

Severing the tie between the eLAN and automatic syntactic processing

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Current neurocognitive processing models [1,2] map ERP component latency onto discrete processing stages of a serial parser, mapping the early left anterior negativity (eLAN) onto automatic first-stage parsing, as it is elicited between 100-300 ms by purported word category violations that interfere with initial syntactic structure assignments.

Recent studies [3,4,5] have begun to weaken the causal link between word category violations and the eLAN by providing examples of word category violations that do not elicit an early negativity. It has likewise been shown [6] that the eLAN disappears when factors such as probability of violation and context change. Thus, a word category violation is not always *sufficient* for eliciting an early negativity.

It has thus far been impossible to sever the link between the eLAN and automatic syntactic parsing because there has been little evidence that a word category violation is not *necessary* to elicit an early negativity. There is some evidence for this, however, from lexical processing (an M100 response to visual form expectation [7]), as well as previously unnoticed or underreported early negativities in response to sentences that crucially do not contain word category violations: an incorrect member of a correct word category [8,9], a pseudoword/nonword in a predictive context [10], and a semantic expectancy violation in a highly predictive context [11,12]. We hypothesize that these early responses (eLAN, M100 and unidentified early negativities) may all be a similar response to an unexpected sensory (either auditory or visual) form.

To test this hypothesis, we conducted an ERP study to determine whether a violation of visual form expectancy alone would elicit an early negativity (similar to the eLAN) in a sentence context. The study used idioms normed for greater than 95% cloze probability in order to guarantee that only one visual form was expected, and compared ERP responses to the final word of idiomatic phrases, with either their expected completion (1) or a visually unexpected, yet syntactically correct and semantically plausible completion (2). For the current study, word length and phonotactics were used to render (2) visually different from (1). Thus critical words were controlled for frequency, semantic content, and preceding context, but not word length. Each participant read 60 experimental, 60 control, and 120 filler sentences, presented one word at a time with an SOA of 500 ms.

The visually unexpected ("sentences") vs. expected ("words") comparison elicited:

- (i) an anterior early negativity and
- (ii) an N400 effect.

This provides concrete evidence that a word category violation is not necessary to elicit an early negativity in a sentence processing context. It also provides preliminary evidence that an early negativity can be elicited not just by syntactic violations, but at various levels of linguistic processing (i.e. both syntactic and semantic) based on expectation of word forms. A word category violation is therefore neither sufficient nor necessary for the elicitation of an early negativity, and the link between the early negativity and an automatic stage of syntactic processing should be reconsidered.

- (1) A picture is worth a thousand *words*.
- (2) A picture is worth a thousand *sentences*.

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