Investigating the Word Frequency Effect (WFE) after controlling Age-of-Acquisition (AoA)

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INTRODUCTION

The current study is the first stage of a multi-study project that explores the word frequency effect (WFE) after controlling Age-of-Acquisition (AoA). WFE and AoA are two well-documented predictors of word recognition latencies.

We examined the size of WFE in lexical decision task and word naming task after controlling AoA and a number of other relevant lexical variables. We achieved this by extracting data from the English Lexicon Project (ELP), a database containing behavioral and descriptive data for 40,481 words, and conducting quantitative analysis using SPSS.

BACKGROUND

Studies exploring WFE have demonstrated that high frequency words (i.e. words more common in text or speech) are processed faster than low frequency words (see Brysbaert, Mandera, & Keuleers, 2018 for a review). Studies investigating AoA have shown that words acquired earlier in life (e.g. water, snack) are processed faster than words acquired later in life (e.g. burial, judge). Please see Juhasz, 2005 for a review. The current study integrates the two lines of research by exploring how much of the WFE is accounted for by AoA.

METHODS

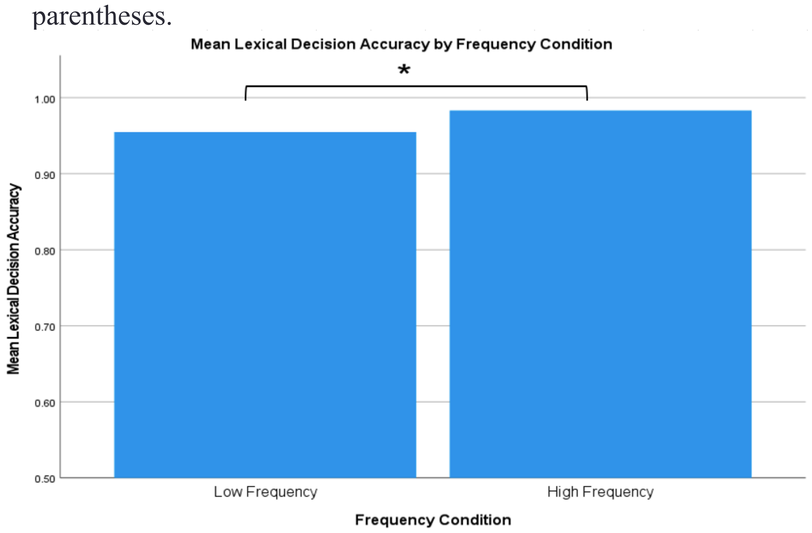
- 54 pairs of words (one high frequency, one low frequency) that are controlled on length, AoA, concreteness, imageability and five other lexical variables were selected.
- Two sentence frames were written for each pair. Below is an example of sentence frames (HF target/LF target in bold):
  - My little sister completed a complicated **course/recipe** without help from anyone.
  - My mother and I love every **course/recipe** that Ms. Greenberg has offered.
- The selected pairs also passed normative assessment on goodness of fit and predictability in the sentences. Normative data was collected from Wesleyan students via online questionnaire.
  - Participants: N=41; Age: M=19.75, SD=.84; 78.0% Female, 22.0% Male; 63.4% English as first language; 95.1% Without formally diagnosed reading disability
- We then conducted independent samples t-test on lexical decision accuracy, the natural log of lexical decision time (ln(LDT)), and the natural log of word naming time (ln(NT)) on selected items.

RESULTS

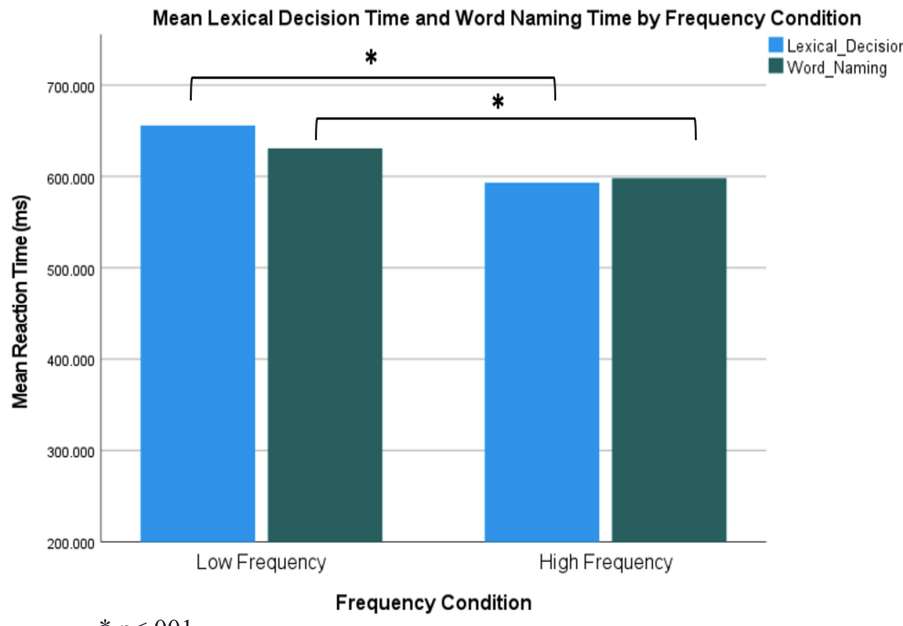
- Our selected items are controlled on the following lexical variables: AoA (p=.79), length (p=1.00), OLD (p=.11), concreteness (p=.06), emotional valence (p=.43), bigram mean (p=.19), number of phonemes (p=.27), number of syllables (p=.85), and imageability (p=.53).
- WFE remained robust after controlling AoA.
  - In lexical decision task, HF words are processed 62.55ms faster than LF words.
  - In word naming task, HF words are processed 50.64ms faster than LF words.
- Independent samples t-test result shows that the difference in the mean of ln(LDT), lexical decision accuracy, and ln(NT) across frequency condition are all statistically significant (p<.001).

Variable	Low Frequency	High Frequency	t test results
Lexical Decision Time (LDT)	655.84 (65.14)	593.29 (35.42)	
ln (LDT)	6.48 (.10)	6.38 (.06)	t(106) = 6.31, p<.001
Lexical Decision Accuracy	.95 (.06)	.98 (.02)	t(106) = -3.57, p<.001
Word Naming Time (NT)	630.81 (49.60)	580.17 (37.43)	
ln (NT)	6.44 (.08)	6.39 (.06)	t(106) = 3.88, p<.001

Note: LDT and NT are measured in ms. Standard deviations are in parentheses.



* p<.001



* p<.001

SUMMARY & CONCLUSIONS

- Although word frequency and AoA are naturally correlated (i.e. words children learn first tend to be higher frequency), this study shows that WFE remain robust in lexical decision and word naming task after controlling AoA.
- In Fall 2022 and Spring 2023, we plan on conducting a self-paced reading experiment to assess the size of WFE by evaluating self-paced reading times (SPRT). We also plan on conducting an eye-tracking study to determine the size of WFE by evaluating fixation durations during reading.

REFERENCES

Brysbaert, M., Mandera, P., & Keuleers, E. (2018). The word frequency effect in word processing: An updated review. Current Directions in Psychological Science, 27(1), 45–50.

Juhasz, B.J (2005). Age-of-acquisition effects in word and picture identification. *Psychological Bulletin, 131,* 684-712.

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