

Getting started with fMRI: An Introduction for Behavioral Scientists

Center for Translational and Prevention Science, University of Georgia

fMRI and Research

Functional Magnetic Resonance Imaging (fMRI) uses the conventional MRI technology of looking at brain structure, to also look at brain function. fMRI research is becoming increasingly common practice and is used to help answer questions about psychological functioning in the brain. Some uses of this technology in research include decision making, treatment of learning

disorders, and exploring memory. Many social scientists and behavioral researchers are beginning to consider how to incorporate this type of data into their research programs.

Collecting data from fMRIs is unique to every study. This document provides a brief orientation to behavioral researchers unfamiliar with fMRI requirements.

Psychologists and researchers are using [fMRI] technology to help answer classic questions in psychology.

– APA, *fMRI: A New Research Tool*

Identify a collaborator

Identifying a collaborator with expertise in fMRI technology brain scanning and analysis is essential when beginning work this area. The nature of data collected, costs, software, as well as necessary skills in conducting the brain scans and interpreting results are unlikely to be quickly obtained by a novice. When identifying a collaborator, questions to consider include:

- ✓ What type of brain data is being sought – structural, functional, resting state?
- ✓ For task-based fMRI block, what type of paradigm is planned? Cognitive- or emotion-focused?
- ✓ Who will be responsible for programming tasks and MRI blocks?
- ✓ How will data be analyzed?
- ✓ How will results from analyses be disseminated?
- ✓ Who will retain rights to scientific products from the study?

*Department of
Health and
Human Services,
NIH Rule:*

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The probability and magnitude of harm [during fMRI] or discomfort anticipated should not be greater than during the performance of medical examinations.

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Staffing and data collection

Staffing:

Hiring trained professionals in fMRI brain scanning will be necessary. A flexible schedule is often beneficial when collecting fMRI data from human participants to allow for flexibility in scheduling appointments. Due to safety protocols around MRI scanners, any personnel who will need access to the scanner area, will need to go through MRI training.

Data collection:

Costs associated with fMRI are much higher than other forms of data collection. Total sample size may be reduced due to financial considerations.

Data loss (often due to motion) also needs to be factored with sample size considerations. Data loss between 10-15% (and higher in some instances) is not uncommon.

Important questions to think through:

- ✓ What information needs to be provided to participants and any family members beforehand?
- ✓ What protocols are in place to ensure participant safety?
- ✓ What types of brain data are of interest (structural, resting state, and/or task-based)?
- ✓ Are task-elicited brain regions consistent with research questions?
- ✓ What staffing and equipment will be needed for scans?

Data analysis

fMRI data analysis can be very time intensive, shaping timelines for when results can be disseminating. Converting and processing raw images collected from structural and functional MRI scans into analyzable data entails multiple labor-intensive steps, all of which have to be completed separately for each participant. Data collected during structural, task-based, and resting state scanning each provide unique forms of data that can be utilized to answer different research questions.

MRI Safety:

Human subjects participating in any MRI procedure will need to be screened for the following important information:

- ✓ Previous surgeries or medical operations involving devices or implants*
- ✓ Previous diagnostic imaging (MRI, CT, Ultrasound)
- ✓ Medical history, including previous head injuries, concussions and diagnoses of mental disorders
- ✓ Medication or drug use
- ✓ Pregnancy (female participants) and IUD implants
- ✓ Body piercing and/or tattoos
- ✓ Work history around metal and machinery
- ✓ Claustrophobia, asthma and breathing disorders
- ✓ Braces
- ✓ Presence of metal in or on clothing
- ✓ Bobby pins in the hair

**Many modern medical devices and implants are MRI safe. Contact the device or implant manufacturer for questions about MRI safety.*

