

The Benefits of Hyphenating Three-Word Expressions

Kacey Wochna

Faculty Sponsor: Barbara Juhasz



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INTRODUCTION

- In English, compound words (e.g., *mailbox*) combine two words to create a new word with a new unified meaning. Accepted compounds are concatenated (combined without spaces).
- Research has shown that the unified compound meaning of these words is easier to access when the spaces are removed (Juhasz, Inhoff, & Rayner, 2005).
- Certain languages, such as German, permit the concatenation of multiple words to create complex compounds. Research indicates that like English compounds, concatenation facilitates the assignment of unified compound meaning (Inhoff, Radach, & Heller, 2000).
- There are many combinations of multiple English words that have unified compound meaning (e.g., *stained glass window*). Although the spaces are usually maintained in these expressions, sometimes the first two words are hyphenated (e.g., *last-minute shopping*).
- The present study examined whether replacing one space with a hyphen affects the reading of common three-word expressions. Hyphenation was predicted, like concatenation, to make compound meaning more accessible.

METHODS

Participants: 38 Wesleyan students.

Stimuli: Three-word expressions, in which the first two words could be hyphenated.

Apparatus: SR EyeLink 1000 eye tracker, which records eye position every millisecond.

Procedure: Participants read sentences on a computer screen while their eye movements were recorded. They were encouraged to read normally for comprehension.

MATERIALS

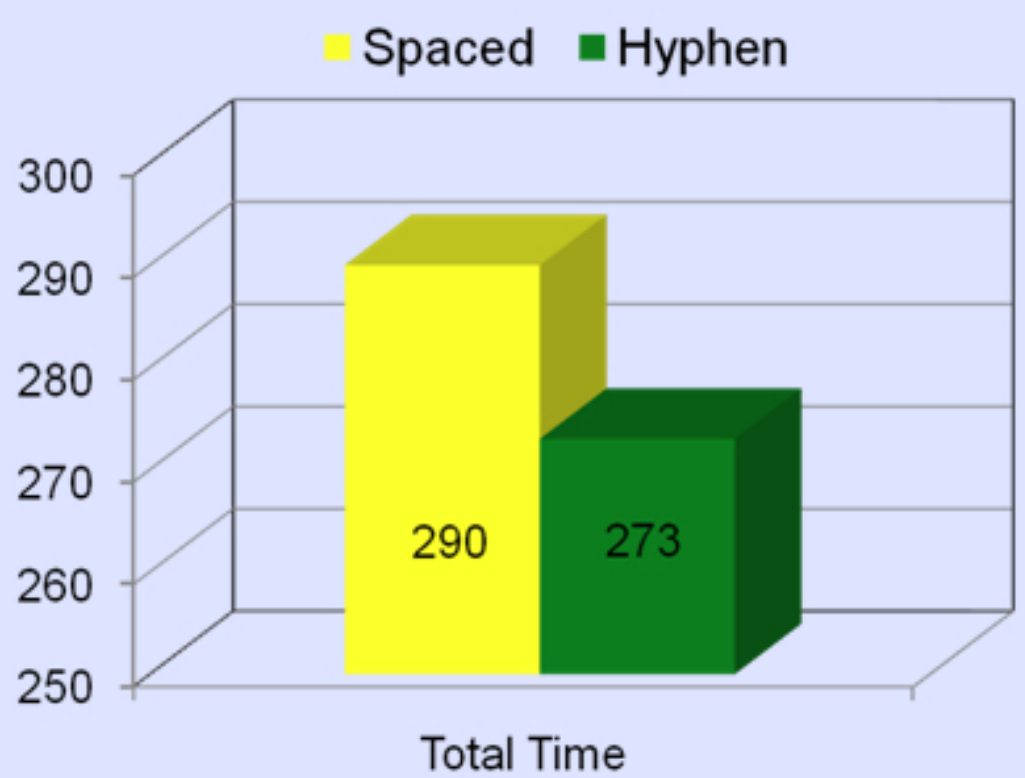
- 60 three-word expressions were embedded in sentences in spaced and hyphenated forms.
 - Each participant saw all 60 expressions, half in spaced form and half in hyphenated form.
- Spaced:** Ted became a **human rights activist** after participating in a few protests.
Sue and her boyfriend had a romantic **candle lit dinner** on Valentine's day.
- Hyphenated:** Ted became a **human-rights activist** after participating in a few protests.
Sue and her boyfriend had a romantic **candle-lit dinner** on Valentine's day.
- All expressions were above a minimum approximate frequency.
 - All sentence contexts were above a minimum for goodness of fit (rated independently).

