THE INFLUENCE OF IMPLICIT CAUSALITY ON THE ESTABLISHMENT OF COREFERENCE: AN EVENT-RELATED POTENTIAL STUDY OF READING

Kerry Ledoux1, Barry Gordon1,2, Mikael Roll1, and Tamara Y. Swaab4
1Cognitive Neurology/Neuropsychology and 2Department of Cognitive Science, Johns Hopkins University
3Department of Linguistics, Lund University
4Center for Mind and Brain and Department of Psychology, University of California at Davis

INTRODUCTION

Implicit causality is a feature of certain interpersonal verbs by which information about the cause of events described by a verb is conveyed implicitly as part of the verb’s meaning. Verb implicit causality has been demonstrated to have immediate effects during reading, as measured by word-by-word self-paced reading and eye tracking (Koornneef & Van Berkum, 2006). Recently, Van Berkum et al. (2007) measured the effect of violating a verb’s implicit causality bias using event-related potentials (ERPs). When readers encountered a pronoun that was inconsistent with the bias of the verb (Linda apologized to David because he…), a P600 effect was observed (relative to consistent pronouns).

The current experiment used a similar experimental design, but included an examination of the ERP response to coreferential repeated names. Repeated name coreference has been shown previously to depend on the prominence of the antecedent (a structural factor of a sentence): names that corefer with a prominent antecedent are more difficult to process than names that corefer with a non-prominent antecedent (Camblin, et al., 2007; Ledoux, et al., 2007; Swaab, et al., 2004). We examined the extent to which implicit causality acts as a focusing mechanism in reading, and whether that mechanism would override the focusing mechanism of structural prominence. In doing so, we examined the interplay of semantic and structural factors during discourse processing.

RESULTS

ANOVA were done on the mean amplitude of the N400 (250-450ms) and the P600 (500-900ms) to the critical repeated names and pronouns (see examples). For pronouns, there was a main effect of verb congruency in the later time window: the amplitude of the P600 was greater to pronouns that were inconsistent with the bias of the verb, relative to those that were consistent, F(1,11) = 6.69, p = .03. For repeated names, there was an interaction of consistency and prominence in both time windows. When the antecedent was not prominent, the amplitude of the P600 was greater to repeated names that were inconsistent with the bias of the verb, relative to those that were consistent, F(1,13) = 5.35, p = .04. When the antecedent was prominent, the effect of consistency was significant in the N400 time window: the amplitude of the N400 was reduced to repeated names that were consistent with the bias of the verb, relative to those that were inconsistent, F(1,13) = 5.39, p = .04.

DISCUSSION

When coreference was established using pronouns, the effect of the implicit causality of a verb was seen on the P600: a greater positivity was seen to pronouns that were inconsistent with the implicit causality bias of the verb (relative to pronouns that were consistent), regardless of the prominence of the antecedent. Our results are thus similar to those observed by Van Berkum, et al. (2007).

The locus of the effect of implicit causality for sentences containing repeated name coreference depended on the prominence of the antecedent. When the antecedent of the repeated name was not prominent in the discourse representation (a situation in which repeated name coreference depended on the prominence of the antecedent), the amplitude of P600 was larger to names that were inconsistent with the bias of the verb. When the antecedent of the repeated name was prominent in the discourse representation, and repeated name coreference was expected to be infelicitous, we observed an effect of verb implicit causality instead on the N400, the amplitude of which was reduced to names that were consistent with the bias of the verb.

Van Berkum et al. (2007) interpreted their result with pronouns as suggesting that readers viewed the incongruent pronoun as a morphosyntactic violation; that is, the pronoun was seen to be of the wrong gender based on the foregrounding of one antecedent relative to the other by the implicit causality of the verb. This explanation seems similar to those observed recently by several groups (see Kolk & Chwilla, 2007 and Kuperberg, 2007 for review and discussion), in which strong semantic expectations exert an influence over syntactic processing. In the present experiment, this is observed in cases in which semantic integration can proceed without hindrance, that is, cases in which the pronoun or repeated name is used felicitously. The infelicitous use of a repeated name to corefer with a prominent antecedent resulted in a disruption of semantic integration processing (similar to that observed previously as a repeated name penalty; Camblin, et al., 2007; Ledoux, et al., 2007; Swaab, et al., 2004), the magnitude of which was influenced by verb consistency.

WORKS CITED


ACKNOWLEDGEMENTS

This research was supported by the Cognitive Neurology Gift Fund (KL, BG) and by NIH grant R01-MH066271 (TYS).