Goal Information and Text Comprehension

By

Eric D. Richards

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A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University

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Abstract

This study examined how readers use goal information during comprehension. Passages with complex goal structures that described two characters who shared a superordinate goal and had independent subgoals were used. For example, to go on vacation, Phillip has to borrow a car, and Andy has to book a hotel room. In Experiment 1, the first subgoal succeeded or failed (e.g., Phillip succeeds or fails in borrowing a car) and the second subgoal succeeded (e.g., Andy books a room). A subsequent target sentence described the second character's attempt to execute the superordinate goal. The target is inconsistent with the prior failure of the first subgoal. Target reading time was predicted to be longer in the failed than succeeded condition. No difference was found, and, to the contrary, reading time for the next sentence revealed the opposite pattern. In Experiment 2, both the first subgoal's success and its position (first or second in the text) was varied. The reading time advantage of the spillover sentence was replicated only when the manipulated subgoal appeared first. The failed advantage in Experiment 1 and 2 is discussed with respect to a working memory and suspension of comprehension hypotheses. In Experiment 3, a recognition priming procedure was used to assess the activation of the manipulated subgoal in memory before and after the target and spillover sentences. Participants responded more quickly to probe words (e.g., CAR), that referred to the manipulated subgoal and appeared after spillover sentences, in the succeeded than failed condition. This suggests that readers reinstate previously succeeded subgoals to understand current actions of characters. This memory retrieval elevates the reading time of target sentences compared to when the subgoals have failed, thus accounting for the reading time effect.

Goal Information and Text Comprehension

When people read text, they combine information that is stated explicitly along with information based on their general knowledge of the world. In doing this, readers construct a coherent representation of the message being conveyed by the author. One feature of a text that assists readers in constructing a coherent representation is the text's underlying causal structure. The causal structure of text plays a central role in normal text comprehension (Schank & Abelson, 1977). With narrative text specifically, the goals and motives of protagonists in a story can represent this causal structure (Black & Bower, 1980).

For example, consider the following passage (Suh & Trabasso, 1993):

1.   (a)   One day Betty found that her mother's birthday was coming soon.

           (b)   She really wanted to give her mother a present.

           (c)   She went to the department store.

           (d)   She found a pretty purse.

           (e)   She bought the purse.

This passage outlines a general causal or goal structure centred on Betty's goal to buy a present for her mother's birthday. Sentence (1b) presents Betty's original goal. The subsequent actions and events in Sentences (1c) and (1d) are motivated by this goal, and are undertaken by Betty to satisfy this goal. Finally, in Sentence (1e), the goal of buying a birthday present is achieved.

This simple example demonstrates how the underlying causal structure, specifically represented by a protagonist's goal plan, can characterize narrative passages. This causal

or goal structure is one text feature that allows the reader to understand any new information that is provided in each subsequent sentence. New information (e.g., protagonist actions) is understood relative to the text's overall causal structure. The reader connects current actions or events involving protagonists to previously stated goals of the protagonists (Lutz & Radvansky, 1997; Suh & Trabasso, 1993). These connections aid the reader in constructing a coherent representation of the information presented in the text.

In this thesis, I will focus on readers' use of goal-related information to construct coherent representations of narrative texts. Traditionally, researchers have used very simple causal or goal structured text to investigate readers' comprehension processes. The experiments presented in this paper will use a set of new, more complex causal texts. These texts will permit a more stringent test of readers' comprehension processes.

In the first part of this paper, I will present a survey of the relevant representational structures and cognitive processes that readers use during text comprehension. Subsequently, I will survey pertinent experimental procedures used by researchers to investigate language comprehension. A discussion of causal and goal-related representations and processes will follow this section. I will include a review of the relevant empirical studies. Three experiments that I have completed will then be presented. These studies investigate a set of new narrative passages constructed to examine goal-related inferences.

An inference is information generated by readers that is not explicitly presented in the text. For example, after reading the sentence The tailor swept the floor, individuals

may infer that the tailor used a broom (Singer, 1990, p. 168). Inferences provide connections between explicit information in the text and help augment its underlying meaning. Goal-related inferences provide connections between actions or events and previously stated goals of protagonists. In the Betty example above, readers may connect the actions in Sentence (1e) (e.g., <u>Betty bought the purse.</u>) to the original goal stated in Sentence (1b) (e.g., <u>Betty wanted to give her mother a present.</u>). Readers generate inferences to help maintain the coherence of the text. A text is coherent if the information presented in the passage is well-connected and related (Kintsch & van Dijk, 1978). Coherent passages are clear and can be comprehended by readers with little trouble. More specifically, a well-connected and coherent passage enables readers to construct a coherent representation of the meaning of the passage.

The new passages employed in the experiments presented in this paper portray a more complex goal structure than do passages in previous studies. The experiments presented in this thesis involve the on-line assessment of cognitive processes of readers. <u>On-line</u> measurements involve the measurement of normal comprehension processes of readers that occur while they are initially comprehending narrative passages. An example of an <u>on-line</u> measure is the time it takes an individual to read a sentence. If individuals have difficulty in comprehending a sentence, it will take them longer to read the sentence.

The first two experiments presented here demonstrate that these more complex passages produce unusual patterns of comprehension processes, as indicated by the duration of reading times for specific key sentences. These reading time results are taken to reflect the underlying cognitive processes that readers are engaging in when they

comprehend narrative text. A third experiment expands upon these findings and consists of

an on-line evaluation of the activation of goal-related information in memory. This

information is used by readers to generate goal-related inferences.

<div align="center">Levels of Text Representation</div>

When individuals comprehend text, they must be able to internally represent the

meaning of the text in some form. Psychologists have distinguished three levels of

cognitive representation that are constructed during comprehension of text (Kintsch,

1988; Kintsch, & van Dijk, 1978; Kintsch, Welsch, Schmalhofer, & Zimny, 1990; van Dijk

& Kintsch, 1983). Consider the following example,

     2.   (a)   The pilot started the red plane.

           (b)   He taxied onto the runway.

During reading people construct a cognitive representation of the verbatim

structure of the sentence, the surface level of representation. This surface representation

preserves the exact wording and syntactical structure of the sentence. Readers also

construct a representation of the semantic content of the sentence, called the textbase level

of representation. The psychological representation of meaning at this level is in the form

of propositions. Propositions consist of a predicate and one or more arguments, and

represent the underlying meaning being conveyed by a sentence (Kintsch, 1974). The

predicate of a proposition is usually the concept derived from the verb, adverb, or

adjective of a sentence. Arguments refer to concepts related to the predicate. These

arguments are usually derived from the nouns of a sentence. The propositions underlying

the previous sentences are as follows:

P1   START(PILOT, PLANE)

P2   RED(PLANE)

P3   TAXI(PILOT,PLANE)

P4   LOCATION: ONTO(P3, RUNWAY)

Figure 1. Network of connected propositions.
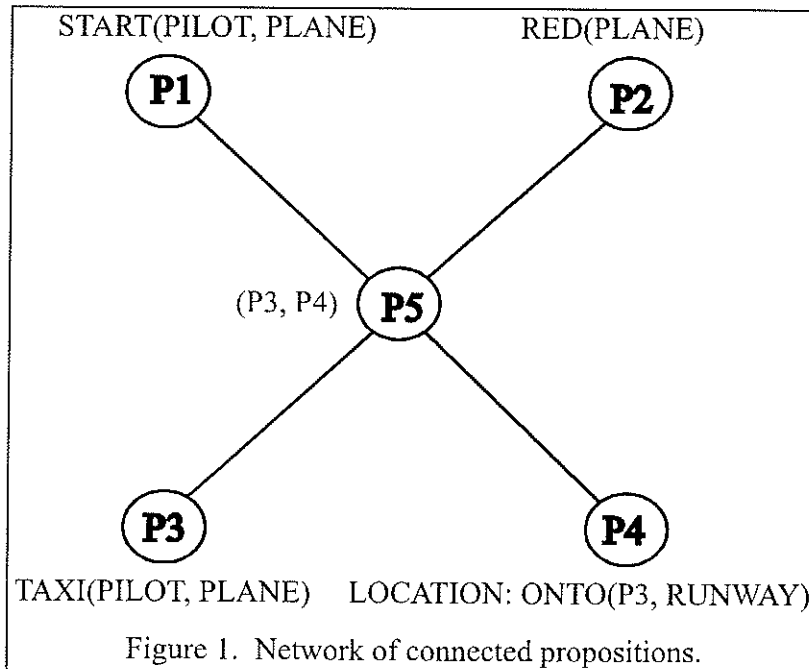
The textbase is constructed as an interconnected network of associated propositions. For example, when readers comprehend Sentences (2a) and (2b), they connect the proposition from Sentence (2a), START(PILOT, PLANE) to the proposition in Sentence (2b), TAXI(PILOT). The common text idea of PILOT that is present in each sentence (i.e., argument overlap) results in these two propositions being connected to one another. The proposition RED(PLANE) is connected to START(PILOT, PLANE), and the proposition ONTO(P3, RUNWAY) is connected to TAXI(PILOT). The interconnected network of propositions is presented in Figure 1. This network of propositions represents the underlying meaning of Sentences (2a) and (2b).

The textbase may also include a small number of inferences that are needed to

preserve coherence (Haviland & Clark, 1974). Inferences are propositions that are not

presented explicitly in the text. They are generated by readers to aid in the comprehension

and integration of each new sentence with the previous sentences. Inferences provide

connections between information provided in the text. In Sentence (2b), the pronoun HE

refers to the pilot, and as a result of an anaphoric inference the reader understands that the

second sentence refers to the agent in Sentence (2a), the PILOT. The reader will also infer

the proposition

P5   (P3, P4).

This proposition is not explicitly expressed in Sentence (2b). The reader needs to know

that it was the plane that the pilot taxied onto the runway. When the reader makes this

inferences they can more easily understand these two sentences. They are comprehensible

in that they have referential connections between them.

Finally, the situation model or mental model level of representation is an even more

elaborate referential representation of text meaning. A situation model is a representation

of the people, setting, actions, and events that are explicitly stated in the sentence(s) and

referred to inferentially by the sentence(s) (van Dijk & Kintsch, 1983; also see Kintsch,

1988). Situation models integrate explicit information given in the text with readers'

general world knowledge. Causal and goal information that provide an implicit underlying

structure to a text are examples of the type of information represented at the situation

model level. The situation model is distinct from the surface and textbase levels of

representation. It is a more abstract representation of the information presented in the text.

The causal relationships (obtained from general knowledge about the world) between

explicit information, are one type of information used by readers to construct situation models.

The situation model is also dynamic in that each new sentence is integrated into this developing representation. Regarding the previous example (Sentences 2a & 2b), any general knowledge that readers may possess about pilots and planes can be integrated with the explicit information provided by the sentence. This integration results in a more elaborate representation of the meaning of the text (i.e., the situation model).

Processing Models of Text Comprehension

Most models of normal text comprehension assert that representations of text are constructed in cycles. During each cycle, each sentence or text segment is processed one unit at a time (Garnham & Oakhill, 1992; Kintsch, 1974, 1988; Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983). This assumption is based on the fact that our memory system has a limited capacity (Kintsch & van Dijk, 1978). This limitation restricts the amount of information that can be held active in working memory at any one time.

These models of comprehension also emphasize that as each sentence is processed, the propositions underlying each sentence are extracted and stored in our memory system. This memory system can be analyzed into <u>long-term memory</u> and <u>working memory</u> stores.

The concepts and propositions currently being processed and propositions being held over from previous cycles of processing are maintained in <u>working memory</u>. The verbatim representation (i.e., surface level) of the sentence is only transiently stored in our memory system (see Clark & Sengul, 1979; Jarvella, 1971). All other textbase ideas (e.g., propositions) are stored in our long-term memory for later access if required, based upon

some limited retrieval probability (e.g., Kintsch & van Dijk, 1978).

During every cycle of processing, each new sentence (i.e., new propositions) is integrated with the memory representation that has been developed to that point in the comprehension process. Argument overlap between successive propositions and referential connections between propositions are two simple methods for identifying propositions to be maintained in working memory across cycles of processing (Kintsch & van Dijk, 1978).

Exactly what information (i.e., propositions) is held over in working memory from one cycle to the next is an essential point in any processing model. The most valuable strategies optimize the possibility that information maintained in working memory (i.e., from previous cycles of processing) will provide connections for new information (i.e., from the current cycle of processing; O'Brien & Albrecht, 1992). Several strategies that readers may use for selecting and maintaining information in working memory have been proposed. According to Kintsch and van Dijk's (1978) leading edge strategy, readers are maintaining information in working memory based upon how important the information is and the recency of this information.

Alternatively, models of comprehension incorporating causal reasoning have also been proposed. These theories emphasize that readers are engaging in a problem solving process. Readers are attempting to organize incoming information into a sequence of causal relations. According to the current state strategy, readers maintain the most recent causal antecedent without a consequence in working memory (Bloom, Fletcher, van den Broek, Reitz, & Shapiro, 1990; Fletcher & Bloom, 1988; Fletcher, Hummel, & Marsolek,

1990). If, during the next cycle of processing, a causal connection can be made between the new information and what has been maintained in working memory, comprehension can proceed smoothly. Consider the following sequence (Singer, 1994).

4.   (a)   Don was about to start all night duty at the hospital.

(b)   He checked/had checked the list of patients

When readers read Sentence (4b) in the checked version, the events in Sentence (4a) are antecedent to Sentence (4b). The fact that Don is starting work enables him to check the list of patients. The information in Sentence (4a) has a consequence and will not be retained in working memory for additional processing. The causal antecedent of starting work has a consequence and can be purged from working memory. Alternatively, when readers read (4b) in the had checked version, Sentence (4a) has no consequence, because Don has already checked the list of patients in Sentence (4b) (e.g., He had checked the list of patients.). Thus, the current state strategy predicts that the information in Sentence (4a) will be retained in working memory.

Alternatively, a search of long-term memory can be undertaken to find a causal connection between the new sentence and the preceding text. Readers use the underlying causal structure, represented by the goals of protagonists, to organize their representations of narrative text. How causal and goal information is used by readers during comprehension will be addressed in more detail in the section dealing with causal and goal representations and processes.

Inferences

When readers comprehend a series of sentences, many of the ideas necessary for

complete understanding are not stated explicitly in the text. These ideas are inferred by readers to bridge any coherence gaps in the text. A coherent passage is one in which the separate parts of the text (sentence to sentence) are connected or related to each other (Kintsch & van Dijk, 1978; Singer, 1990). The reader can, as a result of these connections, fully comprehend the passage.

Consider the following example of Haviland and Clark (1974),

5.   (a)   We checked the picnic supplies.

       (b)   The beer was warm.

To comprehend these sentences, the reader must link the concept beer in Sentence (5b) with the antecedent concept picnic supplies in Sentence (5a). Thus, the reader must make the inference that the beer was part of the picnic supplies. Readers usually produce an inference when the inference is necessary to establish a connection between two or more propositions (Keenan, Baillet, & Brown, 1984; Kintsch & van Dijk, 1978; Singer, 1980; van Dijk & Kintsch, 1983). Thus, for the propositions underlying Sentences (5a) and (5b), the proposition CHECK(WE,PICNIC-SUPPLIES) and WARM(BEER) must be mediated by the proposition PART-OF(PICNIC-SUPPLIES, BEER). This type of inference is called a bridging inference.

Inferences that are generated by readers are based upon general world knowledge. The explicit text ideas that are presented in text are elaborated and extended by this background knowledge. This knowledge is made up of specific and general knowledge structures that are pertinent to the text. These structures contain information required by readers to explain, predict, and comprehend narrative events (Graesser, Singer, &

Trabasso, 1994, p. 374).

Various theorists have also contrasted the level of representation at which readers are attempting to make connections (i.e., inferences) and maintain coherence. The following section provides an overview of local and global coherence, specifically focusing on the levels of text representation that are being processed.

<u>Local and Global Coherence</u>

Many researchers emphasize the difference between locally and globally coherent text (McKoon & Ratcliff, 1992; Singer, Graesser, & Trabasso, 1994). These views maintain that, during comprehension, readers are attempting to preserve the coherence of text at either one or both the local and global levels. In this paper these terms will be defined as follows (see Singer et al., 1994).

<u>Local coherence</u> refers to maintaining connections between text information at a low level of representation (i.e., the text base). An example of readers maintaining local coherence is when inferences are generated to connect explicit information provided in the text (e.g., propositions). The anaphoric connection between the pronoun HE, and the previous male name BOB is an example of a low level or local coherence maintenance process. When readers understand the current sentence with reference to previously read sentence(s), local coherence is maintained. A local coherence break occurs when a reader is unable to map the current information onto information in working memory (O'Brien, 1995). It has been asserted that readers need to resolve such coherence breaks for them to comprehend a text fully (Kintsch & van Dijk, 1978).

<u>Global coherence</u> refers to maintaining connections between text information at a

high level of representation (i.e., the situation or mental model). This involves mapping

information that is currently being processed onto the pertinent context information that is

no longer in working memory (e.g., from the situation model) (Graesser et al., 1994;

Singer et al., 1994). Examples of global coherence processes are any connections between

protagonists' actions and their previously stated goals (i.e., goal-related inferences). In the

previous example a goal inference connection between Betty buying a purse and her

previously stated goal of getting her mother a present, is an example of high level or

global coherence maintenance process. Global coherence processes allow readers to make

causal connections between each episode of a text, from the opening to the end of the text

(Long & Golding, 1993; Long, Golding, & Graesser, 1992; Long, Seely, Oppy, &

Golding, 1996). A global coherence break occurs when readers are unable to map current

information onto information represented at the situation model level of representation,

which is maintained in long-term memory. The new information does not make sense with

respect to the general context of the text or with respect to the situation model of the text.

In the following section, I will outline some general experimental methods used for

studying comprehension and inference processes will be briefly outlined. Following this, I

will discuss the role that causal and goal-related information plays in normal

comprehension will be discussed.

Comprehension Methodology

In the following section, some general experimental methods used by language

researchers are presented. These testing procedures can generally be divided into memory

measures, and on-line measures (Keenan, Potts, Golding & Jennings, 1990; Singer, 1990).

Memory measures refer to methods that assess individuals' memory of previously studied

text material. On-line measures refer to methods that assess language processes that occur

during the initial comprehension of text material.

Memory Measures

This type of measure requires individuals to access their representation of a text to

see if a test stimulus is part of their memory representation of the text. Recall and

recognition are two examples of this type of experimental measure. Recall requires

individuals to simply recall as much of the previously studied text as possible (e.g., Kintsch

& van Dijk, 1978). With recognition, individuals are asked to indicate whether single

words, phrases, or sentences appeared in the previous text (e.g., Mckoon & Ratcliff,

1992).

On-line Measures

On-line measures can continuously assess individuals' behaviour (i.e., language

processes) during comprehension of text. Alternatively, readers can be interrupted at key

points during comprehension to assess their comprehension processes.

Intermittent on-line measures require individuals to read a piece of text. While

reading, they are occasionally interrupted with a test stimulus (e.g., naming, and lexical

decision). They are required to make a judgment or response to this test stimulus. The

accuracy and/or time it takes individuals to make these judgments or responses reflects the

status of their comprehension processes up to that point in the text. The reciting or naming

of a test word out loud is one example of this type of measure (see Klin, 1995; Klin &

Myers, 1993). Test words are usually related to the information provided in the text, or

can be taken directly from the text. The time it takes the reader to first vocalize the word

is the dependent variable. A difference in naming times across experimental conditions

suggests that, in one condition, the concept related to the test stimulus is active in

memory. The previous activation of the concept; provided by previous repetition of the

probe concept or related concepts; aids the reader in responding more quickly to the

stimulus.

One example of a <u>continuous on-line</u> measure is the time it takes individuals to

read each word or sentence of a text (Albrecht & Myers, 1995; Mckoon & Ratcliff, 1992).

The measurement of reading times usually involves comparing reading times for the

specific sentences across experimental conditions. Haviland and Clark (1974) examined

inferences with reading time for specific sentences.

The following example illustrates sequences of sentences, where the reading time

of Sentence (7) was examined.

6.   (a)   Herb took the picnic supplies from the car.(Inference)

        (b)   Herb took the beer from the car.(Explicit)

7.   The beer was warm.

Haviland and Clark had individual read Sentences (6a) and (7) (<u>inference condition</u>) or

Sentences (6b) and (7) (<u>explicit condition</u>). They found that individuals took longer to

read Sentence (7) after Sentence (6a) compared to when Sentence (7) followed Sentence

(6b). This difference in reading time for Sentence (7) in the Inference condition was taken

to reflect the extra time individuals needed to generate the inference that the beer was part

of the picnic supplies.

Reading Time and Inconsistency Judgments

One method of studying readers' use of causal and goal information during comprehension is the application of the reading time measure to the study of passages with some degree of inconsistency. Inconsistencies in the information provided by a text have been shown to affect reading times and consequently comprehension processes (O'Brien & Albrecht, 1992; Albrecht & O'Brien, 1993; Hakala & O'Brien, 1995). When individuals read sentences that are inconsistent with previously presented information, they require extra time to read these sentences. It has been asserted that readers are attempting to comprehend the text by resolving both local and global coherence breaks (Graesser et al., 1994; Singer et al., 1994).

For example, O'Brien and Albrecht (1992) examined narrative passages containing inconsistent physical movements of protagonists. Initially the location of the protagonist was stated in these passages (e.g., Kim stood **inside/outside** the health club.). Later in the text a critical sentence appeared (e.g., Kim decided to go outside the health club), which described movements of this protagonist that were either consistent or inconsistent with the original location of the protagonist. They found that individuals took longer to read critical sentences (e.g., Kim decided to go outside the health club) when these sentences described protagonist movements that were inconsistent (e.g., Kim stood **outside** the health club), compared to when these movements were consistent (e.g., Kim stood **inside** the health club) with the original location of the protagonist. The distance between this information was also varied. For distant conditions a number of sentences were presented between the critical sentence and the consistent or inconsistent sentence presented earlier

in the passage. For close conditions these extra filler sentences were not included. Longer

reading times for critical sentences in the inconsistent condition were found in both the

distant and close conditions.

In this study (O'Brien & Albrecht, 1992), individuals appeared to be sensitive to

information about the location of protagonists. When this information was violated, or

there was an inconsistency, there was a difference in the reading times of critical

sentences. This suggests that individuals had comprehension difficulty and attempted to

resolve this contradiction. In the close condition, a local coherence break occurs and this

causes readers to have elevated reading times. Readers are attempting to resolve a local

coherence break, the inconsistency in the protagonist's location. In the distant condition,

the filler sentences that separate the inconsistent information were designed to background

the protagonist's location. This backgrounding purges this information from working

memory. Thus, this information is only available at the level of the situation model

representation. The critical sentences used by O'Brien and Albrecht (1992) were locally

coherent, so the elevation in reading times must be the result of an inconsistency between

new information and previous information represented at a high level of representation.

Thus, the elevated reading time in the distant condition provides evidence that readers are

also sensitive to global coherence breaks. They are attempting to maintain connections

between new information (e.g., protagonist's current location) and old information that is

no longer active in working memory (e.g., protagonist's previous location).

Hakala and O'Brien (1995) also demonstrated that readers are sensitive to

inconsistent protagonist information (also see Albrecht & O'Brien, 1993). They found that

individuals took longer to read a critical sentence (e.g., Mary ordered a cheeseburger and fries) when the protagonist's actions portrayed in this sentence were inconsistent with previously stated information (e.g., Mary is a strict vegetarian), compared to when it was consistent (e.g., Mary enjoyed eating anything) or neutral (e.g., Mary frequently ate at restaurants).

The results of these studies indicate that readers are sensitive to inconsistencies both at a low level of representation (e.g., textbase) and a high level of representation (e.g., situation model). The longer reading times for the inconsistent conditions (across distant and close conditions) are consistent with theoretical models of comprehension processes that focus both on the textbase (local coherence) and the situation model (global coherence) levels of representation. Readers appear to be continuously checking and updating their situation or mental model representation. When new information contradicts previously presented information, individuals require more processing time (i.e., reading time) to make sense of the new information. This information appears to include general information about the protagonist's location, actions, and thoughts (e.g., goals).

In general, empirical evidence shows that inconsistency in text information affects the reading time of critical sentences in text. Researchers have extended this type of inconsistency manipulation to include causal or goal information. This type of information is represented at a high representational level (e.g., situation model). However, before we address this I will first outline the general causal and goal structures and processes that are involved with comprehension. Following this, I will deal specifically with goal structures

and processes.

Causal and Goal Information

During language comprehension, readers must make sense of the information

provided in a text. Readers require some form of representational framework within which

they can organize the separate units of information provided by a text (e.g., sentences,

clauses, propositions etc.). Readers can then place this information within this

organizational framework so that they are able to construct coherent representations of

text. Many theories of comprehension assume that the construction of a coherent

representation involves the representation of the causal structure underlying narrative

passages (Black & Bower, 1980; Fletcher & Bloom, 1988; Schank & Abelson, 1977;

Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985). Comprehension is viewed as

a problem-solving process. Readers are attempting to infer causal relations among ideas,

events, and states described by the text (Black & Bower, 1980; Keenan et al., 1984;

O'Brien & Myers, 1987; Schank & Abelson, 1977; Trabasso & Sperry, 1985). In the

following sections I will first provide an overview of theories of causal representational

structures that readers use during comprehension. This will also include an overview of

the relevant inferential processes and associated empirical evidence.

Causal Representations

One model of causal representation is the recursive transition network model

(Trabasso & van den Broek, 1985; Trabasso, van den Broek, & Suh, 1989; van den

Broek, 1990). This model captures the causal information provided in a text within a

graphical network representation. This network represents the causal relationships

between propositions or sentences. The causal relatedness of text information is determined through the following criteria: temporal priority, operativity, and necessity and sufficiency in the circumstances (van den Broek, 1990). Temporal priority refers to the fact that causes must occur before outcomes, and these causes must be operating when the outcome occurs. A cause must also be necessary for the outcome to occur. Consider the following example (van den Broek, 1990):

8.   (a)   Jason dropped the banana peel.

(b)   Mark fell on his back.

In this example, if Jason had not dropped the banana peel, Mark would not have fallen. The fact that Jason dropped the peel is a necessary cause for Mark falling. The cause must also be sufficient for the outcome to occur consequently within the general circumstances of the story. The information provided in Sentences (8a) and (8b) are judged relative to the circumstances provided by the rest of the story. Thus, if within the context of the rest of the story, the event presented in Sentence (8a) occurs (e.g., Jason dropping a banana peel.), this cause is sufficient for the event in Sentence (8b) to occur (e.g., Mark fell on his back.). As an example, consider the network representation presented in Figure 2 that can be constructed for the passage listed in Table 1 (van den Broek, 1990).

To construct this network, the clause units presented in Table 1 are related to one another using the previous four causal properties of temporal priority, operativity, and necessity and sufficiency in the circumstances. These units are then connected into a network according to these properties. The numbered elements represent the events displayed in Table 1, and the connections depict the causal relations between these events.

This method of representing causal relations aids researchers in identifying causally related information and the points in a passage where readers may have difficulty understanding the passage.

Figure 2. Recursive Transition Network model: Network representation of causal relations in narrative text (Adapted from van den Broek, 1990).
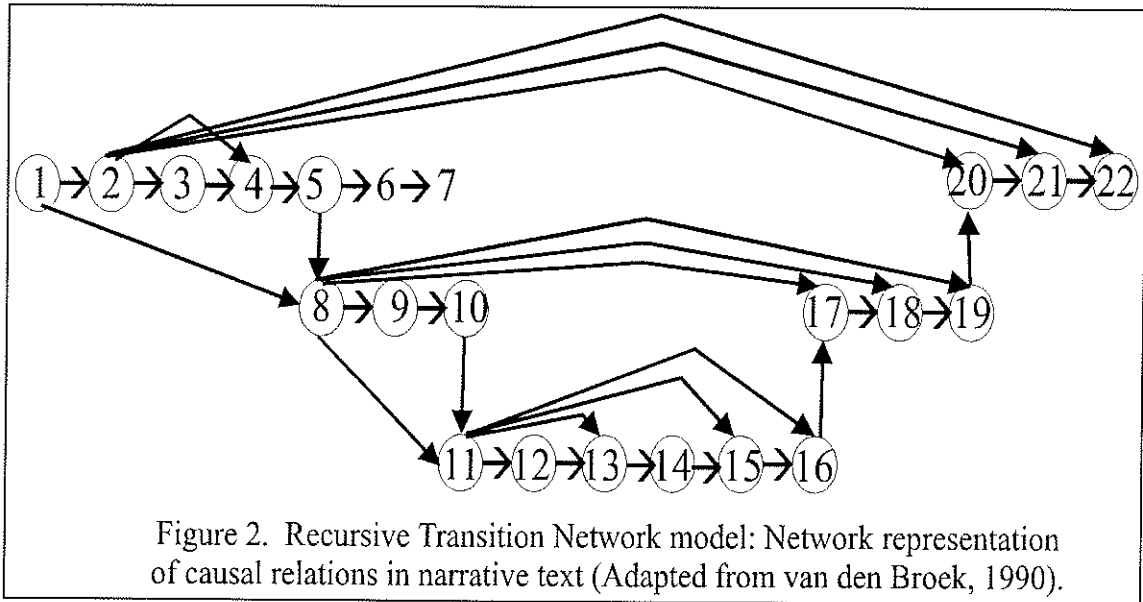
Table 1
Sample Text. (Adapted from van den Broek, 1990)

1. There once was a boy named Jimmy.
2. who wanted to buy a bike.
3. He called a bike store to ask for prices.
4. He counted his money.
5. the money was not enough for a bike.
6. He put his piggy bank back on the top shelf of his closet
7. and covered it with clothes.
8. Jimmy wanted to get some money
9. so he asked his mother for some.
10. His mother said, "No, you should earn your own."
11. Jimmy decided to get a paper route.
12. He called the newspaper agency
13. and asked about a route.
14. The secretary told him to come in.
15. Jimmy talked to the manager
16. and got his job.
17. He worked very hard on his job
18. and earned a lot of tips.
19. Pretty soon he had earned $200.
20. He went to a bike store
21. and bought a beautiful bike.
22. He was the happiest kid in town.

