INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

University
Microfilms
International
300 N. Zeeb Road
Ann Arbor, MI 48106

Fitch, Margaret Erin

THE EFFECT OF MESSAGE STRUCTURE ON INFERENCE MAKING IN RECALL

The University of Oklahoma PH.D. 1982

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECT OF MESSAGE STRUCTURE ON INFERENCE MAKING IN RECALL

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

MARGARET ERIN FITCH

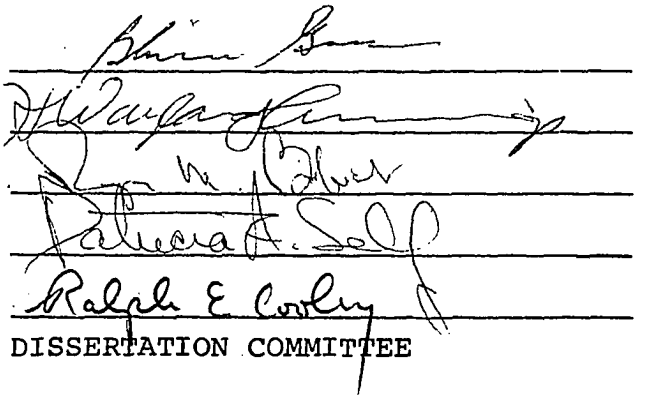
Norman, Oklahoma

1982

THE EFFECT OF MESSAGE STRUCTURE ON

INFERENCE MAKING IN RECALL

APPROVED BY:



DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

Many people have contributed to the completion of this dissertation and degree. Only a few of them can be mentioned in this small space. However, I hope all of them know how much I care for and appreciate them.

My many aunts and uncles and friend, Buck, deserve a thank you for always letting me know that they supported my endeavors and cared for me regardless of my excentricities.

William G. Powers is another one that deserves special mention. Without him I would never have entered the field nor would my curiosity to learn more have been aroused.

Johnney S. Payne has a special place in my heart and a role in the completion of this degree. His support at the beginning of my college career and his support since has often kept me going when I wanted to quit.

To Blaine Goss, I owe a very special thank you for being a friend as well as an advisor. To him I say thank you for letting me develop at my own pace (as slow as that may have been).

Another note of appreciation goes to Drs. Wayland Cummings, Ralph Cooley, Roger Babich, and Patti Self who took the time to serve on my committee.

Debbie Roach, Cathy Little, and Adele Humphreys also contributed to this dissertation in their special ways. To Debbie,

thank you for the hours of idea swapping and support. To Cathy, whose fingers spent many hours at the typewriter, thank you for the typing and the proofreading. And, to Adele, thank you for the moral support and the help with SAS.

Lastly to the two most important people in my life, my mother and my husband. I couldn't have done it without you.

ABSTRACT

This study attempted to determine the effect of manipulating the structure of a story on the production of inferences in recall. One independent variable, story structure, was manipulated four times. Each manipulation was administered to one of four groups composed of Communication 1113 students. After the presentation of the stimulus material, a question packet was administered to each subject. The questionnaire tapped the three dependent variables: recall of cause, recall of consequence, and recall of congruency. In addition, the instrument also tapped the subjects' confidence in the accuracy of their answers. Analysis of the results revealed that when a story node is deleted or made incongruent, the subjects will produce inferences in recalling the manipulated node. The results also revealed that the manipulation of the cause node has a greater effect on recall than the manipulation of the consequence node. Testing of the confidence scores revealed that subjects were not aware of making cause or congruency inferences but were aware of making consequence inferences.

TABLE OF CONTENTS

LIST OF TABLES

THE EFFECT OF MESSAGE STRUCTURE ON INFERENCE MAKING IN RECALL

CHAPTER I

RATIONALE AND LITERATURE REVIEW

Introduction

For years communication scholars have conducted research on communication related factors which seemingly affect message output. Those factors include source variables, receiver variables, and message variables. Even our communication textbooks teach that a message can be adapted so that receivers properly understand the meaning. Despite everything that we have learned about the way human beings communicate with each other, we are still unable to exchange messages without some kind of distortion taking place.

Several attempts have been made to explain information distortion. These explanations include distortion caused by selective perception and distortion caused by information storage and recall processes in either long term or short term memory. All of these are valid explanations, but some types of information distortion are still not adequately explained. One of these is the distortion caused by inference making.

Many approaches to information processing have treated memory as a linear, step-by-step process which begins with encoding and ends with decoding. However, the memory process, like the communication process, may not be linear. Instead, the process may be interactive. If memory is an interactive process, all phases of information processing interact, beginning with the message that is encoded and continuing through the recall of the same information. An interactive approach could address the distortion that occurs when individuals recall information which is different from the message they originally heard.

Frequently, the information individuals recall includes inferences. An inference can be defined as an attempt to make information fit into existing expectations. Inferences occur when individuals add, delete, or reorganize a message in such a manner that the meaning of the original message is changed. In other words, inferences are a form of information distortion. A possible explanation of where inferences occur in the memory process may be found in the interaction between the stages of encoding and decoding information. The encoded information seems to be integrated into and affected by the person's memory system. One method of integrating new information into the existing memory structure will be called schematic processing.[1]

---

[1]A number of researchers have discussed this type of information processing, but they have used a variety of labels. The term schematic processing will integrate these various labels.

Schematic processing is a memory process which utilizes schema (schemata). Bartlett (1932) used the term schema to refer to the central cognitive structure in perception. As the central cognitive structure of perception, schema acts as an intermediary between the encoded message and recall.

Schemata provide plans or maps for perceiving incoming information. In this capacity schemata are large units of knowledge that organize much of what individuals know about the world around them. As large units of knowledge, schemata establish sets of expectations for incoming information. These expectations are formed as a person grows and learns about the surrounding world. An individual learns that certain types of events occur in certain ways; and that person uses that set of expectations or schema to predict or perceive incoming information. One schema which is discussed further in this paper causes a person to expect information to be presented in a particular sequence. This expectation is especially applicable to information in story form.

When individuals use schematic processing, the incoming information is perceived and categorized according to the appropriate schemata or schema. However, the system can only process the message as it is presented. Because the message which is recalled is not always the same as the original, something must happen between the encoding of the message and recall. Very possibly, an interaction is occurring between the message as it is presented and the receiver's schema. As the

system perceives and integrates the message into memory, the schema probably determines what is stored and recalled by making the information fit the existing expectations. Evidence indicates that this type of process does indeed occur.

Much evidence indicates that during schematic processing, some inferences are created as messages are first comprehended (Graesser, Robertson, and Anderson, 1981). Other researchers (Schank, 1973 and 1975; and Schank and Abelson, 1977) feel that a foundation exists for constructing conceptual representations which include both information that was truly in the message as well as inferences about the information during schematic processing. The evidence strongly suggests that the message and the receiver's schema do interact and the interaction determines what is remembered.

This study examines the interaction of a particular type of message, stories, and schemata in an attempt to see if the interaction between the two may explain how information distortion in the form of inferences occurs in some messages. In order to address this issue, two areas must first be explored. The first area is inferences. The section on inferences attempts to find when and where inferences occur in the memory process. The second area discusses story structure (the organizational pattern of the message). This section will compare the original message with recall and further explore the notion of an interaction between story structure and schematic processing. After the review of these two areas, hypotheses are presented which further explore the question.

Inferences

Function and Type of Inference

Schank (1975) functionally defines inference as a "process in which an individual tries to represent incoming information in a well-defined structure." In other words, an inference is a tool used to make information fit into an existing information category. In this capacity, inferences serve two main functions: (a) they fill in gaps in the structure of the incoming information (slot-filling) and (b) they connect events in the structure with other events in order to provide a higher level of organization (text-connection).

Warren, Nicholas, and Trabasso (1979) feel that inferences are based primarily upon three identifiable sources of information. The first is logical relations between events in the text. The relations are causes, motivations, and conditions allowing the events. An example of an inference based on logical relations would occur if a receiver inferred why a particular act was done. The second source of inferences is the informational relations between events in the text. Examples are specific people, instruments, objects, times, places, and contexts of events; in other words, who, what, when, and where. If a receiver infers that an act in a story was performed by using a particular tool, then the inference is based on informational relations. The third source is world knowledge. This includes knowledge about vocabulary, items referred to and the functional relations among them. This category is based upon prior

knowledge and perceptions and it affects the other two categories. Using these sources of information, an individual (listener or reader) focuses on the present (focal point) and uses this focal point to connect events from the past and to predict future events.

Warren, Nicholas, and Trabasso (1979) also theorized that these same sources of information are used to fill empty slots in a story. They felt that individuals use their world knowledge (past experience and knowledge) to infer information missing in a story.

