

# Word Learning From Context in School-Aged Children with SLI: An EEG Study

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## INTRODUCTION

- Word learning from context
- Using surrounding linguistic information to infer a word's meaning<sup>1</sup>
- Primary means by which school-age children acquire vocabulary<sup>2</sup>
- Existing research uses behavioral measures, which assess the final stage of learning but not the *process* of word learning process<sup>3,4</sup>
- Event Related Potentials (ERPs)
- Offer way to index incremental changes in processing without overt behavioral responses
- N400 - index of lexical processing; has been shown to be sensitive to word learning in children and adults<sup>5,6</sup>

## PURPOSE

Combine behavioral and ERP measures to examine the processes underlying word learning from context in school-aged children with SLI

## METHODS

### PARTICIPANTS

- 14 children average age= 9;4
- 7 children with SLI
- 7 typical language (TL) age-equivalent peers
- Inclusion criteria: Right-handed, monolingual English, no significant neurological issues, normal nonverbal cognition

### PROTOCOL

- Behavioral assessment battery
  - Wechsler Intelligence Scale for Children-5<sup>th</sup> edition (WISC)<sup>7</sup>
  - Clinical Evaluation of Language Fundamentals-4<sup>th</sup> edition (CELF)<sup>8</sup>
  - Peabody Picture Vocabulary Test-4<sup>th</sup> edition (PPVT)<sup>9</sup>
  - Expressive Vocabulary Test-2<sup>nd</sup> edition (EVT)<sup>10</sup>
  - Nonword repetition Task (NRT)<sup>11</sup>
- Word learning from context task

**Table 1.** Behavioral assessment battery; Mean (SD)

	WISC	CELF*	PPVT**	EVT**	NRT*
SLI	98.0 (8.5)	75.0 (11.9)	91.14 (5.24)	98.0 (7.9)	81.88% (10.4)
TL	101.57 (6.6)	111.43 (10.9)	107.57 (6.1)	107.14 (9.4)	94.71% (1.6)

\* p<0.01, \*\* p<0.001

## WHAT IS SPECIFIC LANGUAGE IMPAIRMENT (SLI)?

- The most prevalent neurodevelopmental language disorder in children, affecting 7% of children<sup>12</sup>
- Characterized by language deficits without other concomitant diagnoses
- Affects ability to comprehend and produce language, including vocabulary and word learning

## WORD LEARNING TASK STIMULI AND PROCEDURE

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

**Table 2.** Word learning task example stimuli

Conditions (50 Triplets Each)	Sentence #	Example triplet (novel word in italics)
<b>Meaning</b> 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> .
<b>No Meaning</b> 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