Three features of the causal network model have been shown to be important predictors of readers' comprehension. First, within these network representations the series of events that connects the opening of a story to its end can be identified as a <u>causal chain</u> of connected events (Trabasso et al., 1989; van den Broek, 1990). Second, the events that play no part in this causal chain are termed <u>dead-ends</u>. For example in Figure 2, all causal chain events are circled, and dead-end events are uncircled. Statements on the causal chain play a central role in the theme of the text and aid in providing coherence to the story. Statements that are part of dead-ends do not provide important thematic information to the reader (Schank & Abelson, 1977; Trabasso, Secco, & van den Broek, 1984; van den Broek, 1990). Finally, the number of <u>causal connections</u> between text statements also varies between different statements. Statement (8) (<u>Jimmy wanted to get some money.</u>) has seven causal connections, whereas Statement (15) (<u>Jimmy talked to the manager.</u>) has only three causal connections.

These three aspects of causal representations have been shown to predict readers recall and importance ratings of narrative information. It has been found that readers recall statements more often, and rate them as important to a story under the following conditions;

(1)   The statement appears on the causal chain, compared to statements in a dead end, of the causal representation of a text (Omanson, 1982; Trabasso et al., 1984; Trabasso & Sperry, 1985).

(2)   The statement has more causal connections to other statements in the network representation of the causal structure of a text (Graesser,

Robertson, Lovelace, & Swinehart, 1980; Omanson, 19982; Trabasso et

al., 1984; Trabasso & Sperry, 1985; Trabasso, & van den Broek, 1985).

For example, Trabasso and Sperry (1985) derived causal networks for six narrative

passages. They performed a multiple regression analysis of the importance ratings of

participants for each statement in stories, using the number of connections and causal

chain position as independent factors. They found that both the number of direct

connections for each statement in the network, and the position of the statement on the

causal chain, predicted importance ratings of participants. The left panel of Figure 3

presents a graph representing the relationship between importance ratings and the number

of causal connections and causal chain position.

Figure 3. Average percent recalled and importance judgment values for causal chain
(°) and dead-end (•) statements that differ by the number of causal connections.
(Adapted from Trabasso & Sperry, 1985 and van den Broek, 1990).
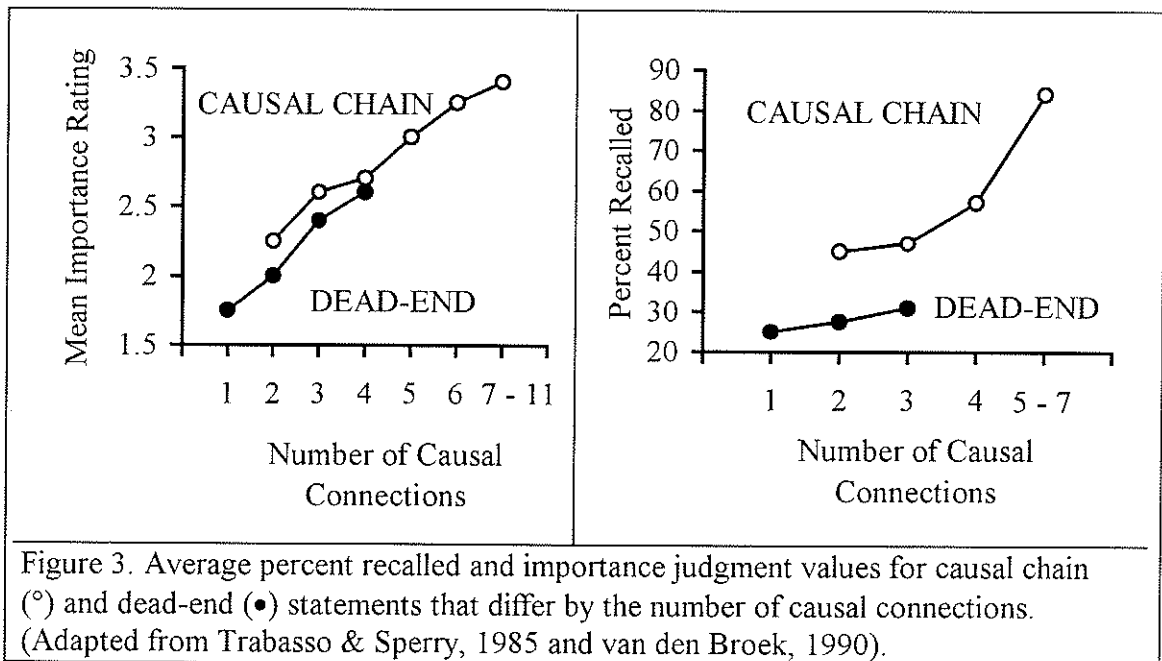
Trabasso and van den Broek (1985) also completed a multiple regression analysis

of participants recall performance, using the number of causal connections and causal

chain position as predictors. The right panel of Figure 3 presents a graph presents their

findings. Taken together these findings support the assertion that readers are using the

underlying causal relationships among the ideas provided in narrative text to construct

coherent representations.

In the following section the processes that readers undertake to connect causally

related information is discussed. Specifically, the process of connecting causally related

information via causal inferences is described.

Causal Inferences

The previous section provided evidence for the assertion that readers use the

causal relationships between text ideas to construct coherent representations of the

meaning of text. Specifically, during comprehension readers connect information provided

in the text together via the causal relations between this information. Readers are

attempting to identify causal antecedents for the narrative events described in a text. As

the cyclical model of comprehension asserts, readers are generally focusing their

comprehension processes upon a single chunk of text during active processing of a text.

The concepts and information underlying this unit of text can be defined as the focal event

that readers are currently processing. This view emphasizes that individuals generate

causal inferences about the focal events they read. The following section provides an

outline of how readers make connections between information currently focused on in the

text and previously presented information in the text, by the generation of causal

inferences.

Initially, readers may attempt to find a cause for events and actions in the

information that currently resides in working memory (Bloom et al., 1990). This specifically refers to readers trying to maintain local coherence, by making connections between propositions at a low level of representation (e.g., textbase).

Recall Example (8) (van den Broek, 1990):

8.   (a)   Jason dropped the banana peel.

       (b)   Mark fell on his back.

These two sentences are not ostensibly related. Each sentence refers to different protagonists and there is no explicit relationship between each sentence. There is a local coherence break. For a reader to comprehend and relate these two sentences to one another, further information is required. These two sentences require a mediating idea or inference that connects the information presented in Sentence (8a) to the information provided by Sentence (8b). This causal inference is that Mark stepped on the banana peel. This causal inference is needed to maintain the causal structure of the information provided in Sentences (8a) and (8b).

If a cause for the focal event cannot be found in working memory, there is a causal coherence break. The current sentence cannot be understood within the context of the recently processed information. Readers may then search their long-term memory representation of the text they have read to that point, for a cause for the current action. This refers to readers attempting to maintain global coherence, by connecting information at a high level of representation (i.e., situation model). If a cause is identified in their long-term memory representation, it is linked to the currently processed action or event. The following example illustrates another passage that requires causal inference (Singer &

Halldorson, 1996).

    9.   (a)   Laurie left early for the birthday party.

           (b)   She headed north on the freeway.

           (c)   She exited at Antelope Drive.

           (d)   She spent an hour shopping at the mall.

Since Sentences (9b) and (9c) intervene between Sentences (9a) and (9b), any causal information in Sentence (9a) should be purged from working memory by the time Sentence (9d) is read. To maintain causal coherence and for readers to understand the actions of the protagonist in Sentence (9d), the cause for Laurie's actions needs to be found. To understand Sentence (9d), the reader needs to generate a motive inference (e.g., Laurie wants to buy a birthday present.). This causal inference maintains the causal coherence of the passage, and links the cause in Sentence (9a) to the action in Sentence (9d). Thus readers are maintaining causal coherence at a high level of representation (i.e., global coherence).

    Passage representations can be characterized as maintaining a causal chain of actions and events that are connected by causal relationships between these events. Causal bridging inferences provide causal connections between current statements and the preceding text (Bloom et al., 1990; Fletcher et al., 1990; Singer & Ferreira, 1983; Singer, Halldorson, Lear, & Andrusiak, 1992). Evidence that readers during normal comprehension generate causal inferences, has been demonstrated using a variety of experimental procedures. The following sections provide converging evidence that causal inferences accompany normal comprehension.

Reading time. The causal relatedness of sentences has been shown to affect comprehension processes as indexed by reading times (Bloom et al., 1990; Fletcher et al., 1990; Keenan et al., 1984; Myers, Shinjo, & Duffy, 1987). Consider the following example (Keenan et al., 1984);

10.   (a)   Joey's big brother punched him again and again.

       (b)   Racing down the hill, Joey fell off his bike.

       (c)   Joey went to a neighbour's house to play.

11.   The next day his body was covered with bruises.

This example portrays high, medium, and low causally related sentence pairs (10a & 11, 10b & 11, and 10c & 11, respectively). Keenan et al. (1984) and Myers et al. (1987) found that individuals progressively took longer to read the second sentence of sentence pairs as the causal relatedness between these sentences decreased. The causal inference processes that connect sentence pairs appear to vary with differing levels of causal relatedness. With highly causally related sentences, readers can easily bridge the information provided by the sentences with a causal inference (e.g., Joey was covered with bruises, because his brother beat him.). Comprehension difficulties ensue as sentence pairs become less causally related, and readers require more time to fully understand the second sentence.

Probe judgments. Further evidence that causal inferences accompany normal text comprehension comes from probe judgment research. Probe judgments involve the interruption of readers during the process of reading a sentence or passage. Readers are then given a probe stimulus to respond to (e.g., Naming; see above Comprehension

Methodology: On-line measures). This allows researchers to directly probe the contents of individuals developing memory representations of text. Reading times as an on-line measure may only diagnose comprehension difficulties, and can not determine the contents of readers' comprehension processes (Klin, 1995; McKoon & Ratcliff, 1980). Probe judgments allow the direct testing of the contents of readers' text representations constructed during comprehension. A number of studies have demonstrated that readers respond more quickly to probe words when these probe words directly assess the causal information presented by the text and comprehended by readers (Klin, 1995; Klin & Myers, 1993; Rizzella & O'Brien, 1996).

Klin and Myers (1993) tested for the presence of information underlying causal inferences using probe words that represented the causal concepts required for the generation of these causal inferences. Klin and Myers presented participants with passages in one of two conditions (e.g., inference and control). Sentence Sequences (12) and (13) illustrate inference and control conditions, respectively.

12.   (a)   The boys had played catch in the living room with a baseball.

       (b)   Dick found a broken lamp lying on the living room floor.

13.   (a)   The boys had played catch in the living room with a baseball.

       (b)   Dick found both of his sons sleeping soundly in their beds.

A number of intervening sentences separated both sentence sequences in (12) and (13). These intervening sentences were unrelated to the causal inference information, and were designed to purge working memory of any information provided in the first sentence. After participants read either inference or control passages, they were given a probe word

to name out loud. Participants named probe words (e.g., BASEBALL) more quickly following inference passages, compared to when the probes followed control passages. This probe word (e.g., BASEBALL) represented the causal concept described earlier in the text.

In the inference passage, Sentence (12b) produced a causal coherence break. The preceding sentence does not provide a sufficient cause for the event in Sentence (12b). The reader needs to provide a cause for Dick finding a broken lamp. This information is provided earlier in the text (e.g., The boys had played catch in the living room with a baseball.). To fully understand Sentence (12b), readers need to generate a causal inference that connects the events in Sentence (12a) with the cause in Sentence (12b). This causal inference is that the boys' baseball playing caused the lamp to be broken. The probe word BASEBALL is the key information that needs to be connected to the actions in Sentence (12b). Readers fully comprehend this passage when they construct this causal inference. This aids readers in maintaining the causal coherence of the passage at a global coherence level. In the control condition, Sentence (13b) is causally coherent with the previous passage, and can be understood within this context. No additional information or causal information is required for readers to comprehend this sequence completely.

In general, causal coherence involves maintaining coherent representations at a global level (i.e., situation model). At the local level, if information provided in a sentence can be connected to the previous sentence's information (or information maintained in working memory) by a causal inference, causal coherence is maintained. If antecedent events (e.g., information provided in the previous sentence) or the information held in

working memory does not supply an adequate causal framework for the focal events in the text, a causal coherence break is detected (Klin, 1995, p. 1484). If readers are employing causal information to construct coherent representations of passages, global information should be reinstated and used to understand sentences that are currently being processed. This reinstatement process involves the reactivation of information in long-term memory, and its reinstatement into working memory. This reinstated causal information can then be connected to the focal event via a causal inference. This reactivated information in working memory consequently aids readers to comprehend focal events with respect to the causal structure of the text.

These causal inference processes may also occur even when local coherence is maintained. In the first example presented in this thesis, the goal inference connecting Betty's action of buying a purse to her motive of giving her mother a present was made even though the text was locally coherent. Each sentence could be understood with reference to the previous one. However, this causal inference assists the readers in successfully comprehending the text.

Alternatively, information that is contained in a reader's high level representation (i.e., situation model) may not provide a sufficient cause for the focal action or event. The text will seem incoherent, and the text contains an inconsistency or global causal coherence break, which can impair readers' comprehension processes.

Question answering. It is generally agreed that causal inferences are based upon readers general world knowledge (Kintsch & van Dijk, 1978; Singer et al., 1994; van Dijk & Kintsch, 1983). For a reader to understand the sentences, Sharon took the aspirins. Her

headache went away., a causal inference that connects the two sentences is required. This inference is based on readers' knowledge of general causal relationships present in the world. In the example above, the fact that taking aspirin will relieve a headache is based upon general knowledge about cause and effect that the reader possesses.

Using a question answering procedure, Singer and colleagues have evaluated the information underlying causal inferences within the structure of a Validation Model (Singer et al., 1992; Singer, & Halldorson, 1996; Singer, Revlin, & Halldorson, 1990). For example, for complete understanding of the following sentences, the reader needs to realize that the action in Sentence (14a) causes the event in Sentence (14b).

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

        (b)   The fire went out.

The causal inference that connects these two sentences is that pouring water on the fire causes the fire to go out. However, before a reader accepts this to be the true state of affairs, this causal bridging inference needs to be validated against their general world knowledge. Readers do this by identifying a mediating idea that accounts for the fact that pouring water on the fire causes the fire to go out. This mediating idea would be that water extinguishes fire. Readers then compare this mediating idea with their general world knowledge, specifically relating cause and effect relationships. Since this mediating idea agrees with the readers' general knowledge about water extinguishing fire, the causal inference is validated as true. The information underlying causal inferences, framed within the Validation Model, has been evaluated using passages similar to the following (Singer & Halldorson, 1996).

15.   (a)   Laurie left early for the birthday party. (Motive)

(b)   Laurie left the birthday party early. (Control)

16.   She spent an hour shopping at the mall.

In the motive condition (Sentences (15a) & (16)), the events in Sentence (16) can be

understood with reference to the idea that Valerie was motivated to buy a birthday

present, so she went shopping at the mall. In the control condition (Sentences (15b) &

(16)), no such connection is needed to understand the sequence of sentences.

After reading passages in either the motive or control condition, participants

answered questions.

17.   Do birthday parties involve presents?

These questions probed the knowledge that was relevant to the causal bridging inference.

Singer and Halldorson (1996; also see Singer et al., 1992; Singer et al., 1990) found that

answering times for the question were faster following motive passages compared to

control passages. If readers generate the causal motive inference that Valerie wanted to

buy a birthday present, this inference should be integrated into the developing textbase and

situation model representation of the text. Thus, faster reaction times to questions that

probe the causal inference information are expected, if this inference has been drawn and is

active in the memory representation of the text. This question answering research, in

conjunction with reading time and probe judgment evidence, provide converging evidence

that causal inferences are generated by readers during normal comprehension.

The type of causal inference discussed in the question answering section above,

specifically focuses on motives for protagonist's actions. These causal inferences relate

directly to the overall representation of the goal structure of the text. This goal structure

represents a causally related series of events presented in the passage. The motives of

protagonists, and subsequent actions and events that result from the protagonists' actions,

are components of this goal structure, and are represented at a high level of representation

(i.e., goal situation model). In the following section, the representation of goal information

and related inferential processes will be discussed.

Goal Representations and Inferences

The causal representation of information can be further modified to include causal

substructures of narrative passages (i.e., events, goals, etc.). In narrative passages, clauses

that make up a causally related passage can be categorized as settings, initiating events,

goals, actions, outcomes, and reactions. Figure 4 presents the transition network model

(see Causal Representations above), based upon the narrative categories stated above (see

Trabasso et al., 1989; van den Broek, 1990).

Figure 4. Causal network model using narrative text categories. (Adapted from Trabasso et al. (1989)).
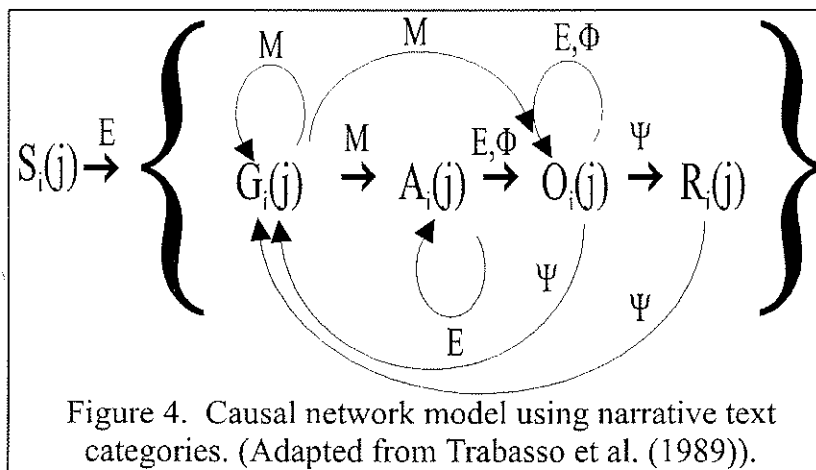
In the network presented in Figure 4, the settings, events, goals, attempts, outcomes, and reactions (S, E, G, A, O, R, respectively) are

related to each other by enabling, psychological, motivational, and physical causal

relations (E, Psi, M, and Phi, respectively) (Trabasso et al., 1989). The information

provided in a narrative text (e.g., sentences, clauses, and propositions) are linked in this

structure by the causal relationships between each category (Suh & Trabasso, 1993;

Trabasso et al., 1989). When readers read a sentence about a goal or an action, they

attempt to fit these events into the overall causal structure of the text (i.e., the goal plan of

the passage).

Many narrative passages have a goal-subgoal hierarchical structure in which a high

level goal (i.e., superordinate goal) relies on actions that accomplish a lower level goal

(i.e., subordinate goals; Long & Golding, 1993; Long et al., 1992; Long et al., 1996).

Superordinate goals depict the circumstances that the character wishes to attain by

performing a purposeful action. Subgoals (or Subordinate goals) are goals, plans, or

actions that specify how an agent's purposeful action is achieved.

For example consider the following passage (adapted from Suh & Trabasso,

1993):

18.   (a)   Jimmy wanted to have a new bike. (Goal 1)

        (b)   His mother refused to buy him a bike. (Goal 1 failure)

        (c)   Jimmy wanted to earn some money. (Subgoal 1)

        (d)   He asked for a job at a grocery store.

        (e)   He earned a lot of money. (Subgoal 1 success)

        (f)   He bought a new bike. (Goal 1 success)

In Sentence (18a) the protagonist Jimmy is described as having a goal to have a new bike .

In Sentence (18b) this goal is thwarted, His mother refused to buy him a bike. As a result,

a new subgoal is set up in Sentence (18c); Jimmy wanted to earn some money. In

Sentence (18e), this subgoal is satisfied; <u>He earned a lot of money.</u> In Sentence (18f), the original goal is satisfied, <u>He bought a new bike.</u> This passage presents an example of a narrative passage containing a goal structure that relates goals of the protagonist (e.g., Jimmy wants a bike, and wants to earn some money.) to his actions (e.g., Jimmy buys a bike, and earns some money at a job.) by the causal relationships between these events.

The classification of a specific goal as either a superordinate goal or a subgoal is judged with regard to its relationship to specific events and actions and not its specific content. Therefore, a goal may be superordinate to one action or goal, or subordinate to another action or goal. If readers are attentive to the goals and motivations of protagonists in narratives, readers will comprehend subsequent statements more easily when they describe plans or actions that have been undertaken to satisfy protagonists' goals.

Goal inferences can be defined as connections between propositions that represent focal actions or events, and previously presented information about superordinate or subgoals of protagonists. These connections are based upon causal relationships between events and actions, and protagonists' antecedent goals.

For example in the passage above, the subordinate goal of <u>earning some money</u> serves the superordinate goal of <u>having a new bike</u>. Readers will generate a goal inference that connects the propositions underlying Sentences (18c) to (18a). This goal inference is that the subordinate goal, Jimmy wants to earn some money, is caused or motivated by the higher level goal of getting a new bike. Readers will additionally generate connections between the actions in Sentence (18e) (e.g., <u>Jimmy earned a lot of money.</u>) and the subordinate goal in Sentence (18c) (e.g., <u>Jimmy wanted to earn some money.</u>). A goal

inference connection will also be generated between the actions in Sentence (18f) (e.g., Jimmy bought a new bike.) and the superordinate goal in Sentence (18a) (e.g., Jimmy wanted to have a new bike.).

When a goal or action conforms to the overall goal plan of a passage (i.e., it is consistent and coherent with respect to this overall goal plan), it can be connected to the antecedent goal via a goal-related inference. The cause for a protagonist's action is that they are trying to achieve or satisfy this goal. When actions result in unsatisfied goals, conditions are set for the establishment of a subgoal; Jimmy's mother would not buy him a bike so he had to earn some money to buy it. When more than one unsatisfied goal is present in a passage (original goal or subgoal), the most recent unsatisfied goal is used to evaluate the current actions and attempts. Thus, there is also a hierarchy of unsatisfied goals (Suh & Trabasso, 1993). When a subgoal is satisfied, subsequent actions can then be evaluated with regard to the most recent unsatisfied goal in the hierarchy. This type of causal integration occurs until all goals are satisfied. Alternatively, the passage may result in one or many goals being left unfulfilled. In this case a causal coherence break occurs, whereby the current state affairs or actions of a protagonist have not satisfied all the stated goals in the passage.

Empirical evidence for how readers use goal information during normal comprehension of narrative text converges from two general measurement approaches; probe judgment and reading time measures (see Comprehension Methodology for a more detailed discussion of these types of measures). Probe judgments involve presenting individuals with test stimuli (e.g., words or sentences) during comprehension of text (i.e.,

on-line) or after comprehension of a text (i.e., memory measure). Reading time measures

entail the measurement of the time it takes individuals to read specific text segments (e.g.,

clauses & sentences).

Probe judgments. Previously it was shown that readers respond more quickly to

causally related probe words following passages containing a coherence break requiring a

causal inference (Klin, 1995; Klin & Myers, 1993; Rizzella & O'Brien, 1996). The causal

information (i.e., cause) that these probe words represent is required by readers to explain

current actions or events (i.e., effect) portrayed in the passage. Regarding goal inferences,

this subclass of causal inferences has also yielded similar results. Using recognition, lexical

decision, and naming probe judgment procedures, various researchers have shown that

individuals respond more quickly to probe words that assess the underlying goal

information needed by readers to generate goal inferences (Dopkins, Klin, & Myers, 1993;

Long et al., 1993; Long, Golding, Graesser, & Clark, 1990; Lutz & Radvansky, 1997;

McKoon & Ratcliff, 1992; Suh & Trabasso, 1993).

For example, McKoon and Ratcliff (1992) presented participants with passages

that outlined a hierarchy of nested goals that a protagonist was trying to achieve. After

participants finished reading these passages, they were asked to make a recognition

judgment (i.e., Did this probe word appear in the passage they had just read? YES/NO;

also see Dopkins et al., 1993). Table 2 presents an example of the passages used by

McKoon and Ratcliff (1992, Experiment 1).

The first paragraph of all passages introduces a general superordinate goal (e.g.,

kill the president) and a subordinate goal (e.g., use a rifle). To fulfill the superordinate

goal, the lower subordinate goal needs to be accomplished. The second continuation

paragraph varied across three conditions; control, try again, and substitution. In control

versions of these passages, the second paragraph described both of these previous goals

being attained (e.g., The assassin hit the president with first shot from his rifle.), and the

introduction of a new goal (e.g., Then he started to run toward the west.). In try again

versions, a problem occurs with the subordinate goal achievement (e.g., The scope fell off

as he lifted the rifle.), and the protagonist attempts to fulfill this goal (e.g., He lay prone to

draw a sight without the scope.).

Table 2
Example Text from Experiment 1 (McKoon and Ratcliff, 1992).

Introduction
1. The crowd's cheers alerted the onlookers to the president's arrival.
2. The assassin wanted to kill the president.
3. He reached for his high-powered rifle.
4. He lifted the gun to his shoulder to peer through its scope.

Control continuation
5(a). The assassin hit the president with the first shot from his rifle.
(b). Then he started to run toward the west.
(c). The searing sun blinded his eyes.

Try again continuation
5(d). The scope fell off as he lifted the rifle.
(e). He lay prone to draw a sight without the scope.
(f). The searing sun blinded his eyes.

Substitution continuation
5(g). The scope fell off as he lifted the rifle.
(h). So he reached for his hand grenades.
(i). The searing sun blinded his eyes.

General goal test word: KILL
Subordinate goal test word: RIFLE

In substitution versions, a problem again occurs with the subordinate goal (e.g., The scope fell off as he lifted the rifle.), but instead of trying again, a new subordinate goal is introduced (e.g., So he reached for his hand grenades.).

In all versions, the continuation paragraphs were written to be locally coherent. Readers should be able comprehend current events and protagonist actions described in this paragraph, within the context of these continuation paragraphs. No local causal coherence break is present. Readers should not need to access any causal or goal-related information provided earlier in the text. The current events should be able to be understood with reference to only the local subordinate goal (e.g., use a rifle). Any information regarding the superordinate goal (e.g., kill the president) should not be required by the reader to understand the current events in the passage (i.e., from the introduction paragraph). Probe words specifically referred to either the superordinate goal or the subordinate goal (e.g., kill and rifle, respectively).

McKoon and Ratcliff (1992) found that participants responded more quickly to subordinate goal words (e.g., rifle) following try again passages, compared to control and continuation passages. There were no differences in response times to superordinate probe words (e.g., kill) across all three versions of passages. This demonstrated that since continuation paragraphs were locally coherent across all conditions, the more global and distant superordinate goal (e.g., kill) was not required to comprehend the actions of the protagonist. This demonstrates that when a passage portrays a number of related goals, the most recent unsatisfied goal is used to evaluate current actions of protagonists. Readers are attempting to generate goal inferences between current events and the most

recently unsatisfied goal.

McKoon and Ratcliff (1992, Experiment 2) also provided evidence that readers will access the higher level superordinate goal information, when a local coherence break occurs. For example, participants initially read the following sequence of sentences.

19.   Diane wanted to lose some weight. She thought cycling might help her lose some weight. She went to the garage to find her bike.

Subsequently, they read either sequence (20a) or (20b).

20.   (a)   Diane peddled her bike .. and became very slim.

(b)   Diane's bike was broken .. so she went to the grocery store to buy grapefruit and yogurt.

Sequence (20a) is locally consistent with Sequence (19). Diane's goal of losing weight and her subsequent subgoal of biking are all achieved, and make sense to the reader.

Sequence (20b) is locally inconsistent with Sequence (19). Substituting grapefruit and yogurt for a broken bicycle does not make sense at a local level. This sequence of sentences contains a local coherence break. However, this does make sense with respect to the global goal of losing weight.

McKoon and Ratcliff found that participants responded more quickly to global goal probe words (e.g., weight) following passages that contained a local inconsistency (e.g., Sequences 19 & 20b) than following locally consistent passages (e.g., Sequences 19 & 20a).

When the actions of the protagonist (e.g., Diane went to the grocery store and bought some grapefruit and yogurt.) are inconsistent with most recent unsatisfied

subordinate goal (e.g., Diane's bike was broken.), the previously stated superordinate goal

information (e.g., Diane wanted to lose some weight.) will be accessed and used to

evaluate the current actions of the protagonist. Readers are attempting to link information

provided in a passage by its causal relatedness. In this case they are trying to make sense

of the events portrayed in the passage with relation to the overall goal plan of the

protagonist.

Other researchers have shown that readers access superordinate goal information

during comprehension of narrative passages even when there are no local coherence

breaks, contrary to Mckoon and Ratcliff's (1992) findings (Long et al., 1992; also see

Long et al., 1990; Long & Golding, 1993). For example participants read goal inference

passages similar to the passage provided in Table 3.

Table 3
The Passage "The Czar and His Daughters" (Long, Golding, & Graesser, 1992)

1. Once there was a Czar	8. As they were being dragged off,
2. who had three lovely daughters	9. the daughters cried.
3. One day the three daughters went walking in the woods.	10. Three heroes heard the cries and
	11. set off to rescue the daughters.
4. They were enjoying themselves so much that	12. The heroes came and
	13. fought the dragon and
5. they forgot the time and	14. rescued the maidens.
6. stayed too long.	15. When the Czar heard of the rescue,
7. A dragon kidnapped the three daughters.	16. he rewarded the heroes.

Long and colleagues predicted that as readers comprehended events in narrative

passages (e.g., The dragon kidnapped the three daughters.), they would generate

superordinate goal inferences (e.g., The dragon wanted to eat the daughters). Readers

would be less likely to generate subordinate goal inferences (e.g., The dragon grabbed the daughters). Long et al. (1992) used lexical decision and naming probe judgment procedures to determine the relative activation of superordinate (e.g., EAT) and subordinate (e.g., GRAB) goal information. Readers read both inference and control passages. Probe words appeared after each sentence of both inference and control passages. Goal probe words followed all statements that described an action that needed to be understood with reference to some overall motive or goal (e.g., The dragon kidnapped the daughters because he wanted eat them).

Long et al. (1992) found that participants responded more quickly to superordinate goal probe words when they appeared in inference passages requiring a goal inference than in control passages. There were no differences between response times to subordinate goal probe words following either inference or control passages. Participants also responded more quickly to superordinate goal words than to subordinate goal words in the inference passages.

