fMRI EXPERIMENT PROTOCOL

Egocentric-Allocentric Translation Study

Protocol Version: 1.0

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TR Value: 2.01 seconds

EXECUTIVE SUMMARY

Total Session Duration: 79.13 minutes (2362 TRs)

fMRI Scanning Time: 48.11 minutes (1436 TRs)

Experimental Conditions: PTSOD, One Target, Multi Arena

Scanner Requirements: 3T MRI with response box

SESSION OVERVIEW

This fMRI experiment investigates egocentric-allocentric spatial translation using three experimental paradigms:

1. **PTSOD (Path Integration Task)**
   - Tests spatial memory and navigation abilities
   - Memory and no-memory conditions
   - Fixed target locations

2. **One Target Experiment**
   - Single target placement and annotation
   - Dynamic target placement based on movement
   - Exploration + annotation phases

3. **Multi Arena Experiment**
   - Multiple target annotation in complex environments
   - Extended exploration and annotation periods
   - Spatial memory and navigation assessment

SESSION TIMELINE

Pre-Scanning (30 minutes)

- Participant briefing and consent
- Task instructions and practice
- Response box familiarization
- Safety screening

Scanning Session ({grand_total_minutes} minutes)

1. **Anatomy Scan** (15.01 minutes, 448 TRs)
   - High-resolution T1-weighted structural scan
   - Purpose: Brain anatomy and registration

2. **Rest Scan 1** (8.01 minutes, 239 TRs)
   - Baseline resting state measurement
   - Eyes open, mind wandering

3. **Rest Scan 2** (8.01 minutes, 239 TRs)
   - Second baseline measurement
   - Ensures stable baseline

4. **PTSOD fMRI Run 1** (7.91 minutes, 236 TRs)
   - First PTSOD experimental run
   - 4 memory trials + 4 no-memory trials

5. **One Target Run** (11.12 minutes, 332 TRs)
   - 6 snake practice blocks + 6 one target blocks
   - 10 TR exploration + 10 TR annotation per trial

6. **Full Arena Run** (21.17 minutes, 632 TRs)
   - 6 snake practice blocks + 6 multi arena blocks
   - 60 TR exploration + 30 TR annotation per arena

7. **PTSOD fMRI Run 2** (7.91 minutes, 236 TRs)
   - Second PTSOD experimental run
   - Identical structure to Run 1

EXPERIMENTAL DETAILS

PTSOD Experiment

- **Memory Trials:** 15 TRs memorization + 17 TRs navigation
- **No-Memory Trials:** 17 TRs navigation only
- **Target Placement:** Fixed, predetermined locations
- **Response:** Navigate to remembered target location
- **Timer Display:** Countdown during memory and navigation phases

One Target Experiment

- **Exploration Phase:** 10 TRs (20.1 seconds) - participant controlled
- **Target Placement:** Dynamic, based on movement and visited cells
- **Annotation Phase:** 10 TRs (20.1 seconds) - fixed timer
- **Response:** Navigate to target location and annotate
- **Timer Display:** None during exploration, countdown during annotation

Multi Arena Experiment

- **Exploration Phase:** 60 TRs (120.6 seconds) - fixed timer
- **Target Placement:** Multiple targets in complex arena
- **Annotation Phase:** 30 TRs (60.3 seconds) - fixed timer
- **Response:** Explore arena and annotate all targets
- **Timer Display:** Countdown during annotation phase (fMRI mode only)

TECHNICAL SPECIFICATIONS

Scanner Requirements

- 3T MRI scanner
- TR = 2.01 seconds
- EPI sequence for functional scans
- T1-weighted sequence for structural scan

Stimulus Presentation

- MATLAB (Psychtoolbox) for PTSOD

- Python (Pygame) for One Target and Multi Arena
- MRI-compatible response box
- Projector or LCD display for visual stimuli

Data Collection

- Continuous logging (frame-by-frame)
- Discrete logging (trial summaries)
- Behavioral responses and timing
- Movement and navigation data

PARTICIPANT INSTRUCTIONS

General Instructions

- Stay as still as possible during scanning
- Use response box buttons for navigation
- Follow on-screen instructions carefully
- Ask questions before scanning begins

Response Box Controls

- Button 7: Rotate left
- Button 8: Move forward
- Button 9: Move backward
- Button 0: Rotate right
- Button 1 or ENTER: Confirm/continue

DATA ANALYSIS PLAN

Behavioral Analysis

- Navigation accuracy and efficiency
- Response times and movement patterns
- Target annotation accuracy
- Spatial memory performance

fMRI Analysis

- Preprocessing: motion correction, normalization
- First-level: task-specific activation maps
- Second-level: group analysis and comparisons
- ROI analysis: hippocampus, parietal cortex

QUALITY CONTROL

Data Quality Checks

- Motion parameters (< 3mm translation, < 3° rotation)
- Signal-to-noise ratio assessment
- Behavioral performance monitoring
- Scanner stability checks

Participant Monitoring

- Comfort and safety throughout session
- Task comprehension verification
- Fatigue and attention monitoring
- Emergency procedures awareness

SAFETY CONSIDERATIONS

MRI Safety

- Standard MRI safety screening
- Metal object removal
- Emergency stop procedures
- Communication system testing

Participant Safety

- Comfort breaks if needed
- Claustrophobia assessment
- Emergency contact procedures
- Post-scan debriefing

CONTACT INFORMATION

For questions about this protocol, contact:

- Principal Investigator: [Name]
- Research Coordinator: [Name]
- Technical Support: [Name]

DOCUMENT INFORMATION

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This protocol describes the complete fMRI experiment for investigating egocentric-allocentric spatial translation. All timing is based on TR-aligned calculations with TR = 2.01 seconds.