RESULTS

- The effects of condition (spaced vs. hyphenated) on various eye movement measures were analyzed using Linear Mixed Effects Regressions (LMERs). LMERs allow the intercepts of the models to vary by participant and by item. Significance was determined using Markov chain Monte Carlo (MCMC) p-values for 10,000 simulations at $\alpha = .05$. All analyses reported are for averages on the third word.

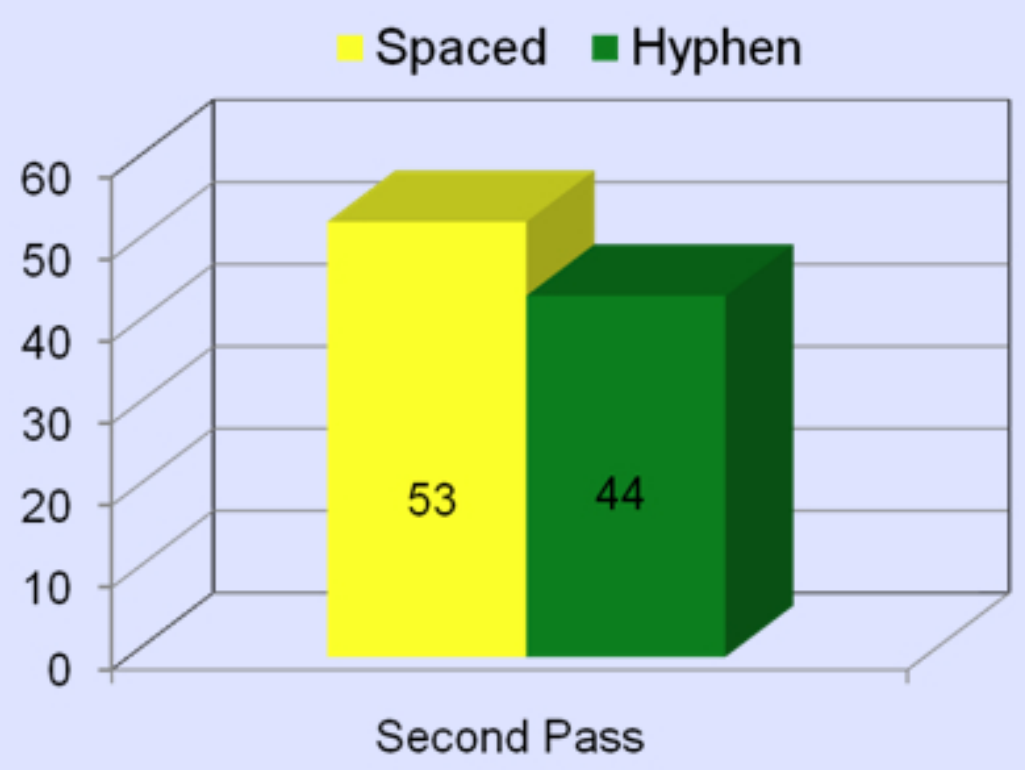
TOTAL TIME

- *Total time* is the cumulative amount of time spent reading a word.
- Participants spent less time reading the third word when the first two words were hyphenated.



