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[1]
  - Bilingual infants show enhanced attentional control during novel word learning compared to monolingual infants[2]
- Bilingual adults engage in deeper semantic processing during word learning compared to monolingual adults[3]
- Influence of bilingualism and SES on vocabulary size in children[4]
- 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:

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

Acknowledgements

- Dr. Alyson D. Abel and members of the Language Learning Lab at San Diego State University
- Dr. Mandy Maguire and the members of the Developmental Neurolinguistics Lab at UT Dallas
- Faculty and Staff of the Joint Doctoral Program in Language and Communicative Disorders
- National Institutes of Health award 2T32DC007361-11A1
- National Science Foundation BCS-1551770

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 (*M*rating=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 *shap*.
2	My brother let me borrow his *shap*.
3	I like to drive my *shap*.
Test question	What does *shap* mean?

Electroencephalography (EEG)

- P200 amplitude (100-300msec)
  - Frontal and central electrodes[5]
- N400 amplitude (300-500msec)
  - Frontal and central electrodes[6]
- 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, $t(44)=-3.10$, $p=.004$

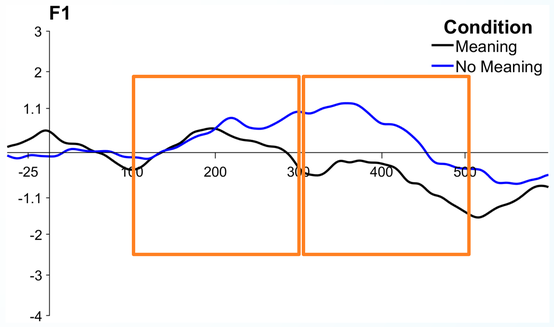
P200

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

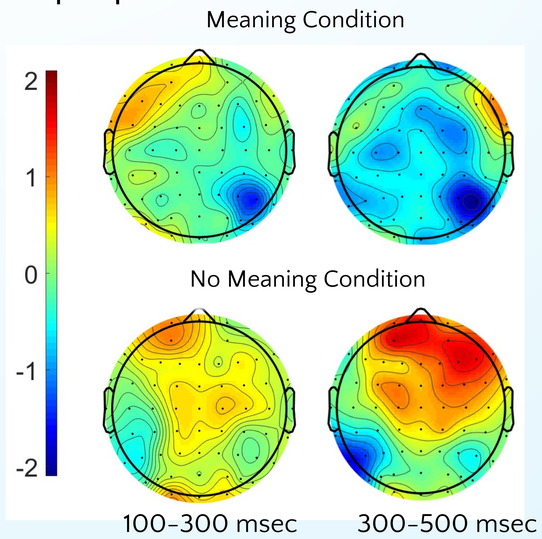
N400

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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