

The Neural Underpinnings of Word Learning from Context in School-aged Children

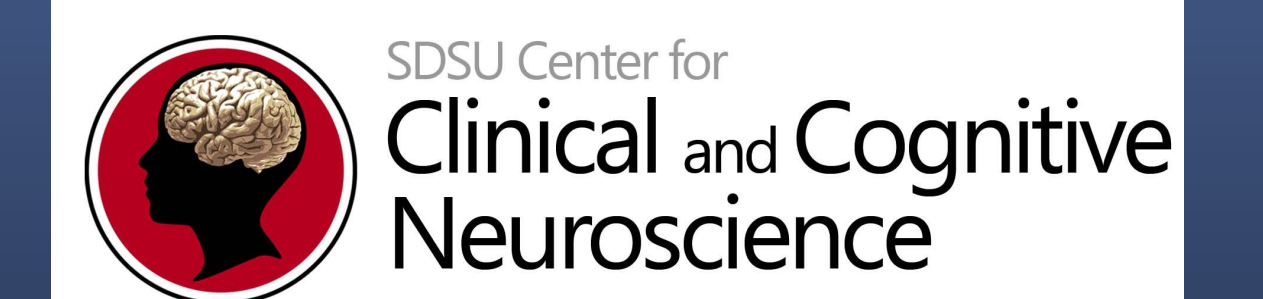
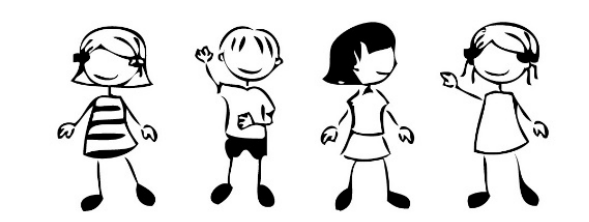
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INTRODUCTION

- School-age children typically acquire vocabulary by using surrounding linguistic information to infer a word's meaning, or *word learning from context*
- Past research has primarily focused on word learning from written contexts, although school-aged children learn more new vocabulary through auditory contexts than written contexts¹
- Past research has also used behavioral measures, which assess the final stage of learning² but do not uncover subtle but important differences in the word learning process
- Event Related Potentials (ERPs) offer a way to index incremental changes in processing without requiring overt behavioral responses
- The N400 ERP component is considered an index of lexical processing and has been shown to be sensitive to word learning in adults^{3,4} and word learning in written contexts in adolescents⁵

PURPOSE

Examine school-aged children's word learning abilities from auditory context using behavioral and ERP measures

METHODS

PARTICIPANTS

- 13 children: 7 males, 6 females, $M_{AGE} = 11;5$, Range = 10-13
- Typically-developing, right-handed, monolingual English speakers with no significant neurological issues and no history of learning or reading difficulties

EEG

- NeuroScan 64-electrode cap EEG System
- EEG data segmented into epochs 500 msec before to 1000 msec after the target word
- Mean amplitude of baseline (-100 msec – 0 msec) subtracted from each time point
- Data averaged across trials to create ERPs