The slot filling and connections are made with various types of inferences which occur with such regularity that they can be categorized. Warren, Nicholas, and Trabasso (1979) placed inferences into two categories. The first category is logical inferences. Inferences in this category are bi-directional. They can predict forward or connect things from the past. Logical inferences answer the questions "why" and "how." The second category of inferences is value inferences. These are evaluative judgements on the actions of characters, intentions of the sources, or the validity of the events.

In addition, the researchers theorized that inferences will be produced in four degrees. The first is called first-order inferences. These are consistent with but undetermined by information in the text. This category consists of straight additions to world knowledge such as elaborative inferences and any guesses at nonindicated causes and motivations. This group

of inferences is not used to connect parts of a story, they merely add information. Second-order inferences are determined but irrelevant. This means that the inference is implied by the text but does not specifically contribute to the flow of the story.

The next two orders of inferences are relevant to the flow of the story. Third-order inferences, however, are only relevant to the flow of a narrative. In addition, these inferences are determined by the text as being relevant and function in the interpretation of information on the basis of one's world knowledge and determining what happened and why. Unlike third-order inferences, fourth-order inferences are not relevant to the flow of the story. Fourth-order inferences are redundant. They duplicate information which is already adequate to specify the story event, and thus add nothing new to the progress of the story text.

A review of some studies which have examined the production of inferences in the recall of information will show a bit better when and where inferences occur.

Location of Inferences

One place inferences occur is in the listener's integration of pieces of information. Bransford and Franks (1972) tested this notion in a study in which they presented a group of related sentences to their subjects. The stimulus sentences presented were either four simple sentences or combinations of two or three simple sentences:

a. The ants are in the kitchen.
b. The ant ate the jelly.
c. The jelly was sweet.
d. The jelly was on the table.
e. The ants in the kitchen ate the jelly.
f. The ants in the kitchen ate the sweet jelly.

After the memory phase of the study, the subjects were asked to (1) identify sentences which they had heard and combined sentences which they had not heard, and to (2) tell how confident they were about their choices. The subjects all stated their claims with a high level of confidence. In many cases, however, subjects claimed that they had heard sentences which combined four simple sentences when in actuality none of these were presented in the experiment. An example of one of the "remembered" sentences was "the ants in the kitchen ate the sweet jelly which was on the table." The subjects thought that they had heard a combination of sentences a, b, c, and e presented above. These results strongly suggest that information gathered from the semantic interpretation of related sentences is stored together and integrated in memory. However, as the information is integrated, inferences are made. As the subjects remembered the information they also inferred relationships between the parts of the whole. These inferences seemed to be a spontaneous part of the reconstruction of information in memory.

Paris (1965) likewise found that even his elementary school age subjects spontaneously constructed inferential relationships which were integrated in their memory representations of the story. This study revealed that comprehension is a constructive process, and that inference making is a constructive

process. Further evidence of this was found by Paris and Carter (1973) when they used a semantic integration paradigm similar to that used by Bransford and Franks. They presented brief stories to elementary age children and instructed them to remember the exact story. However, the children did not recall the stories exactly as they had heard them. The children had problems remembering the exact words. Instead, they integrated information and drew inferential relationships during recall.

Other research indicates that inferences are made by adding information to the original messages. Several studies have found that when certain types of information are not explicitly stated, the subjects will infer the information when they are asked to recall the message. In one such study Paris and Lindauer (1976) read sentences to 7 and 11 year olds. The sentences either implied or stated an instrument of action in a story. (An example of the statements used is "the workman dug a hole in the ground [with a shovel].") Even when the tool was not stated explicitly in the sentence (as in the non-parenthetical portion of the sample sentence) the children could 'remember' the tool used as well as if it had been named in the sentence.

Paris and Upton (1976) conducted a similar study which tested the production of contextual and lexical inferences. Lexical inferences were operationalized as remembrance of an implied tool while contextual inferences focused on "remembering" the consequences which were not stated in the stories. Their findings agree with those of Stein and Glenn (1979). Stein and

Glenn found that 4 categories of information were most likely to be inferred in the recall of a story. The categories were major settings, initiating events, major goal statements, and consequences. Paris and Upton's tools can be found in the initiating events category, and their consequence category is the same as Stein and Glenn's.

Kintsch (1972) reports similar findings. He presented his subjects with sentences like "The man was shot" and asked them to specify other information that was true of the statement. Most subjects indicated that the man had to be shot by something which was probably a gun. Thus, his subjects inferred an instrument or tool which was part of the setting and used in initiating the event.

Johnson, Bransford, and Soloman (1973) supported Kintsch when they found that their subjects inferred instruments along with consequences when the actual information was missing from the story. Furthermore, Kintsch and Monk (1972) found that their subjects made similar inferences regardless of whether their stimulus material was presented in a simple or a complex manner.

All of the research discussed so far indicates that inferences occur when information is either missing or is implied by a message. Another cause of inferences may be the presence of an inconsistency or contradiction in a message. Research indicates that when incoming stimuli are consistent with the expectations of the receiver, the information is assimilated and recalled with relative ease. When information is highly

inconsistent with one's expectations, the information is rejected as not being valid. However, when information is only mildly inconsistent with expectations, the information is easily recalled in short term memory but tends to be converted to fit the expectations in long term recall (Taylor and Crocker, 1980; Kintsch and Van Dijk, 1979). In other words, the presence of a mild inconsistency in a message will cause a receiver to make an inference in order to attain consistency. This information also implies that any message which is contradictory to a receiver's expectations is subject to distortion by inference.

The inference research discussed in this section suggests that some relationships exist between the original message and the inferences which the subjects produced. If a group of related ideas was strung out over several sentences, the subject's memories very efficiently inferred the relationships between the parts. If certain information was implied but not stated, the subjects inferred a consistent version of the message when they recalled the information.

In all of the studies discussed, subjects remembered the information which was presented as well as the inferences. These results strongly point to the possibility that there is some interaction between the way the message is presented and the way it is remembered. To further explore this notion, the next section will focus on the way a message is presented and the interaction of that message with the semantic processing system.

Story Structure and Schematic Processing

Story Structure

When a message's sentences are put together to form a wholistic idea -- a story -- an underlying organization holds the sentences together. This underlying structure will be referred to as story structure or the idealized internal representation of the parts of the story and the relationship among those parts (Mandler and Johnson, 1977). According to Mandler and Johnson (1977) the structure of a story provides a framework for the comprehension of the ideas expressed in the story. This framework provides several functions.

1. It directs attention to certain aspects of incoming material.

2. It helps the listener keep track of what has gone before. In this capacity the story structure provides a summary that increases the predictability of what information will immediately follow.

3. It tells the listener when some part of the story is complete and can be stored, or is incomplete and must be held until more material is encoded.

The pioneer in the study of story structure was Bartlett (1936). As he studied memory he tried to find some explanation for the memory of prose information. He felt that "perceiving, recognizing, and recalling were all functions which belong(ed) to the same general series" of information processing (p. 187). Bartlett's notion indicates that the original form of a message as the receiver perceives it influences how the story will be stored and recalled. Research seems to bear out this notion.

Bartlett found that his subjects had a much easier time recalling stories that were presented in an organized format than stories that had little organization. This same finding has been repeated by others (Rumelhart, 1975; Mandler, 1978; Mandler and Johnson, 1977). In an effort to discover more about the structure of stories, researchers have developed grammars for stories which delineate the parts of a story (Rumelhart, 1975; Mandler, 1978; Mandler and Johnson, 1977). In order to establish a particular grammar, the researchers have used the folk tale as their model. Their rationale for using this material was that folk tales are handed down through the ages orally. The researchers felt that in order for these stories to be transmitted as accurately as they have been, they must be highly structured.

Recently, however, research in this area has been expanded to include additional formats or structures. Mandler (1978) and Mandler and Johnson (1977) felt that some story grammars were incomplete and that some categories were artificial. In an attempt to correct these weaknesses, they expanded story grammar. They felt that a successful theory of story structure must provide a clear "parsing system which can be used to divide a story into structurally important units (p. 111)." This type of system should also be able to predict which units tend to be remembered and which units tend to be forgotten. The grammar that these researchers developed was geared for simple stories, or stories with only one protagonist in each episode. The story structure could also handle a limited amount of conversation if

the emphasis was on the reactions of the protagonist. The story structure then represents the underlying structure of a story as a tree structure which designates the explicit constituent structures and the relationship between the constituent parts. An event which occurs in the story is an example of a constituent structure. That is, the story structure is concerned with underlying information units not just surface structure sentences.

