

# The Influence of Implicit Causality Information in the Language Comprehension System

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In this poster we examine the point at which knowledge about causal relationships in the world has an influence on aspects of processing within the language system. We focus on a class of verbs considered to possess an implicit causality bias. For instance, in example (1) below, the explicit event described in the subordinate clause following the pronoun is consistent with the implicit cause. The verb 'blamed' is interpreted as implying that the second noun phrase, 'Bill', is ultimately responsible for the event described; it is referred to as an NP2 verb. In example (2) however, the explicit and implicit causes are inconsistent. Examples (3) and (4) contain NP1 biasing verbs which impute causality towards the first noun phrase. In example (3), the explicit cause is inconsistent with this bias, while in example (4) it is consistent.

(1) John blamed Bill<sub>[i]</sub> because he<sub>[i]</sub> broke the window.

(2) John<sub>[i]</sub> blamed Bill because he<sub>[i]</sub> was in a bad mood.

(3) John fascinated Bill<sub>[i]</sub> because he<sub>[i]</sub> was easily amused.

(4) John<sub>[i]</sub> fascinated Bill because he<sub>[i]</sub> was interesting.

Previous research has shown a processing cost in both naming (Caramazza, Grober, Garvey & Yates, 1977) and full sentence reading time (Garnham, Oakhill & Cruttenden, 1992) as a consequence of this causal mismatch. We are interested in at what point in the sentence implicit causality bias exerts a processing influence. Studies using the 'probe' technique that have attempted to answer this question have produced contradictory results. As there are questions regarding the sensitivity of this particular methodology, we adopt alternative self-paced reading and eye-tracking measures.

In two self-paced reading studies we split the presentation of the sentence containing the biasing verb at the point following the pronoun. In the first study the participants mentioned in the main clause are not differentiated by gender so, apart from structural factors, the only information available to the system for resolving pronominal reference is the implicit causality information. In the second study the participants are differentiated by gender. It has been suggested that higher level pragmatic information is considered by the system automatically,

regardless of whether it is needed (Stevenson & Viktovitch, 1986). We are interested in whether implicit causality information would be used automatically, even when its application is redundant.

From the two self-paced reading studies, we found evidence for an initial preference to assign reference to the first mentioned noun phrase in the sentence. This is consistent with a general serial position effect (Neath & Knoedler, 1994, Gernsbacher & Hargreaves, 1988). An interaction between verb bias and referent was found only on reading time to the second fragment. It appears that only later does implicit causality information exert an influence. What is interesting is that reading times to the second fragment, ie following the pronoun, provide evidence that implicit causality information is used automatically by the system. This occurs even when resolution can be achieved by considering gender information alone.

We tentatively accept the conclusion that at least an initial aspect of the mechanism of resolving pronominal reference behaves in a restrictive manner, ignoring potentially informative factors. We also report the results of an eye-tracking study which address the issue of the nature of possible temporally distinct stages within the reference resolution system.

## References

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