Suppression of Story Character Goals During Reading

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Abstract

The objective of this study was to determine how readers process narrative texts when the main character has multiple, and changing, goals. Readers must keep track of such goals to understand the causal relations between text events, an important process for comprehension. The structure building framework theory of reading proposes that readers maintain the most relevant goal in focus using the mechanism of suppression. The results of this study confirm that readers maintain the activation of goal information that is rementioned in a text and suppress previous goal information when a new goal is introduced. Thus, in an attempt to understand the causal relations between events in a text, readers keep track of multiple story character goals by using suppression.

To comprehend a narrative story, readers must be able to understand the cause-and-effect relations that exist between events (see van den Broek, 1990, 1994). The importance of understanding the causal relations that exist between narrative events has been well documented (e.g., O'Brien & Myers, 1987; Trabasso, Secco, & van den Broek, 1984; Trabasso & van den Broek, 1985; Varnhagen & Goldman, 1986). Narrative events that are highly causally connected with other events are more often recalled and rated as more important by readers than are events with few causal connections. In addition, readers comprehend texts better when the causal structure has been revised so that the causal sequence of events is easier to follow (Linderholm et al., 2000; Vidal-Abarca, Martinez, & Gilabert, 2000). Thus, for ideal comprehension, readers identify the causal path of events in a narrative story from beginning to end.

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One way that readers can easily identify the causal path of events in a story is by keeping track of story characters' goals (e.g., Fletcher & Bloom, 1988; Foss & Bower, 1986; Schank & Abelson, 1977; Suh & Trabasso, 1993; Trabasso & van den Broek, 1985). NarTatives typically consist of a main character who has a particular goal or desire, and the causal sequence of events typically begins with a description of that goal. The actions that result, and subsequent outcomes, are caused by the character's desire to achieve the goal. Thus, understanding the causal sequence of events is heavily dependent on understanding characters' goals.

Goals are also important for comprehending narrative stories because goals are typically connected to many other events and episodes (e.g., Bower & Rinck, 1999; Trabasso & van den Broek, 1985). Keeping track of characters' goals allows the transition from episode to episode to occur smoothly and provides cohesion between episodes (e.g., Huitema, Dopkins, Klin, & Myers, 1993). Readers who keep track of goals from episode to episode are more likely to understand the major theme of the story (van den Broek, Lynch, Naslund, levers-Landis, & Verduin, 2003). Thus, goals are important for narrative story comprehension because they help readers process the causal relations between events, facilitate a coherent transition from episode to episode, and allow readers to formulate story themes.

Most narrative stories are complex and involve multiple goals on the part of the main characters. To comprehend, readers must be able to keep track of these goals (e.g., Magliano & Radvansky, 2001; Sharkey & Bower, 1987; Suh & Trabasso, 1993). For example, readers in one study were presented with stories that contained a global goal (a superordinate goal) and a subgoal (a subordinate goal) that was causally related to achieving the global goal (Suh & Trabasso, 1993). Readers were probed at the points where the superordinate and subordinate goals were introduced. Both superordinate and subordinate goals were salient to readers. In another set of studies, readers were presented with stories that contained story characters' completed goals to determine whether completed goal information remains active (Lutz & Radvansky, 1997; Radvansky & Curiel, 1998). Results from these studies show that completed goal information also is salient to readers as are new goals that a story character may have. Thus, story characters' multiple goals are salient to readers during the process of reading.

The purpose of this investigation was to study the cognitive processes by which readers process a narrative story when the main character changes goals, which makes one goal, the original goal, irrelevant for understanding the rest of the story. That is, we investigated the processing of goal information when a new goal replaces an original goal, and the fate of the original goal is unknown and is not necessarily causally related to the new goal. Theoretically, this is an interesting topic because it allows us to investigate how readers manage their attentional resources when faced with a situation in which goals are shifting dynamically, as they often are in real life. In this particular situation, a reader might benefit by suppressing the now irrelevant, original goal to ensure comprehension of future story events that are related to the new goal. The primary objective of this study was to investigate how readers process a narrative when story characters' goals change in the sense that one goal becomes irrelevant to the story. It was hypothesized that readers manage this situation by suppressing the activation of the now irrelevant goal.

