

Are Coherence relations computed during reading?

Evidence from a priming experiment

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Abstract

Many theories of discourse structure rely on the idea that the segments comprising the discourse are linked by specific relations such as causality and temporal contiguity. Nevertheless, there is little empirical evidence supporting the claim that such relations are computed during the process of discourse comprehension. This research attempts to provide such evidence through a priming experiment that demonstrates that the process of reading distinguishes between two types of Coherence relations – *elaboration* and *parallel*.

Background

In order to understand how discourse is processed we must first understand how it is represented and structured. However, different theories suggest different ways in which discourse might be organized.

❖ Some theories suggest that discourse is organized in a *hierarchical* manner, where groups of discourse segments are linked to other groups by *coherence relations* (e.g., Segmented Discourse Representation Theory, Asher & Lascarides, 2003; Rhetorical Structure Theory, Mann and Thompson, 1988).

❖ While van Dijk and Kintsch (1983; Kintsch 1998) agree that the representation of discourse is hierarchical, their account of the specific relations between discourse segments is based on *bridging inferences*. Such inferences are generated during the interpretation process, unlike the pre-existing representations that form the catalogue of available coherence relations.

❖ Other theories suggest that discourse might be represented as a unified collection of predicates rather than as a relational hierarchy (e.g., Discourse Representation Theory, Kamp, 1981; Relevance Theory, Sperber and Wilson, 1986).

One important question that might help decide between these theories is therefore:

Do coherence relations play a role in the cognitive representation of discourse?

If specific coherence relations are computed during reading, this should result in a facilitation of the computation of these same relations during future episodes of reading - i.e., *priming*.

The Experiment

This experiment examines priming effects for two types of relations: *Elaboration* and *Parallel*

Elaboration → **Brad attempted to cook Bouillabaisse yesterday.**
He wanted to impress a friend.
In an *elaboration* relation the second sentence describes a part of the first sentence in more detail. For instance, the second sentence of the example explains the motivation behind Brad's actions.

Parallel → **Brad attempted to cook Bouillabaisse yesterday.**
He made an effort to bake crab cakes last week.
In a *parallel* relation the second sentence has similar structure and content as the first. For instance, the second sentence of the example describes another of Brad's efforts at cooking.

Design

- Participants were presented with 32 pairs of sentences in groups of 4 pairs.
- After each group, participants were asked questions about the pairs they had just read.
- Sixteen of the pairs were linked using a parallel discourse relation (*parallel pairs*), the other 16 featured an elaboration relation (*elaboration pairs*).
- Half of the target pairs were *primed* (i.e., preceded by pairs of the same type – a parallel pair that was preceded by a parallel pair) the other half were *unprimed* (e.g., a parallel pair preceded by an elaboration pair).
- Importantly, sentence pairs that had both preceding and following pairs acted as both primes *and* targets.

Stimuli

- The stimuli was comprised of 16 sets of 4 sentences.
- Two sentences were “Head” sentences. These were semantically and syntactically similar. The other two were “Tail” sentences which formed the target *parallel* or *elaboration* relation when combined with one of the head sentences (see sample stimuli set).
- Head-Tail pairings were counterbalanced between participants.

Sample stimuli set	
Type	Sentence
Head 1	Stacy wears a ring on her index finger.
Head 2	Traci keeps a ruby pendant on her desk.
Parallel	She owns a Rolex watch.
Elaboration	She appreciates jewelry.

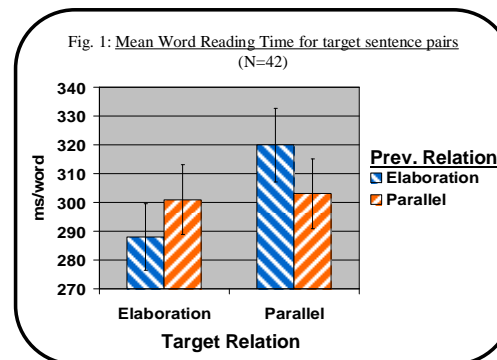
Prediction

Participants will read primed sentence pairs *faster* than they will read unprimed sentence pairs.

Results

- The hypothesized priming effect, represented by the interaction of the target and previous relation types is significant ($p < .01$).
- The effect is significant in the priming of elaboration pairs ($p < .01$), but only marginal for parallel pairs ($p = .06$).
- Additionally, parallel pairs take longer to read than elaboration pairs ($p < .05$). This indicates that elaboration relations are easier to comprehend than parallel relations.

It might appear that the observed priming effect is stronger for elaboration relations than parallel relations. However, this might be an artifact of the experiment method or analysis as both effects are of the same approximate magnitude (~15ms) and the difference is probably due to greater variability in the reading times for parallel sentence pairs.



Discussion

The results described here lend support to the claim that coherence relation are computed as part of the discourse comprehension process. This lends psychological plausibility to models that are based on the computation of such relations, such as SDRT and RST.

However, it is important to note that this experiment does not distinguish whether the observed effects are due to *facilitation* or *interference*. While facilitation would be the most likely explanation for this result, it is also possible that there are some costs associated with switching between computations of different coherence relations. Nevertheless, both of these explanations support the main hypothesis – that coherence relations are computed as part of the discourse comprehension process.

Finally, by employing a similar design it may be possible to create an empirically-motivated set of coherence relations. This would require a significant corpus of semantically-unrelated sentence pairs exhibiting a wide variety of possible coherence relations. By varying the order of the sentence pairs and measuring subsequent reading times, it would be possible to determine which sentence pairs facilitate the comprehension of which other pairs. Since sentence pairs that are primed by the same sentence pair are likely to exhibit the same coherence relation, a cluster analysis would then result in clusters of sentence pairs featuring the same coherence relation. These clusters would then form the basis for a catalogue of coherence relations that are cognitively distinguishable.

References

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