Using such an operationalization of grammar and story structure, Mandler and Johnson divided a story into two very general categories: the setting and the event structure. Each category could be used to analyze the characters and events of the story. When Mandler and Johnson tested their grammar they found that stories which fit their grammar very closely were recalled in more detail and with more accuracy than stories that were not as closely structured. However, the structure of the original story and, as later research has shown, the one that is evident in the stories that are recalled did not seem to be the same (Tulving and Thomas, 1973; Rumelhart, 1976; Mandler and Johnson, 1977). The discrepancy between the two structures for the same story may contain part of the explanation for information distortion which occurs in the inferential recall of information. Mandler and Johnson (1977) believe that recall "comes to approximate the idealized [story structure] more than the actual form of the input (p. 112)." They feel that this shift to the ideal may occur because people can follow more twists and turns in incoming material and irregularities in information can

be retained briefly in short term memory. Long term memory is not quite so flexible. They feel that memory tends to simplify information and make information conform to logical structures. The story structure provides logical patterns for the information.

Mandler and Johnson's (1977) analysis of their study showed strong support for the idea that well structured stories result in well structured recall. They found that fewer distortions occur in the recall of stories that have strong structures. Their analysis also revealed that information distortion occurs in certain types of situations. The first type of situation occurs when an important part of the story structure is weak or missing. For example, if the protagonist's reaction to an action is missing, subjects tend to fill in (infer) the missing or unclear information. Another distortion occurs when a subject reverses the order of events in the story. This occurs when two similar nodes occur in the same story, e.g., two action sections. The final type of distortion that occurs is the addition of information. This happens when the subjects elaborate upon something in the story. This type of distortion usually involves using more adjectives or adverbs as a subject describes a story. These findings were further verified by Mandler (1978) and Stein and Glenn (1979).

Even though story structure is used in both encoding and decoding a story, the rules may not be the same in both incidences. This difference in the rules for the two story structures

has led researchers to conclude that neither the amount encoded, nor the level of processing at which the information is received can predict recall (Craik and Lockhart, 1972; Mandler and Johnson, 1977). Mandler and Johnson feel that recall is partially a function of the goodness of the story structure itself, but they agree with Bartlett's (1932) assertion that information is continuously being rearranged as new information is forthcoming. Spiro (1977) found that incoming information does seem to influence the stored knowledge. He also found that incoming information is selectively remembered and affected by selective perception and context. He felt that the content includes pre-existing information (or prior linguistic context) and the actual context of the situation.

The discussion of story structure indicates that the more highly a story is structured, the more accurately the story is recalled. However, the story structure does not remain static from input to recall. Evidence shows that some changes occur during the storage of the story in memory. In order to discover why and how these changes occur, notions of how information is stored in and retrieved from memory will not be examined.

Schematic Processing

The previous section discussed the structure of a story as it is used during the encoding process. The question that now arises is how the story structure interacts with the schematic processing system as an individual stores and recalls the information. Some theories of memory postulate that information is

stored in an orderly structured fashion somewhat similar to the story structure discussed in the previous section. Information that is related is stored together in a logical order. One such group of theories addresses the use of schema in memory.

Thorndyke and Hayes-Roth (1979) surveyed the various memory models which utilize the notion of schema and found that four elements are essential to any notion of schema:

1. A schema represents prototypical abstraction of the complex concepts it represents.

2. Schemata are induced from past experience with numerous examplars of the complex concept it represents.

3. A schema can guide the organization of incoming information into clusters of knowledge that are "instantiations" of the schema.

4. When one of the constituent concepts of a schema is missing in the input, its features can be inferred from "default values" in the schema.

In general, Thorndyke and Hayes-Roth feel that a schema is an abstraction of a set of concepts and relationships that explicitly occur in a number of unique contexts. This abstraction of concepts and relationships provides a pattern for the individual to use in encoding and decoding information. Note that this group of elements provides a pattern for the individual to use in encoding and decoding information so that the mind can more easily process it. The definition of schema can thus be summarized as <u>data structures for representing generic concepts which are stored in memory as well as those structures used to put the story together for transmission</u> (Rumelhart and Ortony,

1977). Keeping this definition in mind, Rumelhart and Ortony (1977) found four characteristics of schema which qualify it as a means of representing knowledge in memory. The first characteristic is that schema has variables. Secondly, schemata can embed one within the other. Thirdly, schemata represent generic concepts which vary in their levels of abstraction. The fourth characteristic is that schemata represent knowledge areas and definitions. These four aspects seem to rationalize a schema's ability to cope with encoding and decoding information. This is especially relevant in light of postulations about how information is processed in memory.

One example of such a notion about memory was postulated by Bobrow and Norman (1975). They theorized that the human mind is guided by a central, limited processor which utilizes schemata. They felt that three reasons justified this reasoning:

1. The central processor gives the system coherence. "Without purpose, the system will fail to pursue a line of inquiry in any directed fashion." (p. 146)

2. The central processor controls the number of purposes thus minimizing confusion. In other words there must be some type of "central motivational process" which can select among different purposes.

3. Some mechanism with access to all memory schemata must guide the interpretive process. This type is needed to know when a schema is filled out and to judge the goodness of fit between information and schema.

Bobrow and Norman felt that information was processed by using this central limited processor. They felt that the central processor is needed so that the system could respond to the environment in a rational, coherent manner. Based on information available on how the human being functions, they felt that the central processor allocates the resources among the various functions of the system. However, the system is limited. First, the system is data-limited. This limitation occurs when quality of input confuses the mapping process. Due to such confusion there may be some difficulty in mapping input into the memory structure. Secondly, the system is resource-limited. This limitation occurs when the mapping procedure is obstructed by lack of appropriate memory structures. When this limitation exists the demands may exceed the system's ability to cope.

Because the system is limited, it utilizes techniques which allow it to process information in the most efficient manner. The use of schemata is one such technique. Bobrow and Norman (1975) felt that their central processor utilized schemata in at least two situations. First, schemata are used when the system attempts to reduce any ambiguity or fill holes in an existing information category. In other words, schemata provide the guidelines for the system's search for the information needed to complete a category so it can achieve closure. The system also utilizes schemata when it tries to associate new information with existing information categories. In this

capacity, the schemata help the reader to be sensitive to novel information or help confirm or dispute hypothesis (Rumelhart, 1976).

The notion of a schematic processing system (a memory system using schemata) can easily be applied to the processing of linguistic information. Aaronson and Scarborough (1977) felt that an underlying structure exists into which incoming information is integrated. They felt that since evidence indicated that chunking occurs in the recall of sentences, individuals must be identifying, organizing, and integrating linquistic information. Their model suggests "that there is a level of linguistic processing at which words must be integrated into a larger context across phrase units (p. 301)." Schemata can provide the larger context.

Interaction of Story Structure and the Schematic Processing System

The schematic processing system is not static and changes so that new and old information can be integrated during information processing. Because the system does change to accommodate new information, or fit the new and old information together, inferences often become part of the information that is recalled.

When a story is presented to the schematic processing system, it has a structure of its own. If the structure is strong enough, the system integrates the story structure into the mind's system. If however, the story structure is weak or

has missing or incongruent parts, the mind probably changes the story as it is complete or fits into an existing set of ideas or the schema. The distortion of the story results not only from the changes in the schema, but also because of the weaknesses in the original story structure. The difference between information at input and at recall has led some researchers to conclude that the original story structure can not predict the structure of the recalled version of the story.

The fundamental assumption of the schema theorist approach to language comprehension is that neither a spoken nor written text carries the meaning itself -- the text only provides directions to the receivers as to how they should retrieve or construct the intended meaning from each individual's own previous knowledge (Adams and Collins, 1979). The words in a message and their organization help an individual remember past associations and inter-relationships. From this information, the individual infers the meaning of the text. The derivation of meaning from the text comes from two component processes: the application of prior knowledge and the making of inferences (Bartlett, 1936; Warren, Nicholas, and Trabasso, 1979). All of this occurs during schematic processing.

Summary, Research Questions and Hypotheses

The discussions of inferences, story structure, and schematic processing indicate that information distortion in the form of inferences can occur in several ways. The ideas in a group of related sentences are often combined by a reader

and the underlying relationship is inferred. The individual seems to use that underlying relationship to aid recall and to make inferences. The inferences seem to occur when the structure of a story is either missing information or contains incongruent information. In these situations information seems to be either added or deleted from the original story.

The section on inferences and story structure indicated that the message itself partially influences the production of inferences. To arrive at this finding experimenters manipulated the presence or absence of structure and strong and weak structures. They also tested the result of explicitly stating information and only implying information. None of the research seems to really focus on the inter-relationships of the parts of the story. That is, no one has manipulated the story from within. If this type of study was done, research might discover how story structure can cause different types of inferences.

