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N400 and P600 modulation in presupposition accommodation: The effect of different trigger types

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ABSTRACT

This study investigates the neurophysiological correlates of presupposition processing in conditions of satisfaction and accommodation, comparing two types of triggers: definite descriptions and change-of-state verbs. Results showed that, for both types, the accommodation of presuppositions is associated with a biphasic N400-P600 pattern at the processing point. With definite descriptions, we observed a more clear involvement of the N400, while for change-of-state verbs the costs of accommodation were associated with a more pronounced P600. Moreover, when conveyed by change of state predicates, presuppositions seem to elicit also a P200 visible already at the trigger verb. The data nicely fit into the Linking-Updating model and support two main conclusions. First, presupposition accommodation is a sequential process unfolding through a biphasic ERP pattern presumably related to search for antecedent and discourse update. Second, the kind of presupposition trigger seems to affect the cognitive cost of presupposition accommodation at different processing times, with definite description capitalizing more on the earlier search for antecedent and change-of-state verbs capitalizing more on the later updating of the discourse mental model with the presupposed information. Overall, our findings suggest that the brain understands information taken for granted by going through a process whose time course involves several phases, differently modulated based on specific linguistic expressions.

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1. Introduction

1.1. Presupposition satisfaction and accommodation

Traditionally, linguists and philosophers of language characterize presuppositions as background information which is communicated as taken for granted. For example, the utterance in (1) introduces the presupposition in (1a):

(1) John stopped smoking
(1a) John used to smoke

Presuppositions are usually carried by 'presupposition triggers', namely, lexical items and syntactic constructions that, when used in an utterance, activate presuppositions – e.g., definite descriptions, focus sensitive particles, or, as in (1), change-of-state verbs like *give up* etc. (Karttunen, 1974; Kiparsky & Kiparsky, 1971; Levinson, 1983; Stalnaker, 1974).

Presuppositions are generally considered a condition for the appropriateness of an utterance: according to Stalnaker (2002), a sentence *p* presupposes *q* if the use of *p* would be inappropriate when *q* does not belong to the *common ground* in a conversation. If *q* is entailed by the context, then the presupposition *q* is said to be *satisfied*. Conversely, if *q* does not belong to the common ground this leads to *presupposition failure*. If failure occurs, speakers are supposed to *accommodate* the presupposition (Heim, 1982; Lewis, 1979) in order to make sense of the utterance. Accommodation is the process whereby the content of a presupposition that is not satisfied is introduced into the discourse in order to make it possible for the context to be updated with the assertive component of the utterance.

1.2. Processing presupposition accommodation

Compared with other topics of pragmatic research such as figurative language and scalar implicatures (Bambini & Resta, 2012; Noveck & Reboul, 2008; Sauerland & Schumacher, 2016), in the field of Experimental Pragmatics (i.e., the study of pragmatics via empirical methods) an experimental research line on presuppositions is still underdeveloped. In recent years, however, some empirical studies investigated presuppositions using mainly behavioral methods and focusing on processing times. Overall, the contemporary experimental literature offers some preliminary results in support of the idea that presuppositions are processed rapidly in online language comprehension (Schwarz, 2015). Moreover, several studies showed that whether or not a presupposition is processed easily and fast depends first of all on the kind of information available in the context. In particular, an interesting finding suggested by the current psycholinguistic literature is that presupposition accommodation, i.e., the case of presupposition not entailed by the context, as opposed to presupposition satisfaction, seems to involve longer processing times associated with higher cognitive costs, reflecting a process of context repair. Behavioral works on definite descriptions showed, on the one hand, that the processing of context non-supported definite descriptions takes longer than that of contextually supported definite descriptions (Arnold, Wasow, & Losongco, 2000; Haviland & Clark, 1974; Yekovich & Walker, 1978), and, on the other, that falsified definite descriptions are costlier to process than asserted information (Schwarz, 2015). The idea that accommodation involves higher processing costs was also confirmed by evidence on other categories of presupposition triggers. For instance, presupposition accommodation in sentences containing the German additive particle *auch* ("too") generally entails longer reading times compared with presupposition satisfaction in intra-sentential contexts (Schwarz, 2007). Tiemann et al. (2011) showed that not only presupposing sentences in general require longer reading times than non-presupposing sentences, but, independently of the trigger in use, a presupposition falsified by the context requires longer processing times than a verified presupposition, and that presupposition accommodation takes longer than the processing of falsified presuppositions. More recently, Tiemann (2014) used a word-by-word self-paced reading task to look at *wieder* ("again") in conditions of presupposition satisfaction versus accommodation, finding longer reading times on the critical word in the latter case.

Presupposition accommodation constitutes therefore a condition that involves higher processing costs. Two factors, moreover, may affect presupposition accommodation. First, the type of presupposition trigger: Domaneschi, Carrea, Penco, and Greco (2014) showed that the accommodation of the presuppositions activated by triggers like definite descriptions and factive verbs is more mandatory than the accommodation of more optional presuppositions like those triggered by focus sensitive particles (e.g., *too*) and iterative expressions (e.g., *again*). Second, the role of plausibility: Frazier (2006) found an effect of plausibility on the reading times of plausible and implausible definite descriptions, while Singh, Fedorenko, Mahowald, and Gibson (2016) showed that accommodation results inappropriate only in implausible contexts.

1.3. Neurolinguistic evidence on presupposition accommodation

Event-Related brain Potentials (ERPs) are voltage changes of the electrical activity of the brain recorded from the scalp (EEG) that are induced by an external stimulation or an internal cognitive event (e.g., Rugg & Coles, 1995). The study of ERPs has provided fundamental evidence on which kinds of cognitive costs a reader may incur during language comprehension, focusing on the functional role of ERP components (e.g., Luck & Kappenman, 2012). The available literature about the cognitive processes underlying ERP components can help in clarifying the nature and the time-course of the cognitive costs of