

This paper presents a study aimed at characterizing individual differences in event-related potential (ERP) responses to semantic and syntactic sentence violations. Although studies of first-language processing typically assume uniformly high language proficiency and homogeneity of ERP responses across native speakers, recent studies have called these assumptions into question (e.g., Newman et al., 2012; Tanner and Van Hell, 2014). Many factors may influence variability in first-language processing, including not only proficiency, but also socioeconomic background, education, language experience, and cognitive abilities. In this study, we sought to determine whether there are systematic relationships between ERPs and these factors.

Forty-three right-handed native speakers of English participated in this study. They completed detailed questionnaires probing demographic information, handedness, socioeconomic status, learning styles, and language background, as well as several tests of English proficiency and cognitive abilities, including working memory and executive control. We recorded ERPs from these participants in response to written English sentences containing lexical-semantic, morphosyntactic, or phrase structure violations, as well as to well-formed control sentences.

Our analyses examined ERP components typically elicited in sentence processing studies: the N400, typically associated with lexical-semantic processing; and the P600, typically associated with syntactic processing but also seen after semantic violations in some contexts. Mean amplitudes in the 300-500 (N400) and 600-800 (P600) ms windows were analyzed using generalized additive mixed effects modelling, with individual difference measures included as continuous fixed effects terms. At the group level, biphasic early negativity-late positivity patterns were observed for all three violation types, although the scalp distribution varied with violation type. In particular, the early negativity for morphosyntactic and phrase structure violations was more left-lateralized than for lexical-semantic violations, consistent with previous work. However, closer investigation revealed systematic differences in the magnitude and scalp distribution of these components as a function of individual differences. These findings contribute to a growing appreciation of the role that individual differences play in modulating ERP responses to sentence processing. These results will be discussed in the context of characterizing individual strategies in sentence parsing and how other cognitive factors (e.g., working memory) may contribute.

References

- Newman, A. J., Tremblay, A., Nichols, E. S., Neville, H. J., and Ullman, M. T. (2012). The influence of language proficiency on lexical semantic processing in native and late learners of English. *Journal of Cognitive Neuroscience*, 24(5), 1205-1223.
- Tanner, D. & van Hell, J. G. (2014). ERPs reveal individual differences in morphosyntactic processing. *Neuropsychologia*, 56, 289-301.