At this point research should address the notion that manipulating story structure can affect the inferences that are produced during recall. If a story structure does interact with a story schemata, manipulations of story structure should produce corresponding differences in recall. If research can produce a better way of studying that interaction, it should be able to address the question of the effect of story structure on inference making.

Before the question can be addressed, story structure needs to be broken down into some workable elements which could correspond to a story schemata. By examining the structure of recalled stories and comparing stories which are remembered with those that are not remembered clearly, researchers have been able to determine what elements are most important in story structure (Freedle and Hale, 1979; Stein and Glenn, 1979; and Mandler and Johnson, 1977). These elements are a setting, a goal, a beginning, a simple reaction, an attempt, an outcome, and an ending. Paris and Upton(1971) found that several of these categories could effectively be collapsed into two general categories, cause and consequence. The cause category included any goals and attempts in a story. Reactions, outcomes, and endings were put into the consequence category. Mandler and Johnson (1977) also found the elements could be collapsed into general categories. Their categories were setting and event. They placed any information other than background information (setting) into the event category; included in the event were causes, the actual action in the story, and any outcomes and reactions.

As long as the above categories of information or nodes were present in a story, the story was easily recalled. However, stories that could not be parsed into some version, either general or specific, of these categories were not remembered very well (Bartlett, 1932 and Mandler, 1978). This suggests that overall story structure has a strong influence on whether information is remembered.

Although most research to date has addressed the overall effect of the presence of story structure on recall, some has focused a bit on the manipulation of story structure. This research however, has addressed the filling in of missing data as the schematic processing system seeks closure by filling missing portions of the schema. Research, to date, has not addressed the question of how the manipulation of one part of story structure influences the recall of the rest of the story.

Still another question which arises is whether one part of a story (a node) is more important than other parts of the story structure in cuing the accurate recall of a story. If so, the manipulation of that node should effect the inferences made in recall. Mandler and Johnson (1977) found that their subjects did have more difficulty recalling endings and reactions (consequences) in stories than the other nodes. This finding suggests that the consequence node is not as important to recall as some other story nodes.

Another issue which needs to be addressed is what happens when all the story nodes are present but are not congruent with each other. Research done by Taylor and Crocker (1980) shows that when individuals perceive someone and hear something about the individual which is inconsistent with their perceptions, the perceivers tend to either forget the incongruent information or revise the incongruent information so that all the information recalled is congruent. This same type of phenomenon could also occur during the perception of other forms of information such as stories.

Three questions, then, develop from the discussion of whether story structure can be manipulated to produce inferences.

(A) Will the deletion of a story node cause inferences about the rest of the story as well as the missing node? The research discussed in this chapter has established the importance of good story structure for the accurate recall of a story. If the structure of a story is manipulated so that one node is missing, subjects will probably do one of two things when they recall the story. They might simply fill in, or infer, the missing information and accurately remember the rest of the story, or subjects might make inferences in several story nodes as they try to fill in the missing link in the story structure. In either case the inference(s) would occur as the subjects attempt to fit the story into their own "larger story schema." During the process of recalling the story, the production of one inferred story node might cause subjects to make inferences in other parts of the story as they attempt to make that story fit the "larger schema."

(B) Will the manipulation of one node create more inferences than the manipulation of other nodes in the same story? Although most of the research about story structure has been concerned with the effect of the presence or absence of a story structure, some research has suggested that the cause node is the most important node and the consequence node is the second in importance. If these two nodes are the cornerstones of

story structure which cue memory, it seems that the manipulation of these two nodes, particularly the cause node, could cause subjects to make other story nodes fit the manipulated cause or consequence node.

(C) Will an incongruency in the story cause inferences? According to the sources discussed in this chapter, all of the parts of a good story structure fit logically together. When story structure is a little disjointed, the story is difficult to remember. Person perception research indicates that when one aspect of another is incongruent with everything else a perceiver knows about that individual, the perceiver tends to forget the incongruent information. Likewise, if one element of a story does not fit logically with the rest of the story (it is incongruent) a receiver could very possibly forget the incongruent story node and make an inference which would fit logically with the rest of the story.

H_1: More inferences will be produced in the recall of a story missing the cause node than in the recall of an unaltered story.

H_{1a}: More cause nodes will be inferred when the cause node is deleted than when it is presented.

H_{1b}: The deletion of the cause node will produce more inferences in the recall of all story nodes than the recall of an unaltered story.

H_2: More inferences will be produced in the recall of a story missing the consequence node than in the recall of an unaltered story.

H_{2a}: More consequence nodes will be inferred when the node is deleted than when it is present.

H_{2b}: The deletion of the consequence node will produce more inferences in the recall of all story nodes than the recall of an unaltered story.

H_3: More inferences will be produced when the cause node is deleted than when the consequence node is deleted.

H_4: More inferences will be produced in the recall of a story when one node is incongruent than when all story nodes are congruent.

H_5: There will be no significant difference in confidence scores when subjects recall either inferences or information presented in the message.

H_{5a}: There will be no significant difference in confidence scores when subjects infer the cause node or recall a cause node presented in the message.

H_{5b}: There will be no significant difference in confidence scores when subjects infer the consequence node or recall a consequence node presented in the message.

H_{5c}: There will be no significant difference in confidence scores when subjects infer a congruent conclusion or recall a congruent conclusion presented in the message.

CHAPTER II

METHODOLOGY

Subjects

The testing of the hypotheses presented in Chapter I was accomplished by using 152 subjects from eight sections of Communication 1113 at the University of Oklahoma. Since the Communication 1113 course is open to students from all majors at the university the subjects are assumed to be representative of the general student population.

Design

The research design used in this study contained one independent variable and three dependent variables cast into a one-way, four group comparison. Story structure, the independent variable, was manipulated to create four conditions: unaltered story structure (UA), cause deleted story structure (CA), consequence deleted story structure (CQ), and incongruent story structure (IC). The dependent variables were the recall of the cause, the recall of the consequence, and the recall of the incongruency.

Stimulus Material

The discussion in Chapter I established the presence of certain story nodes in an individual's story schema. The four

most basic nodes established in the previous discussion were background, cause, event, and consequence. Therefore, these four nodes were used to parse the three communication case studies which were used as stimulus material in this experiment. (All stimulus stories can be seen in Appendix A.)

The parsing of the stimulus material into the four nodes made the manipulation of different parts of the story structure possible. This type of manipulation was essential for testing the research questions and the hypotheses presented in the previous chapter.

To be certain that the parsing of the stimulus material was compatible with the expectations of an individual's story schema, several stages were involved in the parsing of the case studies. After the experimenter had written the stories to fit the fourth node structure, the stories were submitted to a panel of raters to validate the parsing. All of the raters involved in the validating procedure were graduate students in either Business or Communication. None of the judges were familiar with the experimenter's research so her expectations did not bias the way the raters judged the parsing of the stories.

During the judging process, each rater received a packet which contained the definitions of the nodes as well as a copy of all three case studies. The background was defined as information providing the setting of the story. The cause was defined as the reason the action occurs and the event was the main action occurring in the story line. The fourth node,

consequence, was defined as the result of the event. After they had read the definitions, the raters were asked to read each story and parse each of them into the four nodes. The criterion for acceptance, which had been previously set, was that at least 4 of 5 judges must agree.

The criterion was met the first time by two of the three stories. Both the "Big Bite" and "Communicate or Perish" were easily parsed into the designated categories by the required 4 of 5 judges. The third story, "Nick's Crisis," had to be revised and the parsing revalidated by a new group of 5 judges who were also graduate students in either Business or Communication. The four story nodes were accurately identified by 4 of the 5 judges who read the revised version.

A separate validation procedure was used to validate the incongruent version of the stories which were used to test the third hypothesis. The validators used in this phase of the study were more graduate students in Communication or Business. Two criteria had to be met before a judge was chosen. First, the judge could not have participated in the parsing of the stories. This criterion prevented the possibility of someone being familiar with the congruent version of the story. The second criterion was that, once again, the validators could not be familiar with the researcher's study so her expectations would not bias their judgement. Three judges who met the criteria were chosen for this phase.

The judges were presented a packet which contained the definition of an incongruency and a copy of the incongruent version of the three stories. Incongruency was defined for the raters as the part(s) of the story that does (do) not fit together logically. The raters were asked to read each story and indicate if any portion of the story fit the definition of incongruency. The criterion for acceptance was set at 2 of 3 judges being in agreement. This criterion was exceeded in the validation of the incongruent version of the "Big Bite" and "Communicate or Perish." Once again, "Nick's Crisis" failed to be validated. The incongruent consequence node was revised and submitted to a new set of three judges. The revised version was validated when two of the three judges agreed that the node was incongruent with the rest of the story.

Dependent Measure

The dependent measure used in this study was a multiple-choice questionnaire which was structured so that at least one question addressed each story node which was manipulated, as well as one of the other nodes, either the background or the event. (See Appendix B.) Four categories of questions were used on the questionnaire for each study: cause, consequence, congruity, and the filler. All four types of questions were presented for each story. The cause question addressed the cause node of the story; the consequence, the consequence node; and the congruity question, the portion of the story that was

incongruent in the IC condition. The filler question was directed toward either the background or the event node of the stories. Following each question was a confidence scale. The scale ranged from 1 (little confidence) to 5 (very confident). The subjects were asked to indicate the degree of confidence they felt about their responses to each question in the questionnaire.

Each question had four possible responses. The responses included three content related choices plus a fourth choice, "(d) the story doesn't say." Each question had only one correct response. The correct answer, of course, depended on which group the respondent was in. In the CA and CQ conditions, the fourth choice or "(d)" was the correct response to the questions about the cause and consequence nodes respectively. In all other cases, the choice of "(d)" was considered as an indication that the subject could not remember the information. In these situations, "(d)" was not considered as either correct or incorrect. All incorrect responses were considered to be inferences.

A pretest was conducted to check the quality of the questions. During the pretest, the experimenter read the unaltered version of the case studies to 120 students enrolled in 4 sections of Business Communication 3113. The order of presentation of the stories was randomized in each class to control for order effects. An item analysis confirmed the effectiveness of the questions over two of the case studies, "The Big Bite" and

"Communicate or Perish." The percentage of correct responses ranged from 64% to 92%. (A 60% criterion had been previously determined for acceptability). Unfortunately, the questions over the third story, "Nick's Crisis," did not fare as well. Only one question was judged acceptable at 67%. Therefore, the questions over this story were revised and tested again using another section of 3113. This time the percentage of correct responses to all four questions were all over the 60% mark.

Procedure

All stimulus material used in this study was recorded on video tape. The same presenter, a professional radio and television announcer, recorded all the messages. The use of video tapes insured that no variances existed in the manner in which the material was presented across the classes. That is, the two classes who composed a group heard exactly the same material, thus eliminating any variance caused by possible differences in presentation. The use of the same source on all of the tapes also controlled any variance which might have been caused by the source. For example, any difference in response to the perceived credibility or appearance of different sources was minimized by using only one source.

Each of the Communication 1113 sections was assigned to one of four experimental groups. Each group was comprised of two classes occurring at different times of day. Two time periods were used to minimize any variance caused by Type G error

or errors caused by extraneous variation between groups. Each group heard one set of stimulus material. That is, the first group (CA) heard stories from which the cause node had been deleted. The consequence node was deleted from the set of stories presented to the second group (CQ). The third group (IC) heard stories which contained an incongruous consequence node. The fourth group (UA) heard stories which had not been altered.

The study was done over two class periods. The classes ranged in size from 14 to 23 students. A student had to be present during both class periods in order to qualify as a subject. On the first day the experimenter went into class and told the students that she wanted them to watch and listen to some communication case studies on the TV monitor in the room. The students were told that the experimenter could not discuss the case studies that day, but would return the next class period to ask some questions and discuss the cases with them. The experimenter returned the next class meeting and distributed the test packet which included four questions over each case study. The same questionnaire was administered to all classes. The subjects were told that answering the questions was voluntary. Only nine students chose not to cooperate. The subjects that chose not to participate were randomly scattered throughout the eight classes.

Statistical Analysis

The data gathered in this study were coded into inference scores and recall scores. Inference scores were the number of inferential responses, or incorrect answers, each subject made summed across all three stories. These scores were computed for the cause, the consequence, and the congruency questions. Each subject could have an inference score ranging from 0 to 3 for each of the dependent variables. Likewise, the recall scores were the number of correct responses each subject made summed across all three stories. These scores were also computed for each of the three questions and each subject's recall score could range from 0 to 3.

After the data were coded into the two categories, both sets of scores were submitted to a series of Hotelling's T Squares (Winer, 1979). The Hotelling's statistic is a multivariate analog of the Student's *t*-test. The statistic provides a test of the differences between two means. The UA group's inference and recall scores served as a baseline against which the other groups' scores were compared. If the Hotelling's statistic produced a significant F value (an alpha level of .05 or better), Student's *t*-tests were performed to determine where the differences existed.

The confidence scores were also submitted to the Hotelling's T Square statistic. Once again, if a significant F value was produced, Student's *t*-tests were performed to explore the differences between the groups.

CHAPTER III

RESULTS

The results of the data analysis discussed in the previous chapter are presented in this chapter. However, prior to conducting the statistical analysis, a determination had to be made concerning whether the data could be treated as interval level data. The data were first coded as correct (1) or incorrect (0) for all questions of all three stories across all 4 conditions. At that point the data were only dichotomous. If, however, the data could be collapsed across all three stories, the data could be treated as interval level with a range of 0 to 3 for the recall score (correct responses) and 0 to 3 for the inference scores (incorrect responses excluding "(d) story doesn't say") for each dependent measure.

In order to determine if the data from all three stories could be combined, an item analysis was performed on the questionnaire. The recall scores, number of correct responses, were computed for the UA group. The mean percentage of correct responses are shown in Table 1. These figures indicate several things about the instrument as well as the data. First, the questionnaire showed an acceptable degree of difficulty. The percentage of correct responses ranged from 64% to 74%. If the

questions had been too difficult the scores would have been much lower. Conversely, if the items had been too easy, the scores would have been much higher. The small range between the scores showed that the performance was comparable across all three stories and the data could therefore be collapsed together and treated as interval level data.

Table 1

Correct Responses

Story	Nick	C or P	Bite
Mean Recall (%)	69	64	74
Standard Deviation (%)	11.4	11.8	5.1

The data used in the above analysis, as well as the statistical analysis discussed in the rest of this chapter, used only the responses to the cause, the consequence, and the congruent questions. The filler questions were not used in the data analysis since they did not address any manipulated portion of the stories nor did they address any one specific node as did the other three questions.

General Findings

The results of the experiment may be seen in Tables 2, 3, and 4 which show the mean inference scores, the mean recall scores, and the mean confidence scores, respectively. The data presented for the UA group in all three tables was used as a baseline against which all other groups were compared during the data analysis. A brief overview of the means shows that the cause, the consequence and the congruency manipulations all affected the number of inferences made as well as the accuracy of the recall of the story nodes. As Table 2 shows, the CA group made an average of 2.48 inferences while the UA group made an average of only 0.73 inferences on the cause question. Likewise, the CQ group averaged 1.69 inferences and the UA group only 0.67 on the consequence question. The IC group also made more inferences than the UA group by averaging 1.33 inferences in response to the congruency question compared to 0.73 average inferences for the UA group. As the following discussion of the hypothesized findings show, these differences all produced alpha levels which met or exceeded the .05 acceptability criterion, thus supporting the first three hypotheses.

Unfortunately, the mean confidence scores, shown in Table 4, also varied across the groups instead of remaining consistent as had been hypothesized. The UA group expressed an average confidence score of 10.94 compared to the 9.76 average reported by the CA group about their responses to the cause

Table 2

Inference Scores: Group Means

(DV=inference of cause, consequence, and congruity)

	Story Structure Condition			
	UA	CA	CQ	IC
Cause	.73	2.48	.67	.60
Consequence	.67	.58	1.69	1.33
Congruent	.47	.85	1.07	.79

UA = Unaltered

CA = Cause deleted

CQ = Consequence deleted

IC = Incongruent

Table 3

Recall Scores: Group Means

(DV=recall of cause, consequence, and incongruity)

	Story Structure Condition			
	UA	CA	CQ	UC
Cause	1.97	.52	1.83	2.02
Consequence	2.03	2.18	1.26	.95
Congruent	2.09	1.79	1.93	1.86

UA = Unaltered

CA = Cause deleted

CQ = Consequence deleted

IC = Incongruent

Table 4

Confidence Scores: Group Means

	Story Structure Condition			
	UA	CA	CQ	IC
Cause	10.94	9.76	10.26	10.72
Consequence	10.24	10.03	8.48	8.63
Congruent	9.79	9.61	8.38	10.58

UA = Unaltered

CA = Cause deleted

CQ = Consequence deleted

IC = Incongruent

question. The CQ group, likewise, reported a confidence score of 8.48 which was lower than the mean score of 10.24 reported by the UA group about their responses to the consequence question. The IC group also seemed less confident in their responses to the consequence question, averaging a confidence score of 8.38 compared to the score of 9.79 for the UA group. However, the IC group reported a slightly higher confidence score for the congruency question than did the UA group, 10.58 compared to 9.79. Although the scores did not remain consistent across all four conditions, all of the differences were not statistically significant. The ones that were and were not will be discussed further in this chapter. An examination of the data by hypothesis will more clearly show which hypotheses were supported and which were not.