These results present evidence that readers are accessing higher level goal information (e.g., superordinate goals) when they read about actions of a protagonist. They are attempting to generate goal inferences between current actions and higher level goal information (i.e., superordinate goals). This contradicts the evidence provided by McKoon and Ratcliff (1992). McKoon and Ratcliff found that readers use superordinate goal information to understand current actions of protagonists only when a local coherence break occurs.

However, the type of passages used by Long et al. (1992) did not vary the

satisfaction of the goal information (success vs. failure). In another series of studies by

Suh and Trabasso (1993; also see Lutz & Radvansky, 1997) the relative availability of

superordinate goal information was assessed using passages that were more comparable to

the passages used by McKoon and Ratcliff (1992). Using recognition probe judgments,

Suh and Trabasso (1993) assessed the on-line status of goal information with passages

similar to the example presented in Table 4. Participants read passages in one of two

conditions; goal failure or goal success.

They probed for Goal 1 information (e.g., Jimmy wanted to get a new bike.) after

key sentences in the passage (e.g., after Sentences 4, 8, 9, and 13) with a probe phrase

(e.g., Buy a bike). Participants responded more quickly to these probe phrases after

Sentences (8) and (13) (e.g., Jimmy wanted to earn some money. & He walked to the

second floor., respectively) in goal failure passages compared to goal success passages.

There were no differences in response times to goal phrases across passage versions after

Sentences (4) & (9) (e.g., He spoke to his mother. and He asked for a job at a grocery

store., respectively).

For example, in goal failure passages, when individuals read Sentence (8) (e.g.,

Jimmy wanted to earn some money.), they can infer that Jimmy does this in order to buy a

bike (i.e., a goal inference). Jimmy's mother has refused to buy him a bike, so Jimmy

initiates a new subgoal to satisfy the higher order superordinate goal of getting a bike.

Alternatively, in goal success passages, Jimmy's mother has already bought him a bike, so

this goal information is not needed to explain Jimmy's actions after reading these

sentences. When readers read Sentence (13) (e.g., He walked to the second floor.) in goal

failure passages, Jimmy's actions can again be understood with reference to the

superordinate goal of Jimmy wanting a new bike. In goal success passages, this is not the

case since Jimmy has already obtained his new bike. Because of these differences across

Table 4
Example Passage from Suh and Trabasso (1993)

Goal failure version

1.	(Setting) Once there was a boy named Jimmy.
2.	(Event 1) One day, he saw his friend, Tom, riding a new bike
3.	**(Goal 1)** Jimmy wanted to have a new bike.
4.	(Action 1) He spoke to his mother.
5.	**(Outcome 1: Goal 1 Failure)** His mother refused to buy him a bike.
6.	(Reaction 1) Jimmy was very sad.
7.	(Event 2) His mother told him that he should have his own savings.
8.	**(Goal 2)** Jimmy wanted to earn some money.
9.	(Action 2a) He asked for a job at a grocery store.
10.	(Action 2b) He made deliveries for the grocery store.
11.	**(Outcome 2: Goal 2 Success)** He earned a lot of money.
12.	(Action 3a) He went to a department store.
13.	(Action 3b) He walked to the second floor.
14.	**(Outcome 3: Goal 1 success)** He bought a new bike.

Goal success version

1.	(Setting) Once there was a boy named Jimmy.
2.	(Event 1) One day, he saw his friend, Tom riding a new bike.
3.	**(Goal 1)** Jimmy wanted to have a new bike.
4.	(Action 1) He spoke to his mother
5.	**(Outcome 1: Goal 1 success)** His mother bought him a bike.
6.	(Reaction 1) Jimmy was very happy.
7.	(Event 2) His mother told him that he should have his own savings.
8.	**(Goal 2)** Jimmy wanted to earn some money.
9.	(Action 2a) He asked for a job at a grocery store.
10.	(Action 2b) He made deliveries for the grocery store.
11.	**(Outcome 2: Goal 2 success)** He earned a lot of money.
12.	(Action 3a) He went to a department store.
13.	(Action 3b) He walked to the second floor.
14.	**(Outcome 3: Goal 3 Success)** He bought a new basketball.

---

goal success and failure passages, participants responded more quickly to probe phrases (e.g., Buy a bike) presented after Sentence (8) and (13) in goal failure passages than in goal success passages.

When participants read Sentence (4) (e.g., He spoke to his mother.) in either goal success or failure passages, they can understand that this relates directly to the goal of buying a bike. When they encounter Sentence (9) (e.g., He asked for a job at a grocery store.) they can also infer that Jimmy did this because he wanted to earn some money. Thus, response times to goal probe phrases (e.g., Buy a bike) presented after Sentences (4) and (9), were not different across goal success and failure passages.

These results indicate that readers are accessing superordinate goal information in an attempt to comprehend actions of protagonists. They are generating goal inferences between focal events and the most recently unsatisfied goal. Readers are attempting to understand events and actions with respect to the overall goal plan described in the passage. Readers are generating goal inferences that connect current focal events or actions to previously stated goals of protagonists. These studies provide evidence that readers are attempting to connect information by generating goal inferences, during normal comprehension.

However, the level of the goal hierarchy at which readers are attempting to explain current events is not clear. McKoon and Ratcliff's (1992) results appear to indicate readers are only generating goal inferences that connect current events and actions of protagonists to subordinate goal information. Only when there is a local coherence break, do readers use superordinate goal information. Alternatively, Long et al. (1992) and Suh and

Trabasso (1993) have presented evidence that readers are accessing superordinate goal information. Regardless, readers appear to be attempting to generate goal inferences, and understand current actions of protagonists with respect to previously stated goals. Converging evidence about readers' use of goal information (e.g., goal inference generation) comes from reading time studies.

Reading times. When information presented in target sentences is inconsistent with previously presented information, reading times for these sentences is longer, compared to when this information is consistent (Albrecht & O'Brien, 1993; Hakala & O'Brien, 1995; O'Brien & Albrecht, 1992). The level of causal relatedness between sentences also affects reading times (Bloom et al., 1990; Fletcher et al., 1990; Keenan et al., 1984; Myers et al., 1987).

With regard to goal inferences, several studies have demonstrated that reading times for specific target sentences vary as a function of its causal relationship to previous goal information (Albrecht, & Myers, 1995; Huitema, Dopkins, Klin, & Myers, 1993). In a study by Huitema et al. (1993), the reading times of target sentences were examined with passages that contained some type of inconsistency. This inconsistency was between a protagonist's actions described in the target sentence and previously presented goal information. For example, in one passage, a protagonist was described as wanting to go on vacation where he could swim and sunbathe. Later in the text, a target sentence described the protagonist as either asking for a plane ticket to Florida (i.e., consistent condition) or Alaska (i.e., inconsistent condition). Huitema et al. (1993, Experiment 1) found that individuals took longer to read this target sentence in the inconsistent condition

compared to the consistent condition.

This impact on target sentence reading time was taken to reflect the additional processing required to identify the inconsistency between protagonist's actions in the target sentence and previously presented goals of the protagonist. Additionally, it was posited that readers are accessing goal information presented earlier in the text and are attempting to connect it to actions described in the target sentence. When there is an inconsistency between the actions and the goals of protagonists, readers seem to be undertaking additional processing that elevates reading time. This additional processing time may involve the time it takes to reinstate goal information from long-term memory into working memory. However, because there is an inconsistency between this goal information and current actions, the readers may then search their memory further (or engage in other coherence maintenance processes) to find a reason for the current events.

In another study, Albrecht and Myers (1995) varied whether a specific goal was satisfied or not in passages. Participants read passages, and the reading time for each sentence was recorded. For example a passage first introduced a protagonist and a specific goal that she needed to satisfy (e.g., Mary needed to make an airline reservation by midnight.). Subsequently, the protagonist was either prevented from satisfying her goal (unsatisfied condition) or was able to satisfy her goal (satisfied condition). Sequences (21) and (22) refer to the continuation of passages in unsatisfied and satisfied conditions, respectively.

21.   Unsatisfied Goal: Before Mary confirmed her reservation, she received a

call from her boss, who asked her to complete her project by midnight.

She would have to confirm her reservation later.

22.   Satisfied Goal: After Mary confirmed her reservation she received a call

from her boss, who asked her to complete her project by midnight.

Subsequently, after a certain number of intervening sentences, two target sentences

were presented. The amount of intervening text was also varied so that the manipulated

goal information was either close or distant in the text from subsequent target sentences.

These target sentences described actions that were consistent with the information

provided in the intervening text. However, these actions were either consistent or

inconsistent with the completion of the previous goal.

23.   She was tired and decided to go to bed. She put on pajamas and washed

her face.

Albrecht and Myers (1995) found that participants read these target sentences

significantly slower in unsatisfied passages compared to the satisfied passages. This was

found only when target sentences were close in text to the unsatisfied goal information.

Readers appear to be identifying inconsistencies and connecting previously presented goal

information to current information when it is readily available (within a few sentences).

These findings demonstrate that when passages contain inconsistencies between actions of

protagonists and previously unsatisfied goals, comprehension difficulties result.

These reading time findings (Albrecht & Myers, 1995; Huitema et al., 1993) reveal

that inconsistencies between current actions or events and previously stated goals affect

readers' comprehension processes. Readers take longer to read target sentences when the

actions described in these sentences are inconsistent with previously stated goals than

when they are consistent (Huitema et al., 1993). Additionally, when passages contain a

previously unsatisfied goal and inconsistent actions, readers are slower to read target

sentences than when these actions are consistent and the goal is satisfied (Albrecht &

Myers, 1995).

<u>Complex Goal Passages</u>

The nature of the materials used in the studies discussed in the previous two

sections on probe judgments and reading time also requires some further discussion.

Generally, the materials used by these researchers consists of very simple goal structured

text. Each goal and subsequent subgoal are directly related to each other by the presence

of the same protagonist. The anaphoric reference and repetition of protagonist names,

along with the consistent maintenance of the same situation, may aid in the reinstatement

of protagonist's goal information.

The experimental materials used by investigators of goal-related inferences have

usually outlined very simple goal structures (e.g., Albrecht & Myers, 1995; Dopkins et al.,

1993; Huitema et al., 1993; McKoon & Ratcliff, 1992; Suh & Trabasso, 1993). Passages

have included only one goal (e.g., Albrecht & Myers, 1995) or two goals that the one

protagonist is attempting to satisfy (e.g., McKoon & Ratcliff, 1992; Suh & Trabasso,

1993). These passages have also contained high levels of argument overlap, since these

passages usually presented one protagonist as he moved through a related series of events.

The following experiments were completed to determine if these more causally complex

passages result in similar reading time (Experiment 1, 2, and 3) and probe judgment

(Experiment 3) findings as previous work has shown. The extent to which readers access

goal information in complex passages that portray a series of nested goals, may depend on the relationships among these goals (see Albrecht & O'Brien, 1995). For example, if achievement of a subgoal is seen as a necessary means toward achieving the superordinate goal, then completion of the subgoal may result in easier access to the superordinate goal information (see Suh & Trabasso, 1993). Furthermore, if this hierarchy of goals is expanded to include two subgoals that are necessary for the completion of a superordinate goal, how will this effect readers' access to both the superordinate and subgoal information? Table 5 presents an example of a more complex causal or goal structured narrative passage.

In this example, two protagonists (Greg and Pam) are portrayed in a series of events that outline a more complex goal structure. For the superordinate goal of meeting for lunch to be satisfied, Greg must catch a bus (e.g., Subgoal 1) and Pam must finish a report (e.g., Subgoal 2). Each subgoal is nested within a higher level superordinate goal. The superordinate goal is directly dependent on each subgoal being attempted and satisfied. Additionally, each subgoal is independent and unrelated to the other subgoal. Each subgoal has no propositional or contextual overlap with the other subgoal.

An experiment was conducted to determine whether these more complex goal passages will result in similar reading time effects that previous researchers have found (e.g., Albrecht, & Myers, 1995; Huitema et al., 1993). Specifically, the reading times for target sentences was assessed. These target sentences describe one of the protagonists (e.g., Pam) attempting to satisfy the superordinate goal (e.g., At 12:30, Pam entered McDonald's.). It was predicted that when one of the previous subgoals is left unsatisfied

Table 5
Complex Goal Passage.

Introduction: Introduces Superordinate goal of both protagonists.
1. Greg and Pam arranged to meet for lunch.
2. They had to talk about their coming divorce.
3. They decided to get together at McDonald's at 12:30.

Subgoal 1 section: Describes Subgoal-1's failure or success.
4. Greg had to take bus number 15 to get to the restaurant.
5. To make it on time he had to catch the noon bus.
6. Shortly before 12:00, he hurried out, running to catch it.
7(a). He jumped onto the bus just as it was pulling away.
 (b). The bus door slammed in his face as it was pulling away.

Subgoal 2 section: Describes Subgoal-2's success.
8. At 11:00 AM, Pam's boss asked her to type his year-end report for him.
9. She was worried that she could not finish it before lunch.
10. Surprisingly, she completed it just before lunch.
11. Pam handed in her report and left the office.

Target section: Target and Spillover sentence respectively.
12. At 12:30, Pam entered McDonald's.
13. McDonald's was very busy, and she had to wait for a table.

Conclusion section: Continuation of previous protagonist actions.
14. Pam had to wait five minutes to get a seat.
15. Pam wondered if she had made any mistakes in typing the report.

(e.g., Greg missed the bus), there is an inconsistency between the subsequent actions of

the other protagonists (e.g., Pam entered McDonald's) and this previously unsatisfied

subgoal. Readers are attempting to understand the attempted fulfillment of the

superordinate goal with relation to previously stated goals. As a result, readers are

attempting to connect two inconsistent ideas. This inconsistency causes readers to read

target sentences more slowly, compared to when the passage described consistent goal

attainment (i.e., both subgoals are satisfied). This inconsistency is indirect, in that there are

no direct connections between the actions of the protagonist at the target sentences to the

previously failed subgoal of the first protagonist. This inconsistency involves an

incompatibility between one protagonist's actions and the failed goals of another

protagonist. Experiment 1 was completed to determine if these complex goal passages

give rise to similar reading time effects as less complex passages.

Experiment 1

Previous research has shown that readers take longer to read key target sentences

of passages when the information presented in these sentences (e.g., Mary ordered a

cheeseburger.) is inconsistent with previously presented information (e.g., Mary is a strict

vegetarian..; Hakala & O'Brien, 1992). Additionally it has been shown that individuals'

reading times are affected by the consistency of protagonists' physical position (O'Brien &

Albrecht, 1992). For example readers take longer to read the sentence, Kim decided to go

outside the health club., when they have previously read the sentence, Kim stood **outside**

the health club., compared to when they have read Kim stood **inside** the health club.

Furthermore, readers take longer to read target sentences that describe actions that are

inconsistent (e.g., John asked for a plane ticket to Alaska.) with previously stated goals

(e.g., John wants to go on a vacation where he can swim and sunbathe.), compared to

when these actions are consistent (e.g., John asked for a plane ticket to Florida.) (Huitema

et al., 1993; also see Albrecht & Myers, 1995). In general, readers demonstrate that they

are attentive to the characteristics, movements, goals, and actions of protagonists

described in narrative passages. Readers take longer to read key critical target sentences when there is an inconsistency among any of these types of information.

The main goal of this experiment was to determine if readers display similar reading time differences with more complex goal passages. These passages illustrate a situation where the actions of a protagonist are both inconsistent with previously stated goals, and refer to failed or unsatisfied goals of the protagonist. These complex goal passages describe a more complex goal structure. Two subgoals are nested within one superordinate goal. This superordinate goal is a joint goal being undertaken by two protagonists.

The first passage in Table 6, labeled <u>manipulated subgoal first</u>, presents an example of the experimental passages used in Experiment 1. Initially two protagonists are introduced in the first section of the passage, and are described as having a joint superordinate goal (e.g., <u>Philip and Andy wanted to go away for spring break.</u>). In the second section of the passage, the first protagonist is then described as either succeeding or failing at satisfying a subgoal that was required to satisfy the joint superordinate goal (e.g., <u>Philip needed to borrow a car for the trip. Philip's father said the car **has just been fixed/needed to be fixed**, so he **could/couldn't** take it.</u>). The third section of the passage described the second protagonist as always succeeding at satisfying a subgoal that was needed to satisfy the joint superordinate goal (e.g., <u>Andy needed to book a hotel room in Banff. Andy booked them into the Economy Inn for 35 dollars a night.</u>).

Table 6

Example of Complex Goal Passages used in Experiments 1 and 2.

Manipulated Subgoal First Passage

Introduction: Introduces Superordinate goal of both protagonists.
1. Philip and Andy wanted to go away for spring break.
2. They had saved up enough money to drive to Banff.
3. They both were avid skiers and were looking forward to the trip.

Manipulated subgoal section: Describes first subgoal's failure or success.
4. Philip needed to borrow a car for the trip.
5. He asked all of his friends but nobody could lend him one.
6. At the last minute, he asked his father if he could borrow the family car.
7(a). Philip's father said the car has just been fixed, so he could take it.
  (b). Philip's father said the car needed to be fixed so he couldn't take it.

Succeeded subgoal section: Describes second subgoal's success.
8. Andy needed to book a hotel room in Banff.
9. He phoned the travel agent for some information on accommodations.
10. The travel agent told him that there were many cheap hotels.
11. Andy booked them into the Economy Inn for 35 dollars a night.

Target section: Target and Spillover sentence, respectively.

12. Andy packed his bag and waited out front.
13. Andy had also packed a lunch for the long trip.

Conclusion section: Continuation of previous protagonist actions.
14. They planned to rent all their ski equipment in Banff.
15. The weather report said that Banff had just received 20 cm of new snow.

Comprehension Question:
  Did the men want to go skiing? Yes

Manipulated Subgoal Second Passage

Introduction:
1. Philip and Andy wanted to go away for spring break.
2. They had saved up enough money to drive to Banff.
3. They both were avid skiers and were looking forward to the trip.

(Table 6 continued)

Succeeded subgoal section:
    4. Andy needed to book a hotel room in Banff.
    5. He phoned the travel agent for some information on accommodations.
    6. The travel agent told him that there were many cheap hotels.
    7. Andy booked them into the Economy Inn for 35 dollars a night.

Manipulated subgoal section:
    8. Philip needed to borrow a car for the trip.
    9. He asked all of his friends but nobody could lend him one.
    10. At the last minute, he asked his father if he could borrow the family car.
    11(a). Philip's father said the car has just been fixed, so he could take it.
      (b). Philip's father said the car needed to be fixed, so he couldn't take it.

Target section:
    12. Andy packed his bag and waited out front.
    13. Andy had also packed a lunch for the long trip.

Conclusion section:
    14. They planned to rent all their ski equipment in Banff.
    15. The weather report said that Banff had just received 20 cm of new snow.

Comprehension Question:
Did the men want to go skiing? Yes

_____

Note. The Manipulated Subgoal Second Passage was used in Experiment 2 only.

Two target sentences (target and spillover) followed this section, and described the

second protagonist as he attempted to achieve the superordinate goal (e.g., Andy packed

his bag and waited out front. Andy had also packed a lunch for the long trip.). When the

first protagonist's subgoal has previously failed, the actions of the second protagonist

described in the target sentence are inconsistent with this failed subgoal. These target

sentences refer to the superordinate goal that requires the attainment of this failed subgoal,

and thus are inconsistent with respect to the overall goal structure of the passage. It is

expected that readers will read these target sentences more slowly when the first subgoal has previously failed, compared to when it has been completed.

The passages used in this experiment are also locally coherent at the target sentence section. Both the target sentence and spillover sentence can be readily understood in the context of the last few previous sentences. A passage is said to be locally coherent if readers can make connections between sentences currently being read and the contents of preceding sentences. In the case of these target sentences, the same protagonist is described in Sentence 11 and Sentence 12 (e.g., Andy), and the actions described in each sentence are consistent with one another. No other information other than what is maintained in working memory and located at a low-level of representation is required to comprehend the current events described in the target sentences.

In Experiment 1, participants read passages in either the subgoal succeed or subgoal fail condition. Passages in the subgoal fail condition were considered to include an inconsistency at the target section. The actions of the second protagonist at the target section of attempting to satisfy a joint superordinate goal are inconsistent with the failure of the first protagonist's subgoal. Passages with a satisfied subgoal do not contain this inconsistency at the target section. Both protagonists have satisfied their separate and independent subgoals, and this allows the joint superordinate goal to be satisfied.

This identification of the inconsistency in the subgoal fail passages takes processing time. This will result in longer reading time of target sentences in the subgoal fail condition than the subgoal succeed condition, for which no inconsistency exists.

In summary, Experiment 1 was designed to demonstrate that readers notice inconsistencies in the overall global causal or goal structure of complex goal passages. I predicted that the reading times for target sentences that are inconsistent with previously stated goals would be longer in subgoal fail passages than in subgoal succeed passages. The reading times for first and last sentence of the second subgoal section were also analyzed (i.e., Sentence 8 and 11, respectively). If readers notice any inconsistencies in the overall goal structure before they read the target sentences, analysis of these sentences may reveal differences across subgoal success conditions. Readers may notice this inconsistency initially at the first sentence of the Subgoal 2 section (i.e., Sentence 8) or they may notice this inconsistency when the second protagonist has satisfied his subgoal at the end of this section (i.e., Sentence 11). In subgoal fail passages, Subgoal 1 is left unsatisfied by the time readers come to the Subgoal 2 section. Readers may wonder why the second protagonist is attempting to satisfy his subgoal when a previous subgoal has failed and the superordinate goal can not be achieved. As a consequence, readers may have comprehension difficulties even before they have read the target section sentences.

Method

Participants. Forty-three University of Manitoba introductory psychology students participated in this experiment for course credit. All participants were native speakers of English.

Materials. A pool of 18 experimental passages was constructed with aid of an expert judge. The complete pool of experimental passages used in this experiment is shown in Appendix A. These passages were constructed following similar guidelines that

previous researchers have used to create causal and goal passages (see Albrecht & Myers, 1995; Albrecht & O'Brien, 1993; Hakala & O'Brien, 1995). For example, Albrecht and Myers (1995) constructed narrative passages that were composed of five sections: an opening, a goal section, a filler section, target sentences, and a conclusion. Each experimental passage used in this experiment was also divided into five sections: an introduction, a Subgoal 1 section, a Subgoal 2 section, a target section, and a conclusion section. The experimental passages had the following structure:

1.   Introduction section (3 sentences)

2.   Subgoal 1 section (4 sentences Manipulated subgoal)

3.   Subgoal 2 section (4 sentences)

4.   Target section (2 sentences)

5.   Conclusion section (2 sentences)

Each passage included these five sections and was 15 sentences in length. Table 6 presents an example passage with each section labeled accordingly. The Introduction section introduced multiple protagonists and a joint superordinate goal that the protagonists were attempting to satisfy. This section was always three sentences in length. For example, in the passage in Table 6, Phillip and Andy are introduced and their joint goal of going on a ski trip is described. The subgoal sections that follow describe each of the protagonists as they attempt to satisfy separate and independent subgoals. Each subgoal section was always four sentences in length. The superordinate goal presented in the introduction section can not be satisfied unless each of these subgoals is satisfied. The

subgoals are also independent of each other and do not have any common concepts or features.

The Subgoal 1 section always contained the manipulated subgoal and described only the first protagonist as he attempted to satisfy his subgoal. The subgoal either failed or succeeded by the end of this section. The last sentence of the Subgoal 1 section was the only sentence in the entire passage that was different across subgoal success versions of the passage. The wording of this sentence was kept as similar as possible across passage versions. For example, Philip's independent subgoal was to borrow a car for the trip. In the last sentence of the Subgoal 1 section, Phillip either succeeded at satisfying this subgoal (e.g., ..he could take.. the car.) or failed to satisfy this subgoal (e.g., ..he couldn't take.. the car.).

The Subgoal 2 section described the second protagonist attempting to satisfy their subgoal. The protagonist always succeeded at satisfying Subgoal 2. This section was the same across subgoal success versions of the passage. For example, Andy's subgoal was to book a hotel room. The last sentence of the Subgoal 2 section described the satisfaction of this subgoal, Andy booked them into the Economy Inn for 35 dollars a night.

The Target section described the second protagonist as he attempted to satisfy the joint superordinate goal. This section contained two sentences, the target and spillover sentence (Sentences 12 and 13, respectively). In the example in Table 6, the target sentence described Andy attempting to go on the ski trip, Andy packed his bag and waited out front. The spillover sentence elaborated on the information provided in the target sentence, Andy had also packed a lunch for the long trip. This section was locally coherent

with the previous Subgoal 2 section, and could be understood with reference to the last

sentence of the Subgoal 2 section (Sentence 11). The target section only refers to the

second protagonist and superordinate goal information. No mention or reference was

made to the Subgoal 1 section. This was done to remove any conceptual overlap between

the target section and the manipulated Subgoal 2 section. Any repetition or reference to

Subgoal 2 text ideas in the target section may aid readers in reinstating backgrounded goal

information (i.e., Subgoal 1 information; Albrecht & Myers, 1995). This section was the

same across subgoal success versions of the passages.

The Conclusion section described the second protagonist in further actions or

ruminations that carried on directly from the target section. This section was always two

sentences in length, and was included so as to not end each passage with a direct

inconsistent action of the second protagonist in subgoal fail passages. This was done as a

safeguard against participants developing a strategy of focusing always on the target

section of the passages. Normal comprehension processes of narrative passages are the

focus of this experiment. Readers' use of any strategies may bias the comprehension

processes we are examining in this study.

The protagonist names used for experimental passages were taken from first name

norms for male and females (Battig & Montague, 1969). Protagonist names were

randomly sampled from all first names with a frequency of 6 or higher. These names were

then randomly assigned to each experimental passage.

Comprehension questions followed every experimental passage. These were

included to encourage readers to read the passages carefully. Comprehension questions

were constructed to assess information from one of three sections of the experimental

passages: the introduction section, the Subgoal 2 section, and the conclusion section. The

comprehension questions did not address the manipulated Subgoal 1 section because this

section was the focus of our subgoal success manipulation. Seven questions queried the

introduction section, six questions focused on the Subgoal 2 section, and five questions

focused on the conclusion section. Half of the questions had yes answers and half had no

answers.

A pool of 18 filler passages was randomly sampled from a larger pool of 54

passages (Klin, 1995)[1]. Filler passages were included so that participants would be

unaware of the purpose of the experiment. The complete pool of filler passages is

displayed in Appendix B. Filler passages were 10 to 16 sentences in length.

Comprehension questions followed all filler passages, and were taken directly from the

materials supplied by Klin (1995). Half of the questions had yes answers and half had no

answers.

Sixteen experimental passages were randomly chosen from the pool of 18

experimental passages to be used for experimental trials. The two remaining experimental

passages were used as practice passages at the start of the experiment. One practice

passage was in the subgoal succeed condition and one practice passage was in the subgoal

fail condition. Sixteen filler passages were randomly chosen from the pool of 18 filler

passages to be used in the experiment. The remaining two filler passages were used as two

further practice passages. In total there were four practice passages, two experimental

passages and two filler passages, which provided participants a chance to familiarize themselves with the experimental task.

Two lists of 36 passages (4 practice, 16 experimental, and 16 filler passages) were constructed. First, half of the experimental passages were randomly assigned to the Verbal Set 1 condition and the other half to the Verbal Set 2 condition. In one list, Verbal Set 1 passages were assigned to the subgoal succeed condition and Verbal Set 2 passages were assigned to the subgoal fail condition. The other list reversed this condition assignment. Verbal Set refers to a passage condition variable that was used to assign passages to each subgoal success condition across lists, thus, counterbalancing item assignment to experimental conditions. No further discussion of the variable verbal set will be included in any subsequent methods section. All filler passages were the same in each list. Experimental and filler passages were randomly assigned to trial positions. This ordering was the same across lists. One restriction for this random assignment was that no more than three, consecutive experimental passages could be seen. The 32 passages were presented in two blocks with a rest period between blocks. Half of the experimental passages appeared in the first block of trials.

Procedure. Participants were presented with experimental instructions before they began the experiment (See Appendix C.1.). Each experimental trial consisted of presenting a passage one sentence at a time on a computer monitor. The computer monitor was 22 cm from the front of the computer station table. To minimize distractions, the overhead light was turned off and a small lamp was placed on the floor close to the computer

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1. I wish to thank Celia Klin for the use of this material.

station. The space bar on a computer was labeled as the READY KEY. The "." and "x"

keys were labeled YES and NO, respectively. Participants were instructed to press the

ready key once they had completely understood each sentence. Thus, passages were

presented one sentence at a time, self-paced by participants. When the participants pressed

the ready key, the current sentence disappeared and the next sentence appeared. Reading

times for each sentence were recorded by the computer. If participants did not respond to

a particular sentence within 10 s, the next sentence automatically replaced the current

sentence on the screen.

After the final sentence of a passage disappeared, there was an interstimulus

interval of 2.5 s, and then the fixation point was presented on the same line as the previous

sentence. The fixation point remained on the screen for .5 s and was replaced by the

comprehension question. Individuals were instructed to reply <u>YES</u> or <u>NO</u> to this question.

The question was removed from the screen when they responded. If individuals did not

respond within 6 seconds the question was removed from the screen and an error was

recorded. Participants were not given feedback on their accuracy. There was a inter-trial

interval of 3 s, and then the next passage trial was presented. A rest period of 40 seconds

separated the 32 passages into two blocks of 16 trials. After completing all trials,

participants were given a debriefing sheet that provided a brief outline of the experiment

they had just completed (See Appendix C.2.).

<u>Results</u>

In the experiments presented in this thesis, F_1 values refer to tests using an error

term based on subject variability, and F_2 values refer to tests using an error term based on

item variability. An alpha level of .05 is used throughout, unless otherwise indicated. List

and verbal set were also included in all analysis as between-subjects and between-items

variables, respectively. The variable list was used to counterbalance subject assignment to

experimental items. Thus, each subject saw half of the experimental items in the subgoal

fail condition and half in the subgoal succeed condition. The variable verbal set was used

to counterbalance experimental item assignment to subjects. Thus, each item was seen in

the subgoal fail condition by half the subjects, and in the subgoal succeed condition by the

other half of the subjects. Verbal set is analogous to the list variable and as a result, list

was included in all subjects-random analysis, and verbal set was included in all items-

random analyses presented in the following studies. The inclusion of verbal set made all

item analyses comparable to all subject analyses that included the list variable.

