Readers show trade-offs between print-speech correspondences and semantic imageability in visual word naming

Deanne Tak On Wah[1] (dwah@uwo.ca), Marc Joanisse[1,2]
[1]Department of Psychology, University of Western Ontario, [2]Haskins Laboratories, New Haven CT, USA

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Introduction

- English spelling is quasi-regular: mappings between orthography (O; print) and phonology (P; speech) can be ambiguous
- Vowel pronunciations tend to contain the most ambiguity, though many can be learned via statistical patterns in rime units (context dependent mappings)[1]
- Contemporary reading models propose that words are recognized through joint contribution of analytic (decoding print-to-speech) and holistic (whole-word) processes

Research Questions:

1. What grain size of print-speech information is a reliable reading cue for skilled readers (**vowel surprisal** vs. **context dependent vowel surprisal**)?
2. How does an analytic approach interact with whole-word mechanisms (as indexed by imageability effects)?

OP correspondence is measured using surprisal[2]

Low Vowel Surprisal *(easier to read)* — **High Vowel Surprisal** *(more difficult to read)*

COIN FOIL VOICE ⟵ ⟶ MOTHER DOG TOLD

Low Context Dependent Vowel Surprisal *(easier to read)* — **High Context Dependent Vowel Surprisal** *(more difficult to read)*

COIN JOIN GROIN ⟵ ⟶ PINT MINT LINT

Semantics is measured using imageability[3]

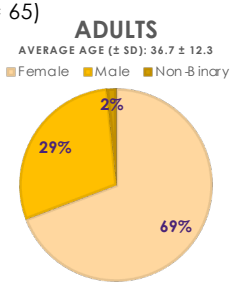
Low Imageability *(more difficult to read)* — **High Imageability** *(easier to read)*

WERE — 1 2 3 4 5 6 7 — CAT

Methods

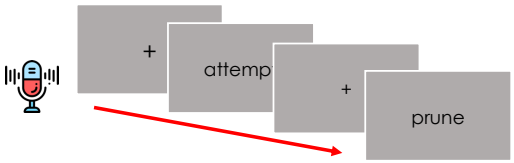
Participants:

- Monolingual English Adults (N = 65)
- Neurologically healthy



Word naming task:

- 300 monosyllabic & disyllabic words that vary along lexical and sub-lexical variables (2 words removed in analyses)
- Measure: log transformed word naming latency



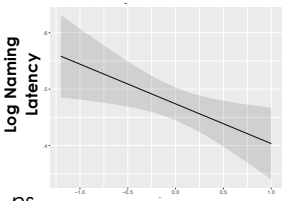
Results

Individual Models:

- Linear mixed effects models of **vowel surprisal**, **context dependent vowel surprisal, imageability** on word naming latency
- For each participant, standardized coefficients indicated degree of reliance on competing mechanisms

Reliance on Reading Routes and Naming Latency:

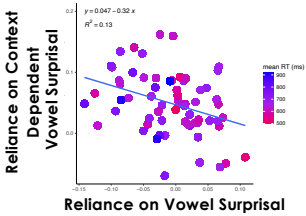
- Greater reliance on vowel surprisal & faster naming latency, $p = .017$
- Imageability & naming latency, *ns*
- Context dependent vowel surprisal & naming latency, *ns*



Results

Comparing Degree of Reliance on Reading Routes:

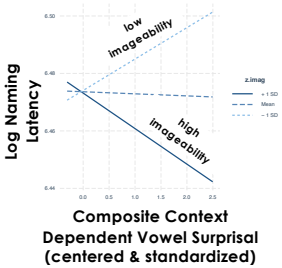
- Tradeoff between vowel surprisal & context dependent vowel surprisal, $p = .004$
- Vowel surprisal & imageability, *ns*
- Context dependent vowel surprisal & imageability, *ns*



Item Analysis – Predictors of Reading in Adults:

Stepwise backwards elimination of linear mixed effects regression predictors:

1. age, $p = .016$
2. word frequency, $p = .025$
3. number of syllables, $p < .001$
4. individual's reliance on vowel surprisal, $p = .031$
5. interaction between word's context dependent vowel surprisal & imageability, $p = .025$



Discussion

- Greater reliance on one-to-one vowel correspondences best accounted for variance in naming time, compared to context-dependent correspondences
- Context-dependent correspondences trade-off with semantic imageability, particularly for low imageability words, suggesting that adults relied more on decoding for these words

References

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3. Cortese, M. J., & Fugett, A. (2004). Imageability ratings for 3,000 monosyllabic words. *Behavior Research Methods, Instruments, & Computers, 36*(3), 384–387. https://doi.org/10.3758/BF03195585