



Western

Differentiating Linguistic and Working Memory Demands on Children's Grammaticality Judgments

Nicolette Noonan¹, Sean Redmond², Lisa Archibald³,

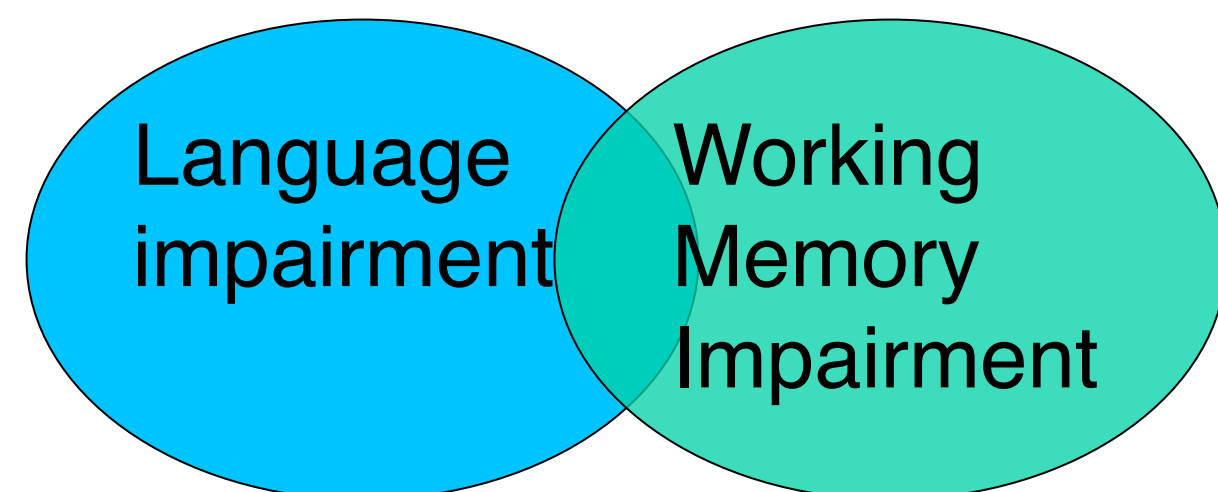
¹Faculty of Health and Rehabilitation Sciences, Western University; ²Department of Communication Sciences & Disorders, University of Utah,

³School of Communication Sciences and Disorder, Western University

nnoonan3@uwo.ca, larchiba@uwo.ca

Introduction

- Developmental impairments in language (LI) and working memory (WMI) have been found to be dissociable (Archibald & Joanisse, 2009).



Specific Learning Impairment (SLI)

- Developmental delay in language learning, despite otherwise typical abilities (Leonard, 1998).
- One hallmark: Difficulties with grammatical structure of language, including tense marking and finite verb morphology (Leonard, 1998)

Working memory

- The ability to store and process information being held in the current focus of attention (Baddeley, 2003).
- Children impaired in this domain may have difficulties storing verbal information in sentence processing when task demands are high (Casasanto et al., 2010)

Grammaticality Judgment

- Participants are required to judge the grammatical well-formedness of stimuli sentences (Miller et al., 2008)
- Not picture-based so allows for distinctions between structures found to be impaired in SLI. For example,
 - He felled* vs. He falls
 - She is jumping vs. She is jump*

Purpose of the Study

- To explore the influence existing language knowledge and working memory in sentence processing by systematically examining the performance of children with deficits in the language only, or both language and working memory
- Predictions:
 - LI will impair sentence processing overall
 - WMI will impair sentence processing under high memory load

Methods

Participants

- School-aged children (6 to 9 years)
- Standardized tests of language (CELF-IV), working memory (AWMA), nonverbal intelligence (WASI)
- Database of 378 (Archibald et al., submitted)

Groups:

- SLI (n=68): <86 on CELF-IV, >86 working memory composite
- LI/WMI (n=18): <86 on CELF-IV and working memory composite

- Separate control groups drawn from database matched on age and nonverbal IQ

	SLI (n = 68)	SLI-Matched TD (n = 68)	LI/WMI (n = 18)	LI/WMI-Matched TD (n = 18)
Age (months)	95.7 (16.0)	95.3 (13.9)	90.7 (25.8)	90.2 (25.8)
Nonverbal IQ	93.5 (10.3)	97.6 (12.8)	89.1 (10.6)	93.6 (7.6)
Language	78.1* (7.1)	104.9 (10.1)	71.6* (7.6)	109.8 (5.4)
Working Memory	99.1 (7.1)	101.12 (9.4)	79.7* (5.3)	106.6 (10.5)

Grammaticality Judgment Task

- The child was asked to decide if an auditorily-presented sentence sounded correct or incorrect

- Consisted of 24 sentences, length $M=10.95$ words

- 12 sentences were grammatically correct

“You must stir the gravy so it doesn’t become too lumpy.”

