Enhancing transparency and reproducibility of hearing science

Tim Schoof[1,2]
t.schoof@ucl.ac.uk

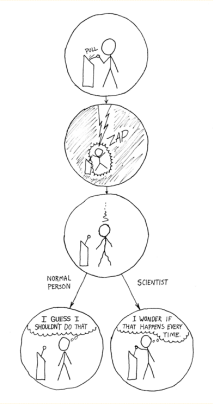
[1]Communication Sciences and Disorders, Northwestern University, Evanston, IL, USA. [2]Now at: UCL Speech Hearing and Phonetic Sciences, London, UK.

Northwestern UCL

Five simple rules

1. Pre-register your study
2. Document everything you do
3. Don't do anything by hand, script everything
4. Use a version control system
5. Provide open access to all publications, scripts, and data

Replication is a cornerstone of science. Only when multiple studies, conducted by different scientists, demonstrate similar results can we obtain a reasonable approximation of how the world works.



However, the methods section of a paper is typically not enough to allow for the *exact* replication of an experiment and its analysis. A key component of reproducible research is transparency, involving open access to scripts and data.

Acknowledgments:
Many thanks to Pamela Souza for making this work possible. Thanks to José Joaquín Atria and Sriram Boothalingam for inspiring discussions on the topic.
Work supported by NIH R01 DC006014 and DC 012289

Pre-register your study

Peer review of study design & analysis details prior to data collection.

Why?
- Guards against p-hacking
- Overcomes publication bias
- Helps distinguish exploratory from confirmatory analyses

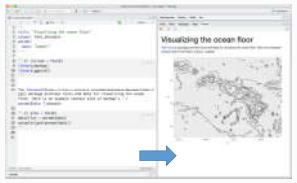
How?
- Most hearing science journals do not offer pre-registration yet. Convince them!
- Pre-registration repository

Automatically embed stats in your manuscript

Integrate your data, code, and manuscript.

Why?
- Avoid copy-paste errors
- Automatically update graphs and statistics after re-analysis

How?
- RStudio:
  - R Markdown
  - knitr & pandoc
  - Sweave
- StatTag



Provide open access to your scripts

Share your code, along with (example) data, and documentation. Why not create your own R package?

Why?
- Enables exact replication of analyses
- Code can be used in future research

How?
- Build an R package: RStudio & devtools
- Distribute your package / scripts: GitHub
- Make your GitHub repository citable: assign it a doi

Document, document, document

Use an electronic lab notebook.

Why?
- store all your research output in one place
- collaborate
- search entries
- re-organize notes
- share your work

How?
- SciNote
- Open Science Framework
- Microsoft OneNote
- Slack
- Evernote

Use a version control system

Keep track of changes in documents and scripts by storing revisions of your files in a centralized repository.

Why?
Easily compare, restore, and merge different versions of files

How?
- Download git
- Create a GitHub account

Provide open access to your data

Deposit your data in an online repository.

Why?
- Data archiving and preservation
- Data reuse and meta-analysis

How?
- Deposit data and documentation in online repository, such as
  - Harvard Data Verse
  - figshare
  - Dryad Digital Repository
  - Open Science Framework

Avoid manual data processing

Write scripts to analyze your data.

Why?
- Exact replication
- Less error-prone
- More efficient

How?
- Use R and RStudio - instead of SPSS - for your statistical analyses
- Use something like the Bash shell or Python to search and manipulate files

Publish open access

Make your publications freely available

Why?
- Drives innovation
- Global impact
- Translation to clinical practice
- Increased visibility, citations, and impact

How?
- Pay journal article processing charge
- Submit post-print article to repository
- Deposit in repository after embargo period
- Provide PDFs on personal website

Excited? Here's how to get started

For more information and a copy of this poster go to: timschoof.com/blog

Or scan the QR code below:

Think about
HIPAA compliance
Intellectual property rights