still used to determine *a priori* power. Authors can also adopt NHST approaches with corrected peeking (e.g. [27]) or Bayesian methods that specify a prior distribution of possible effect sizes rather than a single point estimate [24]. Interestingly, in informal discussions, some researchers — particularly in neuroimaging — have responded to concerns about

power on the grounds that they do not care about the size of an effect, only whether or not an effect is present. The problem with this argument is that if the effect under scrutiny has no lower bound of theoretical importance then the experimental hypothesis (H1) becomes unfalsifiable, regardless of power.

7. Setting a requirement of 90% for statistical power is unrealistic for expensive methods and would require impossibly large sample sizes. The Registered Reports format therefore disadvantages researchers who work with expensive techniques or who have limited resources.

It is true that RRs are not suitable for underpowered experiments. But underpowered experiments themselves are detrimental to science, dragging entire fields down blind alleys and limiting the potential for reproducibility [28]. We would argue that if a particular research field systematically fails to reach the standards of statistical power set by RRs then this is not "unfair" but rather a deep problem within that field that needs to be addressed. One solution is to combine resources across research teams to increase power, such as the highly successful IMAGEN fMRI consortium [29].

8. If reviewers have only the proposed design and methods to assess, won't they rely more on the reputation of the authors in judging study protocols? This could make life harder for scientists who are more junior or less influential.

Structured review criteria mean that reviewers must find concrete reasons for arguing that a Stage 1 submission is inappropriate or flawed. Author reputation is not among them. To provide further assurance, the RR format at *AIMS Neuroscience* will employ masked review in which the reviewers are blinded as much as possible to the identity of the authors.

9. Sometimes a design is sound, but the data are uninterpretable because researchers run the experiment poorly. How will Registered Reports distinguish negative findings and unexpected results arising from poor practice from those that are genuine?

As noted in the Stage 1 publication criteria, authors must include outcome-neutral conditions for ensuring that the proposed methods are capable of testing the stated hypotheses. These might include positive control conditions, manipulation checks, and standard benchmarks such as the absence of floor and ceiling effects. Manuscripts that fail to specify these criteria will not be offered IPA, and Stage 2 submissions that fail any critical outcome-neutral tests will not be accepted for publication.

10. If publication is guaranteed in advance, why would researchers bother running their experiments carefully? This scheme could incentivize false negatives arising from sloppy research practices.

For this criticism to be valid, scientists would need to be motivated solely by the act of publishing, with no desire to make true discoveries or to build a coherent body of research findings across multiple publications. We are more optimistic about the motivations of the scientific community, but nevertheless, it is important to note that running a pre-registered study carelessly would also sabotage the outcome-neutral tests (see #9) that are necessary for final acceptance of the

Stage 2 submission.

11. Stage 1 submissions must have institutional ethical approval to be considered for IPA, and such ethical approval can be highly specific. This means that if a researcher has to change anything about their study design to obtain IPA, the ethics application would need to be amended and resubmitted to the ethics committee. This back-and-forth will be too time-consuming and bureaucratic for many researchers.

This is a legitimate concern with no easy solution. An ideal strategy, where possible, is to build in minor procedural flexibility when applying for ethics approval. The RR editorial team at *AIMS Neuroscience* is happy to provide letters of support for authors seeking to amend ethics approval following Stage 1 peer review.

12. How will RRs prevent pre-registrations for studies that have no funding or approvals and will never actually happen?

Some scientists have argued out that the RR model could increase the workload for reviewers if authors were to deliberately submit more protocols than they could carry out. As one critic put it: "Pre-registration sets up a strong incentive to submit as many ideas/experiments as possible to as many high impact factor journals as possible" [20]. Armed with IPA, the researcher could then prepare grant applications to support only the successful protocols, discarding the rejected ones. Were such a strategy to be widely adopted it could indeed overburden the peer review system.

Again, however, this problem does not apply to the RR model at *AIMS Neuroscience* or at any of the other journals where the format has been launched. All Stage 1 submissions must include a cover letter stating that all necessary support (e.g. funding, facilities) and approvals (e.g. ethics) are already in place and that the researchers could start immediately following IPA. Since these guarantees could not be made for unsupported proposals, this concern is moot.

13. Pre-registration of hypotheses and analysis plans is too arduous to be feasible for authors.

The amount of work required to prepare an RR is similar to conventional manuscript preparation; the key difference is that much of the work is done before, rather than after, data collection. The fact that researchers often decide their hypotheses and analysis strategies after an experiment is complete [2] doesn't change the fact that these decisions still need to be made. And the reward for thinking through these decisions in advance, rather than at the end, is that IPA virtually guarantees a publication.

14. The peer review process for Registered Reports includes two phases. Won't this create too much additional work for reviewers?

