

On causal relations in discourse: Expected and unexpected situations

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Humans anticipate upcoming linguistic material using various cues. In the domain of discourse, factors such as coherence relations, verb semantics and topicality shape expectations about what will be mentioned next. I discuss a series of experiments investigating people's *causality-related* expectations. Causality is a fundamental property of human cognition. Recognizing and comprehending causal relationships allows us to build expectations and to reason about past and future events.

Causal sequences can be segmented into two components, cause and effect. Language allows us to express cause-effect sequences with cause-effect order (isomorphic with the order of events in the world, e.g. *Lisa amused Mary, so Mary laughed*), but also gives us the option of using effect-cause order, which is typically not isomorphic with event order (*Mary laughed because Lisa amused her*; an explanation relation). The question of whether one of these linguistic packaging options is 'more natural', 'more predictable,' or cognitively preferred is still open, and has important implications for our understanding of how humans conceptualize and talk about different kinds of causal relations. The studies we conducted aim to contribute to these issues:

In one series of experiments, we tested whether people's expectations about upcoming causal relations can be influenced by a seemingly unrelated factor: vertical or horizontal motion of the text on the screen (think about TV news where the text scrolls along the bottom). Broadly speaking, this allows us to investigate the modularity (or lack thereof) of discourse-level expectations: If humans use a language-based and meaning-based system where discourse expectations are guided by information grounded in verb semantics, world knowledge, and notions like subjecthood, unrelated vertical/horizontal text motion should not affect expectations about relations between sentences. But if the system that generates discourse-level expectations is permeable, susceptible to influence from cognitive and perceptual processes *unrelated* to language, text motion may have an effect.

To test this, we used IC verbs (e.g. *fascinate, admire*), which -- other things being equal -- typically trigger an expectation for effect-cause/explanation relations (e.g. *Mickey fascinated Daisy. He is an amazing storyteller*). We used a sentence-continuation task to test whether physical motion of text along the horizontal vs. vertical axes influences expectations of the coherence relation between the prompt sentence and the continuation produced by the participant. Does unusual text motion lead people to 'expect the unexpected' in terms of coherence, and push them away from the default explanation bias of IC verbs? Work on vision and motion perception lead us to classify upward motion as more unexpected than downward and right-to-left motion. Indeed, our results show that unexpected text motion (upward) pushes people away from the expected effect-cause relations in an implicit-causality context (and triggers more cause-effect relations). This suggests that generation of discourse expectations can be influenced by unexpected patterns in the visuo-spatial domain, and that choice of cause-effect vs. effect-cause order is malleable.

A related question is whether text genre influences expectations for effect-cause vs. cause-effect order. We conducted a series of experiments investigating production choices with (i) narratives and (ii) safety/warning signs, to see whether genres/discourse types differ in their preferred cause-effect order. We find that while narratives (involving temporally anchored events) elicit cause-effect order, safety signs (with generic statements rather than specific temporally anchored events) show a bias toward effect-cause. This highlights the importance of differences in text type and communicative purpose, suggesting there is no single answer regarding the primacy of cause versus effect.

As a whole, these findings reaffirm the importance of causal inferences during discourse processing. They also highlight the malleable nature of cause-effect ordering: Not only sentence-level but also visuo-spatial and genre-level factors modulate our expectations about whether cause or effect is mentioned first.