Examining the Contributions of Reading Skill and Semantic Knowledge as Predictors of Lexical Quality: Insights from Item-Level Spelling Variance in Skilled Adult Readers

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INTRODUCTION

- The Lexical Quality Hypothesis proposes that readers have a range of low- to high-quality items stored in their mental lexicon, with the quality varying across individuals and words (Perfetti, 1992, 2017; Perfetti & Hart, 2001, 2002).
- A high-quality word representation includes interconnected information about its spelling, pronunciation, and meaning, which allows for effortless and consistent retrieval, affecting overall reading skill.
- The likelihood of a word being represented with high quality depends on factors at the person- and word-levels. Person-level features refer to skills directly measured in the participants in the study (e.g., decoding skill, print exposure).
- Word-level characteristics refer to properties of the specific words in our study (e.g., frequency, length). Spelling accuracy was used to index the lexical quality of words and evaluate these predictions.

PURPOSE

- This study aimed to identify variability in spelling performance attributable to individual differences in person- and word-level knowledge.
- Modeling individual differences in factors that influence spelling performance has the potential to provide new insights into the relationships between person-level skills and word features that affect skilled adult readers' abilities to form high-quality lexical representations.

RESEACH QUESTIONS

1. What **person-level variables** included in the model will make unique and significant contributions to item-level spelling performance?
2. What **word-level variables** will make unique and significant contributions to item-level variance on spelling performance?

METHOD

Participants:

- ***N* = 48** university students (ages 18–26)

Analytic Approach:

- Explanatory Item Response Models (EIRM)

Individual-level Variables:

- **Phonemic Decoding Efficiency** (PDE; Torgesen et al., 2012)
- **Set for Variability** (Tunmer and Chapman, 1998, 2012; Steacy et al., 2019)
- **WORDS Vocabulary** (Chen et al., 2024)
- **Working Memory** (WMTB-C Backward Digit Recall; Pickering & Gathercole, 2001)
- **Author Recognition Test** (Stanovich & West, 1989)

Word-level Variables:

- **Length** (Balota et al., 2007)
- **Age of Acquisition** (Kuperman et al., 2012)
- **Frequency** (Balota et al., 2007)
- **Number of Schwas**

RESULTS

Person and Item-Level Correlations

Variable	*M*	*SD*	1	2	3	4	5
1. PDE	52.90	7.68					
2. SFV	32.42	3.10	.08**				
3. WM	27.83	6.37	.05**	.25**			
4. Vocab	16.04	3.50	.12**	.26**	.08**		
5. ART3	20.50	8.27	.12**	.18**	-.03**	.63**	
6. Pretest	12.19	8.50	.33**	.13**	.48**	.17**	.23**

Note. *M* = mean; *SD* = standard deviation; PDE = Phonemic decoding efficiency; SFV = Set for variability; WM = Working memory; Vocab = Vocabulary; ART3 = Author recognition test; Pretest = Target spelling pretest. *p < .05; **p < .01.

Word and Item-Level Correlations

Variable	*M*	*SD*	1	2	3	4
1. Length	9.93	1.50				
2. Frequency	5.40	1.54	.29*			
3. Schwas	1.28	0.66	.29*	.12		
4. AoA	12.50	2.01	-.26	-.25	-.25	
5. Pretest	12.19	8.50	.23	.32*	.23**	-.22

Note. *M* = mean; *SD* = standard deviation; Schwas = Number of schwas; AoA = Age of acquisition; Pretest = Target spelling pretest. *p < .05; **p < .01.

RESULTS CONTINUED

Results from the Main Effects Model

Variable	Logit	z-value	p-value
Intercept	-1.802	-8.57	<.001***
Person-Level			
Phonemic Decoding	.045	2.55	.010
Set for Variability	.002	0.044	.965
Vocabulary	-.009	-0.184	.854
Print Exposure	.030	1.442	.149
Working Memory	.085	3.799	<.001***
Word-Level			
Length	.104	0.832	0.406
Number of Schwas	.322	1.187	0.235
Frequency	.192	1.639	0.101
Age of Acquisition	-.057	-0.637	0.524

lexical quality across participants

Minuscule
Miniscule, Minisquel, Minisquele

Camaraderie
Comcaraderie, Comradery, Comradere

Mischievous
Mischivious, Mischevious, Mischeifes

Surreptitious
Seruptitious, Siruptious, Suruptisous

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CONCLUSIONS

- Consistent with the Lexical Quality Hypothesis, these preliminary results add to the literature that suggest that forming high-quality lexical representations of a given word depends on an intricate combination of person characteristics, including decoding skill and working memory
- The main effects model explained 41.58% person-level and 17.08% word-level variance
- Results indicate that word-level predictors were not consistent with our hypotheses, as no word level variables were significant predictors for our words selected.
- Given that the mean average of pretest performance was 12.19 (SD = 8.50) words correct out of 54 words total, we would expect to see greater variability if mean performance was higher.
- The words administered reflect a sample of some of the most difficult English words, as the average person spelling the average word in our study had a 14% likihood of spelling a word correctly.
- We observed a wide range of spelling accuracy across words and a diverse set of spelling errors for a given word across individuals (i.e., piorrette, peroet, perioette, piruette), which is consistent with previous literature (Rigobon et al., 2024).

LIMITATIONS & FUTURE DIRECTIONS

- High-quality lexical representations develop through repeated exposure, but because infrequent words are not commonly encountered, potentially affecting pretest performance and the effectiveness of spelling strategies.
- Future research should examine spelling errors across individuals by adding in a familiarity variable to account for item-specific knowledge.
- Rigobon et al. 2024 accounted for a significant 1.07 item-level variance and .05 person-level variance in their model when familiarity was considered.

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