Plan Overview

A Data Management Plan created using DMPonline

Title: Cascading transitions in multistable perception

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Project abstract:
We hypothesize that many critical changes in multilevel complex systems are due to cascading transitions. For instance, many people who are radicalized are often part of a societal transition such as polarization. Within a person, cascading transitions occur in multifigure multistable perception and in thinking about logical paradoxes. To develop a general mathematical model of cascading transitions, we test this mathematical model for these two tractable cases. We build on earlier models and experimental studies of single multistable figure perception and binocular rivarly. We hypothesize that very different cases of multifigure multistable perception and logical paradoxes can be modelled as special cases of the general equation for cascading transitions. We will model basic phenemena, derive, and test new predictions. For this purpose, we develop innovative experimental designs and use recently developed psychophysiological measurement methods. In particular, our experiments will advance known eye-tracking and EEG techniques to novel applications. We will then fit cascading transition models to psychophysiological data in order to advance theoretical understanding of these models. We will then extend newly developed theory to logical reasoning and multimodal perception. The development of quantitative theory of cascading transitions will lead to real society impact through better understanding of psycho-social systems.

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Cascading transitions in multistable perception

General Information

Name applicant and project number

H.L.J. van der Maas
Dossiernr. 406.21.GO.018
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Name of data management support staff consulted during the preparation of this plan and date of consultation.

Jasper G. Wijnen, Ph.D.
Data Steward Psychology
Information Security Officer REC
University of Amsterdam
Date of consultation: 22-08-2022

1. What data will be collected or produced, and what existing data will be re-used?

1.1 Will you re-use existing data for this research?

If yes: explain which existing data you will re-use and under which terms of use.

- Yes

We will use our own previously collected behavior, EEG, and eye-tracking data to pilot our analyses and model-fitting procedures. We will also conduct a literature review of publicly available data that is relevant to studying cascading transitions in multistable perception and cognition. This publicly available data will also be used to pilot our analyses and model-fitting procedures.

However there is no existing data set that will exactly test our hypotheses. Our new study is also designed to best test our model-fitting procedures. We therefore plan to collect our own data.

1.2 If new data will be produced: describe the data you expect your research will generate and the format and volumes to be collected or produced.

The data collected will be numeric spreadsheets of human behavior collected during psychological and perceptual experiments. Numeric data that contains discretized electrophysiological recordings will also be collected, including EEG, EMG, and EOG collected during rest and during psychological and perceptual experiments. In addition, the position of the eyes and pupil diameter will be collected in

discretized numeric form.

The data file system will be stored in a standardized Brain Imaging Data Structure (BIDS) for EEG (Pernet et al., 2019) and proposed-BIDS format for eye-tracking data (Fiedler et al., 2020; Szinte et al. unpublished). The individual files will be stored as follows: raw EEG data will be stored in the European Data Format (.edf, including EMG and EOG records), raw eye-tracking data will be stored in EyeLink format (.asc), extracted behavioral data will be stored in Comma Separated Value (.csv) files, processed EEG will be stored in MNE-Python files (.fif).

References

Fiedler, S., Schulte-Mecklenbeck, M., Renkewitz, F., & Orquin, J. L. (2020, September 11). Guideline for Reporting Standards of Eye-tracking Research in Decision Sciences. *PsyArXiv.* https://doi.org/10.31234/osf.io/f6qcy

Szinte, M. & Draschkow, D. BIDS Extension Proposal 20 (BEP020): Eye Tracking including Gaze Position and Pupil Size. Unpublished. https://docs.google.com/document/d/1eggzTCzSHG3AEKhtnEDbcdk-2avXN6I94X8aUPEBVsw

Pernet, C. R., Appelhoff, S., Gorgolewski, K. J., Flandin, G., Phillips, C., Delorme, A., & Oostenveld, R. (2019). EEG-BIDS, an extension to the brain imaging data structure for electroencephalography. *Scientific data*, *6*(1), 1-5.

1.3. How much data storage will your project require in total?

- 100 – 1000 GB

The amount of storage is necessary for storing 30 to 100 participants worth of EEG data (as well as eye-tracking and behavioral data) as well as preprocessed EEG data. Preprocessed EEG data can be used by future researchers.

2. What metadata and documentation will accompany the data?

2.1 Indicate what documentation will accompany the data.

All documentation and metadata will follow BIDS format. Each independent data set associated with each specific task will contain a README that describes the EEG, behavioral, and eye-tracking data, data collection procedures, and task specific procedures. In addition, lab manuals will be shared with the data that describes the data collection procedures. Headers will be embedded in EEG data files in BIDS, MNE-Python, and EyeLink data formats.