The reading times and proportion of correct comprehension questions are

presented in Table 7 and Figure 5. Reading time results are presented for the first sentence

of the Subgoal 2 section (Sentence 8), the last sentence of the Subgoal 2 section (Sentence

11), the target sentence (Sentence 12), and the spillover sentence (Sentence 13).

Reading times. The four sentences examined here were not equated for word

length within passages. Therefore, the analysis focuses on the planned comparisons of

specific sentence means across subgoal success (i.e., succeed versus fail). Any difference

in means between the four sentences across experimental conditions is not of theoretical

interest, and no further analysis or discussion of this factor will be presented in the

following experiments.

Table 7
Mean Reading Times (cs) and the Proportion
of Correct Comprehension Questions for Experiment 1.

	SENTENCE				
Subgoal Success	8	11	Target(12)	Spillover(13)	Proportion of correct questions
Fail (F)	306.7	232.8	231.1	241.4	.85
Succeed (S)	302.7	240.2	238.8	251.9	.81
Difference (F - S)	+4.0	-7.4	-7.7	-10.5	

Planned comparisons of Sentence 8 revealed that there was no effect of subgoal success (Fs < 1). There was also no effect across subgoal success conditions for Sentence 11 (Fs < 1). For the subjects-random analysis of Sentence 11 there was a significant Subgoal Success x List interaction, $F_1(1,41) = 45.06$, $MSE = 535$, and with the items-random analysis there was a significant Subgoal Success x Verbal set interaction, $F_2(1,14) = 13.95$, $MSE = 192$.

The reading times of the target sentence (Sentence 12) were not significantly different across subgoal success conditions (Fs < 1.7). The subjects-random analysis revealed a significant Subgoal Success x List interaction, $F_1(1,41) = 15.42$, $MSE = 667$. The items-random analysis also revealed a significant Subgoal Success x Verbal set interaction, $F_2(1,14) = 9.91$, $MSE = 236$.

The reading times for the spillover sentence (Sentence 13) were significantly slower in the subgoal succeed condition ($M = 251.9$ cs) than in the subgoal fail condition

($\underline{M}$ = 241.4 cs). This effect was marginally significant with an analysis based on the subject variability, $\underline{F}_1(1,41)$ = 3.68, $\underline{MSE}$ = 608, $\underline{p}$ = .06, and reached significance in the analysis based on item variability, $\underline{F}_2(1,14)$ = 7.69, $\underline{MSE}$ = 108. The subjects-random analysis also revealed a Subgoal Success x List interaction, $\underline{F}_1(1,41)$ = 4.70, $\underline{MSE}$ = 608. The items-random analysis also revealed a Subgoal Success x Verbal set interaction, $\underline{F}_2(1,14)$ = 28.66, $\underline{MSE}$ = 108.

Figure 5. Experiment 1: Mean sentence reading times (cs).
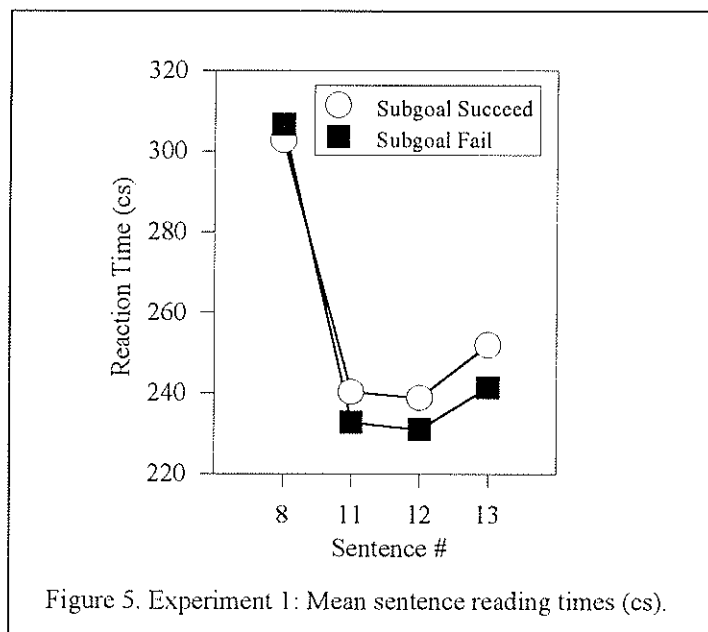
<u>Comprehension questions.</u> The proportion of correct answers to the comprehension questions was not significantly different in the subgoal succeed ($\underline{M}$ = .81) and subgoal fail ($\underline{M}$ = .85) conditions ($\underline{F}$'s < 2.8). The subjects-random analysis revealed a Subgoal Success x List interaction, $\underline{F}_1$ = 5.17, $\underline{MSE}$ = .02.

<u>Discussion</u>

The expected reading time difference was not found with the first sentence of the target section. However, individuals were significantly slower in reading the spillover sentence in the subgoal succeed condition than in the subgoal fail condition. The subgoal success condition effect found at the spillover sentence is opposite to the predicted reading time difference. It was expected that individuals would be slower to read target

sentences in passages containing a failed subgoal compared to passages with a succeeded subgoal. It was found that participants read spillover sentences of subgoal succeed passages ($\underline{M}$ = 251.9 cs) significantly slower than spillover sentences of subgoal fail passages ($\underline{M}$ = 241.4 cs).

The locus of reading time effects on the spillover sentence is consistent with previous reading time effects found by Huitema et al. (1993). Huitema et al. (p. 1058) stated that when the intervening material between the manipulated subgoal and the target sentence represents a clear alternative focus (whether it be a second goal or a second protagonist), the reading time effect will be found on the sentence after the target sentence (i.e., the spillover sentence). The complex goal passages used in this experiment instantiate such an "alternative focus" in the Subgoal 2 section. After the manipulated Subgoal 1 section, the Subgoal 2 section switches focus to the other protagonist and an entirely independent subgoal. Huitema et al (p. 1058) stated that one reason for this delayed effect was that after the failure to relate the current input to the current focus, readers initiate a search of the representation of the text. This search takes some time to complete, and it may not be until the spillover sentence that the reader completes any inconsistency identification.

There are two possible reasons for this unexpected effect. First, with subgoal fail passages, readers may have maintained the failed Subgoal 1 information in working memory from the initial failure in the text (i.e., the end of Subgoal 1 section) until the target section (see Dopkins et al., 1993, p. 73). This failed subgoal information is foregrounded until a subsequent goal achievement is described in the text. Readers are

waiting or expecting the first subgoal (Subgoal 1) to be satisfied. When participants read

target sentences that described the attempted fulfillment of the superordinate goal by the

second protagonist, this superordinate goal information is initially accessed in LTM. They

also have to access all pertinent subgoal information (Subgoal 1 and 2 information) to

determine if the actions to this point are consistent with previously stated goals of the

protagonists. The subgoal information that immediately preceded the target section (i.e.,

Subgoal 2 information) is still in working memory. However, they do not need to search

their long-term memory representation for the Subgoal 1 information. The Subgoal 1

information is already in focus in working memory, and readers quickly identify the

inconsistency.

With comprehension of subgoal succeed passages, readers do not have to maintain

the first protagonists' succeeded subgoal information in working memory. The goal plan

of the protagonists is being achieved with consistent actions of the protagonists across

subgoal sections. When readers read the target sentences, they need to search their long-

term memory representation to determine if all the required goals have been satisfied.

Participants need to access information about the superordinate goal, and the first

protagonist's subgoal. Subgoal 2 information again is still in working memory, because its

satisfaction was described in the previous sentence. However, both the superordinate goal

and Subgoal 1 information must be reinstated from LTM into working memory. This

memory retrieval takes processing time. The additional memory search for Subgoal 1

information, that was not required in subgoal fail passages, elevates reading times in

subgoal succeed passages compared to subgoal fail passages.

The second explanation of these results is as follows. When individuals read passages in the subgoal fail condition, they may have suspended their comprehension processes after the initial failure of the first protagonists' subgoal (van den Broek, Risden, Fletcher, Thurlow, 1996). With subgoal fail passages, the fact that the first protagonist has failed in satisfying his subgoal makes the subsequent actions of the second protagonist seem confusing. Readers may have suspended their comprehension processes in anticipation that further information will be provided later in the passage with respect to the first protagonists' failed subgoal (e.g., further attempts to satisfy this subgoal may be described). Thus, individuals read target sentences of subgoal fail passages more quickly than target sentences of subgoal succeed passages.

The subjects-random and items-random analysis revealed several interactions of list and verbal set (counterbalancing variables) factors with subgoal success conditions. The list and verbal set factors are grouping variables used to counterbalance passage assignment across subgoal success conditions in experimental lists. The assignment of passages to experimental list was done without matching word length or word frequency in the crucial sentences. As a result these interactions may emerge. These interactions do not pertain to the reading time hypothesis that is being investigated. Subsequent list and verbal set interactions are reported in the following experiments, but no further discussion will be provided.

There were no significant differences across subgoal success conditions in the proportion of correct responses to comprehension questions. This indicates that readers were reading passages conscientiously throughout the experiment. In Experiment 2, the

position of the manipulated subgoal was varied in order to contrast the working memory

and suspension of comprehension hypotheses.

Experiment 2

In the second experiment, an additional variable was included, the position of the

manipulated subgoal. For example, in the manipulated subgoal first passage, illustrated in

Table 6, the first subgoal section describes Philip's attempt to borrow a car. This

manipulated subgoal is either satisfied (subgoal succeed condition) or left unsatisfied

(subgoal fail condition) at the end of this section (e.g., Phillip fails or succeeds at

borrowing a car.). The manipulated subgoal section is followed by the succeeded subgoal

section (e.g., Andy books a hotel room.), the target section (e.g., Andy packs his bag and

waits to be picked up by Phillip.), and the conclusion section, respectively. Passages with

the manipulated subgoal in first position are equivalent to the passages used in Experiment

1.

The manipulated subgoal second passage, presented in Table 6, illustrates a

passage in which the manipulated subgoal appears second in the passage. In these

passages, the introduction section was followed by the succeeded subgoal section (e.g.,

Andy books a hotel room.). This was followed by the manipulated subgoal section (e.g.,

Phillip fails or succeeds at borrowing a car.), target section, and the conclusion section,

respectively.

According to the suspension of comprehension hypothesis (van den Broek et al.,

1996), readers are suspending their comprehension processes in anticipation that

subsequent text will provide a resolution to current events described in these complex goal

passages. In subgoal fail passages, the fact that one of the joint subgoals has failed seems incompatible with the attempted fulfillment of the superordinate goal by one of the protagonists. However, individuals may expect further information to be provided later in the text. This potential subgoal-satisfying information (i.e., protagonist actions) may subsequently resolve any previously failed subgoals. Thus, after the failure of one subgoal, readers tend to read target sentences that describe inconsistent protagonist actions more quickly compared to when all the subgoals have been satisfied. Readers are not attempting to connect the causal or goal information (i.e., goals and current actions) together. They have suspended their more complex time-consuming comprehension processes, in anticipation that everything will be resolved later. According to this hypothesis, the manipulation of the subgoal position in this experiment should not affect the subgoal success effect found in Experiment 1. Regardless of the position of the manipulated subgoal (first or second in the passage), once readers get to the target section they have suspended their comprehension processes, and are awaiting further information. The same subgoal success effect found for target sentences should appear in both manipulated subgoal first and manipulated subgoal second passages.

Concerning the working memory hypothesis, when the manipulated subgoal section is brought closer to the target section the subgoal success effect should be eliminated or reversed. Previous research by Albrecht and Myers (1995; also see McKoon & Ratcliff, 1992) demonstrated that when a previously failed goal is close in text to target sentences, reading times for these sentences are longer than when the goal has been satisfied. With manipulated subgoal second passages, the manipulated subgoal information

is closer to the target section and the inconsistency between this failed subgoal and the second protagonist's actions can be readily identified by individuals. When participants read target sentences of all manipulated subgoal second passages (subgoal fail or succeed), the superordinate goal and succeeded subgoal information need to be retrieved from LTM. The manipulated subgoal (succeed or fail) information is still in working memory, because it appeared in the preceding sentence. The manipulated subgoal information is readily available in working memory and any inconsistency can be readily identified by the reader, and causes comprehension difficulties. Thus, the reading time effect found for the target sentences of subgoal fail passages will be eliminated or reversed with manipulated subgoal second passages. Additionally, the target sentences are not locally coherent with the previous subgoal section of manipulated subgoal second passages. The previous subgoal section deals with Philip's subgoal failure or success while the target sentence describes Andy's attempt at satisfying the superordinate goal. With manipulated subgoal first passages, the working memory hypothesis predicts that the same subgoal success effect found in Experiment 1 will be replicated.

In summary, Experiment 2 was designed to contrast the working memory hypothesis and the suspension of comprehension hypothesis. The working memory hypothesis predicts that with passages in the manipulated subgoal first condition that the subgoal success effect found in Experiment 1 will be replicated. However, when the manipulated subgoal is presented second in the passage, this reading time effect will be eliminated and/or reversed. Readers will read target and/or spillover sentences of manipulated subgoal second passages at equal rates across subgoal success, or more

slowly in the subgoal fail condition than subgoal succeed condition. Alternatively, the suspension of comprehension hypothesis predicts that the subgoal success reading time advantage will occur in both types of passages (manipulated subgoal first or second). The same sentences analyzed in Experiment 1 were examined in this experiment.

Method

Participants. Sixty-five University of Manitoba introductory psychology students participated in this experiment for course credit. All participants were native speakers of English.

Materials. The experimental materials were the same passages used in Experiment 1. The only change was that the position of the manipulated subgoal was either first or second in the passage. Experimental passages maintained the following structure across experimental conditions:

Manipulated subgoal first passages

1.   Introduction section

2.   Manipulated subgoal section

3.   Succeeded subgoal section

4.   Target section

5.   Conclusion

Manipulated subgoal second passages

1.   Introduction section

2.   Succeeded subgoal section

3.   Manipulated subgoal section

4.   Target section

5.   Conclusion

Table 6 presented example passages that follow the passage structure detailed above and are labeled accordingly. The subgoal sections that were manipulated in Experiment 1 were the same subgoal sections varied in this experiment. Only their position relative to the target section was varied.

Four lists of 36 passages each were constructed. Each list was made up of 4 practice passages, 16 experimental passages, and 16 filler passages. Four practice items preceded all lists: Two had the form of the experimental passages and two had the form of the filler passages. Each passage was followed by a comprehension question that probed the information described in the passage. In the first list, a quarter of the experimental passages appeared in each of the four conditions obtained by crossing subgoal success and position of the manipulated subgoal. This condition assignment was cycled across the four lists using a Latin square procedure.

All filler passages were the same across lists. Experimental and filler passages were randomly assigned to trial positions. This ordering was the same across lists. One restriction for random assignment was that no more than three experimental passages could be seen in a row. The 32 passages were also split into two blocks, with a rest period between them. Another restriction was that half of the experimental passages appeared in the first block of trials (before rest), and half in the second block of trials (after rest). As well, two experimental passages in each of the four conditions appeared in each block of trials.

The level of inconsistency detected by readers at the target section of complex goal passages was also assessed. The passages may present differing levels of inconsistency when one of the subgoals has failed. As stated previously, these inconsistencies are indirect and are the product of inconsistencies between current actions and previously stated goals of the protagonist. Some readers may elaborate, predict, or expect certain events and actions to occur in passages after one of the subgoals has failed. I have assumed that readers are attempting to comprehend these passages with the minimum of elaborative processes. These inconsistency judgments provided a measure of how inconsistent each judge perceived the subgoal fail passages to be. Four expert judges completed inconsistency rating questionnaires. Expert judges made inconsistency judgments about each complex goal passage used in Experiment 1 and 2. Subsequently, the reading times (e.g., Sentences 8, 11, 12, & 13) for high and low inconsistent passages were examined across Experiment 1 and 2.

To measure the relative inconsistencies perceived by readers in experimental passages, a passage ratings questionnaire was designed. Each experimental passage used in Experiments 1 and 2 was presented in this questionnaire. The instructions for this task and two example passages are presented in Appendix D. Each story was broken up into two parts that were presented on two pages. On the first page, the first part of the passage was presented, and was made up of all sentences that occurred before the target section of experimental passages (e.g., Sentences 1 to 11). The second page presented the second part of the experimental passages, and comprised the remaining sentences (e.g., Sentences 12 to 15). An inconsistency judgment appeared between Sentence 13 and 14. Participants

were required to indicate on a scale from 1 (very consistent) to 7 (very inconsistent) how

consistent or inconsistent the actions and events described in these two sentences were

with respect to the information provided in the first part of the story.

Each judge completed the inconsistency-rating questionnaire as follows. Each

judge was given a ratings booklet, with instructions on the first page. Each judge read

these instructions and then began the questionnaire. First, judges read the first part of the

story. This corresponded to the all sentences that occurred before the target section of

experimental passages (e.g., Sentences one to 11). Judges then read the second part of the

story (e.g., Sentences 12 to 15). After reading the target (Sentence 12) and spillover

sentence (Sentence 13), judges were required to make the judgment on how consistent the

actions and events described in these two sentences were with respect to the information

provided in the first part of the story. All experimental passages were read in this manner,

and consistency judgments were made for each passage.

The average inconsistency rating of each experimental passage is presented in

Table 8. The correlation among the judges' inconsistency ratings ranged from $r = .29$ ($p =$

.27) to $r = .65$ ($p = .01$). A reliability analysis was performed on the four judges

inconsistency ratings, and a Cronbach's α of .64 was found. This indicates that the pool of

experimental passages is heterogeneous, with differing levels of inconsistency being

represented across all passages. Additionally, an ANOVA comparing each passages rating

revealed a significant difference between passage ratings, F (15, 45) = 4.77, $MSE = 2.32$.

Table 8

Mean inconsistency ratings ($\underline{N}$ = 4) for experimental
passages used in Experiments 1 and 2. Passage # refers to
passage numbers used to label passages in Appendix A.

Passage #	Passage Theme	Rating
3	ROB BANK	1.75
4	FISHING TRIP	2.75
5	BUILD DIKE	2.00
6	TRIP TO HAWAII	2.75
7	MOVE PIANO	4.75
8	PUT ON PLAY	4.25
9	WATCH MOVIE	3.25
10	HAVE DINNER	5.50
11	FAMILY REUNION	5.25
12	MEET FOR LUNCH	1.00
13	FINISH MOVIE	5.50
14	BAKE PIE	5.50
15	PAINT HOUSE	6.25
16	BREACH CASTLE	6.25
17	PUT OUT NEWSPAPER	3.25
18	OPEN RESTAURANT	3.75

The median ($\underline{Mdn}$ = 4) rating score for all passages was used to split the items into the two groups. The reading times of the six passages with a inconsistency rating of less than 4 are displayed in the left panel of Figure 6. The right panel displays the reading time for the six passages with a inconsistency rating of more than 4. Reading times for Sentences 8, 11, 12, and 13 were averaged across Experiments 1 and 2. All reading times from Experiment 1 were used, and for Experiment 2 only the reading times for manipulated subgoal first passages were included.

The reading time of Sentence 13 (spillover sentence) was compared across subgoal success conditions. This involved performing a 2 (subgoal success) by 2 (experiment #) ANOVA on Sentence 13 reading times for each group of inconsistent passages. Subgoal success was the within-items factor, and experiment # was the between-items factor. This comparison showed that with passages with inconsistency ratings less than and equal to 4, there was no significant difference across subgoal conditions ($\underline{F}$ < 1). With passages with

an inconsistency rating of more than 4, Sentence 13 was read significantly slower in the

subgoal succeed condition (M = 261.7 cs) than in the subgoal fail condition (M = 238.4

cs), $F_2(1,14)$ = 15.57, MSE = 280.

Figure 6. Mean sentence reading times (cs), averaged across Experiments 1 and 2. The left panel presents mean reading times for items (n = 8) with inconsistency ratings equal to and less than the median (Mdn = 4) rating value for all items (N = 16). The right panel presents mean reading times for items (n = 8) with inconsistency ratings greater than the median.
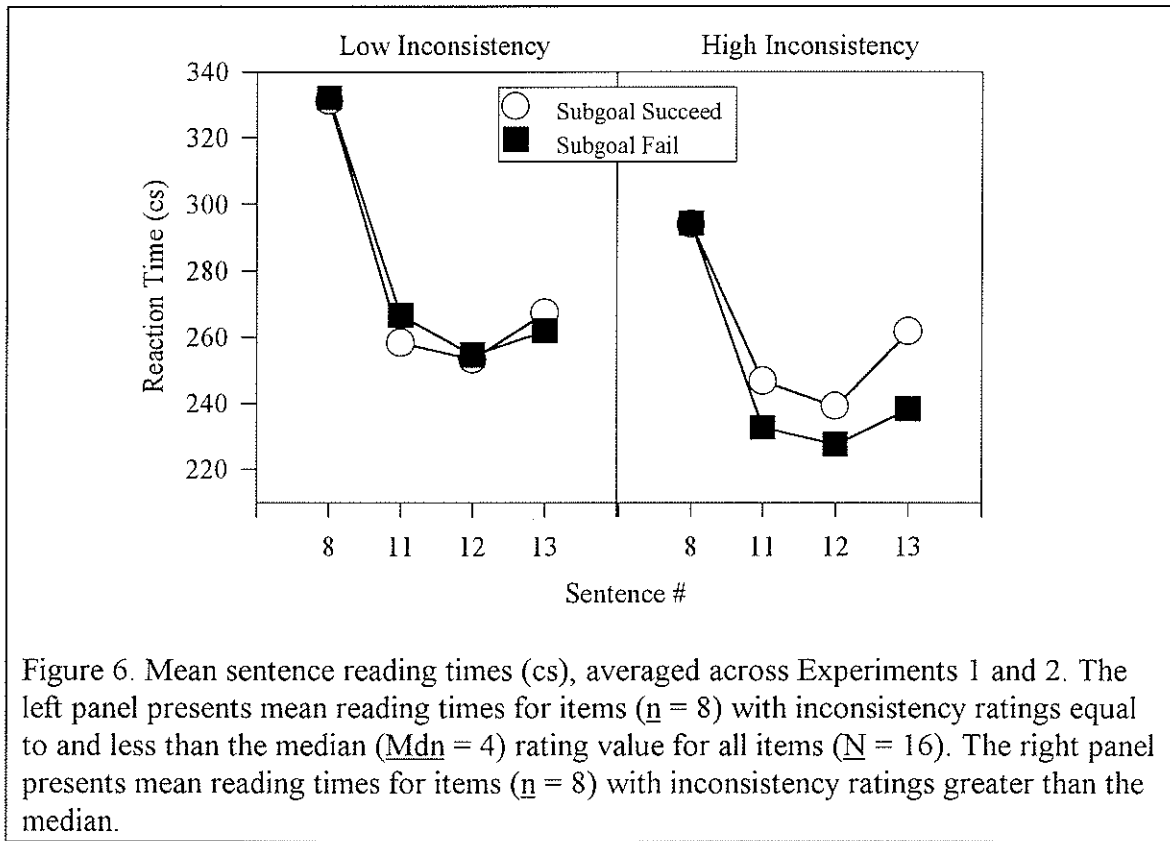
Procedure. The procedure used in this experiment was identical to Experiment 1.

Results

The data of seven participants had to be discarded because of an error in labeling

response keys. One participant's data had to be discarded because of a computer error. As

a result the following analysis is based on the data of 57 participants.

Reading times. Reading times and the proportion of correct comprehension

questions are presented in Table 9 and in Figure 7. Reading times and the proportion of

correct comprehension questions are presented for each of the four experimental

conditions.

Table 9
Mean Reading Times (cs) and the Proportion
of Correct Comprehension Questions for Experiment 2.

	SENTENCE				Proportion of correct questions
Subgoal Success	8	11	Target(12)	Spillover(13)	
Manipulated Subgoal First					
Fail (F)	322.0	267.2	255.2	260.3	.86
Succeed (S)	328.0	265.6	258.1	279.9	.91
Difference (F - S)	-6.0	+1.6	-2.9	-19.6	
Manipulated Subgoal Second					
Fail (F)	317.0	332.8	266.1	259.5	.89
Succeed (S)	317.3	314.3	253.9	264.8	.90
Difference (F - S)	-.3	+18.5	+12.2	-5.3	

Across subgoal position conditions, the manipulated subgoal section is switched

from Sentences 4 to 7 in manipulated subgoal first passages, to Sentences 8 to 11 in

manipulated subgoal second passages. In manipulated subgoal first passages, Sentences 8

and 11 correspond to the first and last sentence of the succeed subgoal section. The

subgoal in this section is always satisfied. In manipulated subgoal second passages,

Sentences 8 and 11 correspond to the first and last sentence of the manipulated subgoal

section. This sections always depicts the success or failure of its subgoal. This fact makes

Sentences 8 and 11 different across manipulated subgoal positions. As a result, Sentences

8 and 11 cannot be directly compared across subgoal positions, and were analyzed for

subgoal success effects within each manipulated subgoal position (first or second).
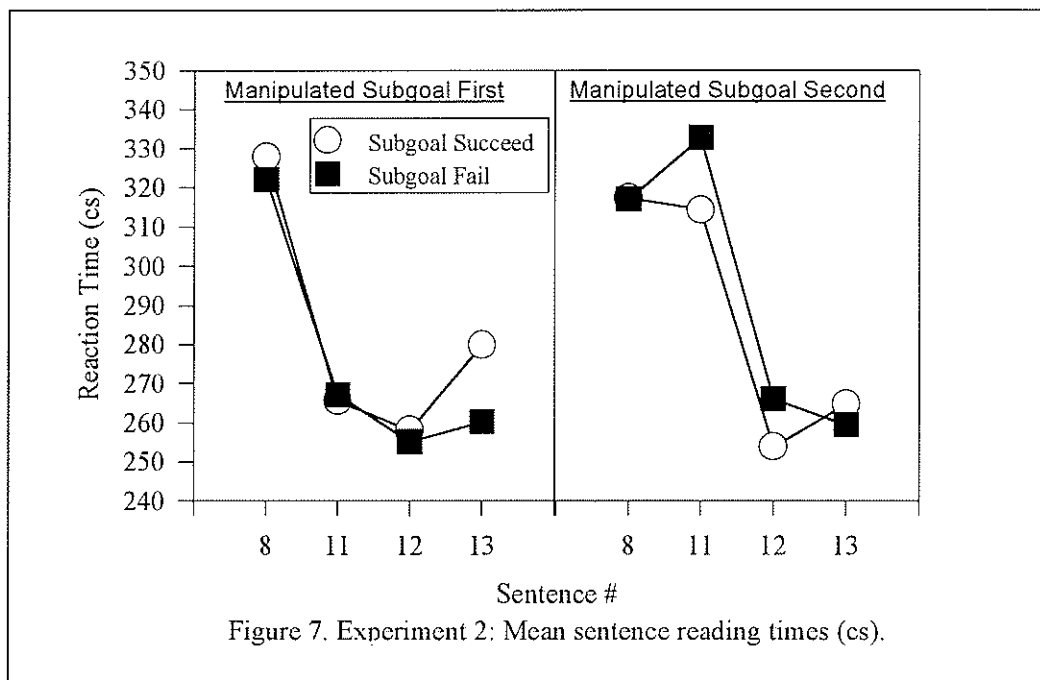
Figure 7. Experiment 2: Mean sentence reading times (cs).

There was no significant difference of subgoal success at Sentences 8 and 11 in

either subgoal position ($F < 3.69$). The subjects-random analysis of Sentence 8 in

manipulated subgoal first condition revealed a Subgoal Success x List interaction, $F_1(3,53)$

= 6.34, MSE = 1,538. The subjects-random analysis of Sentence 8 in manipulated subgoal

second condition revealed a Subgoal Success x List interaction, $F_1(3,53) = 9.42$, MSE =

2,316. The subjects-random analysis of Sentence 11 in manipulated subgoal first condition

revealed a Subgoal Success x List interaction, $F_1(3,53) = 3.48$, MSE = 1,383. The subjects-random analysis of Sentence 11 in manipulated subgoal second condition revealed a Subgoal Success x List interaction, $F_1(3,53) = 4.04$, MSE = 2,459. The items-random analysis of this sentence revealed a Subgoal Success x Verbal set interaction, $F_2(3,12) = 3.48$, MSE = 1,281.

In order to examine the effect of subgoal success (fail versus succeed) and manipulated subgoal position (first versus second) on the reading times of Sentences 12 and 13, I performed the following ANOVAs on both sentences. The subjects-random analysis involved performing a 2 (subgoal success) x 2 (manipulated subgoal position) x 4 (list) ANOVA. The items-random analysis involved performing a 2 (subgoal success) x 2 (manipulated subgoal position) x 4 (verbal set) ANOVA. Subgoal success and manipulated subgoal position were within- variables for the subjects and the items-random analyses. In all analyses list was a between-subjects variable, and verbal set was a items-random variable.

For Sentence 12, there were no significant differences in reading times across subgoal success and manipulated subgoal position variables ($Fs < 2$). The following list interactions were significant in the subjects-random analysis: Subgoal Success x List, $F_1(3,53) = 3.19$, MSE = 1,901, Manipulated Subgoal Position x List, $F_1(3,53) = 8.69$, MSE = 1,856, Subgoal Success x Manipulated Subgoal Position x List, $F_1(3,53) = 9.02$, MSE = 2,057. The items-random analysis revealed a Manipulated Subgoal Position x Verbal set interaction, $F_2(3,12) = 3.47$, MSE = 512.

The analysis of Sentence 13 reading times revealed a marginally significant

Subgoal Success effect, $F_1(1,53) = 3.83$, MSE = 2,700, $p = .056$; $F_2(1,12) = 3.84$, MSE =

671, $p = .074$. The reading times for Sentence 13 were slower in subgoal succeed

passages ($M = 272.3$ cs) than the subgoal fail passages ($M = 259.9$ cs). The subjects-

random analysis revealed a Subgoal Success x List interaction, $F_1(3,53) = 24.79$, MSE =

2,700.

