Variable Binding and Coreference in Sentence Comprehension: Evidence from Eye Movements

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Psycholinguistic research has shown that pronoun resolution during sentence comprehension is guided by a number of syntactic, semantic and discourse-level factors [3]. Similarly in theoretical linguistics, it has been posited that pronoun interpretation can be resolved in two ways, either via variable binding mediated by syntactic structure, or via coreference assignment in the discourse representation [4]. Within this framework, syntactic variable binding is only possible between a pronoun and an antecedent that c-commands it, while non c-commanding antecedents can only be linked via coreference. Therefore, in ‘Every man who saw Jim said that he was ill’, while every man c-commands the pronoun and can thus be linked via variable binding, the non c-commanding potential antecedent Jim can only be linked via coreference. Crucially for the current work, syntactic variable binding is hypothesized to be computed before discourse-mediated coreference assignment [2].

We tested this hypothesis in two experiments. In Experiment 1, 27 native English speakers read 24 experimental and 60 filler texts while their eye-movements were monitored. Experimental sentences contained a pronoun and two potential antecedents, a c-commanding quantified noun phrase (QP), and a non c-commanding proper name, as in (i). Gender congruence (match vs. mismatch) was manipulated between the pronoun and the two potential antecedents in a 2x2 design. Gender congruence was achieved using proper names (James/Helen) for the coreference relation and pre-tested gender stereotypes for the QP (Every soldier... that he/she; see [5]). In Experiment 2, 31 native English speakers read similar texts, except that this time the linear order of antecedents was reversed, as in (ii).

If variable binding is computed before coreference [2], readers should initially link the pronoun to the c-commanding QP rather than the proper name, irrespective of antecedent linear order. In this case, reading times at the pronoun in both experiments should be longer when it mismatches the QP’s stereotypical gender compared to when there is a gender match. Our results did not support this hypothesis. In Experiment 1, both first- and second-pass reading time measures indicated reliably longer reading times at the pronoun (that s/he) and spillover region (should wave) when the pronoun mismatched the gender of the proper name. A different pattern was found in Experiment 2, where both first- and second-pass measures at the pronoun and spillover regions indicated reliably longer reading times when the pronoun mismatched the stereotypical gender of the QP.

These findings fail to support the hypothesis that variable binding is computed before coreference assignment. Instead, we interpret these results as suggesting that the pronoun-antecedent relations examined here are better explained as being resolved via discourse-based mechanisms sensitive to the linear order and referential properties of potential antecedents (see e.g. [1]) rather than via syntactic binding.

The squadron paraded through town...

(i) Every soldier who knew that James/Helen was watching was convinced that he/she should wave as the parade passed.
(ii) It looked to James/Helen that every soldier was completely convinced that he/she should wave as the parade passed.
References: