Fearing and Loving:
Verb Category matters in processing implicit causality

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In comprehending causal relationships between events, the preferred referent of a pronoun varies systematically with the verb in the main clause. These verbs are said to have an 'implicit causality bias' (Garvey & Caramazza, 1974).

Previous ERP studies have shown that implicit causality verbs lead to online expectations about upcoming pronouns, with neural processing costs on mismatch pronouns.

These studies, however, have used rich discourse contexts and quite heterogeneous verbs (e.g., Van Berkum et al., 2007).

The ERP current study used only psych verbs (object-experiencer [subject-biased] and subject-experiencer [object-biased] verbs), defined according to semantic classification by Levin (1993) and taxonomy from VerbNet. These verbs had been tested for pronoun resolution bias in a large-scale behavioral study (Hartshorne & Snedeker, 2013).

Implicit causality subject biased / Object experiencer
> Diane frightened Will because SHE ..

Implicit causality object biased / Subject experiencer
Diane feared Will because HE ..

Methods

Congruity

Verb class		congruent	incongruent
	Subj biased	Diane frightened Will because she was mean	Diane frightened Will because he was a coward
	Obj biased	Diane feared Will because he was mean	Diane feared Will because she was a coward

Ratings to determine IC bias
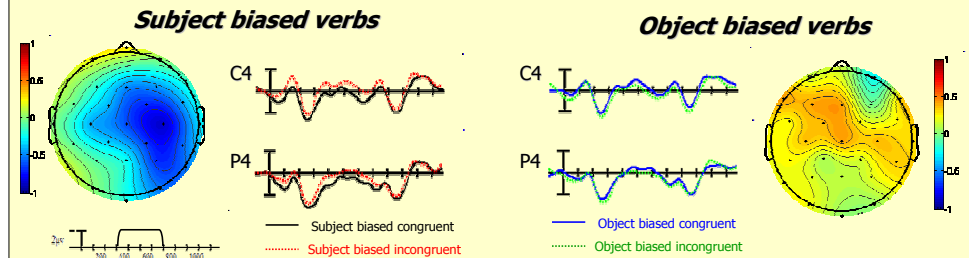
24 subjects

40 sentences per condition

Words presented for 400ms with ISI of 200ms

Sentences presented word-by-word

ERPs measured with 29 active tin electrodes, continuously sampled at 200 Hz

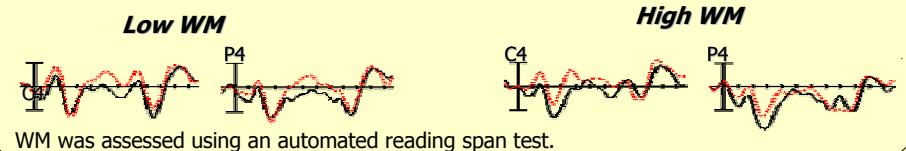Passive reading with yes/no questions

Results

Subject biased verbs
C4
P4
- Subject biased congruent
- Subject biased incongruent

Object biased verbs
C4
P4
- Object biased congruent
- Object biased incongruent

Pronouns that were inconsistent (vs. consistent) with the implicit causality bias evoked a right lateralized prolonged negativity (between 300ms-700ms) when they followed subject-biased (object experiencer) verbs, but not for object biased (subject-experiencer) verbs.

No effects on the word immediately preceding the pronoun ('because')

WM split: preliminary results

Low WM
C4 P4

High WM
C4 P4

WM was assessed using an automated reading span test.

Conclusion

Semantic verb class matters for online use of implicit causality: subject biased/object experiencer verbs were used to quickly generate expectations regarding the cause of the mental state, leading to costs on mismatched pronouns.

This could be because object experiencer verbs, but not subject experiencer verbs, directly encode causality in their lexical entry (e.g., frighten = cause X to feel fear) (e.g., Pesetsky, 1995).

The prolonged negetivity effect can be distinguished from a late positivity effect previously observed with inconsistent IC pronouns (Van Berkum et al., 2007).