Plan Overview

A Data Management Plan created using DMPTool

DMP ID: https://doi.org/10.48321/D1739FCA8B

Title: Impact of autism genetic liability on behavioral reinforcement and accumbal dopamine

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Template: NIH-Default DMSP

Project abstract:

Social interaction and communication difficulties are characteristic of autism, causing life-long challenges for autistic patients and their caregivers. Despite years of research, the neural mechanisms that drive these social difficulties remain elusive. One theory to explain these difficulties is the “Social Motivation Theory of Autism”, which posits that autistic children find social stimuli less rewarding than their typically developing peers, and thus do not adapt their behavior as readily to refine their social interactions with experience. From a young age, this may set autistic children on a distinct trajectory of social development, as they seek out fewer social interactions and learn less from social interactions than their typically developing peers. Despite the influence of this theory on behavioral interventions in children, and support for it in the human literature3, the Social Motivation Theory of Autism lacks mechanistic testing in the framework of behavioral reinforcement. Here, we propose to fill this gap by testing the impact of autism genetic liability on both social and non-social behavioral reinforcement mechanisms in mice (Aim 1) and testing whether autism genetic liability confers deficits in dopamine signaling, a neurotransmitter system that is critical for reinforcement (Aim 2). Finally, we will test whether manipulating dopamine signaling can rescue behavioral deficits in a mouse model of autism genetic liability (Aim 3). Our long-term goal is to inform behavioral or pharmacological interventions to improve the quality of social interactions in autistic children.

Start date: 01-01-2025

End date: 01-01-2028

Last modified: 07-08-2024

Copyright information:

Impact of autism genetic liability on behavioral reinforcement and accumbal dopamine

Data Type

Types and amount of scientific data expected to be generated in the project: *Summarize the types and estimated amount of scientific data expected to be generated in the project.*

Describe data in general terms that address the type and amount/size of scientific data expected to be collected and used in the project (e.g., 256-channel EEG data and fMRI images from ~50 research participants). Descriptions may indicate the data modality (e.g., imaging, genomic, mobile, survey), level of aggregation (e.g., individual, aggregated, summarized), and/or the degree of data processing that has occurred (i.e., how raw or processed the data will be)

This project will produce brain recording data and behavioral data from approximately 104 mice.

1. An estimated 280 behavioral sessions will be acquired in Aim 1, quantifying how mice are performing on the bandit task. These will be stored and shared as .csv files (typically <10MB).

2. An estimated 40 brain recordings (dopamine sensor dLight) will be recorded in Aim 2. These are stored and shared as .csv files (typically <30MB).

1. An estimated 40 behavioral sessions will be acquired in Aim 3, quantifying how mice are performing on the bandit task. These will be stored and shared as .csv files (typically <10MB).

Scientific data that will be preserved and shared, and the rationale for doing so: *Describe which scientific data from the project will be preserved and shared and provide the rationale for this decision.*

In this proposed project, the processed and cleaned data for all variables will be shared openly, along with example quantifications and transformations from initial raw data. Final files used to generate specific analyses to answer the Specific Aims and related results will also be shared. The rationale for sharing only cleaned data is to foster ease of data reuse.

Metadata, other relevant data, and associated documentation: Briefly list the metadata, other relevant data, and any associated documentation (e.g., study protocols and data collection instruments) that will be made accessible to facilitate interpretation of the scientific data.

To facilitate the interpretation and reuse of the data, a README file and data dictionary will be generated and deposited into a repository along with all shared datasets. The README file will include the project title, funder ID, grant number, author name and ORCID iD, date in ISO 8601 format, method description, instrument settings, RRIDs of resources such as antibodies, model

organisms, cell lines, plasmids, and other tools (e.g., software, databases, services), and Protocol DOIs issued from protocols.io. The data dictionary will define and describe all variables in the dataset. If multiple datasets are deposited into a repository, a README file will include a list of file names and descriptions and will be deposited along with datasets. All associated documents such as a data dictionary file, a study protocol, a README file can be freely downloaded along with datasets from a repository.

Related Tools, Software and/or Code

State whether specialized tools, software, and/or code are needed to access or manipulate shared scientific data, and if so, provide the name(s) of the needed tool(s) and software and specify how they can be accessed.

In Aim 1, the raw data generated from our behavioral training equipment (FED3, made by Open Ephys Production Site) is stored in the .CSV format. CSV files can be opened by commercial software like Excel (Microsoft) or with Python libraries. Python is a free software environment for data science and statistical analysis. We will import the data into Python for statistical analysis. Scripts used to process and analyze .CSV files will be made available on the Open Science Framework (OSF.io).