- 12 sentences were grammatically incorrect

“Joan bikes and skate in the park every day after school.”

- Working memory processing load was imposed by manipulating grammatical marker position

- 12 sentences contained an early marker

- 3rd-4th word = low working memory load

“The girls are sit on the bench and giggling to each other.”

- 12 sentences contained a late marker

- 7th-9th word = high working memory load

“Chris and George will learn to carved a pumpkin for Halloween.”

- Scores were adjusted using an A' sensitivity score to correct for chance responding, a ratio that takes into account correct and false positive answers

1.00 = perfect accuracy, preference for grammaticality

0.50 = chance responding, indiscriminate preference

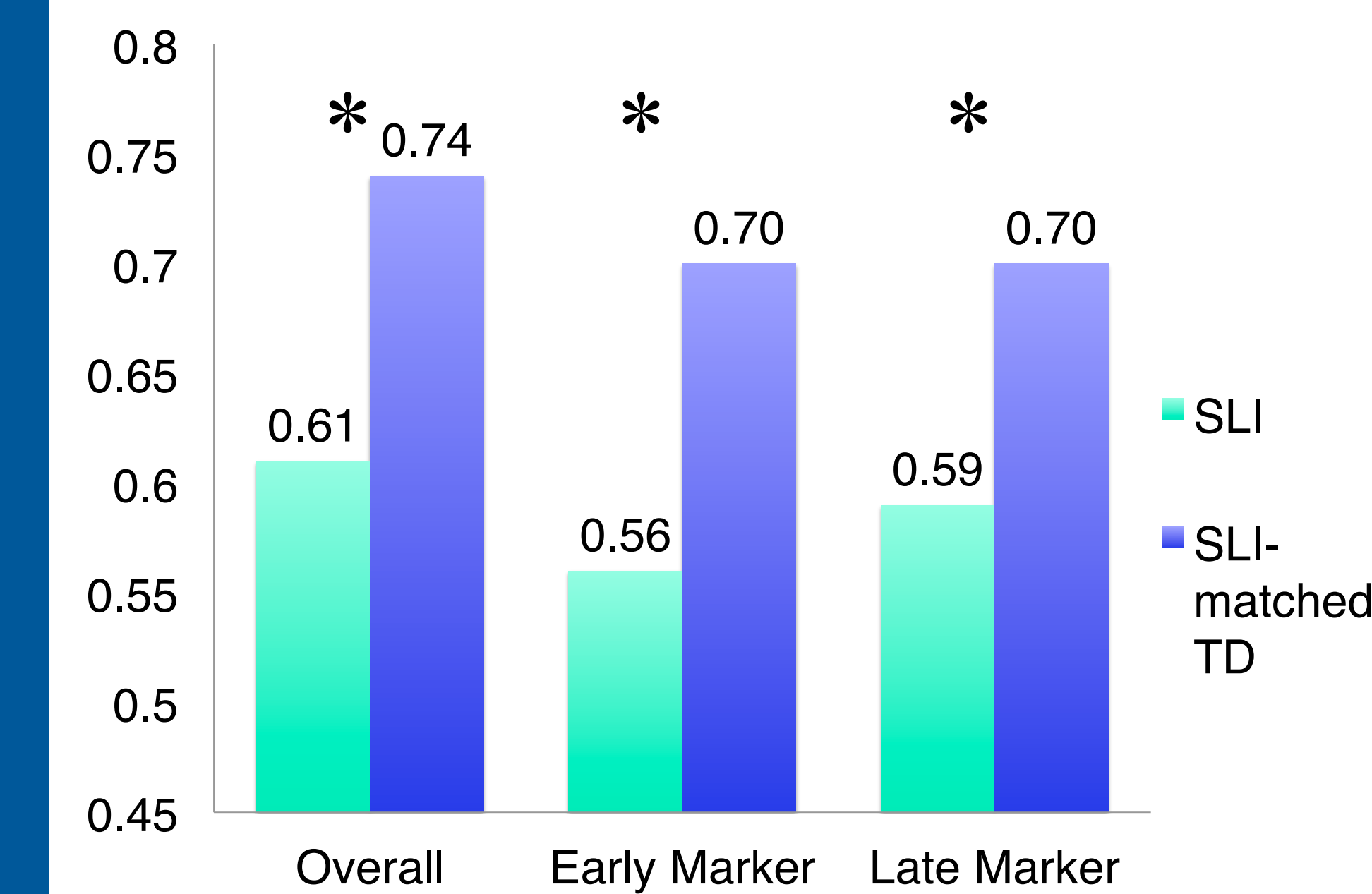
< 0.05 = preference for ungrammaticality

