

Do Orthographic Skills Predict Word Learning When Text is Not Present?

Taylor Bryant ¹, Dawna Duff ², Bethany Bell ³, & Suzanne Adlof ¹

¹ University of South Carolina, ² Binghamton University, ³ University of Virginia

Background

- **Orthographic facilitation:** Word learning is supported when we present the written word form of a target word with the spoken form (Ricketts et al., 2021; Baron et al., 2018, Ehri, 2014).
- **Orthographic skeletons:** Literate children create **expectations for spellings** of newly presented **spoken words**, even when text is not present (Wegener et al., 2018; Wegener et al., 2020; Beyersmann et al., 2021; Jectovic et al., 2022).

Purpose

How does orthographic skill, as measured by word-reading ability, contribute to spoken word learning when orthography is not presented during the word learning instruction? In this study, we consider orthography in the context of other known predictors of spoken word learning ability, including phonological memory, vocabulary knowledge, general language ability, and nonverbal cognition.

Participants

- 335 2nd-grade children (age 7:3-9:4)
- Recruited over 3 academic years via group-administered, in-school screenings of language and reading ability.
- Although most children in this sample are typically developing, children with developmental language disorder (DLD) and/or dyslexia (DYS) are over-represented relative to the normal population.

Demographics

Race	Percent	Ethnicity	Percent
American Indian	0.3%	Hispanic/Latinx	1.2%
Black/African American	32.5%	Not Hispanic /Latinx	44.3%
Multiple Races	0.9%	Unreported	36.2%
Native Hawaiian /Pacific Islander	0.3%		
		Gender	Percent
Other	2.1%	Female	52.3%
Unreported	6.3%	Male	44.3%
White	57.2%	Unreported	3.3%

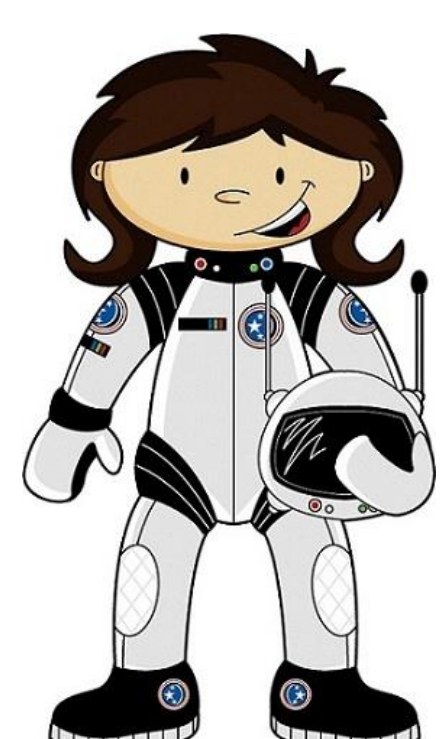
Method

Word Instruction

Participants were asked to help an astronaut study for her "astronaut test." They were:

- Trained on 8 novel pseudowords (23 exposures each)
- Given spaced retrieval opportunities through instances for children to say and point to a given word
- Presented with feedback on naming and pointing practice prior to the start of testing

After the training phase concluded, it was immediately followed by a post-test in which the astronaut asked for help one more time. They then were administered 5 experimental tasks to assess their semantic and phonological knowledge and recall and recognition of each word.