It is true that peer review under the RR model is more thorough than conventional manuscript review. However, critics who raise this point overlook a major shortcoming of the conventional review process: the fact that manuscripts are often rejected sequentially by multiple journals, passing through many reviewers before finding a home. Under the RR model, at least two of the problems that lead to such systematic rejection, and thus additional load on reviewers, are circumvented. First,

reviewers of Stage 1 submissions have the opportunity to help authors correct methodological flaws before they occur by assessing the experimental design prior to data collection. Second, because RRs cannot be rejected based on the perceived importance of the results, the RR model avoids a common reason for conventional rejection: that the results are not considered sufficiently novel or groundbreaking.

We believe the overall reviewer workload under the RR model will be similar to conventional publishing. Consider a case where a conventional manuscript is submitted sequentially to four journals, and the first three journals reject it following 3 reviews each. The fourth journal accepts the manuscript after 3 reviews and 3 re-reviews. In total the manuscript will have been seen by up to 12 reviewers and gone through 15 rounds of review. Now consider what might have happened if the study had been submitted prior to data collection as a Stage 1 RR, assessed by 3 reviewers. Even if it passes through three rounds of Stage 1 review plus two rounds of Stage 2 review, the overall reviewer burden (15 rounds) is the same as the conventional model (15 rounds).

15. Reviewers could steal my ideas at the pre-registration stage and scoop me.

This is an understandable concern but highly unlikely. Only a small group of individuals will know about Stage 1 submissions, including the editors plus a small set of reviewers; and the information in Stage 1 submissions is not published until the study is completed. It is also noteworthy that once IPA is awarded, the journal cannot reject the final Stage 2 submission because similar work was published elsewhere in the meantime. Therefore, even in the unlikely event of a reviewer rushing to complete a pre-registered design ahead of the authors, such a strategy would confer little career advantage for the perpetrator (especially because the ‘manuscript received’ date in the final published RR refers to the initial Stage 1 submission date and so will predate the ‘manuscript received’ date of any standard submission published by a competitor). Concerns about being scooped do not stop researchers applying for grant funding or presenting ideas at conferences, both of which involve releasing ideas to a larger group of potential competitors than would typically see a Stage 1 RR.

16. What is to stop authors with IPA withdrawing their manuscript after getting striking results and resubmitting it to a higher impact journal?

Nothing. Contrary to some stated concerns [20], authors are free to withdraw their manuscript at any time and are not “locked” into publishing with the journal that reviews the Stage 1 submission. If the withdrawal happens after IPA has been awarded, the journal will simply publish a *Withdrawn Registration* that includes the abstract from the Stage 1 submission plus a brief explanation for the withdrawal.

17. Some of my analyses will depend on the results, so how can I pre-register each step in detail?

Pre-registration does not require every step of an analysis to be specified or “hardwired”; instead, in such cases where the analysis decision is contingent on some aspect of the data itself then the pre-registration only requires the decision tree to be specified (e.g. “If A is observed then we will adopt analysis A1 but if B is observed then we will adopt analysis B1”). Authors can thus pre-register the contingencies and rules that underpin future analysis decisions.

It bears reiterating that not all analyses need to be pre-registered — authors are welcome to report the outcome of exploratory tests for which specific steps or contingencies could not be determined in advance of data collection.

18. I have access to an existing data set that I have not yet analysed. Can I submit this proposed analysis as a Registered Report?

No. The current RR model applies only to original research. However we agree that a pre-registered article type for existing data sets would be a useful additional form of RRs.

19. My aim is to publish a series of experiments but the design of the later experiments is contingent upon the outcomes of the earlier ones. Isn't Registered Reports limited to single experiments?

No. The RR model welcomes sequential registrations in which authors add experiments at Stage 1 via an iterative mechanism and complete them at Stage 2. With each completed cycle, the previous accepted version of the paper is guaranteed to be published, regardless of the outcome of the next round of experimentation. Authors are also welcome to submit a Stage 1 manuscript that includes multiple parallel experiments.

20. How will RRs incentivise replications?

Replications are can be expensive and carry little career benefit to authors. Ensuring that a direct replication is convincing often requires a much larger sample than the original study. Once completed, a replication can be difficult to publish because many journals refuse to report them, regardless of the outcome. Unless there is an assurance of publication in advance, it can make little sense from a strategic point of view for life scientists to pursue direct replications. IPA provides this assurance and thus offers the strongest possible incentive for scientists to directly replicate previous work.

21. Registered Reports is based on a naïve conceptualisation of the scientific method.

We believe this criticism is misplaced. Some scientists may well believe that the hypothetico-deductive model is the wrong way to frame science, but if so, why do they routinely publish articles that test hypotheses and report *p* values? Those who oppose the hypothetico-deductive model are not raising a specific argument against RRs — they are criticising the fundamental way research is taught and published in the life sciences. We are agnostic about such concerns and simply note that the RR model aligns the way science is taught with the way it is published.

22. As a junior researcher, I need to publish in high-impact journals. Until *Nature* / *Science* / *PNAS* offer Registered Reports, why would I settle for publishing in a specialist journal?