The hypothesis that readers suppress goal information that is no longer relevant has empirical precedents (e.g., Gernsbacher, Keysar, Robertson, & Werner, 2001; Gernsbacher, Robertson, Palladino, & Werner, in press). For example, when Gernsbacher and her colleagues presented participants with multiple story characters' names, readers suppressed an original story character's name when a new character was introduced. Further, readers suppressed the original story character's name below the level of a neutral condition, suggesting that readers not only deactivated the original character's name but also suppressed it so it would not interfere with ongoing comprehension (Gernsbacher et al., in press). Story characters' names are suppressed in such a way to maximize comprehension. This provides empirical support for the notion that readers modulate the activation of pertinent information in narrative stories, using suppression, to maximize comprehension.

Although Gernsbacher's previous research (Gernsbacher et al., 2001; Gernsbacher et al., in press) supports the current proposal that readers suppress irrelevant story characters' goals, this prior research has focused on concrete constructs such as story characters' names. A story character's goal, of course, is a more abstract construct. Keeping track both of story characters' names and of story characters' goals would seem important for understanding the cause-and-effect relations between events described in texts, so it is plausible that suppression is used to maximize comprehension. Support for this hypothesis would allow the theory that readers use the mechanism of suppression to be extended beyond concrete constructs to include abstract constructs such as character goals.

To provide justification for our hypothesis about how readers might process a narrative story with multiple, and changing, character goals, we can extend the structure building framework, a theoretical description of the process of reading, to the processing of goals (Gernsbacher, 1990, 1995, 1997). The structure building framework proposes that readers attempt to input incoming information into their current mental structure of the text. If the information is consistent with the current structure, it is mapped onto it. If the information is inconsistent, it is shifted into a new substructure. According to this theory, readers use the cognitive mechanisms of suppression and enhancement to create mental structures and substructures and to modulate the activation of relevant story information. Specifically, readers increase and/or maintain activation of relevant information and decrease activation of irrelevant information. For example, if readers encounter a word that has dual meanings, both meanings may initially be activated and then the irrelevant meaning suppressed in order to comprehend the word in its context (see Gernsbacher & Faust, 1991). The structure building framework theory, in particular the mechanism of suppression, allows predictions of how readers might process multiple story character goals in an attempt to keep track of important story information.

Extending the structure building framework to goals, we hypothesized that when readers encounter a situation in which a story character's goals are dynamic, they will maintain goal information that is most relevant to the understanding of text in immediate focus and suppress goal information that is no longer relevant to the focus of this portion of the text. Specifically, when readers have encountered a goal in a narrative story, they will maintain the activation of the goal when the goal is elaborated on and/or mentioned again. In contrast, when readers encounter a new goal in a narrative story that is unrelated to the original goal,

they will remove the original goal from immediate focus and suppress its activation. Encountering a new goal signals the reader that the original goal is no longer crucial for forming a coherent mental structure of text events. In fact, it may actually hinder comprehension for readers to continue activating an old goal that is no longer relevant for understanding this direction of the story, so a mechanism such as suppression may be necessary for quickly dampening the activation of a goal that is no longer relevant. Thus, using suppression, readers are expected to modulate the activation of goal information to keep the most important information for comprehension in focus and to reduce activation of less important information.

The following experiment was designed to test the hypothesis that readers maintain story characters' goals that are rementioned in a story and suppress original, irrelevant goals when new ones are encountered. In this experiment, participants read short narratives that initially described the original goal of a story character. This was done to ensure that all participants, irrespective of condition, formed a representation of the original goal. Stories were continued in one of three conditions to assess readers' subsequent activation strengths of goal information: the original goal was rementioned, a new goal was introduced, or neutral information was described (i.e., neither the original goal nor a new goal was mentioned). It should be noted that the neutral condition was constructed so that readers did at one time have a representation of the original goal. This is important because the relative strength of this same information can then be assessed in the other two conditions. To assess the strength of the original goal's representation, readers' probe verification latency and ability to accurately recognize the original goal after reading narratives in one of the three aforementioned conditions were collected. According to the suppression hypothesis, participants will quickly suppress the activation of the original, irrelevant goal to free up resources for the new direction the story is taking when a new goal is introduced. If suppression is indeed the mechanism readers use to keep track of multiple, and changing, story characters' goals, readers will be faster and more accurate in responding to original goal information in the neutral condition than in the new goal condition.

