Situation Models: The Mental Leap Into Imagined Worlds

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Abstract

Situation models are mental representations of the state of affairs described in a text rather than of the text itself. Much of the research on situation models in narrative comprehension suggests that comprehenders behave as though they are in the narrated situation rather than outside of it. This article reviews some of this evidence and provides an outlook on future developments.

Keywords

situation models; language; comprehension

When reading a fictional text, most readers feel they are in the middle of the story, and they eagerly or hesitantly wait to see what will happen next. Readers get inside of stories and vicariously experience them. They feel happy when good things occur, worry when characters are in danger, feel sad, and may even cry when misfortune strikes. While in the middle of a story, they are likely to use past tense verbs for events that have already occurred, and future tense for those that have not. (Segal, 1995, p. 65)

In the 1980s, researchers proposed that understanding a story, or any text for that matter, involves more than merely constructing a mental representation of the text itself. Comprehension is first and foremost the construction of a mental representation of what that text is about: a situation model. Thus, situation models are mental representations of the people, objects, locations, events, and actions described in a text, not of the words, phrases, clauses, sentences, and paragraphs of a text. The situation-model view predicts that comprehenders are influenced by the nature of the situation that is described in a text, rather than merely by the structure of the text itself.

As a first illustration, consider the following sentences: *Mary baked cookies but no cake* versus *Mary baked cookies and cake.* Both sentences mention the word *cake* explicitly, but only the second sentence refers to a situation in which a cake is actually present. If comprehenders construct situation models, the concept of cake should be more available to them when the cake is in the narrated situation than when it is not, despite the fact that the word *cake* appears in both sentences. Consistent with this prediction, students who read (from a computer screen) short narratives containing sentences such as these recognized words (presented immediately after each text) more quickly when the denoted object was actually present in the narrated situation than when it was not (MacDonald & Just, 1989).

G.A. Radvansky and I have recently reviewed the extensive literature on situation models (Zwaan & Radvansky, 1998). Here, I focus specifically on the evidence pertaining to situation models as vicarious experiences in narrative comprehension. When we place ourselves in a situation, we have a certain spatial, temporal, and psychological "vantage" point from which we vicariously experience the events. Such a perspective has been termed a *deictic center,* and the shift to this perspective a *deictic shift* (Duchan, Bruder, & Hewitt, 1995). In everyday life, we are typically aware of our location and time. We are also aware of our current goals. We are aware of people in our environment and their goals and emotions. And we are aware of objects that are relevant to our goals. This is a useful first approximation of what should be relevant to a deictic center.

SPACE

People exist in, move about in, and interact with environments. Situation models should represent relevant aspects of these environments. Very often (but not necessarily), objects that are spatially close to us are more relevant than more distant objects. Therefore, one would expect the same for situation models. Consistent with this idea, comprehenders are slower to recognize words denoting objects distant from a protagonist than those denoting objects close to the protagonist (Glenberg, Meyer, & Lindem, 1987).

When comprehenders have extensive knowledge of the spatial layout of the setting of the story (e.g., a building), they update their representations according to the location and goals of the protagonist. They have the fastest mental access to the room that the protagonist is currently in or is heading to. For example, they can more readily say whether or not two objects are in the same room if the room mentioned is one of these rooms than if it is some other room in the building (e.g., Morrow, Greenspan, & Bower, 1987). This makes perfect sense intuitively; these are the rooms that would be relevant to us if we were in the situation.

People's interpretation of the meaning of a verb denoting movement of people or objects in space, such as *to approach,* depends on their situation models. For exam-

ple, comprehenders interpret the meaning of *approach* differently in *The tractor is just approaching the fence* than in *The mouse is just approaching the fence.* Specifically, they interpret the distance between the figure and the landmark as being longer when the figure is large (tractor) compared with when it is small (mouse). The comprehenders' interpretation also depends on the size of the landmark and the speed of the figure (Morrow & Clark, 1988). Apparently, comprehenders behave as if they are actually standing in the situation, looking at the tractor or mouse approaching a fence.

TIME

We assume by default that events are narrated in their chronological order, with nothing left out. Presumably this assumption exists because this is how we experience events in everyday life. Events occur to us in a continuous flow, sometimes in close succession, sometimes in parallel, and often partially overlapping. Language allows us to deviate from chronological order, however. For example, we can say, "Before the psychologist submitted the manuscript, the journal changed its policy." The psychologist submitting the manuscript is reported first, even though it was the last of the two events to occur. If people construct a situation model, this sentence should be more difficult to process than its chronological counterpart (the same sentence, but beginning with "After"). Recent neuroscientific evidence supports this prediction. Event-related brain potential (ERP) measurements[2] indicate that "before" sentences elicit, within 300 ms, greater negativity than "after" sentences. This difference in potential is primarily located in the left-anterior part of the brain and is indicative of greater cognitive effort (Münte, Schiltz, & Kutas, 1998).

In real life, events follow each other seamlessly. However, narratives can have temporal discontinuities, when writers omit events not relevant to the plot. Such temporal gaps, typically signaled by phrases such as *a few days later,* are quite common in narratives. Nonetheless, they present a departure from everyday experience. Therefore, time shifts should lead to (minor) disruptions of the comprehension process. And they do. Reading times for sentences that introduce a time shift tend to be longer than those for sentences that do not (Zwaan, 1996).