Hypothesized Findings

The discussion in Chapter 1 suggested five hypotheses for testing. A summary of the data analysis for each hypothesis is presented on Table 8 at the end of this chapter. The first hypothesis speculated that more inferences would be produced in recall when the cause node was deleted than when it was present. The hypothesis was further broken down to speculate that the inferences would occur in the recall of the cause node (H_{1a}) as well as in all other nodes (H_{1b}). A Hotelling's T Square (Winer, 1979) showed that the CA group did make more overall inferences than did the UA group ($F=38.69$; $p<.0004$).

In order to find if the difference was caused by the experimental manipulation, a series of Student's t-tests were performed on each dependent variable (see Table 5). Significant t values were produced when the inference scores for the cause and the congruency questions each were compared. The CA group made significantly more cause ($t=10.29$; $p<.04$) and congruency ($t=2.02$; $p<.047$) inferences than did the UA group, thus supporting the first hypothesis. The analysis of the recall scores also supported the above results.

The Hotelling's T Square was also performed on the recall scores for the UA and CA groups (see Table 6). If the forgetting option did not significantly distort the data, the results should be the inverse of the testing of the inference scores. The results showed that the UA group did indeed make a higher recall score than did the CA group ($F=29.48$; $p<.0004$). That is, the UA group more accurately recalled the information. This finding further supports the first hypothesis that the deletion of the cause node will produce inferences in recall.

The second hypothesis postulated that the deletion of the consequence node would produce inferences in recall. This hypothesis was also subdivided into two parts. The two parts speculated that the inferences would occur in the recall of the consequence node (H_{2a}) as well as all other nodes (H_{2b}). Hotelling's T Squares were performed on both the mean recall and the mean inference scores (see Tables 5 and 6) for the UA and CQ groups. A significant F value was produced by both

Table 5

Hotelling's T Tests on Inference Scores

Groups	Variables	Test	Test Value	d.f.	P Value
Cause deleted vs Unaltered	All	Hotelling's T	F=38.69	3,61	.0004
	Consequ.	t	t= -.53	64	NS
	Cause	t	t=10.29	64	.04
	Congruent	t	t= 2.02	64	.047
Consequence deleted vs Unaltered	All	Hotelling's T	F= 8.21	3,70	.0004
	Consequ.	t	t= 4.62	73	.0004
	Cause	t	t= -.32	73	NS
	Congruent	t	t= 2.89	72	.005
Incongruent vs Unaltered	All	Hotelling's T	F= 6.29	3,71	.001
	Consequ.	t	t= 3.37	74	.001
	Cause	t	t= -.73	74	NS
	Congruent	t	t= 1.99	73	.05
Cause deleted vs Consequence deleted	All	Hotelling's T	F=52.45	3,71	.0004
	Consequ.	t	t=-5.32	73	.0004
	Cause	t	t= 9.48	73	.0004
	Congruent	t	t=-1.02	73	NS

Table 6

Hotelling's T Square on Recall Scores

Groups	Variables	Test	Test Value	d.f.	P Value
Cause deleted vs Unaltered	All	Hotelling's T	F=29.48	3,63	.0004
	Consequ.	t	t= .84	65	NS
	Cause	t	t=-7.67	65	.004
	Congruent	t	t=-1.45	65	NS
Consequence deleted vs Unaltered	All	Hotelling's T	F= 4.40	3,72	.007
	Consequ.	t	t=-3.39	74	.001
	Cause	t	t= -.70	74	NS
	Congruent	t	t= -.74	74	NS
Incongruent vs Unaltered	All	Hotelling's T	F=12.53	3,73	.0004
	Consequ.	t	t=-5.93	75	.0004
	Cause	t	t= .27	75	NS
	Congruent	t	t=-1.19	75	NS
Cause deleted vs Consequence deleted	All	Hotelling's T	F=29.66	3,71	.0004
	Consequ.	t	t= 4.47	73	.0004
	Cause	t	t=-7.13	73	.0004
	Congruent	t	t= -.63	73	NS

Hotelling's statistics, thereby showing significant differences in both the number of inferences as well as the number of correct responses made by the two groups. The CQ group made significantly more inferences than did the UA group ($F=8.21$; $p<.0004$). Conversely, the UA group more accurately recalled the stories than did the CQ group ($F=4.40$; $p<.007$). The results therefore, support the notion that the deletion of the consequence node will produce inferences in recall.

The *t*-tests on the individual dependent variables showed that the CQ group made more inferences in response to the consequence ($t=4.62$; $p<.0004$) and the congruency ($t=2.89$; $p<.005$) questions. The *t*-tests run on the recall scores revealed that the UA group made a higher recall score on the consequence question ($t=-3.39$; $p<.001$). However, the *t*-tests revealed no significant statistical difference on the recall scores to the congruency question thus suggesting that the subjects used the "(d)" option. The choice of "(d) the story doesn't say" indicated that the subject had forgotten the answer. According to the hypothesis, the CA group would make more inferences in recall than the CQ group. A Hotelling's T Square (see Table 5) computed between the mean inference scores of the two groups produced an F value of 52.45 which was significant at the .0004 level ($df=3.71$). The *t*-tests showed that the difference was caused by the greater number of cause inferences made by the CA group ($t=9.48$; $p<.0004$). The results, then, support the

notion that the effect of cause deletion on inference making in recall is stronger than the effect of consequence deletion.

The Hotelling's T statistic run on the mean recall scores of the CA and CQ groups also produced a significant F value ($F=29.67$; $p<.0004$). The *t*-tests revealed that the CQ group more accurately recalled the cause node ($t=7.43$; $p<.0004$). These results suggest that the choice of the forgetting option did not affect the data.

The inference scores of the IC and UA groups were compared in testing the fourth hypothesis. A Hotelling's T Square (see Table 5) between the mean inference scores of the two groups produced an F value of 6.29 ($p<.001$). Therefore, the results indicated that the presence of an incongruity produced more inferences than when no incongruity was present. The *t*-tests revealed that the differences occurred in the responses to the consequence ($t=3.37$; $p<.001$) and the congruency ($t=1.99$; $p<.05$) questions. Once again, the statistics performed on the mean recall scores revealed no forgetting effect. The Hotelling's T produced a significant F value of 12.53 ($p<.0004$). The *t*-tests revealed that the UA group more accurately recalled the consequence node ($t=-5.93$; $p<.0004$). Therefore, the results indicate that the presence of an incongruity produced more inferences than when no incongruity was present as hypothesized.

The final hypothesis speculated that inferences would be made with equal confidence as the recall of any other

information. Because this hypothesis is stated in the null form certain concerns must be addressed. These concerns are different than the ones governing the testing of a regular statistical hypothesis. Situations, like the present one, in which the rationale supports the null and the statistics are set up to reject the null are controversial. However, certain guidelines have been established which allow one to cope with testing the null in a fairer way. These guidelines were established by Fisher (1949), Neyman and Pearson (1928) and Binder (1963).

According to the guidelines discussed by Binder (1963), a researcher can, after considering the N size and the power of the statistic, set a more conservative (more conservative in testing the null) alpha level. The conservative alpha level increases the likelihood of rejecting the null, thus places more stringent limitations on "accepting" the null. Following Binder's guidelines, the alpha for testing H_5, was set at .20. The actual difference between means that were significant at the .05 alpha are not especially large in terms of actual value. The .20 alpha quadruples the alpha level, thus reducing the possibility of falsely "accepting" the null hypothesis. The .20 alpha will, therefore, make it more difficult to support the hypothesis.

To test the fifth hypothesis, three Hotelling's T Squares were run to compare the confidence scores (see Table 7) of the different groups. The first Hotelling's statistic compared the

Table 7

Hotelling's T Square on Confidence Scores

Groups	Variables	Test	Test Value	d.f.	P Value
Cause deleted vs Unaltered	All	Hotelling's T	F= 2.82	3,63	0.046*
	Consequ.	t	t= -.26	65	0.793
	Cause	t	t=-1.61	65	0.112*
	Congruent	t	t= -.26	65	0.795
Consequence deleted vs Unaltered	All	Hotelling's T	F= 2.77	3,72	0.048*
	Consequ.	t	t=-2.48	74	0.015*
	Cause	t	t= -.97	74	0.335
	Congruent	t	t=-2.02	74	0.047*
Incongruent vs Unaltered	All	Hotelling's T	F= 7.19	3,73	0.0004*
	Consequ.	t	t=-2.46	75	0.016*
	Cause	t	t= -.35	75	0.728
	Congruent	t	t= 1.18	75	0.241
Cause deleted vs Consequence deleted	All	Hotelling's T	F= 6.51	3,71	0.0001*
	Consequ.	t	t= 2.50	73	0.015*
	Cause	t	t- -.76	73	0.45
	Congruent	t	t= 2.01	73	0.048*

*Significant

confidence scores of the CA and the UA groups. The F value of this statistic was significant at the .045 level. The t-tests revealed that the significance was most likely caused by the confidence scores on the cause question ($t=-1.61$; $p<.112$). This finding, then, casts doubt on the hypothesized notion that the CA group would be just as confident as the UA group. According to the test results, the CA group was less confident in their cause answers than were the UA group.

