Linguistic and cognitive constraints on the use of referring expressions

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In this paper we argue that the use of referring expressions is determined by the interplay between the speaker's perspective and the listener's perspective, and that this interplay is subject to cognitive constraints such as speed of processing and working memory capacity. We investigate this interaction between linguistic and cognitive constraints using cognitive modeling. Cognitive models are computational simulations of the cognitive processes involved in performing a task, for example comprehending a sentence. By implementing a linguistic theory in a cognitive model, a cognitively plausible explanation can be provided for prior empirical observations and new testable predictions can be generated. We present two case studies providing evidence that the acquisition and use of referring expressions is determined by the interaction between linguistic and cognitive constraints.

1. Acquisition of referring objects.

Up to the age of 6, English-speaking children have been shown to experience difficulties in the interpretation of pronouns (but not reflexives), and incorrectly allow an object pronoun to corefer with the local subject (the so-called Delay of Principle B Effect, e.g., Chien & Wexler, 1990). We simulated these children's acquisition of object pronouns by implementing a bidirectional optimality theoretic (OT) account of pronoun interpretation, according to which adult listeners take into account the speaker's perspective (Hendriks & Spenader, 2005/2006; see Figure 1). The model predicts that children are unable to do so during on-line sentence comprehension because they lack sufficient processing speed. We tested this prediction by giving children more time for interpretation by slowing-down the speech rate. We found that a slower speech rate has a beneficial effect on children's comprehension of sentence-internal pronouns, but not on their comprehension of reflexives (Van Rij, Van Rijn, & Hendriks, 2010). These results suggest that the interplay between the speaker's and the hearer's perspective is part of the grammar rather than an end-of-the-sentence pragmatic process, and is crucially dependent on sufficient processing speed.

2. Acquisition of referring subjects.

Up to the age of 6, children also show non adult-like performance on their use of referring subjects. In certain discourse contexts, children produce unrecoverable pronouns where a full NP would have been the adult choice (see Wubs, Hendriks, Hoeks, & Koster, 2009, for Dutch). The same children also fail to interpret full NPs as signaling a topic shift. We developed a cognitive model capturing these phenomena, again implementing a bidirectional OT account of the data. Based on our computational simulations, we argue that the mature use of referring subjects not only requires sufficient speed of processing, but also requires sufficient working memory capacity to identify the discourse topic (Van Rij, Van Rijn, & Hendriks, submitted). On the basis of these results, we predict that even adults will make errors in their use of referring subjects if their working memory capacity is (permanently or temporarily) inhibited.

We thus argue that the speaker's choice of referring expression is delimited by the listener's preferences, and the listener's interpretation of referring expressions is delimited by the speaker's options. Whether speakers and listeners are able to take into account each other's perspective is dependent on sufficient cognitive resources.

References

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Figures

1. HEARER'S PERSPECTIVE   **2.** SPEAKER'S PERSPECTIVE

input f_1 *optimal meaning* m_1 *optimal form* f_2

reflexive → coreferential → reflexive

pronoun → disjoint → pronoun
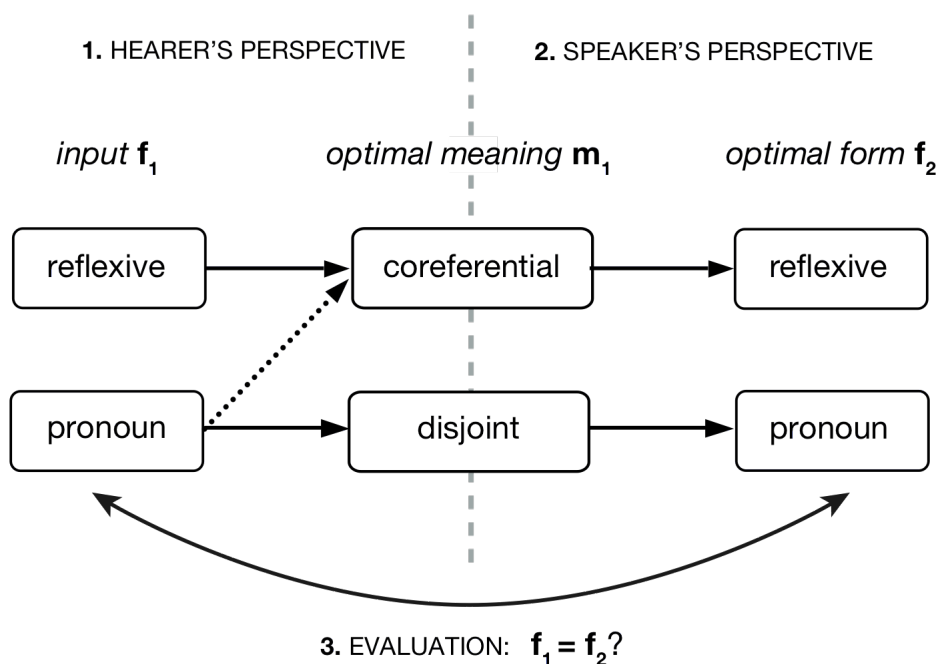
3. EVALUATION: $f_1 = f_2$?

Figure 1. Taking into account the speaker's perspective in comprehension. The coreferential interpretation for pronouns (represented by the dotted line) is blocked because a coreferential interpretation is best expressed by a reflexive.