The influence of American Sign Language on neural dynamics and spatial cognition

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Introduction

- Visual-spatial languages like ASL may influence visual spatial skills and neural networks.
- Fluent signers often outperform non-signers on mental rotation, perspective-taking, and spatial attention.
- However, we don't yet have a clear picture of if these changes are due to hearing status or ASL fluency gradient.

Hypotheses

- Higher ASL fluency predicts faster and more accurate 2D mental rotation.
- Fluent signers make fewer perspective-switching errors during navigation.

Participants and Measures

- **Participants:** Deaf n = 5, Hearing n =10, so far
- **Spatial Navigation Task:** Participants see a simple maze and must press an arrow key to indicate the first move toward a target location
- **Mental Rotation Task:** participants mentally rotate 2D letters and decide if they match or are mirrored.

Mental Rotation Test Example Stimulus

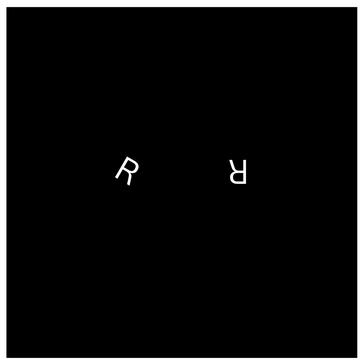
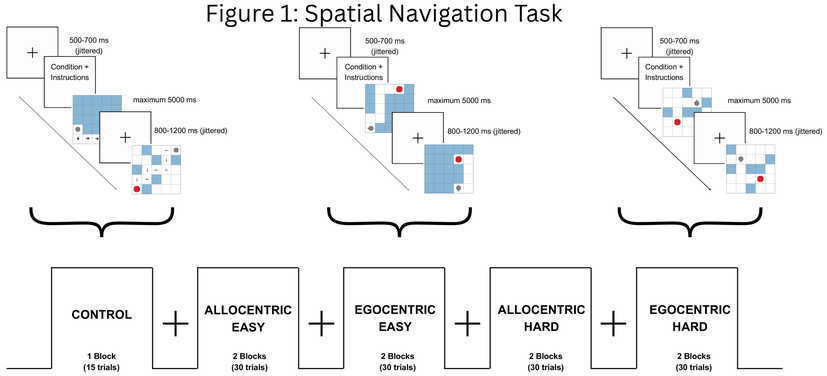
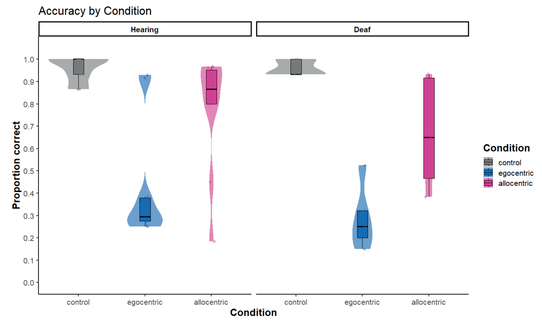
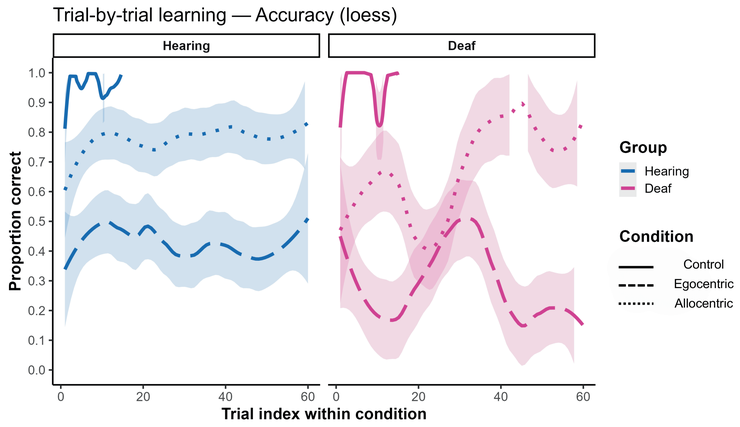


Figure 1: Spatial Navigation Task







Preliminary Findings

- **Spatial Navigation Task:**
  - Accuracy: control > allocentric > egocentric for both groups.
    - Strong main effect of condition on accuracy (p<.001; ges≈.60). No condition effect on RT (p≈.55).
  - Learning (slope across trials)
    - Overall trial effect: ns (χ^2=0.61, p=.44) → accuracy doesn't reliably improve as trials progress
    - Deaf: Although not significant, there is a trend towards improved egocentric performance and decreased allocentric performance over time.
- **Mental Rotation Task:**
  - No group difference in accuracy; RT increases as the angle increases.
  - No overall difference between Same and Mirror conditions; within Deaf, mirror accuracy is lower as a trend (p=.069).