All other things being equal, events that happened just recently are more accessible to us than events that happened a while ago. Thus, in a situation model, *enter* should be less accessible after *An hour ago, John entered the building* than after *A moment ago, John entered the building.* Recent probe-word recognition experiments support this prediction (e.g., Zwaan, 1996).

GOALS AND CAUSATION

If we have a goal that is currently unsatisfied, it will be more prominent in our minds than a goal that has already been accomplished. For example, my goal to assist my wife in preparing for a party at our house tonight is currently more active in my mind than my goal to write a review of a manuscript if I finished the review this morning. Once a goal has been accomplished, there is no need for me to keep it on my mental desktop. Thus, if a protagonist has a goal that has not yet been accomplished, that goal should be more accessible to the comprehender than a goal that was just accomplished by the protagonist. In line with this prediction, goals yet to be accomplished by the protagonist were recognized more quickly than goals that were just accomplished (Trabasso & Suh, 1993).

We are often able to predict people's future actions by inferring their goals. For example, when we see a man walking over to a chair, we assume that he wants to sit, especially when he has been standing for a long time. Thus, we might generate the inference "He is going to sit." Keefe and McDaniel (1993) presented subjects with sentences like *After standing through the 3-hr debate, the tired speaker walked over to his chair (and sat down)* and then with probe words (e.g., *sat,* in this case). Subjects took about the same amount of time to name *sat* when the clause about the speaker sitting down was omitted and when it was included. Moreover, naming times were significantly faster in both of these conditions than in a control condition in which it was implied that the speaker remained standing.

As we interact with the environment, we have a strong tendency to interpret event sequences as causal sequences. It is important to note that, just as we infer goals, we have to infer causality; we cannot perceive it directly. Singer and his colleagues (e.g., Singer, Halldorson, Lear, & Andrusiak, 1992) have investigated how readers use their world knowledge to validate causal connections between narrated events. Subjects read sentence pairs, such as 1a and then 1b or 1a' and then 1b, and were subsequently presented with a question like 1c:

(1a) Mark poured the bucket of water on the bonfire.

(1a') Mark placed the bucket of water by the bonfire.

(1b) The bonfire went out.

(1c) Does water extinguish fire?

Subjects were faster in responding to 1c after the sequence 1a-1b than after 1a'-1b. According to Singer, the reason for this is that the knowledge that water extinguishes fire was activated to validate the events described in 1a-1b. However, because this knowledge cannot be used to validate 1a'-1b, it was not activated when subjects read that sentence pair.

PEOPLE AND OBJECTS

Comprehenders are quick to make inferences about protagonists, presumably in an attempt to construct a more complete situation model. Consider, for example, what happens after subjects read the sentence *The electrician examined the light fitting.* If the following sentence is *She took out her screwdriver,* their reading speed is slowed down compared with when the second sentence is *He took out his screwdriver.* This happens because *she* provides a mismatch with the stereotypical gender of an electrician, which the subjects apparently infer while reading the first sentence (Carreiras, Garnham, Oakhill, & Cain, 1996).

Comprehenders also make inferences about the emotional states of characters. For example, if we read a story about Paul, who wants his brother Luke to be good in baseball, the concept of "pride" becomes activated in our mind when we read that Luke receives the Most Valuable Player Award (Gernsbacher, Goldsmith, & Robertson, 1992). Thus, just as in real life, we make inferences about people's emotions when we comprehend stories.

Just as we empathize with real people, we seem to empathize with story protagonists. Comprehenders' preferences for a particular outcome of a story interfere with the verification of previously known information about the actual outcome of the story. For example, comprehenders had difficulty verifying that "Margaret made her flight" when they had learned previously that Margaret's plane would plunge into the sea shortly after takeoff (Allbritton & Gerrig, 1991). Allbritton and Gerrig hypothesized that during reading, comprehenders generated *participatory* responses (e.g., "I hope she will miss the flight") that interfered with their verification performance.

THE FUTURE OF SITUATION MODELS

How close are we to a scientific account of the vicarious experiences described in the epigraph to this article? Advances are to be expected on two fronts. On the theoretical front, there will be discussion of the proper representational format for situation models. Researchers, most notably Kintsch (1998), have proposed computer models of how people construct situation models. The question has been raised recently as to whether such computer-based models can account for the full complexity of situation-model construction (and human cognition in general), or whether a biologically oriented approach has more explanatory power (e.g., Barsalou, in press). On the methodological front, the repertoire of cognitive tasks is being supplemented with measures of brain activity. Initial findings provide converging evidence (e.g., Münte et al., 1998).

To summarize, many aspects of narrated situations have already been shown to affect our understanding of stories. However, there is still a great deal that must be learned before we have a good understanding of people's fascinating ability to make a mental leap from their actual situation, reading a book on the couch, to an often fictional situation at a different time and place. Recent theoretical and methodological developments give reason to be optimistic about this endeavor.

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Notes

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2. ERPs are modulations of electrical activity in the brain that occur as a result of the processing of external stimuli.

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