This is a legitimate concern that will not be settled until life scientists either dispel the myth that journal hierarchy reflects quality [30] or the most prestigious journals offer RRs. The RR model is

spreading quickly to many journals, and we believe it is only a matter of time before high-impact outlets come on board. In the meantime there are several rewards for junior scientists who choose the RR model where it is available. First, because RRs are immune to publication bias they ensure that high quality science is published regardless of the outcome. This means that a PhD student could publish every high-quality study from their PhD rather than selectively publishing the studies that "worked". Second, a PhD student who submits RRs has the opportunity to gain IPA for several papers before even submitting their PhD, which in the stiff competition for post-doctoral jobs may provide an edge over graduates with fewer deliverables to show. Third, because RRs neutralise various QRPs, such as *p*-hacking, HARKing and low statistical power, it is likely that the findings they contain will be more reproducible, on average, than those in comparable unregistered articles.

23. Much of my research stems from student projects, which operate over too short a time scale to be suitable for Registered Reports.

This is a legitimate concern that cannot be solved by the RR model. However, one way authors can address this is to design and pre-register student projects several months before students commence. Although the cover letter for RRs requires certification that the study could commence immediately, it is possible to negotiate a delayed commencement date with the editors.

24. Registered Reports may not apply to my specific field therefore it is not a good solution.

Contrary to what some critics have suggested [21], the RR model has never been proposed as a "panacea" for all fields of science or all sub-disciplines within fields. On the contrary we have emphasised that "pre-registration doesn't fit all forms of science, and it isn't a cure-all for scientific publishing" [19]. Furthermore, to suggest that RRs are invalid because they don't solve all problems is to fall prey to the *perfect solution fallacy* in which a useful partial solution is discarded in favour of a non-existent complete solution.

Some scientists have further prompted us to explain which types of research the RR model applies to and which it does not [20]. Ultimately such decisions are for the scientific community to reach as a whole, but we believe that the RR model is appropriate for any area of hypothesis-driven science that suffers from publication bias, *p*-hacking, HARKing, low statistical power, or a lack of direct replication. If none of these problems exist or the approach taken isn't hypothesis-driven then the RR model need not apply because nothing is gained by pre-registration.

25. Registered Reports may become seen as the gold standard for scientific publishing, which would unfairly disadvantage exploratory or observational studies that cannot be pre-registered.

This need not be the case. It bears reiterating that the RR model does not prevent or hinder exploration — it simply enables readers to distinguish confirmatory hypothesis testing from exploratory analysis. Under the conventional publishing system, scientists are pressured to engage in QRPs in order to present exploration *as* confirmation (e.g. HARKing). Some researchers may even apply NHST in situations where it is not appropriate because there is no *a priori* hypothesis to be tested. Distinguishing confirmation from exploration can only disadvantage scientists who rely on exploratory approaches but, at the same time, feel entitled to present them as confirmatory.

We believe this concern reflects a deeper problem that the life sciences do not adequately value

exploratory, non-hypothesis driven research. Rather than threatening to devalue exploratory research, the RR model is the first step toward liberating it from this hegemony and increasing its traction. Once the boundaries between confirmation and exploration are made clear we can be free to develop a format of publication that is dedicated solely to reporting exploratory and observational studies. We know of at least one journal that, having launched RRs, is now poised to trial a complementary "Exploratory Reports" format. Rather than criticizing the RR model for devaluing exploration, our community would do better to push reforms that highlight the benefits of purely exploratory research.

Conclusions

The unique selling point of Registered Reports is its prevention of publication bias and QRPs in hypothesis testing. This article has introduced the format at *AIMS Neuroscience* and outlined our response to a number of the most pressing concerns. As we note in the beginning, our purpose is not to preach or to admonish — it is to inspire researchers to consider an alternative pathway and to provide a clear incentive for engaging in transparent practices. Pre-registration carries the reward of assuring readers that a scientist's practices adhered to the hypothetico-deductive method, which benefits individual practitioners as much as it benefits science. As Leif Nelson has put it:

> Note that this line of thinking is not even vaguely self-righteous. It isn't pushy. I am not saying, "you have to preregister or else!" Heck, I am not even saying that *you* should; I am saying that *I* should. In a world of transparent reporting, I choose preregistration as a way to selfishly show off that I predicted the outcome of my study. [31]

Over the coming years we look forward to seeing Registered Reports expand across more journals and scientific fields, challenging traditional hegemonies and altering incentive structures. In parallel with this initiative, pre-registration of basic science is growing in prominence at the Open Science Framework (https://osf.io/), and the 2013 revision of the Declaration of Helsinki (DoH) now requires some form of study pre-registration for all research involving humans [32]. Although this requirement technically applies only to clinical research, many of the major journals that publish basic neuroscience also request or require adherence to the DoH, such as the *Journal of Neuroscience* [2] and *Cerebral Cortex* [3]. The Registered Reports model complements these advances by incentivising rigour and reproducibility.

The feedback we have received from the academic community has been invaluable in helping us shape this initiative. In return we hope this editorial responds usefully to some of the most frequent questions and concerns.

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[2] *http://www.sfn.org/Advocacy/Policy-Positions/Policies-on-the-Use-of-Animals-and-Humans-in-Research*

[3] *http://www.oxfordjournals.org/our_journals/cercor/for_authors/general.html*

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