Results

Data Analysis

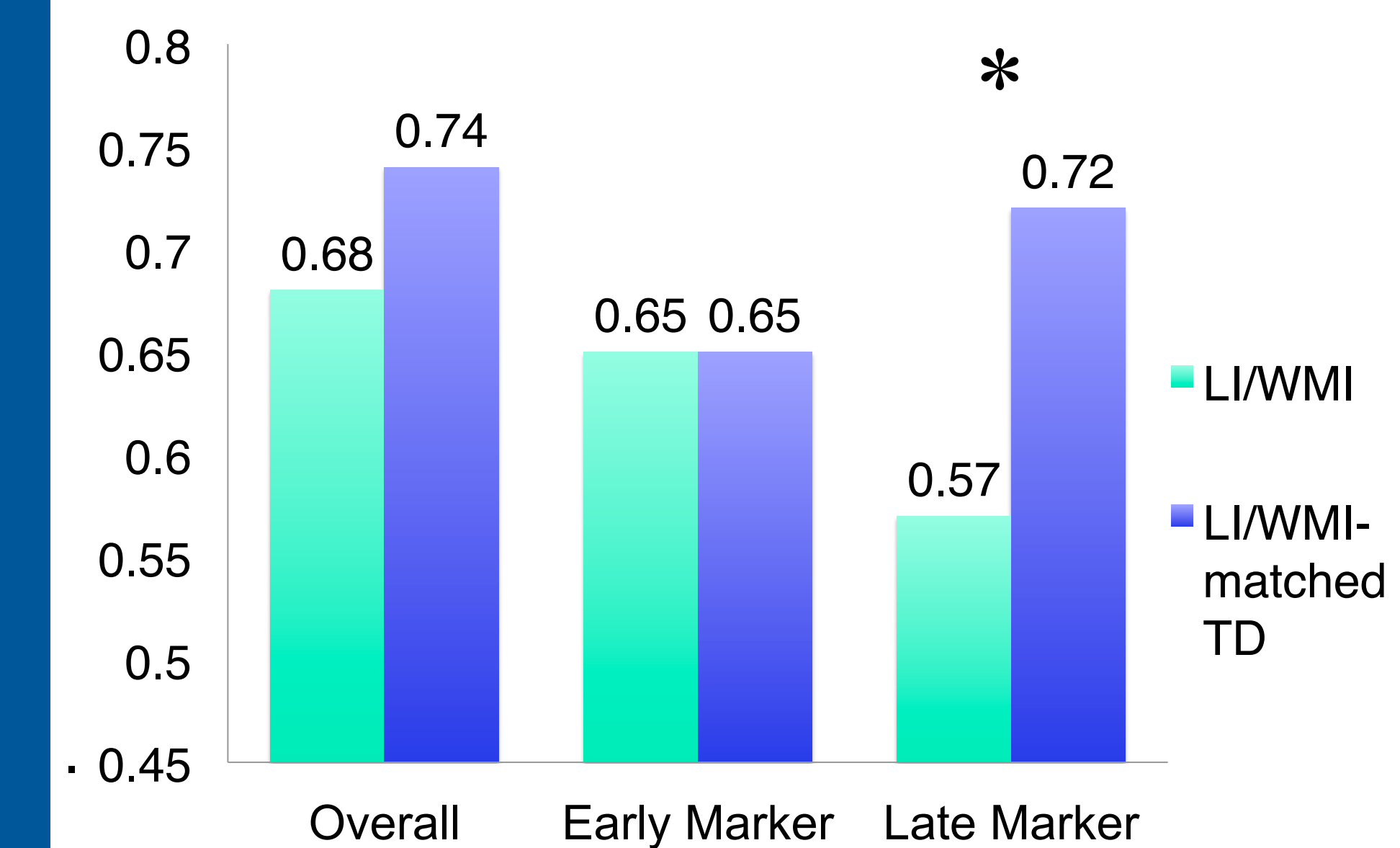
- The performance of each impairment group (SLI and LI/WMI groups) and corresponding matched control groups on early and late marker sentences was compared in separate ANOVAs.

Comparing Performance across SLI and SLI-matched TD Group



Children with SLI showed a lower preference for grammaticality than age-matched peers, regardless of error marker position

Comparing Performance across LI/WMI and LI/WMI-matched TD Groups



Children with LI/WMI were impaired only on late-marker sentences.

Conclusions

- There are distinct and dissociable impacts of working memory and linguistic skills on language learning
- SLI resulted in poorer sentence judgments regardless of memory load
- LI/WMI had poorer performance only on longer sentences with increased memory load
- The LI in children with or without working memory impairment may be qualitatively different

References

Archibald et al., (submitted), *JLD*; Archibald & Joanisse (2009) *JSLHR*, 52, 899-914; Baddeley (2003), *Journal of Communication Disorders*, 36, 189-208; Bishop (2001), *Philosophical Transactions of the Royal Society: Biological Sciences*, 365(1407), 369-380; Casasanto et al. (2010), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*; Leonard (1998), Cambridge, MA: MIT Press; Miller et al., (2008), *International Journal of Language and Communication Disorders*, 43, 346-360