Method

Participants

One hundred ten undergraduate participants were recruited from an introductory psychology human participant pool at a large mid-western university. Twenty-six participants' data were removed from the experiment because of failure to meet a preestablished criterion of 62% response accuracy in each experimental condition. This criterion is the minimum rate at which responses could be reliably above chance in this particular experimental design. Of the remaining 84 participants, 42 were men and 42 were women. All participants were native speakers of American English and had normal or corrected-to-normal vision.

Materials

Thirty-two texts, each consisting of three paragraphs, were constructed (see Table 1 for an example). As shown in Table 1, each text began with a paragraph that described a story character and a goal; the first paragraph was the same across participants. The second

paragraph contained the story character goal manipulation and resulted in the creation of three versions of each text (original goal rementioned, new goal introduced, and neutral as shown in Table I). Each participant saw only one version of each text. In Version I, the character's original goal was rementioned; in Version 2, a new goal of the same story character was introduced; and in Version 3, neutral information was presented that pertained to neither the original nor the new goal. Each text ended with a third, concluding paragraph that was the same across versions. There were corresponding probe words for each story that summarized the original goal.

In addition, 16 filler narratives were created using the same three-paragraph structure as the experimental texts. As with the experimental texts, the main story character had an original goal, then either that original goal was rementioned, or it was not mentioned, or a new goal was introduced. Each filler story was written in only one of the aforementioned versions.

Procedure

Participants read the 32 experimental and 16 filler texts from a computer monitor. A probe verification task was used to determine how accessible goal information was at two test points: immediately after the description of the original goal (the first paragraph) and then after the story character goal manipulation paragraph (the second paragraph). Participants responded either "Yes" or "No" as to whether they had seen the word in the story that they were currently reading. The length of time spent verifying the probe word (in milliseconds) and error rates at verifying the probe word were collected. To ensure that participants did not formulate expectations about what was being tested, we added a final test point in the third paragraph of each text. At this point, all participants responded to a filler probe word.

"Yes"–"No" responses at each of the three test points were counterbalanced so that participants' responses would vary. In addition, to balance the number of "Yes"–"No" responses and the pattern of "Yes"–"No" responses within each text, participants read 16 filler texts that were presented randomly throughout the experiment. Finally, to ensure comprehension, participants were periodically asked to write one-line continuations for one fourth, or a total of 12, of the texts. They were given 15 s to write continuations for each text. Participants had no prior knowledge of which texts would come with a continuation task.

Participants heard general instructions at the beginning of the session and were given two practice trials. Participants were asked to read at their own pace and to read for comprehension. Each trial began when the participant pressed the "Advance" key on the computer keyboard upon hearing and seeing the cue "READY?" on the center of the computer screen. Participants then read each text, one paragraph at a time. After finishing a paragraph, participants were instructed to press the "Advance" key as an indication that they were ready for the next paragraph. Immediately after each paragraph, participants saw a probe word appear on the computer and were to press the "Yes" or "No" key to indicate whether they had seen the word in the story thus far. During the experiment, participants kept their fingers-hands ready to respond to the probe verification task by keeping their middle and index fingers on the computer keyboard.

Results

Prior to conducting the analyses, responses that were faster than 250 ms were removed from the data set because it is doubtful that meaningful responses at such a fast rate could be based on stimuli. One-way analyses of variance (ANOVAs) were conducted on verification latencies (in milliseconds) as well as verification error rates (in percentages) with story character goal status as the independent variable (original introduction of goal, original goal rementioned, new goal introduced, and neutral goal). Planned comparisons were conducted to test specific hypotheses. All ANOVAs were conducted using participants (F_1) and probe words as random effects (F_2). An alpha level of .05 was used for all analyses.