**Table 3.** Accuracy on word learning task, M (SD)

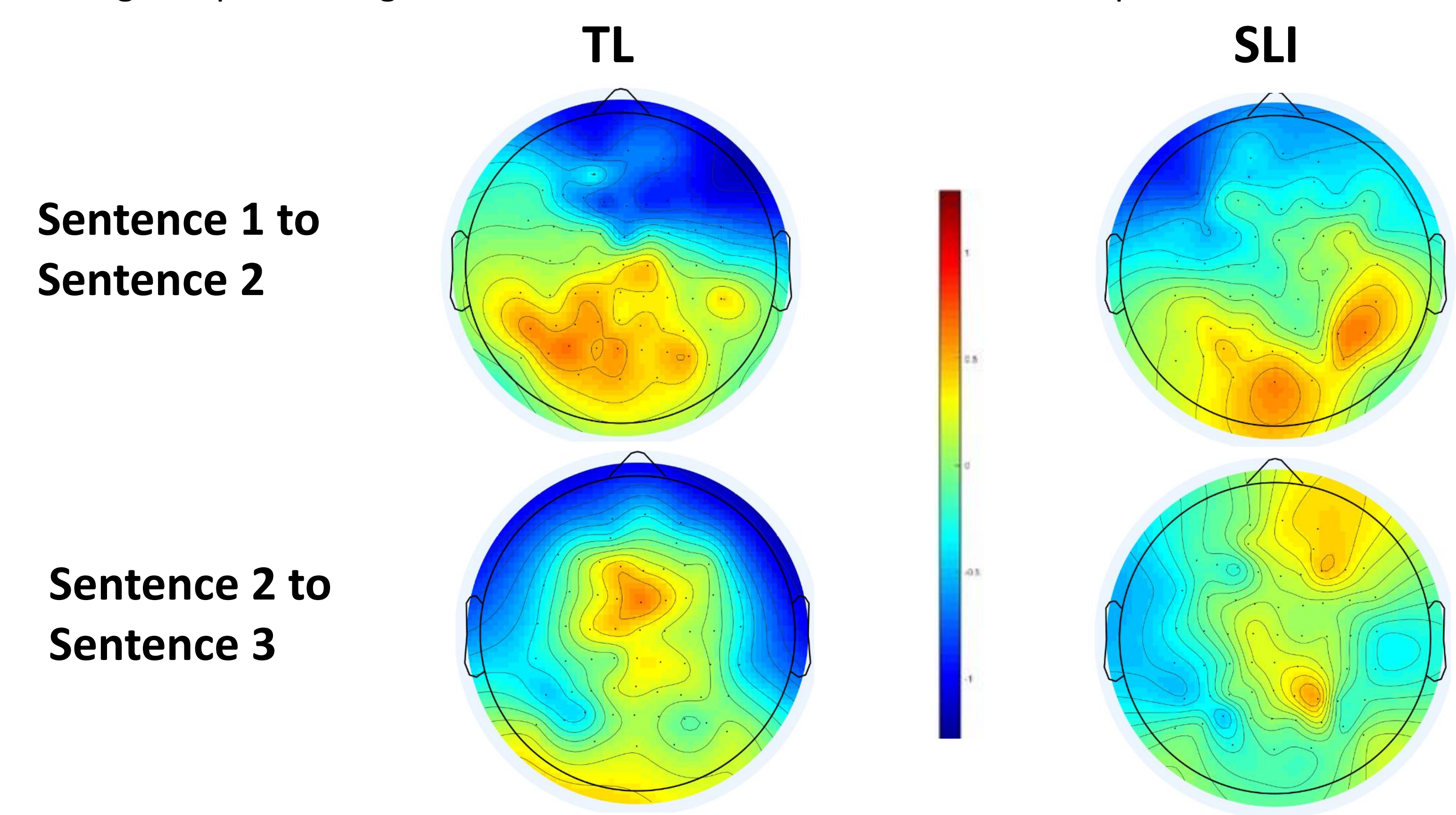
	Meaning *	No Meaning <sup>n.s.</sup>
SLI	49.7 (19.9)	62.9 (30.5)
TL	73.4 (4.5)	78 (12.9)

\* p<0.01

**Table 4.** Individual differences in word learning

Outcome	Predictors
<b>Behavioral word learning</b>	EVT R <sup>2</sup> =0.56, p<0.05
	CELF R <sup>2</sup> =0.48, p<0.05
<b>EEG learning effect</b>	PPVT R <sup>2</sup> =0.34, p<0.05
	EVT R <sup>2</sup> =0.24, p=0.07

**Figure 1.** ERP voltage maps showing differences between sentences 300-600ms post-novel word onset, Meaning condition



## FINDINGS

### GROUP FINDINGS

- Behavioral word learning:
  - Children with SLI learned fewer words compared to TL controls
- EEG learning effects:
  - N400 amplitude increase across sentences with contextual support for word learning
  - Learning effect for both groups in centro-parietal sites
  - Less learning effect from sentence 2 to sentence 3 for children with SLI
    - Suggests decreased semantic processing during word learning in children with SLI compared to TL peers

### INDIVIDUAL DIFFERENCES

- Expressive vocabulary and overall language ability predictors of behavioral word learning accuracy
- Receptive and expressive vocabulary predictors of EEG learning effect

## DISCUSSION

- Children with SLI show deficits in word learning from context
- Decreased semantic processing during word learning in the SLI group compared to the TL group.
- Vocabulary knowledge best predicts the engagement of semantic processing during word learning
- Lower vocabulary abilities and atypical engagement of semantic processing in SLI negatively affects word learning ability
- Clinicians should allow for more exposures to a new vocabulary word or concept for children with SLI before expecting the word changing from known to unknown.

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