

The effect of analytic choices on fMRI results and what we can do about it

Rotem Botvinik-Nezer Co Organizer

Dartmouth College
Hanover, NH
United States

Tom Schonberg Organizer

Tel Aviv University
Tel Aviv, Israel
Israel

1833

Symposium

The “replication crisis” in many scientific fields has raised concerns regarding the reliability of published results. One reason for the high rate of false positive results is the large number of “researcher degrees of freedom”, where the process of data analysis can be performed in multiple ways (Simmons, Nelson, & Simonsohn, 2011; Wicherts et al., 2016). This is specifically apparent in neuroimaging, where there is a thriving “garden of forking analysis paths”. In the Neuroimaging Analysis Replication and Prediction Study (NARPS; <https://www.biorxiv.org/content/10.1101/843193v1.full>), we studied the variability of reported fMRI results across analysis pipelines that are used in practice in research laboratories. Seventy analysis teams from 17 countries/regions around the world independently analyzed the same fMRI dataset to test the same pre-defined hypotheses. One hundred and ninety-seven neuroimagers and economists were involved in NARPS. The findings of this large-scale study are relevant for any researcher in the field and remind all to be aware of the impact of potential flexibility of analysis pipelines and the implications on the reproducibility and replicability of fMRI results. In this proposed symposium, we will present the development of this unique international collaborative study across three years, highlight the most important results and discuss the implications for the field as well as potential solutions and future directions. Presenters diversity: The presenters are from four different institutions and three different countries (USA, Israel and Belgium). The presenter list is gender balanced.

Objective

- 1) Learn about the variability of analysis pipelines and the effect of analytic choices on fMRI results.
- 2) Learn about potential solutions and future directions for replicability and reproducibility.
- 3) Learn about the importance and how to achieve large scale community projects.

Target Audience

Researchers using fMRI or any other complex imaging analysis pipeline with multiple possible analytic choices who are interested in replicability and reproducibility. In addition, researchers interested in conducting large-scale community-wide scientific projects with multiple collaborators, as well as researchers interested in training in the neuroimaging field.

Presentations

1) (at the beginning of the symposium) NARPS: Context and overview 2) (at the end of the symposium) Summary and future directions

1) We will present the background for this project in the context of researcher's degrees of freedom and the influence of this variability on results (Carp, 2012; Silberzahn et al., 2018). We will then present a general overview of how this unique international collaborative project was run and the order of events during three years until obtaining the results. 2) Finally, we will conclude with what we see as the implications of the NARPS findings. We will discuss tools to address the variability observed in NARPS such as pre-registration, data and code sharing. The topic of a "gold standard" analysis pipeline will be discussed as well as new solutions under development to perform multiverse analyses at the single lab level.

Presenter

Tom Schonberg, Tel Aviv University Tel Aviv, Israel
Israel

NARPS findings

We will describe the dataset that was collected as the basis for this project, the nine ex-ante hypotheses that were chosen to be tested and how the analysis part of NARPS was conducted. We will highlight the main findings of the study, from aggregated final reported results across the 70 analysis teams to the variability in the statistical maps, the factors found to be related to the variability and the ability of researchers in the field to predict the results.

Presenter

Rotem Botvinik-Nezer, Dartmouth College Hanover, NH
United States

From the eyes of an analysis team

Remi Gau, a member of one of the analysis teams in NARPS, will talk about how being part of a multi-analysis team project can differ from the more traditional one team setting. He will also discuss how using pre-registration as well as standardized dataset and pipeline can speed up your work. Finally he will conclude with some of the lessons learned from this project.

Presenter

remi gau, Institute of Psychology, Université Catholique de Louvain Louvain la neuve, Wallonie
Belgium

Looking ahead: sharing uncorrected data and design matrices, and training future

neuroimagers

Jeanette Mumford, the winner of the OHBM Education in Neuroimaging Award 2019, will discuss her experiences in analysis of the results and the importance of sharing uncorrected statistical maps and design matrices that helped reveal sources of variability due to model parameterization and interpretation. She will also discuss issues related to training future neuroimagers to accommodate replicability and reproducibility.

Presenter

Jeanette Mumford, University of Wisconsin-Madison Madison, WI
United States