Planned comparison of Sentence 13 reading times revealed that in the manipulated

subgoal first condition, readers read this sentence significantly slower in the subgoal

succeed condition ($M = 279.9$ cs) than in the subgoal fail condition ($M = 260.3$ cs). This

effect was significant by both subjects-random and items-random analysis, $F_1(1,53) = 5.28$,

MSE = 2,267, $F_2(1,12) = 5.18$, MSE = 543. The subjects-random analysis revealed a

Subgoal Success x List interaction, $F_1(3,53) = 18.02$, MSE = 2,267.

Planned comparison of Sentence 13 showed that in the manipulated subgoal

second condition, there were no significant differences between subgoal success

conditions ($Fs < 1$). An interaction of Subgoal Success x List was revealed in the subjects-

random analysis, $F_1(3,53) = 12.25$, MSE = 2,277.

Comprehension questions. In the manipulated subgoal first condition, participants

responded with 91 % accuracy in the subgoal fail condition and with 86 % accuracy in the

subgoal succeed condition. In manipulated subgoal second passages participants

responded with 90 % accuracy in the subgoal fail condition and with 89 % accuracy in the

subgoal succeed condition. The proportion of correct comprehension questions that

readers gave was not significantly different across subgoal success and manipulated

subgoal position conditions (Fs < 1). The subjects-random analysis revealed the following

list interactions: Manipulated Subgoal Position x List, $F_1(3,53) = 3.10$, $\underline{MSE} = .03$,

Subgoal Success x Manipulated Subgoal Position x List, $F_1(3,53) = 6.22$, $\underline{MSE} = .02$.

<u>Discussion</u>

The suspension of comprehension hypothesis predicted that the subgoal success

effect would be found when the manipulated subgoal section appeared first or second in

passages. When the manipulated subgoal appeared first in the passage, the original reading

time effect found in Experiment 1 was replicated. Because the subgoal success effect

found in Experiment 1 was unexpected and contrary to previous findings, this replication

was needed. However, as the working memory hypothesis predicted, when the

manipulated subgoal appeared second in passages, the subgoal success effect was

eliminated.

Readers were faster to read the spillover sentence of subgoal fail passages,

compared to subgoal succeed passages, when the manipulated subgoal information is

located distant in the text (manipulated subgoal first passages). When this manipulated

subgoal section is moved closer to the target section (manipulated subgoal second

passages), this subgoal success effect was eliminated.

Readers appear to be maintaining failed goal information in working memory.

They may be expecting subsequent actions of protagonists to be undertaken to satisfy this

failed goal. When they encounter target sentences that describe protagonist attempted

fulfillment of the superordinate goal, any inconsistency judgments are facilitated. The

reader has to reinstate superordinate goal information from LTM. Subsequently, the

manipulated subgoal information must be accessed to determine if the overall goal structure is consistent.

In subgoal fail passages with the manipulated subgoal first, the failed subgoal information is readily available in working memory from its initial failure in the manipulated subgoal section until readers process target sentences. Thus, the inconsistency between the current action described in target sentences can be identified without the need of any additional memory retrieval. However, in subgoal succeed passages with the manipulated subgoal first, the succeeded subgoal information must be retrieved from LTM when readers encounter target sentences. This additional memory retrieval elevates reading times of the spillover sentence of subgoal succeed passages.

When the manipulated subgoal section was moved closer to the target region, the subgoal success effect was eliminated. In both subgoal success versions of manipulated subgoal second passages (subgoal fail and subgoal succeed), the manipulated subgoal information is still in working memory when readers encounter target sentences. The inconsistency judgment that is required in the subgoal fail condition is as a result not facilitated. In both subgoal success conditions, the manipulated subgoal information is available in working memory when readers process the target sentences. No additional memory retrieval is needed in the subgoal succeed condition. Thus, the reading times for the target sentences are not affected. There are no differences in reading times for the spillover sentence across subgoal success conditions for manipulated subgoal second passages.

I expected that the difference in the target sentence reading times, found in Experiment 1, would be eliminated and/or reversed with manipulated subgoal second passages in Experiment 2. However, no difference in target sentence reading times were found across subgoal success conditions. There was a trend at Sentence 11 for participants to read this sentence more slowly in the subgoal fail condition (M = 332.8 cs) than in the subgoal succeed condition (M = 314.3 cs). This trend also appeared at Sentence 12, with the subgoal fail condition (M = 266.1 cs) longer than the subgoal succeed condition (M = 253.9 cs). However, these reading time differences did not reach statistical significance.

Comprehension questions. There were no effects of subgoal success or manipulated subgoal position in the proportion of correct responses to comprehension questions. This indicates that readers were reading all experimental passages appropriately throughout the experiment. However, the proportion of correct responses in this experiment (M = .89) were slightly higher than in Experiment 1 (M = .83). Regardless of this difference, participants in both experiments responded correctly to these comprehension questions the majority of the time, indicating that readers were reading these complex passages for comprehension.

Inconsistency ratings. The inconsistency ratings indicate that this pool of complex passages contain differing levels of inconsistency. This pool of passages appears to be a heterogeneous group of causally complex passages. Specifically, the subgoal succeed reading time effect was found only with highly inconsistent passages (inconsistency rating of 4 or higher). However, the reading time effect has been replicated in two experiments

(Experiments 1 and 2). Across the entire pool of complex goal passages, there is a persistent reading time effect at the spillover sentence.

Some passages appear to have more obvious inconsistencies than others. These passages were composed to describe a complex causal or goal situation. Additionally, the inconsistency conveyed by these passages is indirect; and over all passages, seems to represent a continuum of inconsistency. This pool of complex goal passages appears to sample a larger population of inconsistent passages. Regardless, the joint results of Experiments 1 and 2 indicate that there is a significant reading time effect across all items, and these complex passages are resulting in differing comprehension processes across subgoal success conditions.

In summary, Experiment 2 provides evidence that readers attend to the overall goal structure of complex goal passages. The complex organization of multiple protagonists and goals in these passages appears to affect readers' comprehension processes differently. The reading times of spillover sentences were significantly longer in the subgoal succeed condition than the subgoal fail condition (Experiment 1 and 2). The working memory hypothesis appears to account for this reading time effect. Readers are maintaining failed subgoal in working memory from its initial failure until subsequent target sentences. At target sentences, because this failed subgoal is available in working memory, readers can quickly identify the inconsistency. Alternatively, when this subgoal has been satisfied and shifted to LTM, readers need to retrieve this subgoal information and then determine any inconsistency. This further memory reinstatement cause reading times of the spillover sentence to be longer compared to when the subgoal had failed. In

Experiment 3, the status of the manipulated subgoal information in working memory will be assessed using a recognition probe judgment task. Although Experiment 2 provided support for the working memory hypothesis, the results of Experiment 3 refute this hypothesis.

Experiment 3

The first two experiments demonstrated that inconsistencies in the causal structure of passages, outlined by the goals and actions of protagonists, affect readers' comprehension processes. Specifically, it was found that with complex goal passages, readers take longer to read target sentences that refer to succeeded subgoals than those that refer to failed subgoals (Experiment 1 and 2). These target sentences describe protagonists' actions that are either consistent (subgoal succeed condition) or inconsistent (subgoal fail condition) with previously described protagonist's goals and actions.

This subgoal success effect is contrary to previous findings which have shown that readers take longer to read target sentences that refer to failed goals (see Albrecht & Myers, 1995; Hakala & O'Brien, 1992; Huitema et al., 1993; O'Brien & Albrecht, 1992). In Experiment 2, this subgoal success effect disappeared when the manipulated subgoal information was brought closer in the text to the target sentences.

It is hypothesized that readers are maintaining failed subgoal information in working memory from the point of failure, until subsequent target sentences are read. When individuals read target sentences that refer to a joint superordinate goal, relevant goal information is accessed and any inconsistencies are identified. When one of the subgoals has previously failed, it is maintained in working memory when readers read

about related subgoals. When readers encounter target sentences, this allows readers to quickly identify the inconsistency between the current actions of one protagonist and the failure of another protagonist to satisfy their subgoal.

Experiment 3 was designed to determine the relative activation of this goal-related information in people's memory representations. This assessment of goal information is assumed to reflect the relative activation of subgoal information on-line, during normal comprehension. A probe word recognition judgment task was used to assess this relative level of subgoal concept activation in working memory across subgoal success conditions. Participants read the same passages used in Experiment 1 and 2. Experimental passages were seen in either the subgoal success or subgoal fail condition. The manipulated subgoal section always appeared first in passages. Participants were presented with a probe word directly after key target sentences of experimental passages. Participants responded YES or NO to the question, Has this word appeared in the current passage? These probe words were subgoal words taken directly from the manipulated subgoal sections of experimental passages. Higher activation in memory is indicated when the response to the subgoal word is faster in one subgoal success condition than the other. If the subgoal concept is active in working memory, this will prime participants' responses to the subgoal probe words. This will produce faster reaction times to probe words presented during the recognition task.

This on-line assessment was performed at three points during the comprehension of these passages. Participants were given probe words either after Sentence 10, after Sentence 12 (i.e., the target sentence), or after Sentence 13 (i.e., the spillover sentence). Because the significant reading time effect has been localized at the target region

(Experiment 1 and 2), it is reasoned that the memory probes should be presented before, during, and after the comprehension of these target sentences.

The "working memory" hypothesis presented in Experiment 1 and 2 states that failed subgoal information is maintained in working memory until a related goal achievement sentence is encountered. With subgoal fail passages, the failed subgoal information is in working memory when readers encounter target sentences that refer back to the superordinate goal. This failed subgoal information is retained in working memory from its initial failure. Subsequently, readers will respond more quickly to probe words presented before target sentences (e.g., after Sentence 10) in the subgoal fail condition than in the subgoal succeed condition. In subgoal succeed passages, the previously satisfied subgoal information is only retrieved after participants read target sentences.

For example, in the passage presented in Table 10, participants will respond more quickly to the probe word CAR when it is presented after Sentence 10 in the subgoal-fail condition than in the subgoal-success condition. Phillip has failed to borrow a car in subgoal-fail passages. Subsequently, readers will maintain Philip's subgoal (e.g., borrow a car) in memory until the target sentences are encountered. In subgoal-success passages, Phillip has borrowed a car. Readers will purge this concept from working memory as the passage moves on to Andy's subgoal. Only after the target sentences have been encountered, will readers access this purged subgoal information in LTM. Thus, the subgoal fail advantage will disappear when probe words are presented after Sentence 12 or 13. This is because, by this point in comprehension, readers will have retrieved all relevant goal information. They are attempting to comprehend the current actions and

events described at the target section with respect to the overall goal structure of the

passage.

Table 10

Example of a Complex Goal Passage and Probe Positions used in Experiment 3.

Introduction: Introduces Superordinate goal of both protagonists.
    1. Philip and Andy wanted to go away for spring break.
    2. They had saved up enough money to drive to Banff.
    3. They both were avid skiers and were looking forward to the trip.

Manipulated subgoal section: Describes first subgoal's failure or success.
    4. Philip needed to borrow a car for the trip.
    5. He asked all of his friends but nobody could lend him one.
    6. At the last minute, he asked his father if he could borrow the family car.
    7(a). Philip's father said the car has just been fixed, so he could take it.
     (b). Philip's father said the car needed to be fixed so he couldn't take it.

Succeeded subgoal section: Describes second subgoal's success.
    8. Andy needed to book a hotel room in Banff.
    9. He phoned the travel agent for some information on accommodations.
    10. The travel agent told him that there were many cheap hotels.
    -----**Probe Word**-----
    11. Andy booked them into the Economy Inn for 35 dollars a night.

Target section: Target and Spillover sentence, respectively.
    12. Andy packed his bag and waited out front.
    -----**Probe Word**-----
    13. Andy had also packed a lunch for the long trip.
    -----**Probe Word**-----

Conclusion section: Continuation of previous protagonist actions.
    14. They planned to rent all their ski equipment in Banff.
    15. The weather report said that Banff had just received 20 cm of new snow.

Comprehension Question and Probe Word:
    Did the men want to go skiing? Yes
    CAR

However, this subgoal fail advantage may also appear when probe words are presented after Sentence 12. Because the reading time effect found in Experiments 1 and 2 was localized at spillover sentences (Sentence 13), all relevant goal information (i.e., superordinate and subgoal information) may not be active in working memory (i.e., in both subgoal fail and succeed passages) until after participants have read this sentence. Only in subgoal fail passages will this failed subgoal information be available in working memory. Thus, there may also be faster probe judgment times after Sentence 12 in subgoal fail passages than in subgoal succeed passages. After the spillover sentence has been read, all retrieved goal information will be active and equal probe responses across subgoal success conditions may occur.

In summary, Experiment 3 assesses readers' on-line memory for manipulated subgoal information. Probe words that represent this manipulated subgoal information were presented to participants while they read either subgoal fail or subgoal succeed passages. These probes were presented at one of three points in the passages: after Sentence 10, after Sentence 12 (target sentence), or after Sentence 13 (spillover sentence). If readers maintain failed subgoal information in memory, they will respond more quickly to probe words after Sentence 10 in the subgoal fail condition than in the subgoal succeed condition.

Method

Participants. Ninety-six University of Manitoba introductory psychology students participated in this experiment for course credit. All participants were native English speakers.

Materials. The same experimental and filler passages used in Experiments 1 and 2 were used in this study. Experimental passages were seen in one of six conditions, obtained by crossing subgoal success (succeed versus fail) and probe position (after Sentences 10, 12, or 13).

The experimental passages were all shown with the manipulated subgoal first in the passage and correspond to the same structure of passages that were used in Experiment 1. Subgoal success passages described a series of events in which the first protagonist either succeeded or failed at satisfying his independent subgoal. The second protagonist subsequently succeeded at satisfying his independent subgoal. The attempts of the second protagonist to fulfill the superordinate goal at the target section is subsequently consistent (subgoal succeed) or inconsistent (subgoal fail) with the previous attempts of the first protagonist to satisfy their subgoal.

Probe position conditions corresponded to when the subgoal probe word was presented to participants during their comprehension of these narrative passages. Probe words were presented either after Sentence 10, after the target sentence (Sentence 12), or after the spillover sentence (Sentence 13).

Some experimental passages were revised with the aid of an expert judge. This was done to remove any repetitions of key goal-related words in the target section and other subgoal sections of the text. Some passages contained direct and indirect references to the overall superordinate goal in the second subgoal section that appeared immediately after manipulated subgoal section. This repetition may aid readers in recalling the overall superordinate goal, and possibly the manipulated subgoal information. These repetitions

may provide reinstatement cues for the manipulated subgoal information (e.g., CAR)

before the target section. The possible reinstatement of the manipulated subgoal

information before the target section would confound any differences across subgoal

success conditions in probe responses. That is, if these reinstatement cues occur before the

target sentence, any differences in probe responses across subgoal success conditions may

be affected when probe words are presented before the target section (i.e., after Sentence

10). The target section was designed to be the point in the passages at which any

inconsistencies in the overall causal structure would most likely be detected by readers and

thereby cause comprehension difficulties. The target section should be the only section

that directly refers to the superordinate goal. Thus, to reduce any repetition of the goal-

related information before the target section, some passages were revised. This pool of

experimental passages was also enlarged by two experimental passages for a total of 20

experimental passages. See Appendix E for the revised set of experimental passages.

From this pool of 20 experimental passages, 18 passages were randomly sampled

to be used as experimental passages in this experiment. The remaining two passages were

used as practice passages. The entire pool of 18 filler passages used in Experiment 1 and 2

were used in this experiment. See Appendix B for the full set of filler passages.

In total, four practice passages provided participants with the chance to familiarize

themselves with the experimental task. The two passages left over from random sampling

of the pool of 20 experimental passages were used as two of these practice passages.

Because all filler passages were needed to construct counterbalanced lists, two other

passages were required for practice passages. These two passages were taken from a pool

of unfinished experimental passages. This pool was the source of the original pool of 20 experimental passages, but contained many passages that did not fulfilled the requirements of these new complex passages. The four practice passages are also provided in Appendix B. One of the two experimental practice passages was presented in the subgoal succeed condition with the probe word after Sentence 12 and the other passage in the subgoal fail condition with the probe word after Sentence 13. The two additional practice passages are both presented with the probe after the fifth last sentence.

One probe word was selected for each experimental passage (18 experimental passages and 2 experimental practice passages). These probe words were nouns and were taken directly from the manipulated subgoal section. They directly referred to the subgoal that the first protagonist was attempting to satisfy in the manipulated subgoal section. Twenty probe words for the filler and practice passages (18 filler passages and 2 practice passages) were randomly sampled from another pool of narrative passages (Zimny, 1987). These probe words were selected with the one restriction that these words could not appear anywhere else in the filler or experimental passages. In total, 20 probe words required YES answers (i.e., they appeared in the passage they were presented in), and 20 probe words required NO answers (i.e., they did not appear in the passage they were presented in). The two sets of probe words (experimental and filler) were compared on their number of syllables and their word frequency (Kucera & Francis, 1967). Probe words for the experimental and filler passages did not differ significantly from each other in the number of syllables ($F = .04$, $p = .85$) and their word frequency ($F = 2.18$, $p = .15$).

A comprehension question followed every passage. The comprehension questions did not focus on the manipulated subgoal section. These questions were the same questions used in Experiment 1 and 2. For experimental passages, these questions were constructed so that six questions focused on the introduction section, six questions focused on the succeeded subgoal section, and six questions focused on the conclusion section. Questions for the filler passages were the same questions used in Experiments 1 and 2. Half of the experimental and filler questions required yes answers, and half required no answers.

Six lists of 40 passages each were constructed. Each list was made up of four practice passages, 18 experimental passages, and 18 filler passages. The same four practice items preceded all lists. All passages were followed by a comprehension question that probed the information described in the passage. In the first list, three experimental passages were each assigned to one of six experimental conditions. This assignment was cycled across the six lists using a Latin square procedure. Thus, each list presented three experimental passages in each of the six conditions.

All filler passages were the same across lists. For all lists, one third of all filler passages were assigned to one of three conditions: The probe word appeared after the sixth-last, fourth-last and third-last sentence of filler passages. This was done to equate probe presentation in experimental passages with probe presentation in filler passages. Presenting the probe words in these positions is equivalent to presenting probe words in experimental passages after Sentence 10, after the target sentence, and after the spillover sentence.

Experimental and filler passages were randomly assigned to trial positions. This ordering was the same across all lists. One restriction for this random assignment is that no more than three experimental passages could be seen in a row. The 40 passages were arranged in three blocks, with a rest period after each block. Another restriction was that one experimental passage in each condition appeared in each block of trials. Thus, six experimental passages in all six conditions appeared in all three blocks of trials. Filler passages were also restricted so that two filler passages in each of the three filler probe presentation conditions appeared in each block of trials. Therefore, two filler passages in all three conditions (a total of six filler passages) appeared in all three blocks of trials.

Procedure. The procedure was same as those of Experiment 1 and 2. See Appendix F (F.1. and F.2.) for the instructions and debriefing forms for Experiment 3. The one difference was that participants were required to make probe judgments at varying points during their comprehension of the passages. Passages were read in the same manner as in Experiments 1 and 2. At some point in the text a probe word appeared immediately after participants pressed the READY KEY to indicate they had fully comprehended the previous sentence. According to probe position assignment of each passage, this probe word appeared either after Sentence 10, Sentence 12, or after Sentence 13. The probe word was presented in all capital letters and on the same line as the previous sentence. Four asterisks flanked the probe word on the left and right side. Individuals were instructed to indicate as quickly and as accurately as possible, whether they had seen the word in the current passage (YES or NO). If participants took longer than two seconds to respond, the message "TOO SLOW" appeared on the same line as the probe word for one

second. This message was flanked by rows of asterisks on the line above and below it. If

individuals did not respond within six seconds to the probe word, it was removed from the

screen and an error was recorded. Participants were not given feedback on their accuracy.

After individuals responded to the probe word, the next sentence in the passage was

presented. Two rest periods of 40 seconds divided the 36 passages into three blocks of 16

trials each.

Results

The data for one participant were discarded because he stated that they had

responded incorrectly on half of the experimental trials (e.g., responded yes with the no

key). Two other participants' data were discarded because they made no responses to any

probe words. The following analyses are based on the data of the remaining 93

participants.

Probe reaction times. All probe reaction times are based upon correct probe

responses only. Probe reaction times that were more than three standard deviations away

from the mean for a subject were discarded from the analyses (Suh & Trabasso, 1993).

This resulted in the elimination of 1.1 % of the data. Probe reaction times across subgoal

success and probe position are presented in Table 11 and Figure 8.

In order to examine the effect of subgoal success (succeed versus fail) and probe

position (probe after Sentences 10, 12, or 13) on probe reaction times, I performed a 2

(subgoal success) x 3 (probe position) ANOVA. This analysis revealed no significant

effects across probe position or subgoal success conditions. The following interactions

were revealed in the subjects-random analysis: Probe Position x List, $F_1(10,174) = 3.65$,

$\underline{MSE}$ = 28,335; Subgoal Success x Probe Position x List, $\underline{F}_1(10,174)$ = 1.98, $\underline{MSE}$ = 31,353. The following interactions were also revealed in the item random analysis: Subgoal Success x Verbal Set, $\underline{F}_2(5,12)$ = 6.41, $\underline{MSE}$ = 3,333; Subgoal Success x Probe Position x Verbal Set, $\underline{F}_2(10,24)$ = 3.72, $\underline{MSE}$ = 7,005.

Table 11
Mean Probe Reaction Times (ms)
for Experiment 3.

Subgoal Success	Probe Position (Probe after Sentence #)		
	10	12	13
Fail (F)	1309	1330	1345
Succeed (S)	1294	1329	1291
Difference (F - S)	15	1	54

Planned comparisons of probe reaction times when probe words were presented after Sentence 10 revealed no significant differences across subgoal success conditions. The following interaction was revealed with the items-random analysis: Subgoal Success x Verbal Set, $\underline{F}_2(5,12)$ = 4.65, $\underline{MSE}$ = 6,453. There were also no significant differences across subgoal success when the probe word was presented after Sentence 12. The following interaction was revealed with the subject-random analysis: Subgoal Success x List, $\underline{F}_1(5,87)$ = 2.69, $\underline{MSE}$ =32,904. The following interaction was also revealed with the items-random analysis: Subgoal Success x Verbal Set, $\underline{F}_2(5,12)$ = 7.35, $\underline{MSE}$ = 4,042.

When the probe word appeared after Sentence 13, participants responded more quickly to probe words in subgoal succeed passages ($\underline{M}$ = 1291 ms) than in subgoal fail passages ($\underline{M}$ = 1345 ms). This difference was significant in both the subjects-random and items-random analysis, $\underline{F}_1(1,87)$ = 4.97, $\underline{MSE}$ = 26,169; $\underline{F}_2(1,12)$ = 4.76, $\underline{MSE}$ = 6,849.

This difference in probe reaction times across subgoal success conditions indicates that the manipulated subgoal information was more available in memory in the subgoal success condition after the spillover sentence than in the subgoal fail condition.

Figure 8. Experiment 3: Mean probe reaction times (ms)
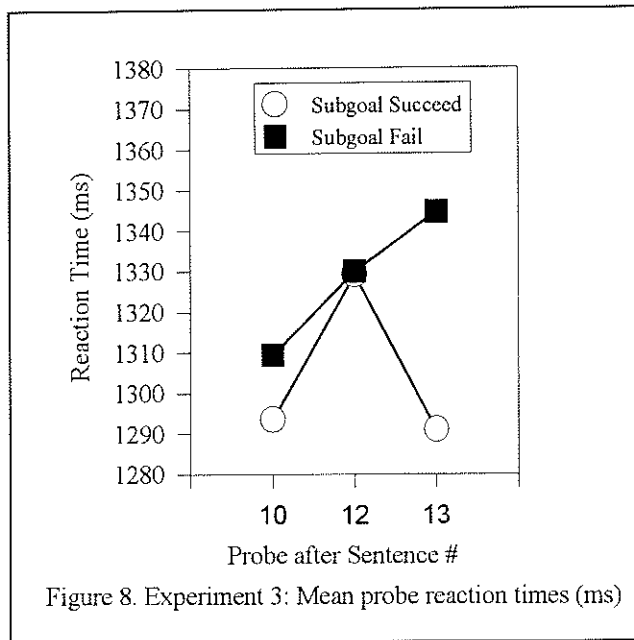
The effect of probe position on probe reaction times was examined in each subgoal success condition. No significant differences were found across probe positions in subgoal succeed passages. The following interaction was revealed in the subjects-random analysis: Probe Position x List, $F_1(10,174) = 3.37$,

MSE = 28,022. The following interaction was also reveled in the items-random analysis: Probe Position x Verbal Set, $F_2(10,24) = 3.91$, MSE = 5,203. No significant differences were revealed across probe positions in subgoal fail passages. The following interaction was revealed in the subjects-random analysis: Probe Position x List, $F_1(10,174) = 2.24$, MSE = 31,666.

Percentage of correct probe responses. The percentage of correct probe responses is presented in Table 12 and Figure 9. In order to examine the effect of subgoal success and probe position on the percentage of correct probe responses, I performed a 2 (subgoal success) x 3 (probe position) ANOVA. This analysis revealed a marginally significant effect of subgoal success only in the subjects-random analysis, $F_1(1,87) = 3.39$, MSE =

230, $\underline{p}$ = .07. Participants responded more accurately to probe words in subgoal succeed

passages ($\underline{M}$ = 90 %) than in subgoal fail passages ($\underline{M}$ = 88 %).

No significant effect of probe position was found with the subjects- and items-

random analysis. The subjects-random analysis also revealed the following interaction,

Subgoal Success x Probe Position, $\underline{F}_1(2,174)$ = 3.57, $\underline{MSE}$ = 224. This interaction was not

significant in the items-random analysis. The subjects-random analysis also revealed the

following interactions: Subgoal Success x List, $\underline{F}_1(5,87)$ = 8.78, $\underline{MSE}$ = 230; Probe

Position x List, $\underline{F}_1(10,174)$ = 7.48, $\underline{MSE}$ = 253; Subgoal Success x Probe Position x List,

$\underline{F}_1(10,174)$ = 4.89, $\underline{MSE}$ = 224.

Table 12
Mean Percentage of Correct Probe
Responses (%) for Experiment 3.

	Probe Position (Probe after Sentence #)		
Subgoal Success	10	12	13
Fail (F)	87.1	88.2	88.1
Succeed (S)	93.2	91.0	86.4
Difference (F - S)	-6.1	-2.8	1.7

Planned comparisons at each probe position were used to examine the effect of subgoal success on the percentage of correct probe responses. When the probe appeared directly after Sentence 10, there were significant differences across subgoal success conditions in the subjects-random analysis, Subgoal Success, $\underline{F}_1(1,87)$ = 11.75, $\underline{MSE}$ = 154. Participants responded to probe words presented after Sentence 10, more accurately when they appeared in subgoal succeed passages ($\underline{M}$ = 93 %) than when they appeared in subgoal fail passages ($\underline{M}$ = 87 %). The items-random analysis revealed no

significant differences across subgoal success. The following List effects were also

revealed with the subjects-random analysis: List, $F_1(5,87) = 5.07$, MSE $= 319$; Subgoal

Success x List, $F_1(5,87) = 6.98$, MSE $= 154$.

When probe words appeared directly after the target sentence (Sentence 12), there

were no significant differences across subgoal success conditions. The following List

effects were also revealed with the subjects-random analysis: List, $F_1(5,87) = 2.77$, MSE $=$

341; Subgoal Success x List, $F_1(5,87) = 5.17$, MSE $= 262$. The following verbal set effect

was also revealed with the items-random analysis: Verbal Set, $F_2(5,12) = 3.93$, MSE $=$

130.

Figure 9. Experiment 3: Mean correct probe responses (%).
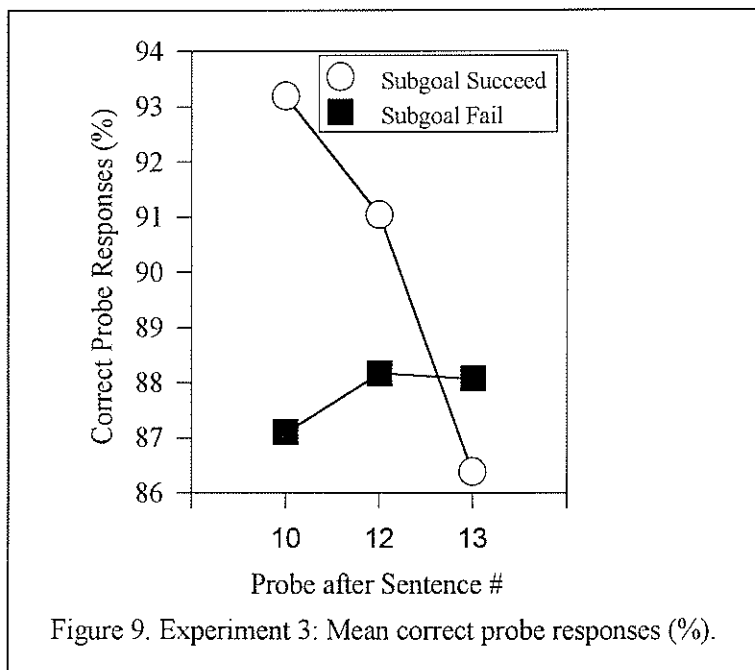
When probe words appeared directly after the spillover sentence (Sentence 13), there were also no significant differences across subgoal success conditions. The following List effects were also revealed with the subjects-random analysis: List, $F_1(5,87) = 4.64$, MSE $= 355$; Subgoal Success x List, $F_1(5,87) = 6.81$, MSE $= 261$.

The effect of probe position on the percentage of correct probe responses was

examined in each subgoal success condition. With passages in the subgoal success

condition, the subjects-random analysis revealed that the percentage of correctly identified probe words significantly differed across probe positions, $F_1(2,174) = 5.28$, $\underline{MSE} = 224$. This effect was only marginally significant by the items-random analysis, $F_2(2,24) = 3.07$, $\underline{MSE} = 57$, $\underline{p} = .065$. The following significant effects were also revealed with the subjects-random analysis: List, $F_1(5,87) = 4.08$, $\underline{MSE} = 268$; Probe Position x List, $F_1(10,174) = 4.44$, $\underline{MSE} = 224$.