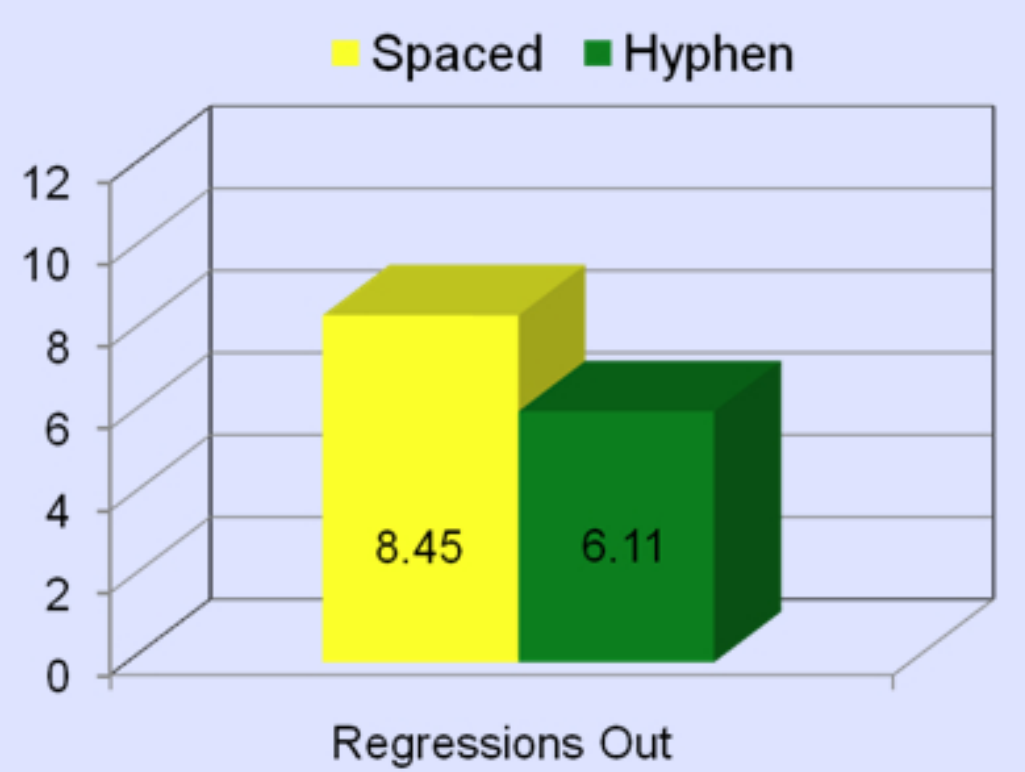
SECOND PASS DURATION

- *Second pass duration* is the amount of time spent rereading a word after leaving and returning to that word.
- Participants spent less time rereading the third word when the first two words were hyphenated.



REGRESSIONS OUT

- *Regressions out* is the probability that a reader will leave a word to return to an earlier word (returns to earlier words are *regressions*).
- Participants were less likely to return to an earlier word while reading the third word when the first two words were hyphenated.
- Some additional measures for the third word (go past, probability of single fixation) were also significant ($ps < .05$), following the same pattern.
- No significant effects were observed in measures for first two words ($ps > .05$).



CONCLUSIONS

- Previous research on compound words has shown that concatenating compound words increases the amount of initial processing, but decreases the amount of later processing (Juhasz et al., 2005; Inhoff et al., 2000).
- Similar effects were expected from the hyphenation of English complex compounds, on the premise that both hyphenation and concatenation remove the space between words.
- The results indicate that hyphenation is similar to concatenation in its effects on eye movement measures. Although no initial increases were found, hyphenation did produce clear decreases in later processing measures such as total time, second pass, and regressions out.
- Specifically, these benefits applied to the third word: when the first two words were hyphenated, processing of the third word was facilitated.
- **Less rereading was required, suggesting that the third word was more quickly identified as a part of a complex compound.**

REFERENCES & ACKNOWLEDGMENTS

References:
Juhasz, B. J., Inhoff, A. W., & Rayner, K. (2005) The role of interword spaces in the processing of English compound words. *Language and Cognitive Processes*, 20(1/2), 291-316.
Inhoff, A. W., Radach, R., & Heller, D. (2000) Complex compounds in German: Interword spaces facilitate segmentation but hinder assignment of meaning. *Journal of Memory and Language*, 42, 23-50.

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