The Hotelling's T comparing the CQ and UA groups also produced a significant F value ($F=2.77$; $p<.048$). Once again, the t-tests also produced significant results between the two groups on their confidence scores on the consequence ($t=-2.46$; $p<.015$) and the congruent variables ($t=-2.02$; $p<.047$). These results were contrary to those predicted by the hypothesis. The CQ group expressed significantly less confidence in their answers than did the UA group.

The third Hotelling's statistic compared the IC and UA groups. Once again the F value was significant ($p<.0004$). The t-tests revealed that the differences between the two groups were caused by differences in confidence expressed over the responses to the consequence ($t=-2.46$; $p<.016$) question only. No significant difference existed in the confidence expressed on the answers to the congruency question which addressed the experimental. This result, then, lends support to the hypothesis.

Summary

A brief overview of the results presented in this chapter show that the first four hypotheses were supported. As suggested by H_1 more inferences were produced when the cause node was deleted than when it was present in a story. More inferences were also produced when the consequence node was deleted as stated in the second hypothesis. However, the effect of the cause deletion appeared to be stronger than the effect of consequence deletion on the production of inferences in recall as suggested by H_3. Another story structure manipulation which produced inferences in recall was the presence of an incongruity in a story. This finding supported the fourth hypothesis.

Results from the fifth hypothesis found a few significant differences in the confidence scores between the groups. More specifically, the CQ and CA groups expressed significantly less confidence in their consequence and cause responses, respectively, than did the UA group. These results along with the other findings of this study will be discussed in the following chapter.

Table 8

Results of Hypothesis Testing

Groups	Hypo	Variables	Type Test	Test Value	d.f.	P Value
Cause deleted vs Unaltered	1	All Inf.	Hotelling's T	F=38.69	3,63	.0004
	1_a	RCA	t	t=-7.67	65	.0004
		ICA	t	t=10.29	64	.04
	1_b	All Inf.	Hotelling's T	F=38.69	3,61	.0004
Consequence deleted vs Unaltered	2	All Inf.	Hotelling's T	F= 8.21	3,72	.0004
	2_a	RCQ	t	t=-3.39	74	.001
		ICQ	t	t= 4.62	73	.0004
	2_b	All Inf.	Hotelling's T	F= 8.21	3,70	.0004
Cause deleted vs Consequence deleted	3	All Inf.	Hotelling's T	F=52.45	3,71	.0004
Incongruent vs Unaltered	4	All Inf.	Hotelling's T	F=-6.29	3,71	.001
All	5					
Cause deleted vs Unaltered	5_a	All Inf.	Hotelling's T	F= 2.81	3,63	.045
		CCA	t	t=-1.61	65	.112
Consequence deleted vs Unaltered	5_b	All Inf.	Hotelling's T	F= 2.81	3,72	.048
		CCQ	t	t=02.48	74	.015
Incongruent vs Unaltered	5_c	All Inf.	Hotelling's T	F=10.77	3,72	.0004
		CIC	t	t= 1.88	75	NS

RCA = recall of cause
ICA = inference of cause
RCQ = recall of consequence
ICQ = inference of consequence
CCA = confidence for cause
CCQ = confidence for consequence
CIC = confidence for congruency

CHAPTER IV

DISCUSSION

This study has centered around the rationale presented in the first chapter. That rationale resulted in the proposal of five hypotheses which were tested by the methodology presented in the second chapter. The results of the testing were then discussed in the third chapter. This fourth chapter will now interpret those results in light of the research questions and hypotheses presented in the first chapter.

The discussion will be divided into three topic areas which correspond to the type of experimental manipulations suggested by the hypotheses. These areas include a discussion of the hypothesized findings which is divided into the effect of the deletion of story nodes, the effect of an incongruent story node, and the level of confidence expressed by the subjects in the different story structure conditions. In addition to the discussion of the results, some suggestions for future research and a summary of the study are included in this chapter.

Discussion of Hypothesized Findings

Deletion of Story Node

Three hypotheses in this study addressed the effect of story node deletion. These hypotheses addressed the effect of

the deletion of the cause and consequence nodes in a story which, according to some of the sources mentioned in the first chapter, are the most important nodes in a story. The data discussed in the previous chapter suggests strong effects on the recall of stories when either the cause or consequence nodes are deleted. However, both hypotheses were subdivided to express more specific effects of node deletion.

The first hypothesis and its subdivisions were stated as:

H_1: More inferences will be produced in the recall of a story missing the cause node than in the recall of an unaltered story.

H_{1a}: More cause nodes will be inferred when the cause node is deleted than when it is present.

H_{1b}: The deletion of the cause node will produce more inferences in the recall of all story nodes than the recall of an unaltered story.

As predicted in the hypothesis, the cause deletion manipulation produced a significant overall effect on the recall of the stimulus material. The Hotelling's T Square indicated that the CA group made a significantly greater mean number of inferences in the recall of the stories than did the UA group, thus supporting the overall hypothesis. A t-test between the inference scores of the cause question for the two groups validated H_{1a} ($t=10.29$; $p<.04$). Significantly more cause nodes were inferred by the CA group than the UA group. This suggests that the CA group chose to make an inference to fill in the missing

data instead of remembering that the story did not have a cause node. In other words, the subjects' story schemata seemed to have affected the way the group recalled the stories. This finding thus supports the notion that the receivers' schemata interacted with the stories' structures to influence recall.

The second component of the hypothesis speculated that the deletion of the cause node would make subjects produce inferences in other story nodes. The t-tests did not completely support this notion. The CA group did make more inferences in response to the congruency question ($t=2.02$; $p<.047$); however, the group did not make more inferences in response to the consequence question. The results were puzzling since both questions addressed the same node. However, the possible choices available to the subjects were not identical. The correct answer to the congruency questions, on the other hand, were similar to, but did not correspond exactly to the wording in the story. The difference in the wording of the answers may have caused the difference in responses to the two questions over the same node. However, this effect did not occur in any other experimental condition. Therefore, the absence of the cause node may have influenced the subjects as they recalled the rest of the story as the hypothesis suggests.

The analysis of the first hypothesis supported the suggestion presented in the first chapter that the cause node is a very important part of an individual's story schema. When a

story does not have a cause, individuals infer the cause so that the story fits the expectations in their schema. The data analysis also supported the notion that the manipulation of the cause would affect how individuals recall the other nodes of a story. This finding suggests that a person's schema may use the cause node as the basis for establishing expectations for other story nodes. This idea, however, needs to be further explored in future research.

The second hypothesis addressed the effect of the deletion of the consequence node. The second hypothesis and its two components were stated as:

H_2: More inferences will be produced in the recall of a story missing the consequence node than in the recall of an unaltered story.

H_{2a}: More consequence nodes will be inferred when the node is deleted than when it is present.

H_{2b}: The deletion of the consequence node will produce more inferences in the recall of all story nodes than the recall of an unaltered story.

A Hotelling's T Square showed that the CQ group did make significantly more inferences than did the UA group. Individual t-tests revealed that the difference between the groups was caused by the greater number of consequence ($t=3.47$; $p<.001$) and congruency ($t=4.62$; $p<.0004$) inferences made by the CQ group. This finding then, supports H_{2a} which suggests that

subjects use their schemata to infer missing information instead of remembering that the information was actually missing.

The second component of the hypothesis speculated that the deletion of a consequence would produce more inferences in all story nodes. The only other node tapped by the questionnaire was the cause. The t-test revealed no significant difference in the number of inferences made by either group in response to the cause question. Therefore, at this time the hypothesis can not be confirmed.

The results of the testing of the first two hypotheses support the notion presented in Chapter I that an individual will infer data which is missing in a story. The findings support the notion that an individual will attempt to achieve mental closure of information by filling in any gaps in that information. The data analysis also lends credence to the idea that the receiver's expectations about a story, or the schema, will help the person make the incoming message fit the expectations established in the schema. Individuals expect a story to have a cause and a consequence, so when the parts are missing, subjects fill in the missing data with an inference. This finding implies that some interaction takes place between the message structure and schema as suggested in the rationale. The structure of the stimulus material used in this study seemed to have influenced how the receivers recalled the messages from their memory systems. That is, the interaction of

the story structure and the subjects' schemata influenced how the subjects recalled the message, either accurately or distorted.

