Plan Overview

A Data Management Plan created using DMPonline

Title: The Subjective Perception of Sensory Information: Investigating Formats of Mental Representations

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Project abstract:

Subjective aspects of sensory perception remain comprehensively unexplored within normative populations. Different people represent the same sensory information in different “formats” (e.g., as modal imagery, verbal description, or motor simulation), which contribute to an individual’s propensity to experience perceptual deviations, such as hallucinations. I therefore aim to comprehensively investigate the individual “formats” of mental sensory representations, and determine their role in performance differences and anomalous perception. This project relies on a fusion of psychophysics and computational modeling methods. Project SUPER will form the basis of a new branch of individual differences research and ultimately inform new models of perception that account for individual factors. This research will importantly improve public awareness of perceptual differences, and inform specialists on the necessity to address perceptual differences as part of future educational and therapeutic strategies. The specific goals of Project SUPER are to: 1.) map and model a comprehensive spectrum of “formats” with which different people represent mental sensory information; 2.) understand how these differences contribute to perceptual anomalies (pareidolia, pseudo-hallucinations) and anomalous beliefs (e.g., conspiracy theories); and 3.) disseminate findings to academics and the general public; and provide them with quick, simple, and free materials for assessing perceptual differences. This will enhance our ability to recognize and accommodate perceptual differences in the real world, and could potentially lead to new approaches to learning difficulties across the lifespan, and a better understanding of pathological perceptual anomalies (e.g., hallucinations).

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The Subjective Perception of Sensory Information: Investigating Formats of Mental Representations

Assessment of existing data

Provide an explanation of the existing data sources that will be used by the research project, with references

Thus far, there are no existing published datasets that can be used by Project SUPER. However, I am currently collecting pilot data to perform power analyses for the proposed project. Specifically, I am conducting a pilot for the main behavioural paradigm (working memory+interference) and one of the pseudo-hallucination paradigms (Ganzflicker). Furthermore, I already have a pilot dataset for the pareidolia experiment (pre-print manuscript available on PsyArXiv: https://psyarxiv.com/sk4t9/), which will inform the pareidolia paradigm that will be used in Project SUPER. The other paradigm (Perky effect) will be piloted in the first 6 months of the grant.

Provide an analysis of the gaps identified between the currently available and required data for the research

I performed a dataset search through the UK Data Service website to be in compliance with the ESRC datasets review. There is currently no dataset describing the comprehensive individual differences in mental sensory representation formats. I searched first for keywords “individual differences” and “imagery”. This revealed two results on water contamination hazards and e-cigarettes. “Individual differences” and “perception” revealed 98 results, most of which relate to “perception” in the sense of how people feel about a certain topic. Of the visual perception datasets, eight related to individual differences in the perception of faces. These datasets will be relevant to consult for the current project, but do not address aspects of “representation format” and are restricted to a single category (faces). There were a further six datasets on perceptual differences in synaesthesia, the phenomenon of experiencing a fusion of two or more senses. These datasets also provide valuable information about people with specific perceptual differences, but the datasets are focused on a particular subgroup of individuals with particular anomalous qualities. I aim to investigate a number of anomalous qualities, but synaesthesia is outside the scope of the current project. “Individual differences” and “mental representation” delivered four results, one of which is a dataset on which I have worked on in the past (“Tracing the Template”). The target template is a specific kind of mental representation activated in preparation for a perceptual task, and is also a restricted point of focus compared to the current project. The other three projects are related to experiments on body perception, which again, provide relevant background information for the current project (as they relate to sensorimotor and enactive formats) but are more limited in scope. Furthermore, there are no datasets currently available in the UK Data Service on aphantasia, hyperphantasia, pareidolia, the Perky effect, Ganzfeld, or blindfolding. Project SUPER will document all formats used to represent the same stimuli in various behavioural paradigms across 625 individuals. This will establish an entirely unique dataset.

Information on new data

Provide information on the data that will be produced or accessed by the research project

Data for the current project include:

-demographic data (participant age, gender, handedness, primary language, eye dominance, ethnic background). If the participant is a student of the university, I will additionally collect program of study and year of study. If the participant is from the general population, I will additionally collect education level and current area of employment.

-behavioural data (response times, accuracies)

-questionnaire data (separate questionnaires to assess: vividness of multisensory imagery, working memory retention strategies, pseudo-hallucination and pareidolia qualities, prosopagnosia, creative experiences, schizotypy, paranormal beliefs)

Quality assurance of data

Describe the procedures for quality assurance that will be carried out on the data collected at the time of data collection, data entry, digitisation and data checking.