With passages in the subgoal fail condition, no significant differences in the percentage of correctly identified probe words were found across probe position conditions. The following effects were revealed with the subjects-random analysis: List, $F_1(5,87) = 2.86$, $\underline{MSE} = 471$; Probe Position x List, $F_1(10,174) = 7.89$, $\underline{MSE} = 253$.

Reading times. To determine whether the reading time effects found in Experiments 1 and 2 were replicated in this experiment, the same sentences were examined in this experiment (i.e., Sentences 8, 11, 12 (target sentence), and 13 (spillover sentence)). Reading times were analyzed only for those sentences that appeared before a probe word had been presented in a passage (cf. Lea, Mason, Albrecht, Birch, & Myers, 1998). Reading times were collapsed across probe position conditions. Reading times for Sentences 8, 11, 12 and 13 are presented in Table 13 and Figure 10.

Planned comparisons of Sentence 8 revealed that there was no effect of subgoal success on reading times. The following list effects were revealed in the subjects-random analysis, List, $F_1(5,87) = 2.38$, $\underline{MSE} = 9,335$; List by Subgoal Success, $F_1(5,87) = 8.54$, $\underline{MSE} = 741$. The following verbal set effects were also revealed in the items-random analysis, Verbal Set, $F_2(5,12) = 3.09$, $\underline{MSE} = 3,496$; Verbal Set by Subgoal Success,

$F_2(5,12) = 4.01$, MSE $= 303$. There was also no effect of subgoal success conditions for

Sentence 11. The following list effects were revealed in the subjects-random analysis, List,

$F_1(5,87) = 2.62$, MSE $= 7,294$; List by Subgoal Success, $F_1(5,87) = 7.15$, MSE $= 1,027$.

The following verbal set effect was also revealed in the items-random analysis, Verbal Set

by Subgoal Success, $F_2(5,12) = 4.48$, MSE $= 199$.

Table 13
Mean Reading Times (csec) for Experiment 3.

	Sentence			
Subgoal Success	8	11	Target	Spillover
Fail (F)	302.5	255.2	247.2	244.2
Succeed (S)	306.2	259.0	258.0	249.0
Difference (F - S)	-3.7	-3.8	-10.8	-4.8

The comparison of target sentence (Sentence 12) reading times across subgoal

success conditions revealed significant differences, $F_1(1,87) = 5.04$, MSE $= 956$; $F_2(1,12)$

$= 6.39$, MSE $= 138$. Participants read the target sentence significantly faster in the subgoal

fail condition (M $= 247$ cs) than in the subgoal succeed condition (M $= 258$ cs). The

following interaction was also revealed with the subjects-random analysis: Subgoal

Success x List, $F_1(5,87) = 8.01$, MSE $= 956$. The following interaction was revealed with

the items-random analysis: Subgoal Success x Verbal Set, $F_2(5,12)=8.16$, MSE $=138$.

Figure 10. Experiment 3: Mean sentence reading times (cs).
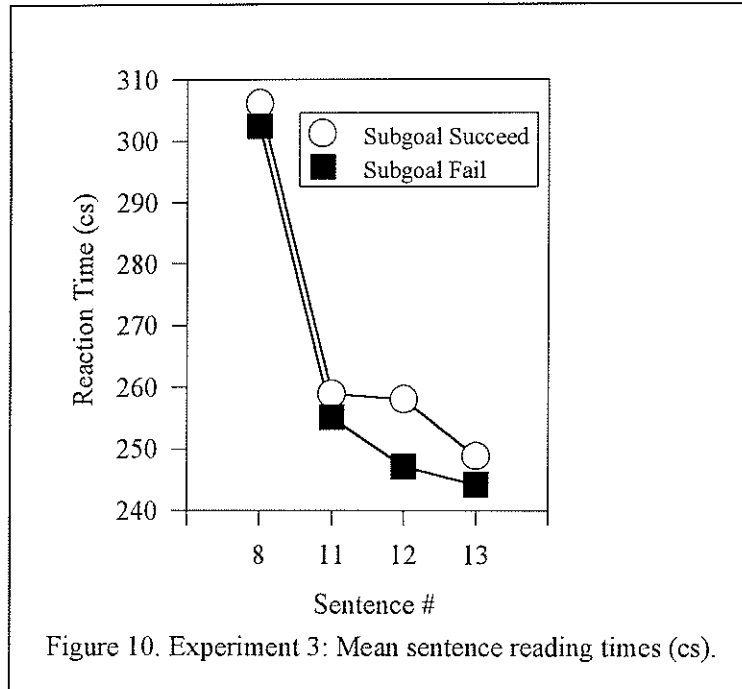
The comparison of Sentence 13 reading times revealed no significant differences across subgoal success conditions. The following interaction was revealed with the subjects-random analysis: Subgoal Success x List, $F_1(5,87) = 5.99$, $MSE = 2,231$. The following interaction was also revealed with the items-random analysis: Subgoal Success x Verbal Set, $F_2(5,12) = 4.66$, $MSE = 413$.

The absence of a reading time effect at Sentence 13 may be due to the small number of trials that Sentence 13's reading times were based on. Sentence 13 only appears before a probe word in 6 passages for each subject, whereas for Sentences 8, 11, and 12 each sentence appears before a probe word in 18, 12, and 12 passages, respectively. This reduction in the number of passages that Sentence 13's average reading time is based upon, results in less power, and a diminished probability of detecting any differences across subgoal success conditions (Aron & Aron, 1994). However, the magnitude of the difference at Sentence 13 was only 4.8 cs. Thus, it may have been the inclusion of the probe judgment task that caused the subgoal success effect to shift from the spillover sentence to the target sentence.

Comprehension questions. The proportion of correct comprehension questions

across subgoal success and probe position is presented in Table 14.

To examine the effect of subgoal success and probe position upon the proportion

of correct comprehension questions, I performed a 2 (subgoal success) x 3 (probe

position) ANOVA. No significant differences were found across probe position and

subgoal success conditions. The following effects were revealed in the subjects-random

analysis: Subgoal Success x List interaction, $F_1(5,87) = 4.96$, $MSE = 236$; Subgoal

Success by Probe Position x List interaction, $F_1(10,174) = 4.69$, $MSE = 268$.

Table 14
Mean Proportion of Correct Comprehension
Questions for Experiment 3.

	Probe Position (Probe after Sentence #)		
Subgoal Success	10	12	13
Fail (F)	.91	.88	.94
Succeed (S)	.90	.89	.91

Discussion

The working memory hypothesis states that readers are maintaining failed subgoal

information (e.g., CAR) in working memory from its initial failure until the target section

of subgoal fail passages. In subgoal succeed passages, this subgoal information is purged

from working memory when it is satisfied. It is not until readers read the sentences of the

target section that this succeeded subgoal information is reinstated into working memory.

Thus, the working memory hypothesis predicted that probe reaction times would be faster in subgoal fail passages than in subgoal succeed passages, when probe words appeared before the target section, after Sentence 10.

No significant difference in probe reaction times was found across subgoal success conditions when probe words appeared after Sentence 10. These results do not support the working memory hypothesis. Additionally, there appears to be an inconsistency effect within the accuracy of these probe responses. Participants were significantly more accurate in recognizing these probe words (presented after Sentence 10) in subgoal succeed passages than in subgoal fail passages.

A significant difference in probe reaction times was found when probe words were presented after Sentence 13 (i.e., spillover sentence). Probe words were responded to significantly faster in subgoal succeed passages than in subgoal fail passages. There was no difference in their response accuracy to these probe words after Sentence 13. This suggests that, when readers' process target and spillover sentences of subgoal succeed passages, they are reinstating succeeded subgoal information presented earlier in the passage. In the process of providing causal or goal inferential connections for current actions of protagonists, readers reinstate any relevant subgoal information presented in the passage.

Conversely, in subgoal fail passages, it appears that readers are not maintaining or reinstating this subgoal information into working memory. In addition to not being more active than the subgoal succeed condition before the target section (i.e., probe words after Sentence 10), there appears to be no reactivation of this failed subgoal information after

the target section (i.e., probe words after Sentences 12 or 13). Readers may be anticipating that the subsequent text may provide a resolution to the previously failed subgoal (van den Broek et al, 1996, p. 167).

For example, in the passage in Table 10, even though Philip may have failed to borrow a car initially, readers may anticipate that Philip may succeed in borrowing a car or he may arrange another mode of transportation later in the text. Even though the passage switches the focus of the passage to Andy's subgoal actions and subsequent superordinate goal attempt, readers may be expecting further information in regard to Philip's subgoal to be provided. Thus, readers are waiting for the general state of affairs described in the passage to come to completion later in the text. Thus, readers will not reinstate the previously failed subgoal, as they are waiting for it to be satisfied at some future point in the text. Whereas in the subgoal succeed passages, all of the subgoals have been satisfied and the goals and actions described in the passage are causally consistent. Thus, readers reinstate previous information (i.e., causes or goals that motivate present events), to place the current actions of the protagonist (i.e., described at the target section) within the overall causal or goal structure of the text. This is supported by the probe reaction time advantage after the target section in subgoal succeed passages.

The general reading time effect found in Experiment 1 and 2 was also replicated in this experiment. In this experiment however, the subgoal fail reading time advantage was found at the target sentence instead of at the spillover sentence. This may have resulted from the decreased number of data points available for calculating reading time for the spillover sentence (see results section above). Alternatively, interrupting reading with a

probe recognition task may have caused this reading time effect to appear at the target sentence. Regardless, the subgoal success effect has been found specifically in the target region of these complex goal passages across three experiments. Therefore, the following assertion is supported: The inconsistencies described at the target region resulted in differences in individuals' reading times across subgoal success conditions.

Taken together, the reading time and probe results suggest that readers are attempting to make goal-related connections when they read target sentences that indirectly refer back to satisfied subgoals that were presented earlier in the passage (i.e., the manipulated subgoal information appeared first in the passage). The succeeded subgoal is reinstated from LTM into working memory, as readers place the current actions of protagonists within the overall goal structure of the passage. When readers read target sentences of passages with a previously failed subgoal, there appears to be no reinstatement of this failed subgoal information. Readers may be expecting further information to be provided in the passage about this subgoal's success. The reading time of subgoal fail target sentences is faster than subgoal succeed target sentences, because no additional memory retrieval process is occurring.

General Discussion

During text comprehension, it has generally been found that readers attempt to explain current events and actions described in a text with reference to previously stated causes and goals (Albrecht, & Myers, 1995; Schank & Abelson, 1977; Singer, & Halldorson, 1996; Suh & Trabasso, 1993; Trabasso & van den Broek, 1985). For example, in the complex goal passages examined in this paper, a complex series of related

events and actions of a group of protagonists was described. The relationship between the

stated goals of these protagonists can be understood with respect to the relationship

between the protagonist's joint goal (e.g., go on ski trip), and other individual subgoals

undertaken by these characters to satisfy this joint goal (e.g., borrow a car, book hotel

room).

Figure 11. Idealized causal/goal structure of "Phillip and Andy"
passage presented in Table 15. Connections between sentces are
shown by solid arrows.
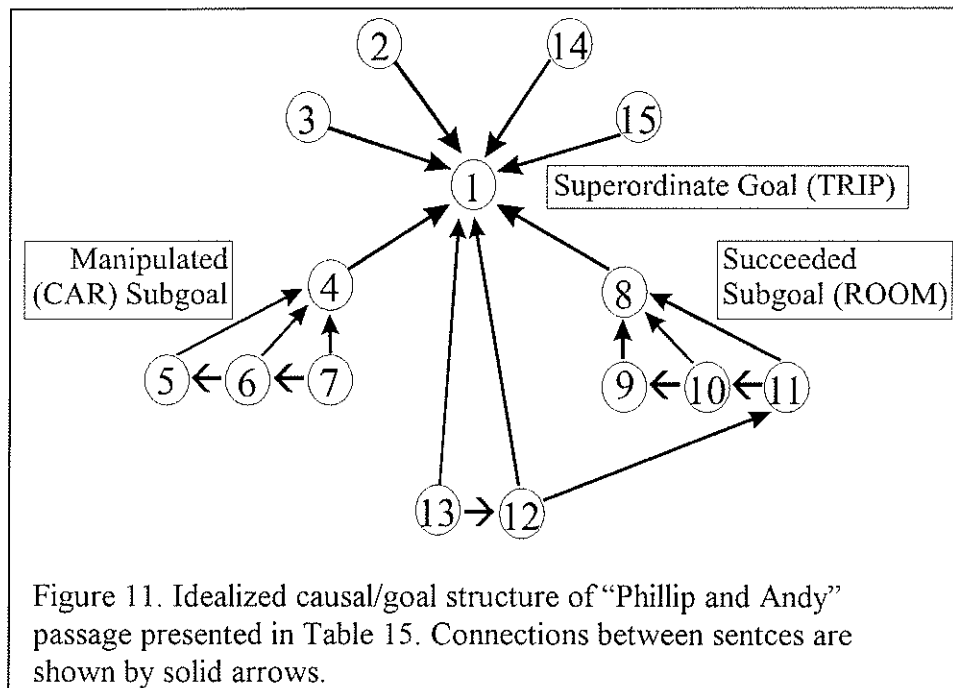
Figure 11 presents the idealized causal structure of the passage presented in Table

15. The events described in each sentence are related back to causally prior events

described in the passage. Each sentence is related to prior sentence with respect to the

overall causal structure of the passage. Lines connect all events described in these

sentences back to causally prior actions, events, and goals described in previous sentences.

Thus, in Sentence (1) of the "Philip and Andy" passage (see Table 15), two protagonists

are introduced, and a superordinate goal they are attempting to satisfy is described (e.g.,

go on a ski trip). This sentence sets the nexus for the ensuing events described in the

passage. All events and actions that are described in subsequent sentences are related to

prior events with respect to what is causally antecedent and related to them.

Table 15
Complex Goal Passage

1. Philip and Andy wanted to go away for spring break.
2. They had saved up enough money to drive to Banff.
3. They both were avid skiers and were looking forward to the trip.
4. Philip needed to borrow a car for the trip.
5. He asked all of his friends but nobody could lend him one.
6. At the last minute, he asked his father if he could borrow the family car.
7 (a). Philip's father said the car has just been fixed, so he could take it.
   (b). Philip's father said the car needed to be fixed so he couldn't take it.
8. Andy needed to book a hotel room in Banff.
9. He phoned the travel agent for some information on accommodations.
10. The travel agent told him that there were many cheap hotels.
11. Andy booked them into the Economy Inn for 35 dollars a night.
12. Andy packed his bag and waited out front.
13. Andy had also packed a lunch for the long trip.
14. They planned to rent all their ski equipment in Banff.
15. The weather report said that Banff had just received 20 cm of new snow.

The information presented in Sentences (2), (3), (14), and (15) are causally related

to the initial statement that the two protagonists want to go on the ski trip. All information

presented in these sentences directly refers to both protagonists using the pronoun THEY,

and relates directly to this overall goal of going on a ski trip.

Sentence (4) initiates a new subgoal that is related directly to the overall

superordinate goal, but directly refers to only the first protagonist. The information

described in Sentences (5) and (6) directly relates to this first subgoal and the

protagonist's attempt at fulfilling this goal. Sentence (7), describes this protagonist failure or success at satisfying this goal.

Sentence (8) initiates another subgoal that is related directly to the overall superordinate goal, but directly refers to only the second protagonist. The information presented in Sentences (9) and (10) directly relates to this second subgoal and the protagonist's attempt at fulfilling this goal. Sentence (11) describes the protagonist's success at satisfying this goal.

Sentence (12) describes the second protagonist as he attempts to fulfill the overall superordinate goal, and is directly related to the initial goal described in Sentence (1). Sentence (13) elaborates on this attempt described in Sentence (12).

Experiment 1 was undertaken to determine if these new complex goal passages would yield the same pattern of reading time effects found with less causally complex passages (Hakala & O'Brien, 1992; Huitema et al., 1993; O'Brien & Albrecht, 1992). It was found that participants were slower to read target sentences of inconsistent passages (i.e., a previously failed subgoal) than target sentences of consistent passages (i.e., all subgoals had succeeded in being satisfied). This reading time effect was opposite to previous findings where readers took longer to read target sentences of inconsistent passages (i.e., containing failed goals) than target sentences of consistent passages (i.e., containing satisfied goals; Huitema et al., 1993; Albrecht & Myers, 1995).

Two hypotheses were proposed to account for this paradoxical finding. The working memory hypothesis suggests that failed subgoal information is maintained in working memory from its initial failure until target sentences are read. This enables readers

to quickly identify the inconsistency between current actions of one protagonist and previously failed actions taken by another protagonist. Alternatively, the suspension of comprehension hypothesis suggests that readers find passages that contain a failed subgoal so puzzling that they are giving up any attempt to comprehend subsequent sentences presented after the first character fails in achieving his subgoal. Thus, participants read subsequent sentences more quickly in the failed condition compared to the succeed condition.

Experiment 2 replicated the reading time effect only when the manipulated subgoal appeared first in passages. However, when the manipulated subgoal appeared second in these complex goal passages, this effect disappeared. These results supported the working memory hypothesis. When the manipulated subgoal was close to the target section of passages, this subgoal information is available in working memory whether it has succeeded or failed. This shift in the position of the manipulated subgoal section may also instill a local coherence break at the target sentence. Sentence 11, the sentence immediately before the target sentence, describes one protagonist either failing or succeeding at satisfying his subgoal (e.g., Philip's father said the car **has just been fixed/ needed to be** fixed, so he **could/couldn't** take it.). The target sentence shifts focus to the other previously described protagonist who had achieved his subgoal (e.g., <u>Andy packed his bag and waited out front.</u>). This protagonist is actively attempting to satisfy the overall superordinate goal (e.g., go on ski trip). This transition from Sentence 11 to the target sentence provides a local coherence break that may cause the subgoal fail reading time advantage to disappear. This local coherence break exists in both subgoal success

conditions (fail or succeed) of these manipulated subgoal second passages. Thus, this local

coherence break may be confounded with the intended working memory manipulation.

The local coherence break may overwhelm the reading time effect found when this

manipulated subgoal appeared first in the passage.

Experiment 3 provided evidence that this manipulated subgoal information is not

reinstated or maintained in working memory from failure until the target section.

Furthermore, it appears that readers are reinstating succeeded subgoal information when

they read target sentences that describe the attempted satisfaction of the overall joint

superordinate goal. This appears to account for the consistent reading time effect found

with complex goal passages where the manipulated subgoal information appeared first in

the passage. Readers are generating causal or goal-related inferences that connect current

events and actions back to previous causes and goals. This experiment also demonstrated

the same reading time effect for target sentences, thus providing a third replication.

Taken together, the results of Experiments 1, 2, and 3 suggest that readers are

attentive to the goals and actions described in passages. When passages portray a goal

structure where all goals and subgoals are satisfied, readers are connecting current events

and actions described in target sentences back to their previously stated goals that

motivate them. The reading time effect found in these experiments is consistent with the

reading time effect found by Long, Seely, and Oppy (1996, Experiment 2). They found

that readers took longer to read critical sentences that referred back to previously stated

protagonist's goals (i.e., consistent) than when these goals were not supplied in the text

(i.e., inconsistent). Additionally, readers were presented with probe sentences that referred

back to previously stated goals. Readers responded more quickly to probe sentences presented after critical sentences of passages where the goal information had previously been provided (i.e., consistent passages) than when it was not (i.e., inconsistent passages; Long et al., 1996, Experiment 3). There was no difference in probe sentence responses in consistent and inconsistent passages, when these probe sentences appeared before the critical sentences. They assert that readers are accessing backgrounded causal information during reading. When protagonists' goals appeared early in a passage, readers appear to be making inferential connections between these goals and current events described in the text. The additional memory retrieval processes involved in retrieving the background goal information causes critical sentence reading time to be longer in the consistent condition than in the inconsistent condition.

However, the passages in this thesis present situations where the protagonists' goals are always present. Only the failure or success of the goal is varied, not its presence in the passage. The suspension of comprehension hypothesis may explain the types of comprehension processes occurring with subgoal fail passage. Readers are finding the complex goal structures described in these passages so complex that they are suspending any inferential processes involved with connecting causal or goal information. They may be waiting for further information to be supplied (e.g., Philip may yet arrive with a car, plane ticket or some other mode of transportation). Thus, readers may be attentive to the overall causal or goal structure in both subgoal fail and succeed passages. Only in subgoal succeed passages do they reinstate subgoal information from long-term memory in order to construct a coherent representation of the passage. This memory reinstatement of the

subgoal information in subgoal succeed passages takes place in the target section of the passages. This, consequently, elevates the reading times of target sentences (e.g., target and spillover sentences) in subgoal succeed passages compared to subgoal fail passages. In subgoal fail passages, readers are not attempting to retrieve this subgoal information. They may still be waiting for or expecting further information to be provided.

Future work should entail a closer examination of the complex passages themselves. As demonstrated from the inconsistency ratings (see Experiment 2), some passages appear to contain more inconsistency between events described at the target section and previously failed subgoals. The revision of some passages using more stringent causal criteria may aid in producing a more homogeneous pool of complex goal passages (see Trabasso & van den Broek, 1985; Trabasso, van den Broek, & Suh, 1989; van den Broek, 1990).

In summary, my results demonstrate that readers are attentive to the goals and actions of protagonists described in narrative passages. Readers who read passages where all goals have succeeded exhibited longer reading times for target sentences that referred back to these goals (indirectly), than when these passages contained a failed goal. In comprehending the actions described in these target sentences, readers are reinstating this goal information in order to explain the current actions of protagonists.

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Appendix A
Experimental passages for Experiment 1 and 2.

Note. The following provides a key for each passage section. Practice items for
Experiments 1 and 2 are indicated in passage headings.

Introduction: 4 sentences.

Subgoal 1 section: 4 sentences with the 4th sentence in either the Satisfied or
                       Unsatisfied sentence version.

Subgoal 2 section: 4 sentences.

Target section: 2 sentences with one target sentence and one spillover
                       sentence.

Conclusion section: 2 sentences.

Question: Comprehension question and answer (Yes/No).

Passage 1 (Experiment 1 & 2 practice item)
The band Stone Deaf had just released their new CD.
The critics were raving about it.
The promoter had booked the band to play a concert in two weeks.
The promoter needed to fill the stadium.
To do this, he needed to advertise the event well in advance.
He had to sell 2000 tickets to make it a financial success.
Subgoal Succeed: Just hours before the concert the tickets finally sold out.
Subgoal Fail: Just hours before the concert the concert was canceled.
The band needed to practice their new songs for the concert.
They devoted a lot of time to rehearsing.
The band went through all of their new songs, and some of their old ones.
In the end, they felt that they were prepared for the concert.
Target sentence: The band arrived at the stadium in their tour bus.
Spillover sentence: They started to unpack their equipment.
The manager phoned the hotel to see that their rooms were ready.
The band was very tired from the long drive.
Question: Did the band practice their new songs? Yes

Passage 2 (Experiment 1 & 2 practice item)
Philip and Andy wanted to go away for spring break.
They had saved up enough money to drive to Banff.
They both were avid skiers and were looking forward to the trip.

Philip needed to borrow a car for the trip.
He asked all of his friends but nobody could lend him one.
At the last minute, he asked his father if he could borrow the family car.
Subgoal Succeed: Philip's father said the car has just been fixed, so he could take it.
Subgoal Fail: Philip's father said the car needed to be fixed so he couldn't take it.
Andy needed to book a hotel room in Banff.
He phoned the travel agent for some information on accommodations.
The travel agent told him that there were many cheap hotels.
Andy booked them into the Economy-Inn for 35 dollars a night.
Target sentence: Andy packed his bag and waited out front.
Spillover sentence: Andy had also packed a lunch for the long trip.
They planned to rent all their ski equipment in Banff.
The weather report said that Banff had just received 20 cm of new snow.
Question: The men want to go skiing? Yes

Passage 3

Sidney and Larry were released from prison.
Both of them had been planning a big robbery while they were in jail.
They had the bank picked out and had taken care of all the details.
Sidney was a master safe cracker, and his job was to crack the safe.
He used his glass cutting tool to enter through a back window.
Sidney needed to use his stethoscope to open the safe.
Subgoal Succeed: Sidney discovered the combination and opened the safe.
Subgoal Fail: Sidney had a lot of problems and could not crack the safe.
Larry's job was to drive the getaway car.
He went to a nearby parking lot to steal a car.
Larry chose a fast sports car.
He hotwired the car and headed back to the bank.
Target sentence: Larry drove the getaway car into the back alley, beside the bank.
Spillover sentence: He kept watch beside the car for any police.
It was very late at night and no one was on the street.
The moon shone very brightly.
Question: Did the Sidney and Larry just finish high school? No

Passage 4

Sam and Shelly always took their vacations together.
This year they had decided to go on a fishing trip to Florida.
They both decided to stay at the hotel close to the ocean.
Sam walked down to the rental shop to rent a fishing boat.
The rental shop was located right beside the dock.
It looked like there were only a few boats left.
Subgoal Succeed: Sam rented the last fishing boat for the weekend.
Subgoal Fail: There were no rental boats left for the weekend.

Shelly drove over to the fishery's office to get a fishing license.
Shelly walked into the office.
The government official told him that each license would cost ten dollars.
Shelly bought the licenses and headed over to the dock.
Target sentence: Shelly walked down to the dock with the fishing gear.
Spillover sentence: Shelly set the gear on the dock, and checked to see if she had all of her equipment.
Shelly noticed that there was not a cloud in the sky.
It was a beautiful day to go fishing.
Question: Was it a sunny day? Yes

Passage 5

The city had proclaimed a state of emergency.
The flood threat was severe.
Clyde and Marion needed to build a dike right away.
Clyde had to use his 1/2 ton truck to get a load of sand bags.
Since they were outside the city limits they were responsible for their own supplies.
Clyde drove into the public works yard and noticed there were a lot of trucks.
Subgoal Succeed: Clyde was relieved to find out there were 100's of sandbags left.
Subgoal Fail: Clyde was dismayed to find out there were no sandbags left.
Marion had to find a group of people to help with the building of the dike.
She phoned the local radio station and asked for some help.
The radio station announced that volunteers were needed right away at 100 Main street.
Marion was very relieved when over 100 people showed up.
Target sentence: The volunteers were all ready to build the dike.
Spillover sentence: They had all brought work gloves and rubber boots.
The city had been hard hit by this years flood.
There hadn't been such a bad flood in over two centuries.
Question: Did the city escape undamaged from the flood? No

Passage 6

Denny and Florence have been looking forward to going on vacation all year.
They had been looking at brochures for weeks.
In the end, they decided to go to Hawaii.
Denny had to arrange to get the next week of work off.
He knew it was very short notice, but called his employer anyway.
He explained the situation to his boss.
Subgoal Succeed: The boss decided that Denny could be spared even though work was very busy right now.
Subgoal Fail: The boss decided that Denny couldn't be spared because work was very busy right now.
Meanwhile, Florence called the local travel agent to get flight information.
The agent said that their destination was very popular right now.

The agent was not sure if there were any flights left open.

Luckily, Florence learned that there were some seats left for this Monday.

Target sentence: Florence got some tickets for this flight.

Spillover sentence: Florence had bought a new bathing suit she wanted to wear on the beach.

It had been 2 years since they had gone on a vacation.

They had saved just enough money to afford the trip.

Question: Did the couple want to go to Hawaii? Yes

Passage 7

The antique piano in the living room was over 100 years old.

It had not been moved in over 50 years.

Russ, Hank and Earl were in charge of moving it to the new house.

Russ had to park the moving truck in front of the house.

He drove around to the front street to look for a parking spot.

There was a sale at the store down the street and there were no parking spots left open.

Subgoal Succeed: Russ found a parking spot right in front of the house.

Subgoal Fail: Russ couldn't find a parking spot and parked in back of the house.

Hank and Earl were in charge of carrying the piano out of the house.

They moved all of the furniture out of their way.

Hank took the back end while Earl grabbed the front end of the piano.

They manoeuvered it through the living room doors.

Target sentence: Hank and Earl carried the piano out the front door.

Spillover sentence: They had to be very careful going down the front steps.

Hank and Earl were hot and tired from carrying the piano.

They gulped down their drinks.

Question: Did Hank and Earl carry the piano out of the house? Yes

Passage 8

The theater group was about to begin their new season.

Their first presentation was a major play.

The actors and stagehands were very busy preparing for opening night.

The stagehands needed to set up the lighting for the audience to see the actors.

Just as the play was about to start, the director yelled at the stagehands, "The main spotlight has burnt out.

The stagehands quickly climbed up the scaffolding to fix the spotlight.

Subgoal Succeed: The stagehands replaced the spotlight and aimed it at the center of the stage.

Subgoal Fail: The stagehands accidentally dropped the spotlight onto the stage.

The actors had found the play very challenging.

It had been very difficult for them to memorize their lines.

They had practiced every day for the last two weeks.

In the end, all of their hard work had paid off.

Target sentence: The curtain rose as the play began.
Spillover sentence: The actors entered the stage from the wings.
The audience watched in silence as the actors began.
The audience started to clap as the curtain fell.
Question: Was the theatre group ending their season? No

Passage 9
Charlie and Bonny had just moved into their new apartment.
The apartment was located in the center of town.
They had bought a new VCR, and wanted to watch a movie.
Charlie took the new VCR out of box, and read the instructions.
He attached all the cords and plugged the machine in.
He then put in an old tape and pressed play.
Subgoal Succeed: The VCR worked perfectly, and Charlie quickly left to make popcorn.
Subgoal Fail: The VCR started to smoke and Charlie quickly unplugged it.
Meanwhile, Bonny put on her coat and walked across the street to the local video rental shop.
She saw that most of the new releases were already rented.
Bonny decided that she wanted to rent Casablanca.
She found the movie in the classics section and got it.
Target sentence: Bonny was looking forward to watching the movie.
Spillover sentence: She hadn't seen Casablanca in years.
She loved old black and white movies.
They seemed to have more depth than newer movies.
Question: Did Bonny dislike black and white movies? No

Passage 10
It is a tradition to have an elaborate dinner every Friday night.
Danny and Barb always invited close friends and family.
They had started this tradition when they first got married.
Danny decided to make a souffle for dinner.
He mixed the ingredients together and placed them in the oven.
He cleaned up the kitchen while he waited for the souffle to cook.
Subgoal Succeed: The timer went off and Danny proudly removed the perfect souffle.
Subgoal Fail: The fire alarm went off and Danny hurriedly removed the burnt souffle.
Barb had to find enough chairs and set the table for dinner.
She found some extra chairs in the attic.
She put place mats out along with utensils and candlesticks.
She was very happy with the way the dinning room looked.
Target sentence: Barb met the guests at the front door and showed them to the table.
Spillover sentence: Barb sat down with the guests and talked about the week's events.
All of the guests commented on how beautiful the dinning room looked.
Everyone was famished.