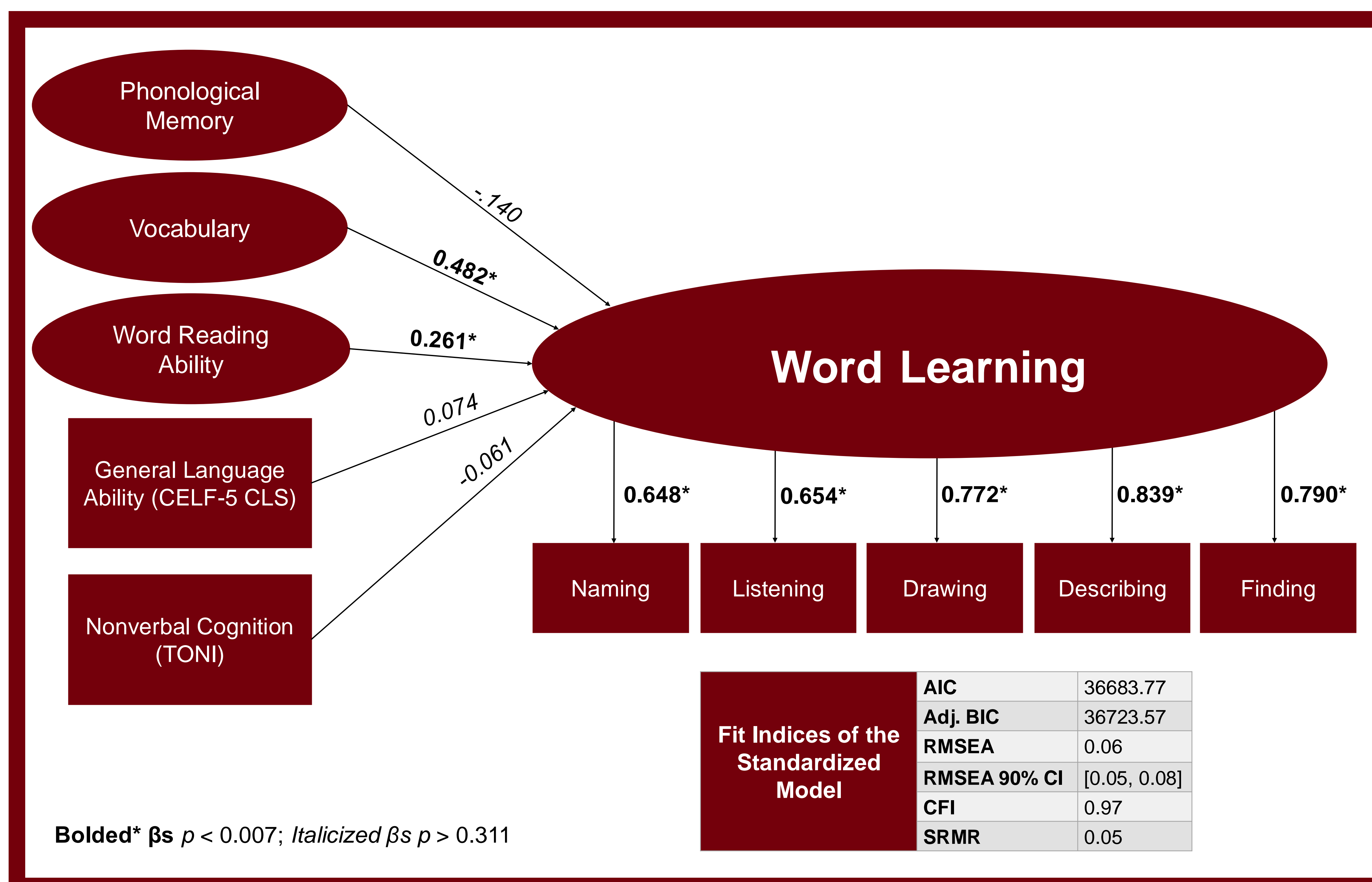


Method, Ctd.

Testing Tasks				
Task 1	Task 2	Task 3	Task 4	Task 5
Phonological Recall (Naming)	Phonological Recognition (Listening)	Nonverbal Semantic Recall (Drawing)	Verbal Semantic Recall (Describing)	Semantic Recognition (Finding)
What's this called?	Listen for the correct word.	I will say a word, then you draw a picture of it. /tɛpɪk/.	Tell me everything you know about a /tɛpɪk/.	Find the /tɛpɪk/.

Data Analysis & Results

- **Confirmatory factor analyses** were run to test three theoretical models of word learning, including (1) a single factor model, and two bifactor models with factors for (2) phonology vs. semantic learning, and (3) recall vs. recognition assessments. Model fit indices were similar and acceptable for all three models. A preference for parsimony and smaller AIC and BIC led us to select the single factor model (RMSEA = 0.000, 90% CI [0.00,0.00], CFI = 1.00, SRMR = 0.01, AIC = 14328.25, Adjusted BIC = 14337.46).
- **Structural equation modeling** was used to examine the relation between measures of phonological processing, vocabulary, word reading ability, general language ability, and nonverbal cognition. The final model explained 36.5% of the variance in word learning.



Standardized Coefficients for Indicators of Latent Factors		
Factor	Indicator	β
Phonological Memory	CTOPP-2 Memory for Digits	0.543*
	CTOPP-2 Nonword Repetition	0.696*
Vocabulary	EVT-3	0.932*
	PPVT-4	0.829*
Reading Ability	WRMT-3 Word Identification	0.969*
	WRMT-3 Word Attack	0.830*
	TOWRE-2 Sight Word Efficiency	0.725*
	TOWRE-2 Phonemic Decoding Efficiency	0.796*

Correlations between Predictors					
	Phonological Memory	Vocabulary	Reading Ability	General Language Ability	Nonverbal Cognition
Phonological Memory	-				
Vocabulary	0.636*	-			
Reading Ability	0.659*	0.573*	-		
General Language Ability	0.778*	0.813*	0.553*	-	
Nonverbal Cognition	0.409*	0.482*	0.413*	0.479*	-

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Discussion

- **Orthographic skill as measured by word and nonword reading tests is an important, unique predictor of spoken word learning in response to explicit instruction in second-grade students (age 7;3-9;4 years).**
- Consistent with other research, existing vocabulary knowledge also uniquely predicted word learning (Maguire et al., 2018; Samuelson, 2021).
- However, with word reading included in the model, other predictors commonly identified in past studies were not significant, including phonological memory, general language ability, and nonverbal cognition (cf. Gathercole et al., 1997; Jackson et al., 2019).
- The word learning factor includes assessments of both phonological and semantic learning, assessed by recall and recognition tasks. Thus, orthographic skills seem to influence not only word-form learning but also the acquisition of form + meaning associations.
- Building on results of past studies of orthographic skeletons, one interpretation of our results is that having stronger orthographic skills enables children to build a more specific representation of a new word form, even when that word is only presented in the spoken modality.
- Another interpretation is that children with better word reading skills and better vocabulary knowledge have likely been exposed to more words, which would support the formation and refinement of an internal schema for learning new vocabulary.
- Our word learning instruction was explicit, with repeated exposures and spaced retrieval practice opportunities. Future studies should examine whether the same findings hold for other types of word learning. For example, implicit word learning may depend more on general language abilities.
- Our stimuli were concrete, imageable nouns although the verbal definitions included both pictured and non-picturable information. Future studies should examine whether the same findings hold for abstract words and other parts of speech. These may also depend more on general language abilities.

