Processing cataphoric pronouns in Dutch: an ERP study

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The processing of cataphoric pronouns has been shown to follow the same mechanisms as the processing of wh-dependencies in that the parser actively searches for an antecedent to interpret the pronoun within the sentence, except in those cases where the pronoun must obey principle C of the binding theory and cannot be c-commanded by the antecedent[1]. This is the case for the Gender Mismatch (GMM) effect, named after a slowdown effect that shows that the parser tries to link an antecedent to a preceding pronoun only when a pronoun can be bound by it [2,3]. Most of the studies that tested whether there is an active search triggered for an antecedent after encountering cataphoric pronouns used behavioral techniques such as self-paced reading or eye-tracking [4,5] and only a few used the EEG technique [6].

The current study on Dutch uses ERPs to examine the processing of sentences with cataphoric pronouns as the parser looks for an antecedent in the upcoming input. If the parser attempts to bind the pronouns zijn and haar in (1a) and (1b) to the masculine antecedent Lodewijk, we expect a GMM effect at the position of the potential antecedent in (1b). On the other hand, if the parser respects Principle C of the binding theory in (1c) and (1d), we do not expect to find any ERP difference at the position of the potential antecedent Lodewijk showing that no link has tried to be made between the pronouns hij and zij and the antecedent. Additional proper nouns were included to guarantee that all pronouns had an antecedent in the sentence.

We conducted an ERP experiment where EEG was continuously recorded while native speakers (n=24) of Dutch read silently 36 sentences such as (1a-d) interspersed with 35 fillers and subsequently answered a comprehension question for every sentence. Results show that there is a central anterior negativity in the 200-600ms window (N400) [7,8] in (1b) condition with respect to (1a) at the point of the potential antecedent Lodewijk (significant 3-way interaction between factors Condition, Hemisphere (left, Right, Central) and electrode position (Anterior, Middle, Posterior); F(12,276)=2.05, p=0.045). Comparison between conditions (1c) and (1d) yielded no significant difference in the ERP waveforms.

The central anterior negativity generated at the antecedent Lodewijk for (1b) condition suggests that the parser attempts to link the antecedent to the preceding pronoun haar and fails to interpret it at the antecedent due to the gender mismatch between the pronoun -marked for feminine gender - and the antecedent Lodewijk – a name in masculine gender. The same effect is absent in the other conditions, which shows that the parser does not try to link the antecedent with the preceding pronoun in (1c) and (1d) so that principle C is respected. Overall results confirm the active search mechanism for an antecedent started whenever there is a pronoun that must be bound in the local context. We discuss implications of these results in light of the accumulated knowledge on long-distance dependency processing.
Experimental items:
No constraint

1a. *Zijn* assistenten kwamen erachter dat *Lodewijk* Boer geen prijswinnaar geselecteerd had, maar *Mirjam* had geen interesse in de roddel.

1b. *Haar* assistenten kwamen erachter dat *Lodewijk* Boer geen prijswinnaar geselecteerd had, maar *Mirjam* had geen interesse in de roddel.

Principle C

1c. *Hij* kwam erachter dat *Lodewijk* Boer geen prijswinnaar geselecteerd had, maar *Thomas* had geen interesse in de roddel.

1d. *Zij* kwam erachter dat *Lodewijk* Boer geen prijswinnaar geselecteerd had, maar *Mirjam* had geen interesse in de roddel.

References: