



The neural correlates of comprehending American Sign Language-English code-blends

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Introduction

Bimodal bilinguals often “code-blend”, producing signs and words simultaneously, which can facilitate comprehension in both the signed and spoken languages (Emmorey, Petrich, & Gollan, 2012. Bilingual processing of ASL-English code-blends: The consequences of accessing two lexical representations simultaneously. Journal of Memory and Language, 67:199-210).

Questions:

- 1) What brain regions are recruited during code-blend comprehension?
- 2) What brain regions mediate the behavioral facilitation observed for code-blend comprehension?
 - Is facilitation associated with increased or decreased activation?

Methods

Participants:

13 hearing native ASL-English bilingual adults (6 female, mean age = 26.85)

Task & Procedure:

60 unique items (trials) per language per subject

Stimuli:

- 18 lists of 10 nouns (mean Celex frequency = 3.05, range = 0 - 6.41)
- Lists counterbalanced across subjects
- Baseline task: silent model at rest with dot on chin, 1/2 with audible tone

Each item filmed with hearing native signer producing:

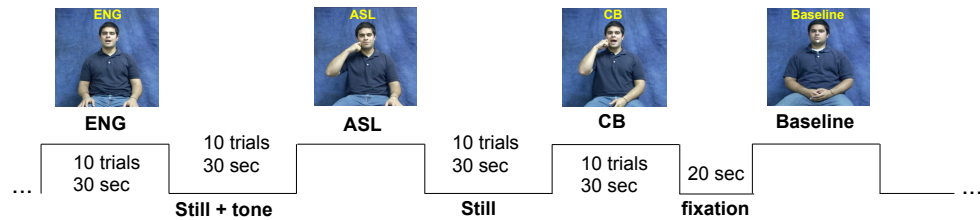
- a) an ASL sign translation (ASL)
- b) an audiovisual English word (ENG)
- c) signed and spoken word simultaneously (code-blend, or CB)

Semantic decision task:

Is it edible?

Control decision task:

Is the dot on the chin black?



MRI acquisition

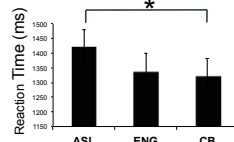
- GE 3T, gradient echo echo-planar imaging
- TR = 2s; FOV = 240mm; 30 4.5mm contiguous sagittal slices

MRI Analysis

- General linear model, multiple regression using AFNI
- Mixed effects group ANOVA on individuals' beta weights

Results

Behavioral

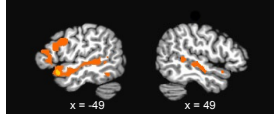


Semantic decisions were:

- faster for code-blends than for ASL, $p < .005$
- faster for English than for ASL, $p < .05$
- equally fast for English and code-blends

Language vs. Baseline

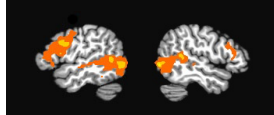
ENG > Still



English recruited:

- L inferior frontal gyrus
- L premotor cortex
- L/R STG (anterior)

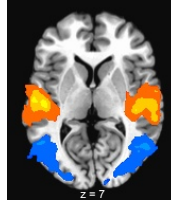
ASL > Still



ASL recruited:

- L/R inferior frontal gyrus
- L premotor cortex
- L/R STG (posterior)
- L Lingual gyrus

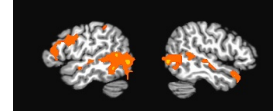
ENG vs. ASL



Legend: Orange = ENG > ASL, Blue = ASL > ENG

Code-blending

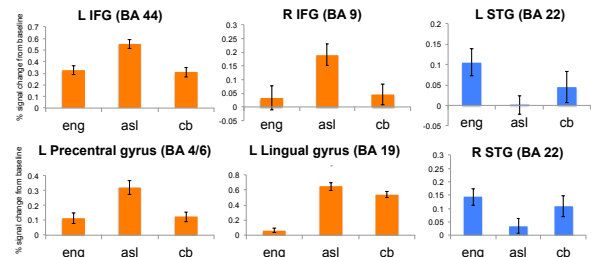
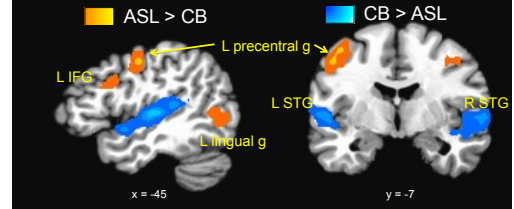
Code-blend > Still



Code-blends recruited:

- L inferior frontal gyrus
- L premotor cortex
- L/R STG (anterior)
- L/R STG (posterior)
- L Lingual gyrus

Code-blend Perception vs. ASL



Conclusions

- Decreased activity for code-blend comprehension in frontal language and posterior visual regions may reflect reduced effort when ASL comprehension is aided by redundant cues from English.
- Similarly, in left STG the trend toward decreased activity during code-blend perception may reflect reduced effort when English comprehension is aided by redundant cues from ASL.

We thank NIH Grant HD047736 to Karen Emmorey and SDSU Research Foundation for supporting this research and all our study participants.

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