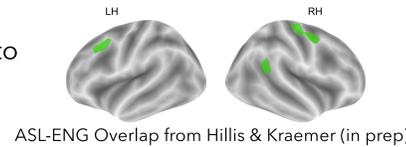


## Introduction

- Early-stage language learners use their established language to **scaffold new learning**<sup>1</sup> and novices' semantic representations may overlap across languages in regions including **posterior superior temporal sulcus (pSTS)**<sup>2</sup>
- LLMs can also be aligned across languages to a **shared semantic embedding space**.<sup>3</sup>

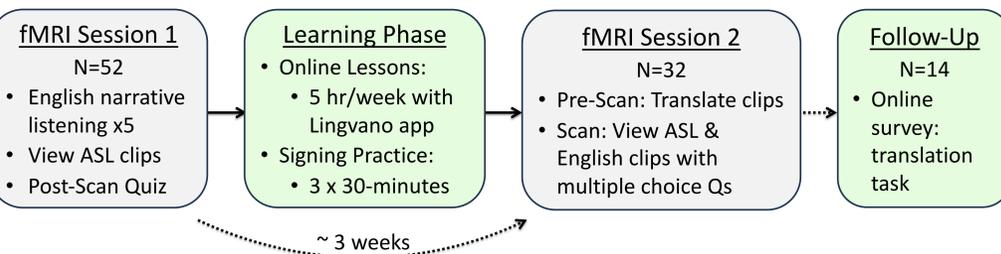


Do novice learners' ASL representations converge with English, allowing a **model trained on semantic–neural feature mappings to generalize across language?**

## Methods

### Study Procedure

- 32 hearing, English-speaking non-signers were scanned **before and after** 3 weeks of ASL learning
- ~5 hr/week self-paced studying, 30 min/week Zoom conversation with expert



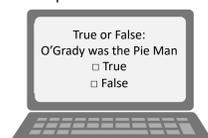
### Tasks

#### English Narratives

- Pre-learning only
- 5 x ~12 min runs
- Natural language stimuli from Narratives Dataset<sup>4</sup>

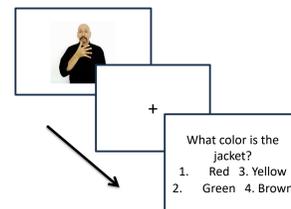


Behavioral: Comprehension Quiz



#### ASL Sentences

- Pre- and post-learning
- 3 x ~12 min runs
- Post learning only: comprehension Qs

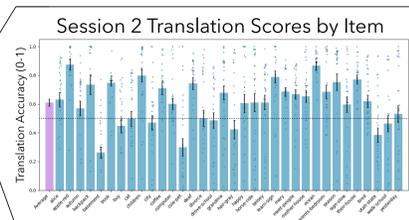
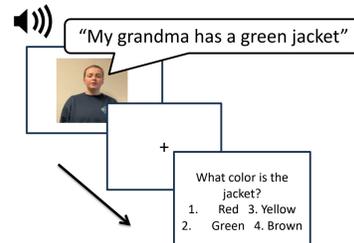


Behavioral: Translation Task



#### English Sentences

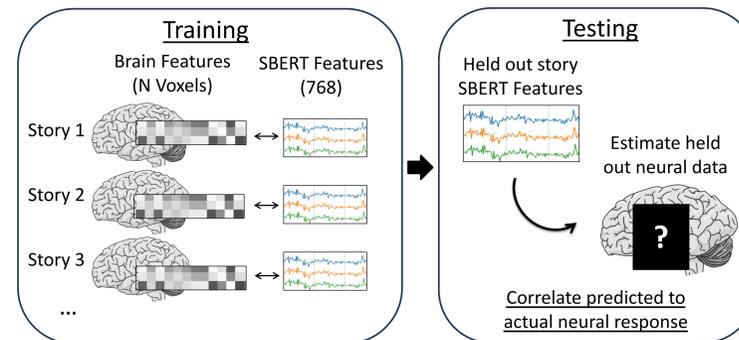
- Post-learning only
- 2 x ~10 min runs
- Same semantic content as ASL trials



## Results

### Model Training: Narratives

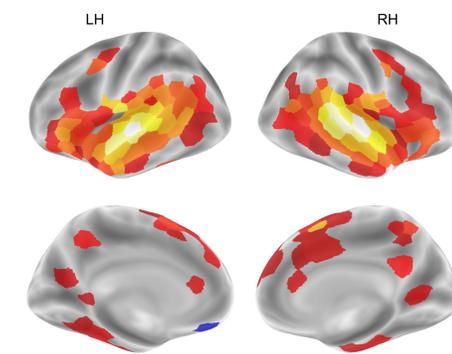
- Train voxelwise ridge regression model<sup>5</sup> (bootstrapped cross-validation with 30-second chunks) on Narratives
- Model learns mapping between **brain features (voxel time course)** and **semantic features** (derived from SBERT<sup>6</sup>)



### Model Testing: English

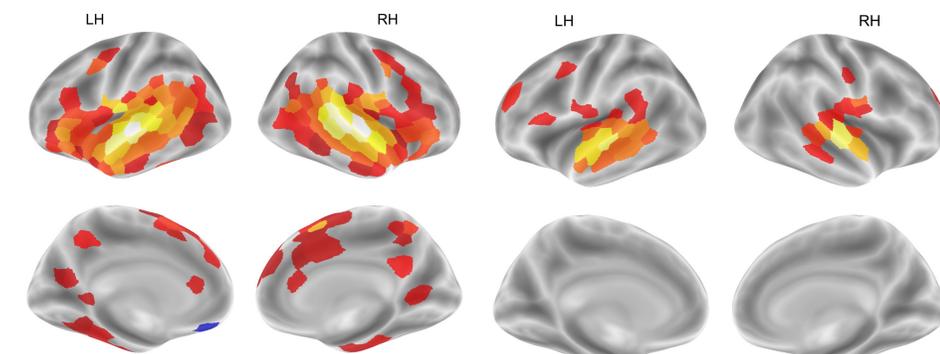
#### Within Task

(Test on held out narrative)



#### Across Task

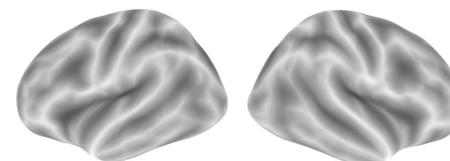
(Test on audiovisual sentences)



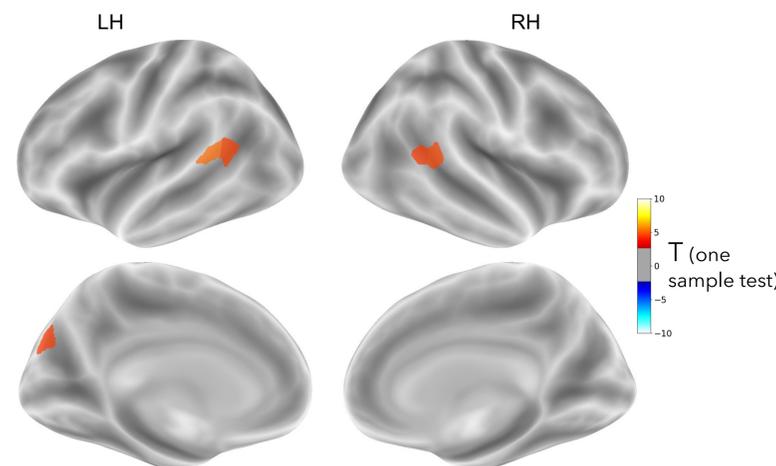
T (one sample test)  
Parcels from Schaefer (2018) atlas where FDR q < 0.05 shown

### Model Testing: ASL

- **ASL Sentences Pre-Learning:**
- No parcels show above-chance model prediction when participants did not know semantic meanings of the signs.

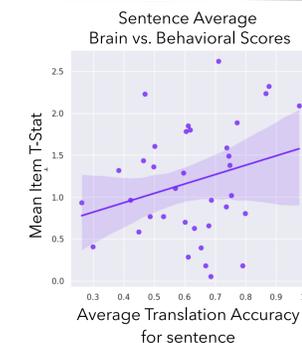


- **ASL Sentences Post-Learning**



Parcels from Schaefer (2018) atlas where FDR q < 0.05 shown

**7 parcels** in the Schaefer 2018 parcellation<sup>7</sup> atlas showed above chance model performance for ASL **after** learning, including **bilateral pSTS and superior temporal gyrus (STG)**



Across these 7 regions, the **model performs best on stimuli that were translated the most accurately.**

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## Conclusions

- Encoding models trained on as little as ~60 minutes of fMRI data can generalize from English to ASL in novice signers
- Bilateral pSTS and left STG showed best performance for ASL trials (after training on English audio-only data).
  - pSTS in particular has been implicated in sign language processing when cognitive demand is high<sup>8</sup>
- **Future Directions:** Can this approach distinguish individual differences in comprehension? (e.g. does the model perform better for students who can translate content more accurately?)

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