All data will be collected digitally in python (in the lab) and online, and stored as JSON (cross-platform, readable unicode format), and CSV (readable tabular format). Data collection will be performed automatically as part of the experiment script after every experimental run. Files will be saved in parallel to a local drive and a dedicated data drive with read-only permission so that the

data cannot be tampered with. File names will be checked automatically so that files cannot be overwritten (e.g., if the same participant number is accidentally used twice). Files will also be uploaded to the cloud immediately following an experimental session. The goal of this method is to make data collection as hands-off as possible to maximally reduce human error. Quality assurance will also be an automated part of the experiment. For the experiment to continue to the next run, there cannot be any unacceptable missing datapoints (e.g., empty lists) or missing files. Unacceptable missing data will throw an error message and quit the experiment until the experimenter fixes the error. Finally, the analysis pipeline will be created before experimentation begins so that results can be determined automatically by the experimenter at the click of a button. I am already implementing these methods in my current projects.

Backup and security of data

Please describe the data back-up procedures that you will adopt to ensure the data and metadata are securely stored during the lifetime of the project.

Data storage will be in accordance with the ESRC Research Data Policy. All experimental data containing participant-identifying information will be stored on password-protected hard drives and will not be made publicly available. All data stored with anonymous participant codes will be uploaded onto online data repositories, as well as the UK Data Service website, following publication. All in-progress or unpublished data will be stored securely on local hard drives and cloud storage for at least 10 years. Because the current project requires a large number of participants (625) to take part in several tasks (working memory+interference, Perky effect, etc.) a data organisation structure will be implemented prior to experimentation and all team members will adhere to the same organisation (save directories, subject codes, readme files, etc.). All data collection will be further documented on paper and stored in a secure lab room, and consent forms will be saved in the same location.

Difficulties in data sharing and measures to overcome these

If you expect obstacles to sharing your data, explain which and the possible measures you can apply to overcome these.

I do not expect any difficulty in sharing data. All identifying participant information will be saved separately from the data and will not be shared publicly. Participants will be known by a subject code throughout experimentation and in all shared and online repositories. Although I will collect a large number of participants (625), all data are behavioural and therefore storage space is not an issue (compared to fMRI data, which can be hundreds of gigabytes in size). Total data size will rather be on the order of megabytes.

Consent, anonymisation and strategies to enable further re-use of data

Make explicit mention of the planned procedures to handle consent for data sharing for data obtained from human participants, and/or how to anonymise data, to make sure that data can be made available and accessible for future scientific research.

All participants in the proposed studies will be healthy, consenting, adult human volunteers recruited from the Edge Hill University student and employee population, and the general population of Ormskirk and the surrounding area. Participants will be recruited via online resources such as participant recruitment systems and student mailing lists. Further recruitment will be achieved through flyers advertising the experiments displayed in public locations, and peer-to-peer contact such as classroom presentations. Samples will come from the normal population and will be healthy adult volunteers who are able to provide informed consent to take part. They will be informed that their participation will not involve any therapeutic techniques and will not be performed by a therapist or clinician. I will obtain legal consent from participants prior to any experimentation (all participants must be at least 18 years of age to take part). Participants will have access to the project description, the estimated time of experimentation, and will know the amount and currency of reimbursement before providing written, informed consent. They may terminate their participation at any time during experimentation with no consequence. Risks to participants are minimal, as all tests are non-invasive, computer-based behavioral experiments. All ethical considerations will adhere to the Declaration of Helsinki. A vote will be obtained from the ethics committee of Edge Hill University and no experiment will begin prior to successful ethics approval.

Identifying participant information will be saved in a secure, password-protected directory. Participants will be told that if they take part in the experiment, non-identifying data will be shared in open, online data repositories. They will have the option to opt-out of performing the experiment if they do not want their data to be shared in this way.

Copyright and intellectual property ownership

Please state who will own the copyright and IPR of any new data that you will generate.

Any new data will be owned by the university and distributed by me, the principal investigator.

Responsibilities

Outline responsibilities for data management within research teams at all partner institutions

I (the PI) will be responsible for overseeing all data management and ensuring good data management practices by my team. My duties will include:

-training all team members on good data management practices
-how and where to check stored data (local drive, data drive)
-how and where to upload data for sharing (cloud, data repositories)
-how to interpret the output of the quality assurance script

The duties of the research assistants include:

-data collection and local/cloud storage
-performing quality assurance on the data
-preparing data to be uploaded to online repositories

Management and curation of data

Outline your plans for preparing, organising and documenting data.

Data will be saved in multiple open-source formats (JSON, CSV) for ease of use across various platforms and programming languages. Separate files will be created for each assessment (e.g., the working memory+interference results, the pareidolia results) and saved in dedicated directories for demographic, behavioural, and questionnaire data. I will include readme.txt files in all data storage locations (local drive, data drive, cloud) detailing the organisation structure. All scripts will be commented for maximal ease of use and sharing.