The results of the testing did not, however, verify the idea that the deletion of one node will affect the recall of the other story nodes as speculated by the hypothesis. The lack of significance of these results may have been caused by the abbreviated nature of the instrument which did not tap the background and event nodes for analysis. The deletion of the cause node did, however, seem to effect the answers to one of the questions over the consequence node, while the deletion of the consequence did not seem to affect the recall of the cause. The difference in the effect of the two node manipulations lends support to the notion that the cause node is the most important one in a story.

Research by Paris (1965) and Mandler and Johnson (1977), discussed in the first chapter, suggested that although both the cause and consequence nodes are essential for the accurate recall of a story, the cause node is the more important of the two. The third hypothesis of this study addressed this speculation in this manner:

H_3: More inferences will be produced when the cause node is deleted than when the consequence node is deleted.

A Hotelling's T Square conformed the speculation that the CA group would produce a larger mean number of inferences than the

CQ group (see Table 7). The t-tests comparing the individual dependent variables revealed that the CQ group made more consequence inferences ($t=-5.52$; $p<.0004$) and the CA group made more cause inferences ($t=9.48$; $p<.0004$). In other words, both groups inferred the missing node instead of remembering that the information was not present in the story. However, the effect of the cause deletion seemed to be greater than the effect of the consequence deletion causing the CA group to produce more inferences than the CQ group. That is, more cause inferences were made than consequence inferences when the respective nodes were missing. Therefore, the findings support the hypothesis that the deletion of the cause will generate more inferences than the deletion of the consequence node; thus, supporting the idea that the receivers' schemata have stronger expectations for a cause node than a consequence node.

Incongruent Story Node

The second type of story structure manipulation suggested in Chapter I was the manipulation of the consequence to make it incongruent with the rest of the story. Research presented in the first chapter by Taylor and Crocker (1980) and Kintsch and Van Dijk (1979) suggested that when an incongruity exists in the incoming stimulus, the receiver will make an inference during memory in an attempt to make all of the information congruent. The fourth hypothesis addressed this effect as it relates to story structure:

H_4: More inferences will be produced in the recall of a story when one node is incongruent than when all story nodes are congruent.

The data on the mean number of inferences made by the IC and UA groups showed that the IC group did indeed make more inferences ($F=6.29$; $p<.001$) thus supporting the hypothesis. A series of *t*-tests were performed on each of the dependent variables. These statistics revealed that the IC group made more consequence inferences ($t=3.37$; $p<.001$) as well as more congruency inferences ($t=1.99$; $p<.05$). Since both questions addressed the incongruent node, the subjects were consistent in their attempt to make the stories congruent. No significant difference was found, however, in the number of cause inferences made by the two groups. In other words, subjects seemed to replace the incongruent consequence node with one which was consistent with the cause of the story as expected during the recall. The subjects did not attempt, however, to make the cause node congruent with the manipulated node. The subjects apparently used the cause node as the basis for recall and fit the remainder of the story to the cause node. Therefore, the notion that the cause node is more important to the receivers' schema is supported by this finding.

Confidence Factor

The final hypothesis suggested by the literature cited in the first chapter concerns the confidence level individuals

express in recall. All of the literature discussed in the first chapter concerning inferences suggests that people make inferences as a natural part of the recall process. According to the literature, people make inferences so naturally that they are not aware of making inferences. If this is indeed so, an individual should express the same level of confidence in an inference as in the recall of information actually presented in the stimulus message. Because the literature suggests that individuals are not aware of making inferences, the fifth hypothesis was stated in the null form:

H_5: There will be no significant difference in confidence scores when subjects recall either inferences or information presented in the message.

For the most part, the data analysis failed to support this hypothesis. Hotelling's T Squares (see Table 7) were used to compare the mean confidence scores of each group pairing suggested by the three components of the hypothesis. The first Hotelling's test produced a significant F value ($p<.045$). Furthermore, the testing of the individual variables by *t*-tests produced differences in the confidence scores of the CA and UA groups in response to the cause question. This finding suggests that the CA group may have been aware that they were making inferences as they filled in the missing cause node. Unfortunately, the same result continued as the other two parts of the hypothesis were tested.

The second analysis also produced a significant F value ($p<.0004$). This time, however, the *t*-tests revealed that the CQ group's confidence score on the consequence question was not the same as the UA group's score in their responses to the same question ($t=-2.48$; $p<.015$). This finding suggests that the CQ group was aware that they were making inferences and that they remembered the information was not actually present in the story. If this was the case, the subjects seemed to be willing to knowingly add information to a story in order to achieve closure and make a story fit their expectations.

The third component of the hypothesis was tested and once again, a significant F value was produced ($p<.0004$) when the confidence scores of the IC and UA groups were compared. The *t*-tests however, revealed that there was no difference in the confidence expressed by the two groups in their responses to the congruency question. This finding supports the notion that the IC group was not aware that they were making inferences which made the consequence node congruent with the rest of the story, thus, this portion of the hypothesis was supported. The difference in the mean confidence scores of the two groups was caused by the responses to the consequence question ($t=-2.46$; $p<.016$). This difference was probably due to the fact that the answers to the two questions over the same node were similar but not identical. The difference in the possible answers may have caused the subjects to express a lack

of confidence in their responses to the consequence question. At this point however, the data seem to support the notion that the IC group was not aware that they were making congruency inferences.

The results of this analysis also lend further support to the idea that the cause node is more cogent to the receiver's schema than the consequence node. Not only did subjects make more cause inferences when the node was missing compared with the number of inferences made when the consequence node was missing, they also expressed less discomfort in their cause inferences than subjects did their consequence inferences. This suggests that the CA group might have been more confident of their cause inferences than the CQ group was of its consequence inferences. To test this notion further, a post hoc Hotelling's T was performed on the confidence scores of the CA and CQ groups. As expected, the CA group expressed a higher level of confidence than did the CQ group ($F=10.77$; $p<.0004$).

Suggestions for Future Research

As suggested earlier in this study, future research needs to further explore how the manipulation of the cause and consequence nodes affects the recall of other story nodes. The present study suggested that the deletion of the cause node might have affected the way subjects responded to the congruency question which tapped the consequence node. No effect was evident on the recall of the cause however, when the

consequence node was deleted. Since, as the discussion in Chapter I established, the cause and consequence nodes are both essential story nodes, the manipulation of one may not influence the recall of the other. However, the manipulation of the two nodes may affect how the story nodes are recalled. To test this notion, the questionnaire used in this study must be expanded to include questions which tap the background and event nodes as well as the cause and consequence. Only when the instrument can test the recall of the other nodes can the question be truly answered.

Future research also needs to explore the effect of the incongruity of a variety of story nodes. This is especially relevant to testing the effect of an incongruent cause node, since that node seems to be so important to an individual's story schema. To test this idea, the cause node would need to be written so it would be judged as being incongruent with the rest of the story; much like the incongruent consequence nodes used in the present study. The notion that the presence of an incongruity in a story causes inferences in recall will only be truly substantiated if the effect occurs when nodes other than the consequence are incongruent.

A method of coping with free recall also needs to be developed in future research. The current methodology tends to shape recall by providing restricted choices. A pilot study conducted by the author and others attempted to test inference making in free recall (Fitch, Gorcyca, and Goss; 1979). The

study had so many methodological problems that no significant finding could be reported. Perhaps if the two methodologies could be combined, the types of inferences made in free recall could be better explored. The first step would have subjects generating free responses to questions over the stories. The responses would then be used to develop the choices provided in a multiple choice questionnaire given to another set of subjects. This type of method would help insure that the possible responses were similar to those that would be generated if the subjects could simply give any answer they wanted.

Another suggestion for future research is to add a time dimension to the study. By testing the effect of different intervals of time the question of whether inferences are more prevalent in the short run or over a long period could be addressed. The time factor should also be applied to the confidence scores to find if time will add to or diminish the amount of confidence one feels about the accuracy of recall.

Another dimension that needs to be added in future research is a mode of delivery factor. None of the research discussed in the first chapter tested the possibility that the mode in which a message is presented might influence what type of information is remembered and what is forgotten. Therefore, research needs to examine whether subjects make more inferences when they listen to a message compared to reading a message. Research should also explore the possibility that different types of inferences might occur with the use of different

delivery modes. The final suggestion for future research is to venture away from messages in story form and test the structure of expository messages to find if the structure of that type of message also influences how the information processing system stores and reconstructs that type of message. Freedle and Hale (1979) suggest that expository information has categories which are very similar to the nodes of story structure. They also feel that individuals have schemata for expository messages which contain expectations that a message will be presented in a coherent manner. