The Entorhinal Cortex as the Task-General Assessor of Difference Magnitude in the Brain

A Data Management Plan created using DMPonline

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Project abstract:

Entorhinal cortex (EC) grid cells are best known for their important role in spatial navigation. Tight correlation between individual neuronal firing and observable animal behaviour has naturally led to important research into the representation of physical space. This unique project will aim to reveal a profound and unrecognised role for these cells beyond spatial navigation, as the brain's task-general assessor of difference magnitude. By producing convergent evidence from in vivo grid cell recordings in rodents, human fMRI, and human lesion studies, this work will find solutions to the multiple challenges that have limited our understanding of the role of the EC. We aim to: 1) link object-vector cells in the EC with feature focussed grid-cell coding using item sets with known similarity information; 2) use representational similarity analysis to demonstrate that the EC condenses multidimensional item sets into 2D feature space; 3) use known similarity information to map the scale of grid cell representations topographically along the dorsoventral axis of the EC; 4) employ concurrent recording in the different MTL cortices and MTL focussed fMRI to reveal how the EC switches between representing physical and feature space as a function of its type of input; and 5) utilise a unique group of human lesion patients and our understanding of neuropsychological testing to provide a causal link between EC processing, and both our comprehension of our world and ability to generate and store episodic memories. These theoretically driven investigations will produce substantial and critical developments in understanding how the brain represents contextualises, communicates, and classifies novel information. Moreover, understanding this mechanism will produce striking new insights into the neural processes of an area of the MTL which displays the earliest signs of degradation in neurodegenerative disorders like Alzheimer's Disease.

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Manchester Data Management Outline

- Ethics
- Funder

- No - only institution involved

- Re-use existing data (please list below)
- Acquire new data

- Other storage system (please list below)
- University of Manchester Data SafeHaven
- University of Manchester Research Data Storage Service (Isilon)

Local hard drives on secure University of Manchester computers.
Encrypted removal storage, e.g. pen drives, for data transport and exchange.

- 1 - 8 TB

- No

- 5 - 10 years

- Anonymised personal data
- Personal information, including signed consent forms
- Pseudonymised personal data

We expect the experiments of this project to generate substantial quantities of data. Human data will fall into two categories: Pseudonymised, and Anonymised. Personal Identifying data will consist of names and contact details, along with any data which could be used to identify a specific participant (e.g. date of birth). We will pseudonymise Personal Identifying data arising from the assessments of the patients in this project. All patient Personal Identifying information that is collected and needs storing will be pseudonymised and kept separately from any experimental data. The link between these data will stored separately and securely. The policy outlined above is in accordance with the data management plan and ethical framework of the project that first identified and characterised these patients.

Other Personal Identifying information collected as part of this project (e.g. name and contact details of human fMRI participants) will be stored without any link to any experimental data. Consent forms will be stored in a locked filing cabinet in a secure facility at the UoM. Data types outlined thus far will be stored for a maximum of ten years from the end of the study in accordance with University of Manchester (UoM) ethical policies. Pseudonymised Personal Identifying data will be stored locally in dedicated facilities. Other Personal Identifying data will be stored in encrypted folders on both UoM computers and the UoM Research Data Management (RDM) Service. This data will only be transferred when encrypted.

- Yes – Other

We will ask the permission of patients involved in this project to confidentially and securely store their personal details to enable them to be contacted for future research studies. Consent for this storage will be re-obtained each year.

- No

- Not applicable

- Yes

We will ask the permission of patients involved in this project to confidentially and securely store their personal details to enable them to be contacted for future research studies. Consent for this storage will be re-obtained each year.

Daniela Montaldi

2019-10-01

Data areas and data types

Each patient (n = 20) will provide personal identifying data. This will consist of names and contact details, along with any data which could be used to identify a specific participant (e.g. date of birth).

Participants (n = 25 x 2) in our fMRI experiments will each provide their name and contact details.

We will also collect behavioural scores (n = 75), MRI images (n = 25 x 2 sets), and animal (n = 30) electrophyisology recordings and histological data as part of the project.

Standards and metadata

All other data collected as part of this project is expected to be classified as anonymous data. As a result, no individual will be identifiable by the data. Hard copies of data originating from animal experiments, e.g. brain slices, will be digitised wherever possible. The hard copies will be retained along with appropriate metadata in slide boxes and folders. Digitised anonymous data will be stored for 10 years using the UoM RDM Service. We will share anonymous data related to all project publications widely using the Open Science Framework (OSF.io) within six months of publication. All members of the research team will be credited in references to the dataset. This is a secure and permanent store of published and unpublished data that improves the reproducibility of experiments and scientific transparency of published work. Github will be also be used to disseminate modelling data and analysis code within six months of publication. We will also supply the raw data on direct request from other researchers after we have completed publication of our planned analyses.

Relationship to other data

Digitised and anonymised data related to all project publications will be shared widely using the Open Science Framework (OSF.io) within six months of publication.

Github will be also be used to disseminate modelling data and analysis code within six months of publication.

We will also supply the raw data on direct request from other researchers after we have completed publication of our planned analyses.

These data will all be accompanied by metadata and information on how to access and process it.

Secondary Use

Sharing our data and files on the Open Science Framework and Github will enable other researchers to conduct further analyses. These may include, but are not limited to, meta-analyses, brain structure analyses, secondary behavioural analyses. None of our participants will be identifiable throughout this process.

We cannot foresee further secondary uses of our data but will supply the raw data on direct request from other researchers after we have completed publication of our planned analyses.

Methods for data sharing

Digitised and anonymised data related to all project publications will be shared widely using the Open Science Framework (OSF.io) within six months of publication.

Github will be also be used to disseminate modelling data and analysis code within six months of publication.

We will also supply the raw data on direct request from other researchers after we have completed publication of our planned analyses.

These data will all be accompanied by metadata and information on how to access and process it.

Proprietary data

We don't forsee any restrictions on the sharing of anonymous data.

Timeframes

Digitised and anonymised data related to all project publications will be shared widely using the Open Science Framework (OSF.io) within six months of publication.

Github will be also be used to disseminate modelling data and analysis code within six months of publication.

We will also supply the raw data on direct request from other researchers after we have completed publication of our planned analyses.

Formats

Electrophysiological recordings - Axona structured files (or similar).

Behavioural data - .csv. This is a widely recognised, internationally accessible file type with a simple and effective storage of behavioural data.

Tetrode tracks - .tif. This can provide high resolution images of our histological data that are appropriate for publication.

MRI images - .Nii. This is a standard format for the storage and processing of MRI files that is internationally recognised and accessible.

Personal identifiable data - hard copy in a locked filing cabinet & encrypted .xlsx files. This file type allows for an additional level of encryption to further protect the confidentiality of our subjects.

All the above file types are widely recognised and accepted. This should minimise the requirement for data management interventions throughout the data storage period.