Question: Did Barb get some chairs from the attic? Yes

Passage 11

The Smith family reunion was planned for this weekend.
It was being held in Toronto, and Brian and Sherry wanted to fly there.
They had forgotten to make arrangements and it was already Friday.
Brian phoned the travel agent to book a flight.
He asked the agent for seats on the flight leaving this afternoon.
He gave the agent his credit card number.
Subgoal Succeed: The agent told Brian the plane tickets for today's flight would be waiting at the gate.
Subgoal Fail: The agent told Brian that he would have to wait for tomorrow's flight.
Sherry had to pack all of their clothes for the trip.
She got the suitcase from the attic.
She picked out some clothes from the closet.
She carefully packed the clothes into the suitcase.
Target sentence: Sherry carried the suitcase to the car.
Spillover sentence: Sherry got into the car and drove to the airport.
Sherry was looking forward to visiting with her family.
It had been two years since she had seen her uncle Bob.
Question: Did Sherry not want to see her uncle Bob? No

Passage 12

Greg and Pam arranged to meet for lunch.
They had to talk about their coming divorce.
They decided to get together at MacDonald's at 12:30.
Greg had to take bus number 15 to get to the restaurant.
To make it on time he had to catch the noon bus.
Shortly before 12, he hurried out, running to catch it.
Subgoal Succeed: He jumped onto the bus just as it was pulling away.
Subgoal Fail: The bus door slammed in his face as it was pulling away.
At 11:00 AM, Pam's boss asked her to type his year-end report for him.
She was worried that she could not finish it before lunch.
Surprisingly, she completed it just before lunch.
Pam handed in her report and left the office.
Target sentence: At 12:30, Pam entered MacDonald's.
Spillover sentence: MacDonald's was very busy, and she had to wait for a table.
Pam had to wait five minutes to get a seat.
Pam wondered if she had made any mistakes in typing the report.
Question: Did Pam Pam finish her report? Yes

Passage 13

Making a movie takes a lot of hard work.
Don and Nick were trying to finish their movie.
There are many jobs and goals that need to be accomplished.
Don had to raise enough money to finance the rest of the movie.
He phoned many of his friends in the financial community.
He made an appointment with the president of the largest bank in the city.
Subgoal Succeed: The meeting was very successful and the money was secured.
Subgoal Fail: The meeting was not very successful and no money was secured.
Nick had to finish the script for the movie.
He was on a tight deadline.
He sat down at the typewriter.
It took him a long time to finish the script.
Target sentence: Nick rushed over to the movie set with the script.
Spillover sentence: He was so happy that the movie was going to be completed.
The movie was autobiographical.
It had been a very emotional script to write.
Question: Does a movie take a lot of hard work? Yes

Passage 14

The school bake sale was tomorrow.
Virginia and Molly wanted to bake a pie.
When they got home from school they took out the recipe.
Virginia needed to be very careful while she made the pastry.
She placed the flour and butter in the bowl.
She added the water and the mixed the dough in the bowl.
Subgoal Succeed: Virginia spread the dough on the table, and then placed it in the pie pan.
Subgoal Fail: Virginia spread the dough on the table, and the dog snatched it from the table.
Molly had to go to the orchard to pick apples for the pie.
She climbed the nearest apple tree.
Molly filled the basket she was carrying.
She walked back to the house.
Target sentence: Molly turned the oven on.
Spillover sentence: She checked the oven to make sure it was empty.
The bake sale proceeds were being donated to UNICEF.
The school held a bake sale every year.
Question: Was the bake sale at the church? No

Passage 15

Laurie and Diane bought a new house.
The house needed a lot of work.
They wanted to paint it before it rained.

Laurie took the ladder out of the garage.

She placed it against the house.

She climbed up the ladder and began to scrape the old paint off the house.

Subgoal Succeed: She finished scraping the paint and climbed down the ladder.

Subgoal Fail: Joan felt rain drops on her hand, and climbed down the ladder.

Diane got in her car and drove to the store for paint and brushes.

She picked out blue paint and brushes and bought them.

She put the paint supplies in the trunk of her car and drove home.

Diane removed the paint and brushes from the car.

Target sentence: She opened the paint cans and stirred the paint.

Spillover sentence: She got out her overalls and changed into them.

She put up her hair to protect it from the paint.

She dipped her brush in the paint and walked towards the house.

Question: Did Nancy cover her hair? Yes

Passage 16

The barbarian clans, the Turks, was expanding their empire.

Their next conquest was to be a large castle on the coast.

The Turks force had to breach the castle stronghold.

A select group of spies was sent ahead.

Their job was to open the main gates of the castle.

They had to sneak through the caverns and infiltrate it.

Subgoal Succeed: Once inside, the spies killed the guards and raised the gates.

Subgoal Fail: Once inside, the spies were caught and killed by the guards.

The main force had to quickly cross the bridge to the castle.

However, as the Turks approached the enemy burned the bridge.

They assessed the situation and went to work.

At the cost of many lives, a bridge was built to the castle.

Target sentence: The Turks had a clear route to attack the castle.

Spillover sentence: The leader of the Turks was looking forward to his victory.

This war had been going on for 20 years.

Neither side had won a decisive victory in all that time.

Question: Did the Turks burn the bridge? No

Passage 17

The Daily Times is a small local newspaper.

Wendy and Craig are the owners and the only employees.

They perform all the jobs essential in putting out the paper.

Wendy hadn't yet received the order of newsprint for printing today's edition.

She didn't have any left in the storage room.

She phoned the newsprint supplier and they told her that the order would be there shortly.

Subgoal Succeed: The order of newsprint arrived at 3:00 PM, just in time for Wendy to print the paper.

Subgoal Fail: The order of newsprint arrived at 4:00 PM, too late for Wendy to print the paper.

Craig had to lay out all the pictures and stories on the computer.

He was using new software that made this process much faster.

He took all the columns and matched them with their appropriate pictures.

It took him very little time to lay out the paper.

Target sentence: He was very happy with the look of today's edition.

Spillover sentence: This edition was 20 pages long.

The paper had been gaining readership over the last few months.

A big story could push them past their competitor in readership.

Question: Had the paper been gaining readers? Yes

Passage 18

Joe and Charles were opening a new seafood restaurant.

They had renovated the building and were preparing for opening night.

Only a few more things needed to be done.

Joe had to pick up the seafood order from the fish market.

Joe drove down to the docks in his van.

He had a hard time finding a place to park.

Subgoal Succeed: When he arrived he was told his order was waiting for him.

Subgoal Fail: When he arrived he was told that they were sold out of seafood for today.

Charles was in charge of decorating the restaurant for opening night.

He had to arrange for the flowers to be delivered before opening at 6:00 PM.

He phone the local flower store and put in his order.

The flower arrangements arrived at 5:30 PM.

Target sentence: Charles put the open sign in the window of the restaurant.

Spillover sentence: The first customers took their seats and started to look over the menu.

The two brother had put a lot of work into their new restaurant.

They had brought many family recipes over from Italy.

Question: Was the new restaurant a chinese restaurant? No

Appendix B
Filler passages (Klin, 1995) and practice filler passages for Experiments 1, 2, and 3.

Note. Each passage is followed by the probe word used in Experiment 3, and the comprehension question used in Experiments 1, 2, and 3. Practice items for Experiments 1, 2, and 3 are indicated in passage headings.

Passage 1

Dick had been a single parent for six months, since he and his wife had separated.
He was raising two sons, aged 11 and 13, while working full time and taking a night class once a week.
Tonight the regular baby sitter called at the last minute to cancel because she was sick so Dick decided to leave the boys alone although it made him nervous to do so.
The last time they had been left alone, it had been a disaster.
He had sworn he'd never do it again, but he didn't seem to have any other choice.
Last time they left the puppy unattended in the living room and it had broken several things.
Dick was sorry he had let the boys have the puppy because they really weren't responsible enough to care for it.
Dick told the boys to please keep an eye on the puppy this evening.
He managed to enjoy his class.
It was a course in Organizational Behaviour that he was taking as a requirement for his M.B.A.
After class, he and several other students had a few beers and agreed to get together later in the week to study for the final exam.
When he arrived home, he walked through the house and found that an expensive lamp had been smashed to pieces on the floor.
SUBWAY
Was Dick happily married? NO

Passage 2

It was Bobby's first camping trip.
When his boy scout troop arrived at the campground, a forest ranger gave an orientation talk.
He talked about the plants and animals they might see.
He warned them to be careful of bears.
One had recently attacked some campers in the woods and they had been badly hurt.
Several boy scout troops had cancelled their plans because they were afraid of the danger that the bears presented.
The ranger told the boys what to do if they should spot a bear.
The ranger then gave each of the boys a map and showed them the location of their campsite.
Bobby and his friend Tim found theirs with no trouble.

They put up their two-man tent and Tim started to open some cans of food while Bobby went off to look for kindling to start a fire.
Minutes later, Tim saw Bobby being chased by a big bee.
He was running hard, obviously very frightened.
HAT
Did Bobby go camping with the Boy Scouts? YES

Passage 3

The great detective, Sherlock Holmes, sat in his chair in his lodgings at 221 Baker street.
His friend, Dr. Watson, sat across the room from him.
Holmes was thinking about the case he was now on.
The Earl of Bath, a much loved man, had been killed.
He felt that he was close to identifying the killer.
The answer was closer now that he had realized that the killer had to have known the Earl's habits and had to have interacted with him very closely.
It was a very important case and he would get a large sum of money if he could find the killer.
As was his habit, Holmes picked up his violin and started to play.
Once in a while, he puffed on a big pipe.
Clouds of smoke filled the room.
Suddenly he put down the violin, rose from his chair, and decided to go offer his condolences to the dead Earl's widow.
POWER
Was Holmes playing the piano? NO

Passage 4 (Experiment 1 & 2 practice item)

Rich's mother Paulette brought him to his friend David's house to play and then went inside to visit with David's mother.
They sat and had a cup of coffee and talked about their jobs and their sons.
Rich and David had been friends since first grade.
Although they were good friends, at various times over the past couple of years they had gotten into terrible fights.
They had been pretty rough on each other.
Once they hadn't been permitted to play together for several months because their fighting was so out of control.
They had both been talked to about the fighting but it didn't always seem to do a lot of good.
These days they were working on building a tree house together and seemed to really enjoy the project.
Paulette decided to head home and told Rich to be home by 6:00.
She needed to go to grade some papers and make up a test for the freshman French class she was teaching.
They were a good group of kids this year and she was having fun with the class.

She finished all her work and then got started on supper.
She looked out the window and saw Rich coming up the walk.
As he approached, she saw that his nose was bleeding.
ROOF
Was Rich's mother a teacher? YES

Passage 5

The Chinese government had called out the troops to suppress the student protest but Chang Lee was determined to continue the battle for democracy.
He worked with other students from the university making posters protesting the actions of the government.
All night they posted them around the city.
Shortly before dawn, the students dispersed after agreeing that Chang Lee would take the posters that had not yet been put up.
He returned home and thought about where to hide the posters.
Even though the remaining posters were the only evidence of his crime, he wanted to save them and use them later on.
If he were caught with the posters he would be in big trouble, but he figured they would be safe if he hid them under the porch.
When he finally entered his house, Chang Lee found his younger brother Hong waiting up.
He often waited up for Chang Lee to discuss the day's events.
Chang Lee often helped him with his homework, especially physics.
He was an engineering major and had a lot of trouble with physics.
It just didn't seem to make any sense to him.
Chang Lee noticed that Hong looked upset and asked him if anything was wrong.
Hong said that he had found out that the police were searching the neighbourhood.
Chang Lee leapt up in alarm.
SUNTAN
Did Chang Lee live with his brother? YES

Passage 6

Bill was overwhelmed by the stack of papers on his office desk.
He was up against several deadlines before the end of the month.
His secretary stopped by to remind him that it was his wife's birthday.
He had not yet bought her a present.
He had forgotten to get a birthday present last year too and his wife had really been hurt.
He would have to get something but right now he was very busy so he would have to take care of it later.
After the interruption, Bill managed to work his way through the pile of papers on the desk.
He swore he'd never get this far behind again.
By noon, he had almost caught up.
After a quick lunch, he spent the afternoon interviewing applicants to replace his secretary.

She was great but unfortunately she had accepted a better job and had given her final two-week notice.
He decided to get her a going-away gift so he phoned a local jeweller.
TENNIS
Was Bill's secretary changing jobs? YES

Passage 7 (Experiment 1 & 2 practice item)

Ron Jackson was surrounded by his supporters at his campaign kick-off dinner.
He had been active in local politics for over 1 years and, after a great deal of deliberation, he had decided to run for the state senate.
One of the reasons he had been hesitant was because of a small bribe he had accepted from a building contractor early in his political career.
He hadn't even really considered it a bribe, but more like an exchange of favours.
But he knew it would be disastrous if it got out to the public.
It was a very small town and the people didn't forgive very easily.
It made him angry that everything he had worked for all these years could be ruined because of one little mistake.
Ron was also somewhat concerned that if he were to win the election he would not have much free time to spend with his family.
But his supporters had convinced him that he could do a lot of good for the state.
He had an impressive record.
The campaign kick-off dinner had turned out wonderfully.
A local jazz band had been hired and the crowd loved them.
After dinner, Ron gave an inspirational speech and then opened the floor for questions.
When a man asked him his views on abortion, Ron knew that he was in big trouble.
VOLUME
Was Ron running for State Senator? YES

Passage 8

Ed was happy to be home.
This was his first leave from the army and he hadn't seen his family for quite some time.
He had not visited home since his father had been slowed down by a mild heart attack.
The doctor had urged him to relax more, warning him that his heart shouldn't be stressed.
Although the heart attack was mild, his father was at risk to have a second more serious heart attack if he didn't take care of himself.
Ed's visit home was a success.
His mother stuffed him with food, fond relatives and old friends came to visit, and Ed caught upon his sleep.
All too soon, Ed's leave was over and he returned to the army camp.
A week later, he got an important long distance phone call.
When he got off the phone, he was in tears.
RAINCOAT
Was Ed a physician? NO

Passage 9

Martha returned home after running out to pick up some groceries.

She changed into her sweatpants, made herself a cup of tea and sat down to read the newspaper.

She thought how much she hated President Johnson for sending the country's children to fight his war.

It wasn't a cause that most of the country even believed in any more.

Martha had spent months worrying about her 18 year old son who was in the 17th Airborne unit in Vietnam.

The stress had been terrible before he returned.

She never knew if her son was alive or dead.

She couldn't believe how wonderful it was to have him home.

Luckily, Martha had an active social life, and her friends had always been a source of comfort.

Tonight she was expecting several friends for the evening to play bridge.

It was her turn to host the game and she had spent the afternoon cleaning up the house and preparing dessert.

While she waited for her friends, she whipped some cream for the pie.

Then she watched the 6:00 news.

Halfway through, she started to cry.

BIRD

Was it Martha's turn to host the bridge game? YES

Passage 10

Erica's parents showed her around the big new house they had just moved into.

The backyard looked like a great place to play.

Her dad told Erica that she could play in the garden or on the swings but not to go near the tree house until he had destroyed a nest of hornets there.

They were buzzing around outside of the nest and Erica was terrified.

She was allergic to hornets and had once had a terrible reaction to a sting.

Erica and her father went for a walk around her new neighbourhood so she wouldn't get lost when she went out to play.

They were both pleased to find a playground a couple of blocks from the house.

When they got back he left Erica to play while he went in the house to help his wife unpack.

This was the part of moving he hated.

He was amazed at the amount of stuff they owned.

As he started unpacking a box of the good china, he looked out the window to check on Erica in the backyard.

She was running to the house screaming.

MODEL

Does Erica's father like unpacking? NO

Passage 11

The Bentons were spending the day in Rockport, wandering through the little shops and art galleries.

They went into a crafts shop which specialized in handcrafted pieces of jewellery.

Jim got bored and wandered outside, telling Jane she could find him down the street when she was through looking.

Jane spotted an ugly pair of jade earrings.

They were oddly shaped and very expensive.

Jane was always amazed at the amount of money some people could spend on earrings.

Jane looked a while longer at all of the other jewellery in the case.

There really wasn't anything in the store that appealed to her at all.

Jane browsed a while longer and then left the shop.

She wondered where Jim had gone to.

She checked out a men's clothing store that Jim really liked, but no one remembered seeing anyone matching his description.

She began to wonder if he'd gotten lost but then saw him coming out of a book store.

She quickly ran over to him, grabbed his arm, and dragged him back down the street.

TERMINAL

Did Jane find Jim by the book store? YES

Passage 12

Arlene had woken up and become sick to her stomach.

She was very frightened.

Her life seemed to be such a terrible mess since she had become involved with her history professor.

At least she didn't have to worry about being pregnant.

Her parents almost killed her sister when she came home pregnant two years ago so Arlene had decided not to have sex with him.

Still, her life was a misery.

She tried to put her worries aside as she walked across campus to her 9:00 class, geology.

She needed science credits and this looked like an easy B at least.

Two of her best friends were in the class so she figured they could share notes and study together.

But the class turned out to be harder then she had expected and she failed the first exam.

Today she almost fell asleep during the lecture.

As she left the class, she realized it was time to get her act together.

She made an appointment at the health centre.

FLAT

Did Arlene need science credits? YES

Passage 13

Sherry was graduating from high school in a few months and she had already been

accepted by several colleges.

Her first choice among these was Cornell.

It had a great agriculture school and her boyfriend was a freshman there.

She couldn't afford to go there unless she won the New York state scholarship she was competing for.

The scholarship would cover most of her expenses.

If the state didn't come through with the scholarship she would have to settle for a local school.

In the meantime, she was incredibly busy at school this year.

She was the editor of the yearbook and there was a deadline in one week.

She was also the captain of the varsity softball team and this year the team had a chance of going all the way to the finals.

She was extremely eager for it, and they were practising every day after school.

Today when she arrived at home after practice, she found a beautiful birthday card from her boyfriend.

She excitedly ripped open the envelope.

PARTY

Was Sherry graduating from college? NO

Passage 14

Dave had flown from Boston to Philadelphia as he did every December for his company's annual meeting.

The company he worked for flew in all its sales representatives once a year to discuss new products and to give a report on the year's successes and failures.

Dave felt relieved throughout the trip because a routine medical check-up on his wife had completely eliminated any possibility that she had cancer.

The abnormality in her blood test was not due to cancer or anything serious at all.

She had nothing but a low iron count.

It was time to get packed and ready to leave.

He was up for a big promotion based on the presentation he was giving at the conference.

When he arrived, he found that the hotel did not have a record of his reservation, and it took an hour before the matter was straightened out.

He finally went to his room and reviewed the notes for his presentation one more time even though he knew he could probably give the talk in his sleep.

When he spoke at the meeting that afternoon, his presentation was very well received.

After the talk, he returned to the hotel and found a telephone message.

After reading it, he decided to return home immediately.

TRAP

Did Dave take the train to Philadelphia? No

Passage 15

It was three days before Betty and her six year old daughter Nancy were due to leave for

their vacation on Cape Cod.

They were really looking forward to it.

Betty hoped that nothing would go wrong.

She was pleased that Nancy had already had the measles.

The little girl next door had just come down with them and Nancy played there most days after school.

Betty knew how contagious the measles could be to children who had never had them.

But Nancy had been very sick with the measles when she was four.

Betty was glad Nancy had them before she started school.

Betty set her mind to getting everything packed, as well as to doing all the last minute errands that needed to be done before they could leave town.

She still had to ask her sister to come by and feed the cats while they were gone, and she needed to remember to swing by and pick up some of her sweaters from the dry cleaner's.

Nights could be cool by the ocean even if the day had been hot.

Betty was making a list of all the things they had left to do when Nancy ran in from playing outside with some of her friends.

She sat down and complained of not feeling well.

STEAK

Were Betty and Nancy going to the mountains on vacation? NO

Passage 16

Although Mike and Kelley lived in the same house, they felt as if they never saw each other.

Mike often worked evenings and Kelley spent most weekends rehearsing with her dance troupe.

Mike and Kelley were determined to spend the next weekend together.

They decided they would escape to Vermont and spend the entire weekend cross-country skiing and relaxing.

The only problem was that there had not been any snow in the past several weeks.

They were hoping it would snow soon; otherwise very few trails would be open.

For the last two winters there hadn't been much snow and both of them really loved to ski.

Mike had brand new cross country skis that he had never even used and he was dying to try them out.

Kelley spent every evening that week putting in extra time with the dance troupe since she would miss the weekend rehearsals.

They were planning a performance in three weeks and there was still a lot to do.

The Friday night before they were to leave she rehearsed almost to midnight.

Before going to bed, she fiddled with her radio and found a broadcast of the Celtics game.

After listening a while, she cheered.

CAMPFIRE

Was Kelley involved in acting? NO

Passage 17

Rick had spent the day playing with his friend Tony.
They had played basketball in the backyard for almost two hours.
Then Rick's mother went out to do some shopping, reminding Rick to take out the trash.
The boys came in and had lunch and then started wrestling in the living room.
This ended quickly when they knocked into the coffee table.
An expensive vase that was on the table went flying through the air.
It crashed against the wall and broke into a million pieces.
The boys cleaned up the mess but there seemed to be pieces everywhere.
They hoped that nobody would notice the vase was missing.
When they were done, they went upstairs to Rick's room to watch a football game on his TV set.
It was an exciting game and the Patriots won the game in the last quarter.
They were both big Patriots fans and they hoped that this year they would get to go to a game.
Rick's father had promised to take them.
After the game ended, Rick's mother came home from grocery shopping.
Rick heard her putting the groceries away.
Then he heard her take out the vacuum cleaner and he started to panic.
MARBLE
Did Rick watch television all day? NO

Passage 18

Marge got home from her office and changed into her jeans and a sweatshirt.
She started washing dishes in her tiny kitchen.
The little apartment was all she and her husband Dan could afford.
Marge thought about the promotion that Dan had been competing for at his office and was thankful that he got it.
Dan's boss had just announced that Dan had gotten the promotion last week.
Now they could afford a larger apartment and maybe they would even start saving for a house of their own.
Life would be a lot easier because of that promotion.
When Dan got home, Marge started to make supper.
She got some lettuce and tomatoes out of the refrigerator to make a salad.
After checking the clock, she began to work faster.
They wanted to catch an early movie that evening.
As they sat down to dinner, they were interrupted by a phone call.
Dan got up and took the call in the living room.
When he got off the phone he looked delighted.
RADIATOR
Did Marge and Dan live in an apartment? YES

Passage 19 (Experiment 3 practice item)

Alex was diagnosed with diabetes, and was admitted to the hospital for tests.
He did not like hospitals very much, and wanted to go home.
He hoped the doctor would let him go home after the tests.
Before the doctor could sign the discharge order, he needed to check the test results.
Alex's blood pressure and pulse all appeared normal.
The doctor then looked at the insulin and blood sugar tests.
The insulin and blood sugar levels were normal, and Alex was discharged.
Francine was at work and was picking Alex up at the hospital.
She left early from work.
She decided to take the freeway, because it was faster.
When she arrived at the hospital, Francine parked in front.
Francine got a wheel chair and wheeled it towards the elevator.
She waited patiently for the elevator to come.
Francine decided to have a cigarette before going up to pick up Alex.
She had stand outside to smoke it.
CREW
Did Alex have cancer? NO

Passage 20 (Experiment 3 practice item)

The airport had been very busy.
It was the holidays, and many people were traveling home.
The pilot of flight # 444 had to get landing instructions from the control tower.
The air traffic controller had to determine which runway was free for landing.
The controller checked his computer for a free runway.
He saw that most of the runways were in use.
The air traffic controller determined that no runways were free.
The pilot needed to prepare the plane for landing.
He announced that they were about to land.
The passengers needed to place their seats in the upright position.
The pilot banked the plane toward the lights of the runway.
He started the plane's descent to the airport.
The co-pilot asked the pilot if he wanted to go golfing with him.
The pilot tried to remember if he had brought his golf clubs along.
PUCK
Did the co-pilot want to go golfing? Yes

Appendix C.1.
Instructions for Experiment 1 and 2.

DURING THIS EXPERIMENT, PLEASE DO NOT MOVE THE TELEVISION
MONITOR OR ADJUST ANY OF ITS SETTINGS. THANK YOU FOR YOUR HELP.

- Instructions -

You have as much time as you need to read these instructions. Feel free to read
them more than once.

The keyboard will sit on the table in front of you. Throughout the experiment,
keep your index fingers on the buttons labelled YES and NO, and one thumb on the space
bar, labelled "READY". The experimenter will illustrate this. Please note carefully which
button is YES and which is NO.

In this experiment, your task will be to read stories on the television screen. After
each story, you will have to answer a question about it.

Here is the exact procedure. Before each story, the message "press Space Bar for
more text" will appear at the top of the screen. Press the Ready bar with your thumb.
You will see the first sentence of the story. Read the sentence and, when you feel that you
understand it, press Ready again to view the second sentence. **Read at a normal pace
and press the Ready bar to indicate that you have understood each sentence. Do
not try to memorize the story.**

A few seconds after the last sentence of a story disappears, an **X** will appear for a
moment. Look directly at the **X**. When it disappears, you will see a question about the
story. Answer Yes if the question describes a fact that is true about the passage, and No if
the question is false. Register your answers by pressing the Yes and No buttons with your
index fingers.

Here is **part of** a sample story.

Once in a land very far away from the sea there was a Princess who was
very proud. She loved to wear pretty dresses and rich jewels and, above all, she
loved to wear pearls. But as pearls all come from the sea you can guess that it was
not very easy to get pearls in that land. The Prince her husband bought her all the
pearls he could, but still she wanted more.

Here are some sample questions from "The Princess and the Pearls," their answers,
and explanations for the answers.

Question: Did the Prince buy all the pearls he could for the Princess? Answer - **YES**. The story indicated that he did.

Question: Did the Princess and Prince live near the ocean? Answer - **NO**. This statement directly contradicts the story information that they lived far away from the sea.

Question: Did the princess love fancy clothes? Answer - **YES**. The story described the princess's love for pretty dresses.

Question: Was the Prince poor? Answer - **NO**. The story is not consistent with the possibility that the prince was poor.

It is very important to answer the questions as quickly as you can without getting the wrong answer. Each question will appear on the screen for only 6 seconds, and you will be counted wrong if you do not respond by then. However, you should respond as quickly as accuracy permits. You won't be told if you are right or wrong.

Occasionally, there will be a 30-second rest period, followed by a 10 second warning to get ready again.

In summary, your task is to **press the Ready bar** to view and signal your understanding of each sentence in the story. After each story, answer the question about it. Answer the questions as quickly as you can without getting the wrong answer. Then, proceed to the next story.

You may reread these instructions if you wish. There will be an opportunity to ask questions before the experiment begins.

Appendix C.2.
Debriefing form for Experiment 1 and 2.

Experiment of Language Understanding

Thank you very much for participating in the experiment. **Since many of your classmates will also take part, please be sure not to discuss it with them until completion of the study in June.**

Consider the brief sentence, the haystack was important because the cloth ripped. While this sentence is completely grammatical, it strikes us as virtually nonsensical. Suppose you are next asked to think about a parachutist floating over a field. The original sentence suddenly takes on a new dimension of meaning.

One thing that has been learned by psychologists studying language is that language only has meaning in the frame of reference of our knowledge about the world. From this perspective, we can view the reader or listener as striving to continually compare each new sentence with familiar concepts and knowledge.

The experiment you just participated in is one of a series which aims to study the way we understand ordinary language. In particular, these experiments have addressed the problem of whether we know more, after reading a sentence, than was directly stated. Take, for example, the sentences the tooth was drilled and the floor was swept. After reading the former, most of us would agree that it was (probably) a dentist who performed the action. For the latter, we would similarly agree that the sweeping was accomplished with a broom. It was hypothesized that when a sentence strongly implies a related concept in this way, that the reader of a sentence "infers" the concept during reading. To test this hypothesis, people were asked to read brief sentences like (1a) and (1b):

(1)   a. The dentist drilled the tooth painlessly.
       b. The tooth was drilled painlessly.

Immediately after seeing (1a) or (1b), the reader had to say whether a test sentence like (1c), a dentist drilled the tooth was true or false in the context of the previous sentence. If the reader infers the participation of a dentist while reading (1b), it should take no longer to judge the test sentence as "true" after (1b) than 1b). If, however, this inference is not drawn, the truth judgement would take longer after (1b) than (1a).

Surprisingly, it was found that people do need more time to judge (1c) true when it follows (1b) than (1a). This outcome supported the position that people do not necessarily draw inferences about even strongly implied concepts. It was speculated that one reason for this is that, since even the simplest sentence has many implications, it is not possible for the reader to draw every corresponding reference.

The next step, therefore, was to try to identify factors that guide the inferences that people draw during reading. The factor first examined can best be explained in terms of an example. Consider the sequence, the patient was examined at the clinic, the doctor was worried. If the reader of this sequence did not infer that the doctor examined the patient, the sequence would appear as disjoint as the car turned the corner, the ice cream was melted. The inference that the doctor examined the patient is necessary for the sequence to maintain its coherence. In three memory experiments, we contrasted directly stated ideas, necessary inferences, and likely but unnecessary inferences (the kind explored in the first experiment). It was found that judgments about unnecessary inferences were worst on every measure. This supported the notion that necessary inferences are drawn during reading.

