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 (i.e., words) stored in their mental lexicon, with the quality (i.e., strength) 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 itemlevel variance on spelling performance?

METHOD

Participants:

• N = 48 university students (ages 18–26)

Analytic Approach:

• Explanatory Item Response Models (EIRM)

Person-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 | М | 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** |

Word and Item-Level Correlations

| Variable | М | 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 | |

Note. M = mean; *SD* = standard deviation; Schwas = Number of schwas; AoA = Age of a Popetreiston; Pretest =112ar/get spe3li50 pretest23p < .05; **3p2* .01. .23** -.22

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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, greater variability would be expected if the mean were higher

• The words administered represent a sample of some of the most difficult English words, as the average person spelling the average word in our study had a 14% likelihood 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 to print. Since the words we selected are infrequent and difficult to spell, pretest performance reflects this selection criterion.

• Future research should examine spelling errors at the item-level across individuals (Treiman et al., 2024)

• Future work should consider adding an item-specific knowledge variable, such as familiarity with each word, as it has shown to account for unique and significant variance in adult's spelling performance (see Rigobon et al., 2024)

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