STUDY DESIGN

- 2 Condition (Meaning, No meaning) x 2 Sentence (1,3) ANOVA

STIMULI AND PROCEDURE

WORD LEARNING FROM CONTEXT TASK

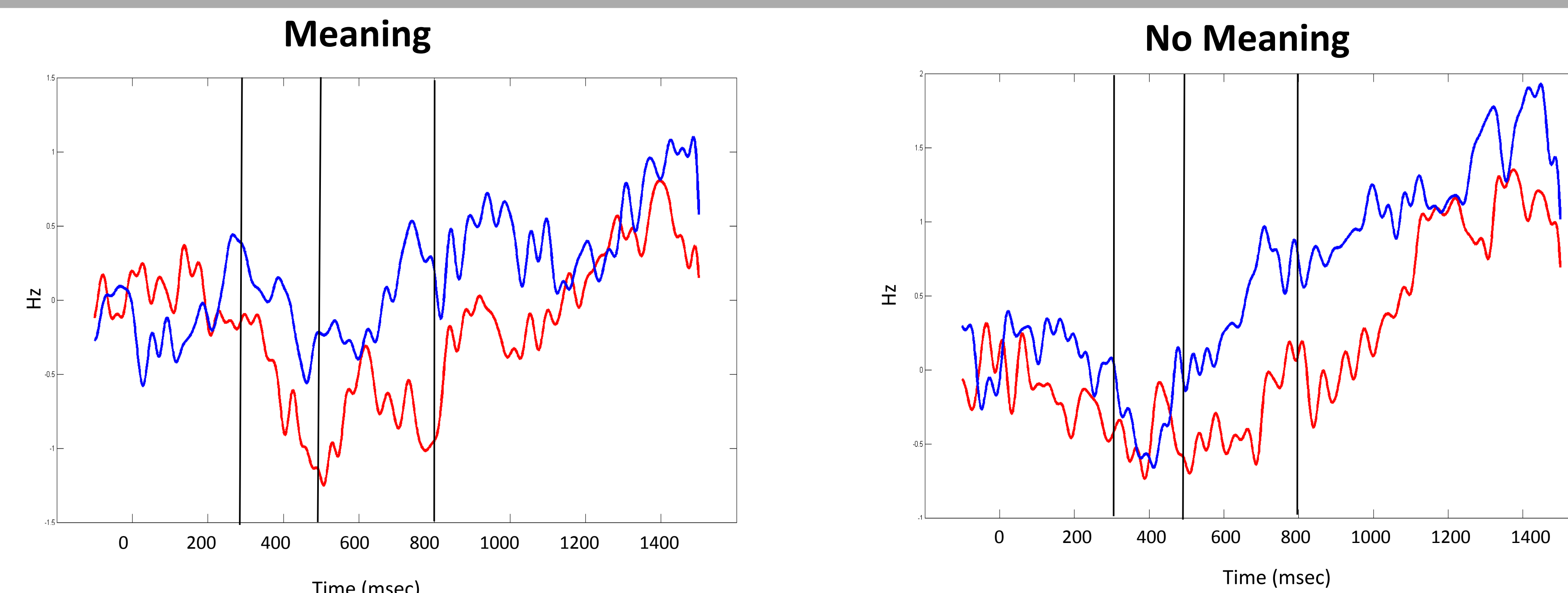
- Sentences 6-9 words in length organized into sets of triplets
- Target novel word in the sentence-final position
- Sentences presented as auditory stimuli
- Test questions (after each triplet):
 - Is there a meaning for the novel word?
 - If so, what is it?

Conditions (50 Triplets Each)	Sentence #	Example triplet (novel word in italics)
Meaning Sentence triplet supports the novel word's meaning	1	The two boys fought over the <i>shap</i> .
	2	They played catch with the <i>shap</i> .
	3	In gym class, I like to throw the <i>shap</i> .
No Meaning Sentence triplet does not provide support for learning the novel word's meaning	1	He was cold because he forgot his <i>gime</i> .
	2	My cat is afraid of my <i>gime</i> .
	3	She took a nap on the <i>gime</i> .

RESULTS: BEHAVIORAL

Meaning: $M=80.5\%$ ($SD=8$), No Meaning: $M=84.2\%$ ($SD=12$)

RESULTS: EEG



Electrode: FZ

Sentence 1 Sentence 3

DATA ANALYSIS

- 2 Condition (Meaning, No Meaning) x 2 Sentence (1,3) ANOVA

Time window 1: 300-500 msec

Interaction: $F(1,12) = 0.47, p=0.5$

Condition: $F(1,12) = 0.01, p=0.91$

Sentence: $F(1,12) = .99, p=0.34$

Time window 2: 500-800 msec

Interaction: $F(1,12) = 0.0005, p=0.98$

Condition*: $F(1,12) = 5.4, p=0.04$

Sentence: $F(1,12) = 4.13, p=0.07$

FINDINGS

BEHAVIORAL

- Participants were successful at learning words from auditory context

EEG

- Two effects: classic N400 (300-500 msec) and a later (500-800 msec) occurring frontal negativity
- Meaning condition: both the N400 and late effect apparent, only late effect statistically significant
- No Meaning condition: only the late effect apparent, not statistically significant

DISCUSSION

- Classic N400: Reflects the ability of the participant to assign a meaning to the novel word
- Late effect: The later negative wave may be a perceptual response to novel stimuli, rather than an indication of lexical processing⁶
- This study is an essential first step to determine how school-age children learn new words presented in naturally-paced speech

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