Finally, the experiment you participated in examined text that described a series of events. These stories outlined characters and the goals they were attempting to satisfy. You were shown stories where these goals were either satisfied or not satisfied;

(2)   a. Philip needed to borrow a car for the trip. **GOAL 1**

1b. Philip's father said the car has just been fixed, so he could take it.
GOAL 1 satisfied
2b. Philip's father said the car needed to be fixed so he couldn't take it.
Later, two target sentences were shown;

(2)   c. Andy packed his bag and waited out front.   **Target 1**
       d. Andy had also packed a lunch for the long trip. **Target 2**

It is hypothesized that these two target sentences will be read more quickly in the satisfied goal version than in the unsatisfied goal version. This hypothesis is based upon previous evidence that certain causal or goal structures are constructed during comprehension.

When readers build a causal representation of stories they attempt to link sentences or ideas together. The unsatisfied goal version is inconsistent with the causal inference that is generated. This creates confusion and therefore elevates reading time.

The aim of the study was to determine whether story representations involve causal structures. Longer reading times of target sentences in the unsatisfied goal condition would indicate that this causal structure is being generated and encoded.

Other students from your class may take part in this experiment, so please do not discuss it with others.

Thank you very much for your participation and cooperation.

Appendix D
Passage Rating Instructions and Example passages.

In the following booklet, individual stories are presented. Each story is shown on two pages; Part 1 and Part 2.

First, read each sentence of Part 1 of the story on the first page. Once you have finished reading Part 1, turn the page to Part 2 of the story.

***Do not read ahead and only turn to the next page once you have read Part 1 of each story.* **

The next page presents Part 2 of the story. Read each sentence of Part 2. You will then be required to make a judgement about the first two sentences in in Part 2 of the story.

Indicate (on a scale from 1 to7) how consistent the events and actions of the characters (described in these two sentences) are with respect to all the information provided in Part 1 of the story.

Whenever the following box appears, indicate how consistent the events and actions described in the previous two sentences are with respect to the information provided in Part 1 of the story.

Very Consistent--Very Inconsistent
1   2   3   4   5   6   7

Circle the number that indicates this judgement.

After you have read the sentences of Part 2 and have made the required judgements, turn the page and start the next story.

Please do not turn back to previous pages
*** when you make this judgement about Part 2 sentences.* **

Story 1 - Part 1.

The band Stone Deaf had just released their new CD.
The critics were raving about it.
The promoter had booked the band to play a concert in two weeks.
The promoter needed to fill the stadium.
To do this, he needed to advertise the event well in advance.
He had to sell 2000 tickets to make it a financial success.
Just hours before the concert the concert was canceled.
The band needed to practice their new songs for the concert.
They devoted a lot of time to rehearsing.
The band went through all of their new songs, and some of their old ones.
In the end, they felt that they were prepared for the concert.

Story 1. - Part 2

The band arrived at the stadium in their tour bus.
They started to unpack their equipment.

Very Consistent---Very Inconsistent						
1	2	3	4	5	6	7

The manager phoned the hotel to see that their rooms were ready.
The band was very tired from the long drive.

****
**READ PART 2 OF THE STORY AND MAKE THE
INDICATED JUDGEMENTS ABOUT THE TWO SENTENCES.
THEN PROCEED TO THE NEXT STORY.**
*****DO NOT TURN BACK TO THE PREVIOUS PAGE OR TO THE **
** NEXT PAGE UNTIL YOU HAVE FINISHED THIS PAGE. *****
****

Story 2 - Part 1.

Philip and Andy wanted to go away for spring break.
They had saved up enough money to drive to Banff.
They both were avid skiers and were looking forward to the trip.
Philip needed to borrow a car for the trip.
He asked all of his friends but nobody could lend him one.
At the last minute, he asked his father if he could borrow the family car.
Philip's father said the car needed to be fixed so he couldn't take it.
Andy needed to book a hotel room in Banff.
He phoned the travel agent for some information on accommodations.
The travel agent told him that there were many cheap hotels.
Andy booked them into the Economy-Inn for 35 dollars a night.

****
READ PART 1 OF THE STORY.
THEN PROCEED TO THT NEXT PAGE.
** DO NOT TURN BACK TO THE PREVIOUS PAGE OR TO THE **
** NEXT PAGE UNTIL YOU HAVE FINISHED THIS PAGE. **
****

Story 2. - Part 2

Andy packed his bag and waited out front.
Andy had also packed a lunch for the long trip.

Very Consistent--Very Inconsistent						
1	2	3	4	5	6	7

They planned to rent all their ski equipment in Banff.
The weather report said that Banff had just received 20 cm of new snow.

****
**READ PART 2 OF THE STORY AND MAKE THE
INDICATED JUDGEMENTS ABOUT THE TWO SENTENCES.
THEN PROCEED TO THE NEXT STORY.**
*****DO NOT TURN BACK TO THE PREVIOUS PAGE OR TO THE **
** NEXT PAGE UNTIL YOU HAVE FINISHED THIS PAGE. *****
****

Appendix E
Revised experimental passages used in Experiment 3.

Note. The following provides a key for each passage section. Practice items used for
Experiments 3 are indicated in passage headings.

Introduction: 4 sentences.

Subgoal 1 section: 4 sentences with the 4th sentence in either the Satisfied or
                           Unsatisfied sentence version.

Subgoal 2 section: 4 sentences.

Target section: 2 sentences with one target sentence and one spillover
                           sentence.

Conclusion section: 2 sentences.

Probe word: Word that relates directly to manipulated Subgoal 1 section.

Question: Comprehension question and answer (Yes/No).

Passage 1
The band Stone Deaf had just released their new CD.
The critics were raving about it.
The promoter had booked the band to play a concert in two weeks.
The promoter needed to sell enough tickets.
To do this, he needed to advertise the event well in advance.
He had to sell 2000 tickets to make it a financial success.
Subgoal Succeed: Just hours before the concert the tickets finally sold out.
Subgoal Fail: Just hours before the concert was canceled.
The band needed to practice their new songs for the concert.
They devoted a lot of time to rehearsing.
The band went through all of their new songs, and some of their old ones.
In the end, they felt that they were prepared for the concert.
Target sentence: The band arrived at the stadium in their tour bus.
Spillover sentence: They started to unpack their equipment.
The manager phoned the hotel to see that their rooms were ready.
The band was very tired from the long drive.
TICKETS
Did the band practice their new songs? YES

Passage 2

Philip and Andy wanted to go away for spring break.
They had saved up enough money to drive to Banff.
They both were avid skiers and were looking forward to the trip.
Philip needed to borrow a car.
He asked all of his friends but nobody could lend him one.
At the last minute, he asked his father if he could borrow the family car.
Subgoal Succeed: Philip's father said the car has just been fixed, so he could take it.
Subgoal Fail: Philip's father said the car needed to be fixed so he couldn't take it.
Andy needed to book a hotel room in Banff.
He phoned the travel agent for some information on accommodations.
The travel agent told him that there were many cheap hotels.
Andy booked them into the Economy-Inn for 35 dollars a night.
Target sentence: Andy packed his bag and waited out front.
Spillover sentence: Andy had also packed a lunch for the long trip.
They planned to rent all their ski equipment in Banff.
The weather report said that Banff had just received 20 cm of new snow.
CAR
Did the men want to go scuba diving? NO

Passage 3

Sam and Shelly always took their vacations together.
This year they had decided to go on a fishing trip to Florida.
They both decided to stay at the hotel close to the ocean.
Sam walked down to the rental shop to rent a boat.
The rental shop was located right beside the hotel.
It looked like there were only a few boats left.
Subgoal Succeed: Sam rented the last boat for the weekend.
Subgoal Fail: There were no rental boats left for the weekend.
Shelly drove over to the game wardens office to get a license.
She walked into the office.
The government official told her that each license would cost ten dollars.
She bought the licenses and headed back to the hotel.
Target sentence: Shelly walked down to the dock with her gear.
Spillover sentence: She set the gear on the dock, and checked to see if she had all of her equipment.
Shelly noticed that there was not a cloud in the sky.
It was a beautiful day to go fishing.
BOAT
Was it raining? NO

Passage 4

The city had proclaimed a state of emergency.

The flood threat was severe.

Clyde and Marion needed to build a dike right away.

Clyde had to use his half-ton truck to get a load of sandbags.

Since they were outside the city limits they were responsible for their own supplies.

He drove into the public works yard and noticed there were a lot of trucks.

Subgoal Succeed: Clyde was relieved to find out there were hundreds of sandbags left.

Subgoal Fail: Clyde was dismayed to find out there were no sandbags left.

Marion had to find a group of people to help with the building of the dike.

She phoned the local radio station and asked for some help.

The radio station announced that volunteers were needed right away at

43 Main street.

Marion was very relieved when over one hundred people showed up.

Target sentence: The volunteers were all ready to build the dike.

Spillover sentence: They had all brought work gloves and rubber boots.

The city had been hard hit by this year's flood.

There hadn't been such a bad flood in over two centuries.

SANDBAGS

Did the city escape undamaged from the flood? NO

Passage 5

Denny and Florence had been looking forward to going on vacation all year.

They had been looking at brochures for weeks.

In the end, they decided to go to Hawaii.

Denny had to arrange to get the next week of work off.

He knew it was very short notice, but called his employer anyway.

He explained the situation to his boss.

Subgoal Succeed: The boss decided that Denny could be spared even though work was very busy right now.

Subgoal Fail: The boss decided that Denny couldn't be spared because work was very busy right now.

Florence called the local travel agent to get flight information.

The agent said that their destination was very popular right now.

The agent was not sure if there were any flights left open.

Luckily, Florence learned that there were some seats left for this Monday.

Target sentence: Florence bought some tickets for this flight.

Spillover sentence: She had bought a new bathing suit she wanted to wear on the beach.

It had been 2 years since they had gone on a vacation.

They had saved just enough money to afford the trip.

BOSS

Did the couple want to go to Hawaii? YES

Passage 6

The antique piano in the living room was over one hundred years old.

It had not been moved in over fifty years.
Russ, Hank and Earl were in charge of moving it.
Russ had to park the moving truck in front of the house.
He drove around to the front street to look for a parking spot.
There was a sale at the store down the street and not many parking spots were left open.
Subgoal Succeed: Russ found a parking spot right in front of the house.
Subgoal Fail: Russ couldn't find a parking spot and parked in back of the house.
Hank and Earl were in charge of carrying the piano.
They moved all of the furniture out of their way.
Hank took the back end while Earl grabbed the front end of the piano.
They manoeuvred it through the living room doors.
Target sentence: Hank and Earl carried the piano out the front door.
Spillover sentence: They had to be very careful going down the front steps.
Hank and Earl were hot and tired from carrying the piano.
They gulped down their drinks.
PARKING
Did Hank and Earl carry the piano out of the house? YES

Passage 7

The theatre group was about to begin their new season.
Their first presentation was a major play.
The actors and stagehands were very busy preparing for opening night.
The stagehands needed to set up the lighting for the audience to see.
Just as they were about to start, the director yelled at the stagehands, the main spotlight had burnt out.
The stagehands quickly climbed up the scaffolding to fix the spotlight.
Subgoal Succeed: The stagehands replaced the spotlight and turned it on.
Subgoal Fail: The stagehands accidentally dropped the spotlight onto the ground.
The actors had found their parts very challenging.
It had been very difficult for them to memorize their parts.
They had practiced every day for the last two weeks.
In the end, all of their hard work had paid off.
Target sentence: The curtain rose as the play began.
Spillover sentence: The actors entered the stage from the wings.
The audience watched in silence as the actors began.
The audience started to clap as the curtain fell.
SPOTLIGHT
Was the theatre group ending their season? NO

Passage 8

Charles and Bonny had just moved into their new apartment.
The apartment was located in the centre of town.
They had bought a new VCR, and wanted to watch a movie.

Charles took the new VCR out of box, and read the instructions.
He attached all the cords and plugged the machine in.
He then put in an old tape and pressed play.
Subgoal Succeed: The VCR worked perfectly, and Charles quickly left to make popcorn.
Subgoal Fail: The VCR started to smoke and Charles quickly unplugged it.
Bonny put on her coat and walked across the street to the local video rental shop.
She saw that most of the new releases were already rented.
Bonny decided that she wanted to rent Casablanca.
She found the movie in the classics section and got it.
Target sentence: Bonny walked in the door, she was really looking forward to seeing the movie.
Spillover sentence: She hadn't seen Casablanca in years.
She loved old black and white movies.
They seemed to have more depth than newer movies.
VCR
Did Bonny dislike black and white movies? NO

Passage 9
It is a tradition to have an elaborate dinner every Friday night.
Danny and Barb always invited close friends and family.
They had started this tradition when they first got married.
Danny decided to make a souffle.
He mixed the ingredients together and placed them in the oven.
He cleaned up the kitchen while he waited for the souffle to cook.
Subgoal Succeed: The timer went off and Danny proudly removed the perfect souffle.
Subgoal Fail: The fire alarm went off and Danny hurriedly removed the burnt souffle.
Barb had to find enough chairs and set the table.
She found some extra chairs in the attic.
She put place mats out along with utensils and candlesticks.
She was very happy with the way the dining room looked.
Target sentence: Barb met the guests at the front door and showed them to the table.
Spillover sentence: She sat down with the guests and talked about the week's events.
All of the guests commented on how beautiful the dinning room looked.
Everyone was famished.
SOUFFLE
Did Barb get some chairs from the attic? YES

Passage 10
Greg and Pam arranged to meet for lunch.
They had to talk about their coming divorce.
They decided to get together at McDonald's at 12:30.
Greg had to take bus number 1 to get to the restaurant.
To make it on time he had to catch the noon bus.

Shortly before 12:00, he hurried out, running to catch it.
Subgoal Succeed: He jumped onto the bus just as it was pulling away.
Subgoal Fail: The bus door slammed in his face as it was pulling away.
At 11:00 AM, Pam's boss asked her to type his year-end report for him.
She was worried that she could not finish it before lunch.
Surprisingly, she completed it just before lunch.
Pam handed in her report and left the office.
Target sentence: At 12:30, Pam entered McDonald's.
Spillover sentence: McDonald's was very busy, and she had to wait for a table.
Pam had to wait five minutes to get a seat.
Pam wondered if she had made any mistakes in typing the report.
BUS
Did Pam finish her report? YES

Passage 11

Making a movie takes a lot of hard work.
Don and Nick were trying to finish their movie.
There are many jobs and goals that need to be accomplished.
Don had to raise enough money to finance the rest of the project.
He phoned many of his friends in the financial community.
He made an appointment with the president of the largest bank in the city.
Subgoal Succeed: The meeting was very successful and the money was secured.
Subgoal Fail: The meeting was not very successful and no money was secured.
Nick had to finish the script for the movie.
He was on a tight deadline.
He sat down at the typewriter.
It took him a long time to finish the script.
Target sentence: Nick rushed over to the movie set with the script.
Spillover sentence: He was so happy that the movie was going to be completed.
The movie was autobiographical.
It had been a very emotional script to write.
MONEY
Does a movie take a lot of hard work? YES

Passage 12

The school bake sale was tomorrow.
Virginia and Molly wanted to bake a pie.
When they got home from school they took out the recipe.
Virginia needed to be very careful while she made the dough.
She placed the flour and butter in the bowl.
She added the water and mixed the dough in the bowl.
Subgoal Succeed: Virginia spread the dough on the table, and then placed it in the pan.
Subgoal Fail: Virginia spread the dough on the table, and the dog snatched it from the

table.
Molly had to go to the orchard to pick apples.
She climbed the nearest apple tree.
Molly filled the basket she was carrying.
She walked back to the house.
Target sentence: Molly turned the oven on.
Spillover sentence: She checked the oven to make sure it was empty.
The bake sale proceeds were being donated to UNICEF.
The school held a bake sale every year.
DOUGH
Was the bake sale at the church? NO

Passage 13

Laurie and Diane bought a new house.
The house needed a lot of work.
They wanted to paint it before it rained.
Laurie took the ladder out of the garage.
She placed it against the house.
She climbed up the ladder and began to scrape off the house.
Subgoal Succeed: She finished scraping and climbed back down.
Subgoal Fail: She felt rain drops on her hand, and climbed back down.
Diane got in her car and drove to the store for paint and brushes.
She picked out the color blue and brushes and bought them.
She put the supplies in the trunk of her car and drove home.
Diane removed the cans and brushes from the car.
Target sentence: Diane opened the cans and stirred the paint.
Spillover sentence: She got out her overalls and changed into them.
She put up her hair to protect it from the paint.
She dipped her brush in the paint and walked towards the house.
HOUSE
Did Diane get paint in her hair? NO

Passage 14

The barbarian clan, the Turks, were expanding their empire.
Their next conquest was to be a large castle on the coast.
The Turks' force had to breach the castle stronghold.
A select group of spies was sent ahead.
Their job was to open the main gates.
They had to sneak through the caverns and infiltrate it.
Subgoal Succeed: Once inside, the spies killed the guards and raised the gates.
Subgoal Fail: Once inside, the spies were caught and killed by the guards.
The main force had to quickly cross the bridge to the castle.
However, as the Turks approached the enemy burned the bridge.

They assessed the situation and went to work.
At the cost of many lives, a bridge was built.
Target sentence: The Turks had a clear route to attack the castle.
Spillover sentence: The leader of the Turks was looking forward to his victory.
This war had been going on for 20 years.
Neither side had won a decisive victory in all that time.
GATES
Did the Turks burn the bridge? NO

Passage 15

The Daily Times is a small local newspaper.
Wendy and Craig are the owners and the only employees.
They perform all the jobs essential in putting out the paper.
Wendy hadn't yet received the order of newsprint for today's printing.
She didn't have any left in the storage room.
She phoned the newsprint supplier and they told her that the order would be there shortly.
Subgoal Succeed: The order of newsprint arrived at 3:00 PM, just in time for Wendy to print.
Subgoal Fail: The order of newsprint arrived at 4:00 PM, too late for Wendy to print.
Craig had to lay out all the pictures and stories on the computer.
He was using new software that made this process much faster.
He took all the columns and matched them with their appropriate pictures.
It took him very little time to lay out the paper.
Target sentence: Craig was very happy with the look of today's edition.
Spillover sentence: This edition was 20 pages long.
The paper had been gaining readership over the last few months.
A big story could push them past their competitor in readership.
NEWSPRINT
Had the paper been gaining readers? YES

Passage 16

Joe and Charles were opening a new restaurant.
They had renovated the building and were preparing for opening night.
Only a few more things needed to be done.
Joe had to pick up some seafood from the fish market.
Joe drove down to the docks in his van.
He had a hard time finding a place to park.
Subgoal Succeed: When he arrived he was told his seafood was waiting for him.
Subgoal Fail: When he arrived he was told that they were sold out of seafood for today.
Charles was in charge of decorating the restaurant for opening night.
He had to arrange for the flowers to be delivered before opening at 6:00 PM.
He phoned the local flower store and put in his order.
The flower arrangements arrived at :30 PM.

Target sentence: Charles put the OPEN sign in the window of the restaurant.
Spillover sentence: The first customers took their seats and started to look over the menu.
The two brothers had put a lot of work into their new restaurant.
They had brought many family recipes over from Italy.
SEAFOOD
Were Joe and Charles opening a hardware store? NO

Passage 17

Dean and Ronald have been friends since childhood.
They had met when they were in first grade.
They were meeting at the country club for a game of golf.
Dean was in charge of booking the start time but had forgotten to phone ahead.
When he arrived Dean noticed the parking lot was very full.
He hurried into the pro shop.
Subgoal Succeed: They told him that there was one start time left today.
Subgoal Fail: They told him that there were no more start times today.
Ronald was worried about his car, it had been making a funny sound lately.
He loaded his golf clubs into his car and headed to the country club.
On the way to the golf course, his car started to smoke.
Luckily, it was just a fan belt and it was easily replaced.
Target sentence: Ronald parked his car, and carried his golf clubs up to the club house.
Spillover sentence: He placed his clubs by the front door and walked into the pro shop.
This was Ronald's first golf game of the year.
He was sure he was going to lose a lot of golf balls.
PHONE
Did Ronald have car trouble? Yes

Passage 18

Eileen and Skip's daughter was getting married.
She had been seeing her fiancee for about a year.
Eileen and Skip decided to host a wedding social for them.
Eileen was in charge of getting the liquor license for the social.
She was not sure where to go to get one.
She phoned the licensing board to find out where the nearest office was.
Subgoal Succeed: They told her that the last day to get licenses for the coming month was today.
Subgoal Fail: They told her that the last day to get licenses for the coming month was yesterday.
Skip was in charge of finding a suitable hall.
He knew the hall had to seat at least 100 people.
The first hotel he went to had a room that only seated 0.
The second hotel he visited had a great room that seated 10 people.
Target sentence: Skip couldn't wait to tell his daughter about the plans.

Spillover sentence: The hall would be perfect.
Skip was sure that the hotel would also give them a good deal on the catering.
He was looking forward to the wedding social.
LIQUOR
Was Skip looking forward to the social? Yes

Passage 19 (Experiment 3 Practice item)

Sidney and Larry were released from prison.
Both of them had been planning a big robbery while they were in jail.
They had the bank picked out and had taken care of all the details.
Sidney was a master safe cracker, and his job was to crack the safe.
He used his glass cutting tool to enter through a back window.
He needed to use his stethoscope to open the safe.
Sidney discovered the combination and opened the safe.
Larry's job was to drive the getaway car.
He went to a nearby parking lot to steal a car.
Larry chose a fast sports car.
He hotwired the car and headed back to the bank.
Larry drove the getaway car into the back alley, beside the bank.
He kept watch beside the car for any police.
It was very late at night and no one was on the street.
The moon shone very brightly.
SAFE
Did Sidney and Larry just finish high school? NO

Passage 20 (Experiment 3 Practice item)

The Smith family reunion was planned for this weekend.
It was being held in Toronto and Brian and Sherry wanted to fly there.
They had forgotten to make arrangements and it was already Friday.
Brian phoned the travel agent to make a reservation.
He asked the agent for seats on the flight leaving this afternoon.
He gave the agent his credit card number.
The agent told Brian that he would have to wait for tomorrow's flight.
Sherry had to pack all of their clothes for the trip.
She got the suitcase from the attic.
She picked out some clothes from the closet.
She carefully packed the clothes into the suitcase.
Sherry carried the suitcase to the car.
She got into the car and drove to the airport.
Sherry was looking forward to visiting with her family.
It had been two years since she had seen her uncle Bob.
RESERVATION
Did Sherry not want to see her uncle Bob? YES

Appendix F.1.
Instructions for Experiment 3.

DURING THIS EXPERIMENT, PLEASE DO NOT MOVE THE COMPUTER MONITOR OR ADJUST ANY OF ITS SETTINGS. THANK YOU FOR YOUR HELP.

Instructions - Sarnia 73

You have as much time as you need to read these instructions. Feel free to read them more than once.

The keyboard will sit on the table in front of you. Throughout the experiment, keep your index fingers on the buttons labelled **YES** and **NO**, and one thumb on the space bar, labelled "**READY**". The experimenter will illustrate this. Please note carefully which button is YES and which is NO.

In this experiment, your task will be to read stories on the computer screen. Sometime during the story a word will appear. You will have to decide if you have seen the word somewhere in story you have just been reading.   After each story, you will have to answer a question about it.

Here is the exact procedure. Before each story, the message "**Press the <Space Bar>(the long key on the bottom) for more text**" will appear at the top of the screen. Press the Ready bar with your thumb. You will see the first sentence of the story. Read the sentence and, when you feel that you understand it, press Ready again to view the second sentence. **Read at a normal pace and press the Ready bar to indicate that you have understood each sentence. Do not try to memorize the story.**

At some point in the story a word will appear instead of the next sentence. As soon as the word appears, answer **YES** if the word appears in the story you have just been reading or **NO**, if you have not seen the word before. Indicate your answer by pressing the YES and NO buttons with your index fingers. After you indicate Yes or No, press the Ready bar to see the next sentence will. If you have made an error about the word, the word **ERROR** will appear on the screen after you answer. **Try to indicate whether you have seen the word before as quickly and as accurately as you can.**

A few seconds after the last sentence of a story disappears, the word **QUESTION** will appear for a moment. When it disappears, you will see a question about the story. Answer Yes if the question describes a fact that is true about the passage, and No if the question is false. Register your answers by pressing the Yes and No buttons with your index fingers. After you have answered the question the message "PRESS <SPACE BAR> FOR THE NEXT STORY" will appear. Press the **READY** key to see the next story.

Here is **part of** a sample story.

Once in a land very far away from the sea there was a Princess
who was very proud. She loved to wear pretty dresses and rich

jewels and, above all, she loved to wear pearls. But as pearls all
come from the sea you can guess that it was not very easy to get
pearls in that land. The Prince her husband bought her all the
pearls he could, but still she wanted more.

Here are some sample words from "The Princess and the Pearls," and their answers.

Word: JEWELS - **YES**. The word appeared in the story.
Word: BRICK - **NO**.   The word did not appear in the story.
Word: PEARLS - **YES**. The word appeared in the story.

It is very important to indicate whether the word appeared in the story you are
currently reading as quickly as you can without getting the wrong answer. Each word will
appear on the screen for only 6 seconds, and the message **ERROR** will appear if you do
not respond by then or if you answer incorrectly.
Here are some sample questions from "The Princess and the Pearls," their answers,
and explanations for the answers.

Question: Did the Prince buy all the pearls he could for the Princess? Answer -
YES. The story indicated that he did.
Question: Did the Princess and Prince live near the ocean? Answer - **NO**. This
statement directly contradicts the story information that they lived far away from the sea.
Question: Did the princess love fancy clothes? Answer - **YES**. The story
described the princess's love for pretty dresses.
Question: Was the Prince poor? Answer - **NO**. The story is not consistent with
the possibility that the prince was poor.

It is very important to answer the questions as quickly as you can without getting
the wrong answer. Each question will appear on the screen for only 6 seconds, and you
will be counted wrong if you do not respond by then. However, you should respond as
quickly as accuracy permits. You won't be told if you are right or wrong.
Occasionally, there will be a 45-second rest period, followed by a 10 second
warning to get ready again.
In summary, your task is to **press the Ready bar** to view and signal your
understanding of each sentence in the story. During the story, indicate whether certain
words have appeared in the story you are currently reading. Try to indicate as quickly as
you can without making a mistake. After each story, answer the question about it.
Answer the questions as quickly as you can without getting the wrong answer. Then,
proceed to the next story.
You may reread these instructions if you wish. There will be an opportunity to ask
questions before the experiment begins.

Appendix F.2.
Debriefing form for Experiment 3.

Experiment of Language Understanding

Thank you very much for participating in the experiment. **Since many of your classmates will also take part, please be sure not to discuss it with them until completion of the study in June.**

Consider the brief sentence, <u>the haystack was important because the cloth ripped</u>. While this sentence is completely grammatical, it strikes us as virtually nonsensical. Suppose you are next asked to think about a parachutist floating over a field. The original sentence suddenly takes on a new dimension of meaning.

One thing that has been learned by psychologists studying language is that language only has meaning in the frame of reference of our knowledge about the world. From this perspective, we can view the reader or listener as striving to continually compare each new sentence with familiar concepts and knowledge.

The experiment you just participated in is one of a series which aims to study the way we understand ordinary language. In particular, these experiments have addressed the problem of whether we know more, after reading a sentence, than was directly stated. Take, for example, the sentences <u>the tooth was drilled</u> and <u>the floor was swept</u>. After reading the former, most of us would agree that it was (probably) a dentist who performed the action. For the latter, we would similarly agree that the sweeping was accomplished with a broom. It was hypothesized that when a sentence strongly implies a related concept in this way, that the reader of a sentence "infers" the concept during reading. To test this hypothesis, people were asked to read brief sentences like (1a) and (1b):

(1)   a. The dentist drilled the tooth painlessly.
        b. The tooth was drilled painlessly.

Immediately after seeing (1a) or (1b), the reader had to say whether a test sentence like (1c), <u>a dentist drilled the tooth</u> was true or false in the context of the previous sentence. If the reader infers the participation of a dentist while reading (1b), it should take no longer to judge the test sentence as "true" after (1b) than 1b). If, however, this inference is not drawn, the truth judgment would take longer after (1b) than (1a).

Surprisingly, it was found that people do need more time to judge (1c) true when it follows (1b) than (1a). This outcome supported the position that people do not necessarily draw inferences about even strongly implied concepts. It was speculated that one reason for this is that, since even the simplest sentence has many implications, it is not possible for the reader to draw every corresponding reference.

The next step, therefore, was to try to identify factors that guide the inferences that people draw during reading. The factor first examined can best be explained in terms of an example. Consider the sequence, <u>the patient was examined at the clinic, the doctor was worried</u>. If the reader of this sequence did not infer that the doctor examined the patient, the sequence would appear as disjoint as <u>the car turned the corner, the ice cream was melted</u>. The inference that the doctor examined the patient is <u>necessary</u> for the sequence to maintain its coherence. In three memory experiments, we contrasted directly stated ideas, necessary inferences, and likely but unnecessary inferences (the kind explored in the first experiment). It was found that judgments about unnecessary inferences were worst on every measure. This supported the notion that necessary inferences are drawn during reading.

Finally, the experiment you participated in examined text that described a series of events. These stories outlined characters and the goals they were attempting to satisfy. You were shown stories where these goals were either satisfied or not satisfied;

(2)   a. Philip needed to borrow a car for the trip. **GOAL 1**

1b. Philip's father said the car has just been fixed, so he could take it.
                                                       GOAL 1 satisfied
2b. Philip's father said the car needed to be fixed so he couldn't take it.

Later, two target sentences were shown;

(2)   c. Andy packed his bag and waited out front.   **Target 1**
        d. Andy had also packed a lunch for the long trip. **Target 2**

It is hypothesized that these two target sentences will be read more quickly in the satisfied goal version than in the unsatisfied goal version. This hypothesis is based upon previous evidence that certain causal or goal structures are constructed during comprehension.

When readers build a causal representation of stories they attempt to link sentences or ideas together. The unsatisfied goal version is inconsistent with the causal inference that is generated. This creates confusion and therefore elevates reading time.

The aim of the study was to determine whether story representations involve causal structures. Longer reading times of target sentences in the unsatisfied goal condition would indicate that this causal structure is being generated and encoded.

Other students from your class may take part in this experiment, so please do not discuss it with others.

Thank you very much for your participation and cooperation.