Verification Latency (in milliseconds)

Descriptive statistics for each of the story character goal status conditions are presented in Table 2. The main effect of story character goal status was significant, $F_1(3, 83) = 94.65$, $p < .001$; F2(3, 31) = 71.82, $p < .001$. Planned comparisons showed that participants were faster to verify the original goal after the goal was rementioned than after a new goal was introduced, $F_1(1, 83) = 196.14$, $p < .001$; $F_2(1, 31) = 148.33$, $p < .00$ 1 . In addition, participants were faster to verify the original goal after the goal was rementioned than after neutral information in which neither goal was mentioned, $F_1(1, 83) = 75.68$, $p < .001$; $F_2(1, 31) = 57.93$, $p < .001$. Participants were slower to verify the original goal after the introduction of a new goal than after the neutral information, $F_1(1, 83) = 28.15$, $p < .001$; $F_2(1, 31) = 20.86$, $p < .0$ 1. Finally, there were no differences in verification latencies between the initial introduction of the goal and a remention of the goal ($Fs < 1$). These results demonstrate that the memory of goal information is maintained by re-mentioning the goal and suppressed when a new goal is introduced.

Verification Errors (Percentage of Errors)

Descriptive statistics for error rates in each story character goal status condition are presented in Table 2. The main effect of story character goal status was significant, $F_1(3, 83) = 25.67$, $p < .001$; $F_2(3, 31) = 14.40$, $p < .001$. Planned comparisons showed that participants made fewer errors verifying the goal when the original goal was rementioned than when a new goal was introduced or when neither goal was mentioned, $F_1(1, 83) = 56.40$, $p < .001$; $F_2(1, 31) = 31.64$, $p < .001$, and $F_1(1, 83) = 38.63$, $p < .001$; $F_2(1, 31) = 21.67$, $p < .001$, respectively. The difference in error rates between the introduction of a new goal and neutral information was not significant ($Fs < 1$). Finally, there was no difference in error rates between the original mention of the goal and when the goal was rementioned ($Fs < 1$). The results of these analyses show that goal information has a stronger, and more accurate, memory trace when rementioned in the course of a narrative story and that this same goal information is suppressed when a new goal is introduced.

Discussion

The objective of this study was to investigate how readers process a narrative text when a story character has multiple, changing goals. The results showed that readers were faster to verify an original goal after the same goal was mentioned again in a story than after the

introduction of a new goal or neutral information. In addition, readers were slower to verify the original goal after a new goal was described than after neutral information was presented. Similarly, readers made fewer errors verifying the original goal after this goal was rementioned than after a new goal or neutral information was presented. The results of this study confirm that readers maintain the activation of goals that are rementioned in a story and suppress goals that are made irrelevant by more recent and more immediately important goals for understanding narrative events. The findings of this investigation provide evidence that, in an attempt to understand narrative events, readers keep track of multiple story character goals by modulating the activation of goals using the mechanism of suppression.

The results of this study extend the structure building framework theory of reading (e.g., Gemsbacher, 1997), developed using concrete types of information such as story characters' names, by showing that it also applies to more abstract constructs such as story characters' goals. Our results indicate that the structure building framework theory accounts for the modulation of activation for both concrete and abstract constructs, underscoring the importance of the mechanism of suppression for building mental structures of narrative text events.

Additional theoretical support for the notion that readers modulate the activation of story character goals in an attempt to maintain causal coherence can be found in the landscape model of reading (e.g., Linderholm, Virtue, Tzeng, & van den Broek, in press; van den Broek, Risden, Fletcher, & Thurlow, 1996; van den Broek, Young, Tzeng, & Linderholm, 1999). The landscape model is a connectionist model that can be used to simulate what concepts are activated during reading and the impact that the patters of activation have on the final representation of a text. One of the characteristics of the landscape model's architecture is that concepts fluctuate in their degree of activation over the course of reading a text. Under the assumption that readers have a limited working memory capacity, concepts must compete for activation to be maintained in working memory. For optimal comprehension only the concepts most relevant for understanding the causal sequence of events will have enough activation to be maintained and concepts that are irrelevant for comprehension must be suppressed to free up working memory capacity. Thus, the results of this study are consistent with a theory of reading that is captured in the landscape model.

An alternative explanation for these findings is that original goal information simply decays after it is last mentioned in the text. Support for this explanation would be found if verification latencies were equivalent in the neutral and new goal conditions at the second test point. In both conditions, the original goal information is mentioned twice in the original paragraph of each text and not after that.[1] Thus, decay would be equivalent in these two

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[1] In the new goal and neutral conditions the goal word was explicitly mentioned two times in the text, whereas in the goal remention condition the goal word was mentioned three times in the text. One might argue that these results can be explained by differences in surface repetition of the goal word among the three conditions. First. evidence for suppression, the focus of this experiment, is based on the comparison between the new goal and neutral conditions, which had an equal number of mentions of the goal word. Second, activation of goal information was equivalent after the first paragraph ($M = 714$ ms), which included two mentions of the goal word. and after the goal word was rementioned ($M = 713$ ms), which included three mentions of the goal word. Thus. a third mention of the goal led to the maintenance of the goal and did not increase its activation over and above a second mention. Indeed, the sheer number of explicit mentions of the goal word (i.e., two vs. three mentions) did not affect its activation.

conditions. Contrary to this prediction, we observed a difference in verification latencies between these two conditions: Participants were slower to verify probe words in the new goal condition than in the neutral condition, in which neither the original nor the new goal was mentioned. Therefore, a decay explanation cannot account for these findings.

The finding that readers keep the most causally relevant goal in focus adds to other empirical findings that the accessibility of original goal information is diminished with the onset of a new goal (Magliano & Radvansky, 2001). This study extends previous findings by showing that the status (i.e., whether or not the goal is completed, failed, etc.) of an original and a new goal can be ambiguous, and this status does not affect the accessibility of original goal information. That is, even when the original goal's success is unknown or ambiguous, the most recent goal remains in the reader's focus.

In conclusion, this study yields support for the importance of goals for understanding the causal sequence in narrative stories. Readers keep track of multiple, and changing, characters' goals in a story by maintaining important goals and suppressing irrelevant goals. Thus, they do what is necessary to optimally identify causal connections by keeping a careful account of the most pertinent goal.

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Table 1

Example of Stimulus Material Used

Experimental Text[a]
Paragraph 1 (Introduction)
Stacy was having a dinner party and wanted to make a special three-layer cake for dessert. It was her sister's graduation and she wanted to celebrate in style. Stacy couldn't wait for her sister to see the cake she was going to bake for her.
Transition 1: Stacy grabbed her purse and prepared to leave the house.
Probe 1: CAKE (Experimental probe); CHOCOLATE (Filler probe)
Paragraph 2 (Goal manipulation)
Original goal rementioned: Stacy went to the store to buy ingredients for the cake. She couldn't believe how expensive grocery items were these days! She hurried to collect the things she needed for the cake.
New goal introduced: Stacy went to the store to buy ingredients for the appetizers. She couldn't believe how expensive grocery items were these days! She hurried to collect the things she needed for the appetizers.
Neutral: Stacy went to the store. She couldn't believe how expensive grocery items were these days! She hurried to collect the things she needed.
Transition 2: Stacy was running out of time, so she rushed out of the store.
Probe 2: CAKE (Experimental probe); FLOUR (Filler probe)
Paragraph 3 (Conclusion)
The graduation party was going to start in two hours. Stacy hoped it would turn out well. Graduating from college had been quite a struggle for Stacy's sister. She nearly flunked out of school three times. Stacy knew that she was back on track and had a bright future.
Probe 3: DIPLOMA (Filler probe)

[a]One of 32 experimental texts (each three paragraphs long) constructed for the experiment. Sixteen filler natTatives were also created using the same three–paragraph structure.

Table 2

Probe Verification Latency and Errors as a Function of Story Character Goal Status

| | Probe Verification | | | |
| | Latency (ms) | | Errors (%) | |
Goal Status	M	SD	M	SD
After 1 st paragraph				
After original introduction of goal	714	14	3	0.6
After 2nd paragraph				
After original goal rementioned	713	14	1	0.4
After new goal introduced	908	20	10	1.2
After neutral	834	18	8	1.0