

Word-Form Typicality Effects on Eye-Movements During Reading

Thomas Farmer, Suzanne Dikker, Klinton Bicknell, Alex Fine and Michael Tanenhaus

Word-form typicality—the degree to which the sound/orthographic properties of an individual word are typical of words in its grammatical category— influences RTs on lexical tasks and words appearing in sentential contexts highly predictive of grammatical category [1–3]. In a recent MEG study [4], the magnitude of the M100 response (a sensory response generated in visual cortex) was modulated by typicality in a grammaticality judgment task. When context created a strong expectation that a noun would not occur, and yet one appeared (as in soda in B), M100 magnitude was larger than when there was a strong expectation for a noun, and the same noun appeared (A). No effect of expectation occurred when the word form of the target noun was neutral (limb, in C–D). Given the pseudo-regular sound-to-letter mapping in English and the fact that this response was localized to visual cortex, this result was interpreted as evidence that the brain was using prior syntactic context to make probabilistic form estimates of incoming information based on predictions about grammatical category while reading.

The relationship between effects elicited in EEG/MEG experiments and overt behavior is sometimes opaque, due to methodological and time-course differences inherent to different paradigms. In this study, we examined the link between the M100 response and natural reading by monitoring eye movements while subjects read a subset of sentences used in [4]. Twenty noun-like nouns and 20 neutral nouns, matched for orthographic neighbors, length in graphemes and phonemes, and overall frequency, were placed in expected and unexpected contexts. Items were counterbalanced across 4 lists in a completely crossed latin squares design; filler items were included to eliminate statistical regularities that might bias word-order predictions. Sentences were presented in 14 pt font at the center of the screen. Subjects made a scaled grammaticality judgment after reading each sentence.

When examining duration-based measures on the target words, there was a clear effect of expectedness: first-fixation duration, gaze duration, and total fixation time were all substantially longer in the unexpected (B and D) than in the expected (A and C) conditions. There was no effect of word-form typicality on duration-based measures. However, there is evidence that word-form typicality influenced “where” the eyes moved. The landing position of the final saccade before entering the target word was significantly closer to the target word when a noun was expected and was noun-like in terms of its form-based typicality than in the other three conditions. Additionally, there was a 17% increase in the probability of regressive movements to the left of the target

word in the unexpected versus the expected condition when the target was noun-like versus when it was neutral.

These results suggest that readers are sensitive to the differential amount of information contained in neutral versus noun-like nouns; the error signal indexed by the M100 component may be correlated with the probability of regression due to rapid detection of a likely anomaly. Thus word-form may provide early feedback for predictive (forward) models in reading.

Experimental Items

- (A) The/ tasteless/ soda/ was marketed. (noun-like noun, expected)
- (B) The/ tastelessly/ soda/ was marketed. (noun-like noun, unexpected)
- (C) The/ painful/ limb/ was amputated. (neutral noun, expected)
- (D) The/ painfully/ limb/ was amputated. (neutral noun, unexpected)

References

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