

# The Influence of the Bilingual Experience on Word Learning in School-Age Children: An ERP Study

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## Background

- Bilingual children exhibit differential neural commitment as a function of exposure to their two languages<sup>1</sup>
  - Bilingual infants show enhanced attentional control during novel word learning compared to monolingual infants<sup>2</sup>
- Bilingual adults engage in deeper semantic processing during word learning compared to monolingual adults<sup>3</sup>
- Influence of bilingualism and SES on vocabulary size in children<sup>4</sup>
- What factors unique to the bilingual experience influence word learning?
  - L2 proficiency
- Purpose:** Examine the relation between the bilingual experience, SES, and word learning in school-age children

## Hypotheses

During a word learning task:

- L2 proficiency and SES will be a significant predictors of the P200 effect, indexing attentional control
- L2 proficiency and SES will be a significant predictors of the N400 effect, indexing semantic processing

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## Methodology

### Participants

- Typically-developing, 10-15 year old children part of larger study
- 23 English/Spanish bilinguals (*Mage*= 12.13, *SD*= 1.50)
- Language proficiency measured via parent report on 1 (low) to 5 (high) scale (*Mrating*=4.22, *SD*= .89)
- Maternal education (scale from 1 to 6) used as a proxy for SES (*IQR* = 2)

### Word Learning Task

- Children read groups of 3 sentences introducing each nonsense word
- 2 conditions (50/condition):
  - Meaning Condition - sentence triplets supported nonsense word meaning
  - No Meaning Condition - sentence triplets did not support meaning

Sentence Order	Meaning Condition Example
1	The bird pooped on my <i>shap</i> .
2	My brother let me borrow his <i>shap</i> .
3	I like to drive my <i>shap</i> .
Test question	What does <i>shap</i> mean?

- P200 amplitude (100-300msec)
  - Frontal and central electrodes<sup>5</sup>
- N400 amplitude (300-500msec)
  - Frontal and central electrodes<sup>6</sup>
- Learning Effects (Difference ERP waves)
  - Sentence 3 - Sentence 1
- Epochs from incorrect responses on task were excluded
- Linear mixed model for each component
  - Fixed effects: L2 proficiency, SES, and condition
  - Random effects: Subjects
  - Interactions: condition\*L2 proficiency and condition\*SES

## Results

### Accuracy

Greater accuracy in the No Meaning (*M* = 76.3%, *SD* = 15.3%) versus Meaning (*M* = 62.0%, *SD* = 16.2%) condition,  $t(44)=-3.10$ ,  $p=.004$

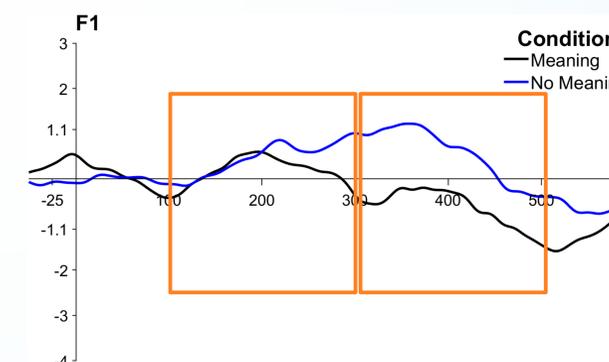
### P200

No significant main effects ( $p>.05$ )  
No significant interactions ( $p>.05$ )

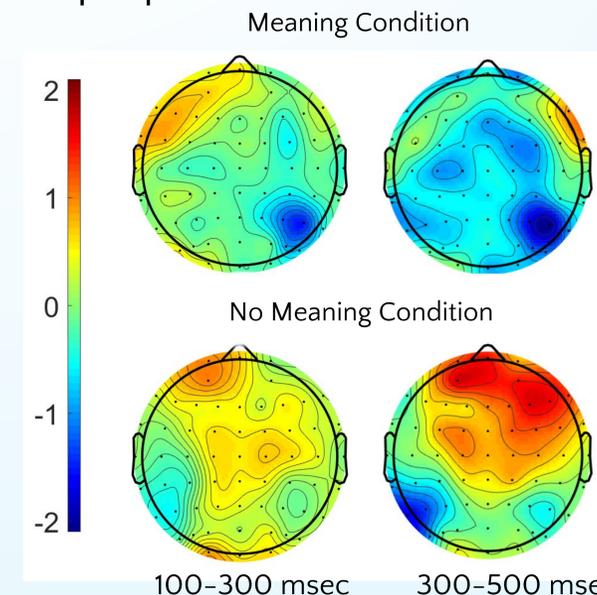
### N400

No significant main effects ( $p>.05$ )  
No significant interactions ( $p>.05$ )

### EEG Difference Waveform (Learning Effect):



### Scalp Maps



## Findings

### Accuracy

**Findings:** Condition had a effect on behavioral accuracy

### P200

**Findings:** Did not find learning effect of L2 proficiency or SES on word learning linked to attention

### N400

**Findings:** Did not find learning effect of L2 proficiency or SES on word learning linked to semantic processing

## Conclusion

**Implications:** No evidence of influence of L2 language proficiency or SES on word learning in bilingual school-aged children

- Larger sample size needed in future studies
- Examining various factors associated with word learning obtain greater insight into the developing mind adapts to different types of early language environments

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