2.2 Indicate which metadata will be provided to help others identify and discover the data.

BIDS-compliant and anonymized EEG, eye-tracking and associated behavioral data will be posted to https://uvaauas.figshare.com/ when complete. The metadata will include the name of the task, the scientific authors of the dataset, the posted time of the data, the updated time of the data, the data modality (EEG, eye-tracking), the type of behavioral tasks, the number of experimental sessions, the number of participants, the age range of the participants, the overall file size, the number of files, the citation information, and the link to the relevant publication.

Data related to stimulation studies will be posted to the Open Science Framework (osf.io) and https://uvaauas.figshare.com/. The metadata will include the name of the simulation, the scientific authors of the dataset, the posted time of the data, the updated time of the data, the data modality (simulation), the overall file size, the number of files, the citation information, and the link to the relevant publication.

3. How will data and metadata be stored and backed up during the research?

3.1 Describe where the data and metadata will be stored and backed up during the project.

- Institution networked research storage

During the project, all data will be stored on the secure UvA file server *fmgstorage*.

All on-premise (fmgstorage) and cloud servers in use by UvA have appropriate automatic backup. This includes on-line mirror systems and off-line tape backups. As well as protections against accidental deletion by user (up to 30 days).

3.2 How will data security and protection of sensitive data be taken care of during the research?

- Additional security measures (please specify)

Data will be immediately anonymized, that is data collected for practical purposes will be separated from research data and then irreversibly deleted / destroyed.

During the project data will be stored the secure UvA file server *fmgstorage. fmgstorage* is accessible on UvA internal networks only or via VPN. Access to authorized folders is possible with university credentials. Servers are backed up daily.

4. How will you handle issues regarding the processing of personal information and intellectual property rights and ownership?

4.1 Will you process and/or store personal data during your project?

If yes, how will compliance with legislation and (institutional) regulation on personal data be ensured?

- Yes

Data will be immediately anonymized. That is, personal data (e.g. participant name) collected for

practical/logistical purposes will be separated from research data and then irreversibly deleted/destroyed after data collection

Personal information such as demographics, names etc. will never be included in the research data as they are not needed for the purposes of this research. Exact time and date of acquisition will also not be included in the data.

4.2 How will ownership of the data and intellectual property rights to the data be managed?

The data will be licensed CC BY-NC-SA (Attribution-NonCommercial-ShareAlike). Ownership of data formally lies with the research institute, but UvA promotes open-access sharing/FAIR data where possible.

5. How and when will data be shared and preserved for the long term?

5.1 How will data be selected for long-term preservation?

- All data resulting from the project will be preserved for at least 10 years

5.2 Are there any (legal, IP, privacy related, security related) reasons to restrict access to the data once made publicly available, to limit which data will be made publicly available, or to not make part of the data publicly available?

If yes, please explain.

- No

5.3 What data will be made available for re-use?

- All data resulting from the project will be made available

5.4 When will the data be available for re-use, and for how long will the data be available?

- Data available as soon as article is published

The data will be "born-open" in the sense that the data will be immediately available before the article is published.

5.5 In which repository will the data be archived and made available for re-use, and under which license?

BIDS-compliant and anonymized EEG, eye-tracking and associated behavioral data will be posted to https://uvaauas.figshare.com/ when complete. The metadata will include the name of the task, the scientific authors of the dataset, the posted time of the data, the updated time of the data, the data modality (EEG, eye-tracking), the type of behavioral tasks, the number of experimental sessions, the number of participants, the age range of the participants, the overall file size, the number of files, the citation information, and the link to the relevant publication.

Data related to stimulation studies will be posted to the Open Science Framework (osf.io) and https://uvaauas.figshare.com/. The metadata will include the name of the simulation, the scientific authors of the dataset, the posted time of the data, the updated time of the data, the data modality (simulation), the overall file size, the number of files, the citation information, and the link to the relevant publication.

All data will be licensed CC BY-NC-SA (Attribution-NonCommercial-ShareAlike).

Analysis scripts will be made available on Github, the Open Science Framework (osf.io), and https://uvaauas.figshare.com/ with the MIT License.

5.6 Describe your strategy for publishing the analysis software that will be generated in this project.

All scripts will be posted with README files and readable, tested R, Python, and/or MATLAB code. One script will run all the other scripts necessary to for that study. Analysis scripts will be made available with the MIT license on Github, the Open Science Framework (osf.io), and https://uvaauas.figshare.com/. The script repository will be version controlled.

6. Data management costs

6.1 What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

Resources spent will be in the form of time taken to order, convert and upload to public repositories as well as creating accompanying lab manuals and README files. This time is approximately 100 hours by the PI and research staff on the grant.

All on-premise (*fmgstorage*) and cloud servers in use by UvA have appropriate automatic backup. This includes on-line mirror systems and off-line tape backups. As well as protections against accidental deletion by user (up to 30 days).