Mathematical Cognition Group: Open Science Policy

Aims

The policy has two aims. First, to allow us and others to easily reanalyse our data and replicate our studies. Second, to increase the confidence that external colleagues have in our work. To this end, all members of our group have agreed to follow this policy on (i) archiving data, stimuli and scripts, and (ii) preregistration.

Archiving Data, Stimuli and Scripts

The University has a Research Data Management Policy. Among other things, this states that:

- Research data that may be of future historical interest, including data that substantiate research findings, should normally be offered and assessed for deposit and retention in an appropriate data service or domain repository, or a University repository.
- Researchers should ensure published results always include information on how to access the supporting data.

Unless there are good reasons not to (use of proprietary data etc.), all group publications should include a link to the anonymised underlying data so that readers can reproduce the analysis.

This can most easily be achieved by using the University's Figshare account. But other options, such as the Open Science Framework, are available. During the peer review process Figshare allows data to be shared anonymously via a private link, this can then be converted to a DOI when the article is published.

Make sure that your participant consent forms inform participants that their anonymised data will be made available to the general public via the internet. Be aware that the University's example consent forms are not very clear about this (they don't seem to comply with the University's data management policy). Instead use some form of words such as:

> The data from this study might be used for other, future research projects in addition to the study you are currently participating in. Those future projects can focus on any topic that might be unrelated to the goals of this study. We will give access to the data we are collecting to the general public via the Internet. **Any personal information that could possibly identify you will be removed or changed before data are shared or results are made public.**

For a helpful discussion about consent forms and open data, see the Open Brain Consent site.

Along with sharing data, it is good practice to share stimuli and analysis scripts (e.g., SPSS syntax, R code, JASP files) using Figshare. See the discussion contained in the Peer Reviewer's Openness Iniative.

The easiest way to think about our archiving policy is this: if you needed to reanalyse your data, or re-run your study, you should be able to do this without needing to access your hard disk.

Preregistration

P-hacking and HARKing (hypothesising after the results are known) are ubiquitous problems in disciplines that use null hypothesis significance testing. John, Lowenstein, & Prelec, (2012) estimated that 90% of psychologists HARK. Even though we do not engage in such practices, if colleagues are to have confidence in our work we need to be able to demonstrate that we don't. This is the purpose of preregistration.

Wagenmakers & Dutilh (2016) explain:

> *Why preregistration?* With preregistration, researchers stipulate their hypothesis and analysis plan in advance of data collection, tying their hands and letting the empirical chips fall where they may (Pierce, 1883). The theoretical advantage of preregistration is that it sharpens the distinction between two complementary but separate stages of scientific inquiry: the stage of generating hypotheses (i.e., exploratory research) and the stage of testing hypotheses (i.e., confirmatory research). By respecting this distinction, researchers inoculate themselves against the pervasive effects of hindsight bias and confirmation bias (e.g., Nuzzo, 2015). Preregistration does not prevent researchers from conducting and presenting exploratory analyses, but it does prevent them from unwittingly presenting an exploratory finding as if it had been confirmatory.

For further discussion, consult Chris Chambers's *Guardian* article or Dorothy Bishop's blog.

If you intend to test hypotheses (which is the case whenever you want to use null hypothesis significance testing to analyse your data) then *you must preregister your hypothesis and analysis plan*. If you have not preregistered because you are conducting exploratory research, then this should be clear in your final manuscript.

At a minimum any preregistered analysis plan should include:

- A brief explanation of the hypothesis being tested.
- The key variables that will be measured.
- A specification of the intended sample size (ideally justified with a power analysis).
- A detailed description of the analysis that will be conducted.

Once the preregistered plan has been agreed by all involved in the study it should be securely stored in a manner that allows sceptics to check the date it was published. Normally the AsPredicted.org site should be used for writing and uploading preregistration analysis plans (but there are other options, such as the Open Science Framework).

If there is some reason why you don't think that a given study should fall under the remit of this policy, you should discuss it with colleagues to gauge their reaction.