

# Semantic Integration during Code-Blend Comprehension in Bimodal Bilinguals

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## Introduction

- Code-blending, simultaneous production of signs and words, presents a unique opportunity to study the costs of *dual lexical access* versus *language inhibition*
- Bimodal bilinguals prefer code-blending over code-switching (Emmorey et al., 2008)
- Code-blending facilitates semantic comprehension (Emmorey et al., 2012), which could reflect cross-linguistic integration at phonological and/or semantic levels.

## Research questions

- Do meaning-based and form-based lexical tasks yield differential patterns of code-blend integration in bimodal bilinguals?
  - Do form cues from one language constrain form recognition in the other? If yes, this suggests integration at the phonological level
  - Does simultaneous comprehension of lexical items from two languages speed semantic processing? If yes, this suggests integration at the semantic level
- Do early and late bimodal bilinguals exhibit different patterns of code-blend integration?

## Participants

	Early bilinguals (CODA, n=16, 8 F)	Late bilinguals (L2 learners, n=15, 13 F)
Age (yrs)	24.2 (5.3)	32.1 (6.3)
# Years of education	14.4 (1.6)	17.4 (2.5)
Age of exposure to ASL	---	17.2 (5.4)
% Time ASL use	34.4 (17.5)	37.0 (13.9)
% Time ASL exposure	41.2 (21.5)	31.2 (17.0)
ASL proficiency (self-rating, 1-7 scale)	6.4 (.7)	5.9 (.7)

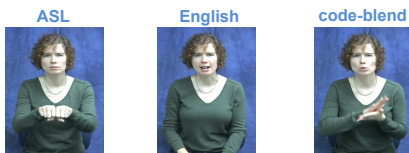
## Tasks

### 1. Semantic Decision

Is this item (ASL sign, English word, ASL-English code-blend) concrete or abstract in meaning?

#### Stimuli

- 120 items (75 concrete, 45 abstract) recorded as audiovisual English words, ASL signs and ASL-English code-blends
- Stimulus lists (40 items per list) were controlled for English frequency (SubtLex-US) and counterbalanced such that all items were viewed in each language condition, but no participant saw the same item twice



### 2. Lexical Decision

Is this form (ASL sign, English word, ASL-English code-blend) a real lexical item?

#### Stimuli

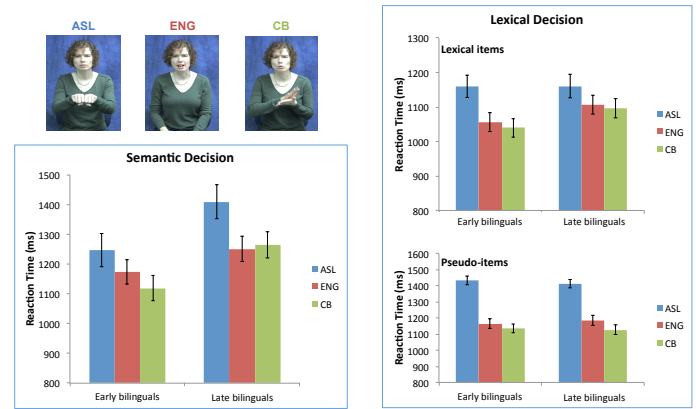
- 120 lexical items recorded as audiovisual English words, ASL signs and ASL-English code-blends (same items as in semantic decision task)
- 120 pseudo-items recorded as audiovisual English pseudo-words, ASL pseudo-signs and ASL-English pseudo-code-blends (English pseudo-words paired with ASL pseudo-signs)
- Stimulus lists (80 items per list) were controlled for English frequency (SubtLex-US) and counterbalanced such that all items were viewed in each language condition, but no participant saw the same item twice

#### Procedure

- Order of semantic and lexical decision tasks and presentation modality within each task counterbalanced across participants

#### Analysis

- Reaction times for ASL and English analyzed separately in 2 x 2 ANOVAs with bilingual group (early, late) and presentation condition (alone, code-blend)



## Results

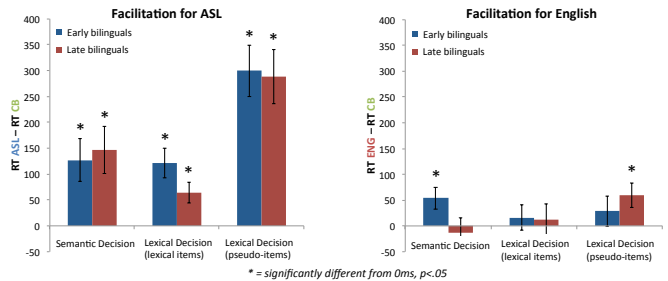
### Semantic Decision

- ASL vs CB: Early bilinguals responded faster than late bilinguals ( $F(1,29)=5.74, p<.05, \eta^2=.17$ ), and both groups responded faster for code-blends than signs alone ( $F(1,29)=19.59, p<.001, \eta^2=.40$ )
- ENG vs CB: Faster responses for code-blends than words alone, but only for early bilinguals ( $F(1,29)=3.69, p=.07, \eta^2=.11$ )
- ✓ *Semantic access to signs benefits from an accompanying English word for both early and late bilinguals, but semantic access to spoken words benefits from an accompanying sign only for early bilinguals*

### Lexical Decision

- Lexical items
  - ASL vs CB: Faster responses for code-blends than signs alone ( $F(1,29)=27.55, p<.001, \eta^2=.49$ )
  - ENG vs CB: Similar response times for code-blends and words alone ( $F < 1$ )
- Pseudo-items
  - ASL vs CB: Faster responses for code-blends than signs alone ( $F(1,29)=66.11, p<.001, \eta^2=.70$ )
  - ENG vs CB: Faster responses for code-blends than words alone ( $F(1,29)=5.33, p<.05, \eta^2=.16$ )
- ✓ *Code-blends facilitated the identification of lexical items only for ASL, but facilitated the identification of pseudo-items for both language modalities*

## Code-blend facilitation



## Discussion

- Evidence for cross-linguistic integration at a **semantic** level in early bimodal bilinguals, but not in late bimodal bilinguals
  - Early bilinguals recognize ASL signs more quickly than late bilinguals, which speeds recognition of English words in code-blends
- Lack of code-blend facilitation for English lexical items suggests cross-linguistic integration is weak or absent at the phonological level
- Evidence for cross-linguistic integration in lexical decision was limited to pseudo-items and appeared stronger for late bimodal bilinguals
  - Early and late bilinguals may be differentially sensitive to the morpho-phonological variation that is allowed in ASL
- These patterns of facilitation suggest simultaneous activation of semantic representations from two languages and indicate cost-free dual lexical access

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## References

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