In Aim 2, the raw data generated from the dopamine fiber photometry system (made by RWD) will be saved in .CSV format. Both .CSV files, and scripts used to process and analyze these files will be made available on the Open Science Framework (OSF.io).

In Aim 3, we will generate .CSV files containing data from behavioral tasks mice are performing. as in Aim 1. These files will be processed with Python scripts. Both .CSV files, and scripts used to process and analyze these files will be made available on the Open Science Framework (OSF.io)

Standards

State what common data standards will be applied to the scientific data and associated metadata to enable interoperability of datasets and resources, and provide the name(s) of the data standards that will be applied and describe how these data standards will be applied to the scientific data generated by the research proposed in this project. If applicable, indicate that no consensus standards exist

To improve interoperability of datasets, we will use open file formats (e.g., csv, txt, mp4, pdf) whenever possible and convert proprietary file formats to open file formats where possible (.csv). The neuroscience community has yet to agree on a single standard data format that is generated by all acquisition systems, so we will use.csv where possible for data that will be preserved and shared. We will collect metadata using common standards (e.g.,ISO 8601 for date/time, instrument settings, software name and version) and PIDs (e.g., ORCID iDs for researchers, funder ID, grant number, DOI for protocols, RRID for resources) to facilitate interpretation of data and interoperability.

Data Preservation, Access, and Associated Timelines

Repository where scientific data and metadata will be archived: Provide the name of the repository(ies) where scientific data and metadata arising from the project will be archived; see Selecting a Data Repository)

All data and related scripts/codes will be deposited into the Open Science Framework (OSF) repository.

How scientific data will be findable and identifiable: Describe how the scientific data will be findable and identifiable, i.e., via a persistent unique identifier or other standard indexing tools.

The OSF will collect relevant metadata (e.g., resource type, title, authors, date, funder ID, keywords, etc.) and issue a DOI linking all PIDs collected during data submission such as ORCID iDs for authors, Funder IDs so data will be easily findable and identifiable via Google search. The DOIs for datasets will also be referenced in the publications and preprints linking to the data.

When and how long the scientific data will be made available: Describe when the scientific data will be made available to other users (i.e., no later than time of an associated publication or end of the performance period, whichever comes first) and for how long data will be available.

All scientific data generated from this project will be made available as soon as possible, and no later than the time of publication or the end of the funding period, whichever comes first. All data will be preserved and accessible to the public according to the OSF retention policy.

Access, Distribution, or Reuse Considerations

Factors affecting subsequent access, distribution, or reuse of scientific data: NIH expects that in drafting Plans, researchers maximize the appropriate sharing of scientific data. Describe and justify any applicable factors or data use limitations affecting subsequent access, distribution, or reuse of scientific data related to informed consent, privacy and confidentiality protections, and any other considerations that may limit the extent of data sharing. See Frequently Asked Questions for examples of justifiable reasons for limiting sharing of data.

To address safety and security concerns related to capturing and distributing pictures or video of vertebrate research animals, access and distribution of behavioral video files generated in our lab will be limited as described and justified in the IACUC protocol governing the project and in compliance with the "Image Recordings of Research Animals" Standard Operating Procedure at our institution. There are no other factors that will impact access, distribution, and reuse for all other scientific data generated by this study.

Whether access to scientific data will be controlled: State whether access to the scientific data will be controlled (i.e., made available by a data repository only after approval).

The data and code shared via the OSF will be made available for re-use and licensed as Creative Commons-Attribution (CC-BY 4.0) to allow for the maximum dissemination and use of the licensed

materials.

Protections for privacy, rights, and confidentiality of human research participants: If generating scientific data derived from humans, describe how the privacy, rights, and confidentiality of human research participants will be protected (e.g., through de-identification, Certificates of Confidentiality, and other protective measures).

Not applicable. This study does not include research on human participants

Oversight of Data Management and Sharing

Describe how compliance with this Plan will be monitored and managed, frequency of oversight, and by whom at your institution (e.g., titles, roles).

Lead PI Susan Maloney will be responsible for the day-to-day oversight of lab/team data management activities and data sharing. Dr. Maloney and research contributors will ensure that the metadata are sufficient and appropriate, and that the data management and sharing plan follows FAIR data principles. Dr. Maloney will report the DMS-related activities as outlined in this DMS plan in RPPR and request approval for a revised plan if there is any deviation from the approved DMS plan.
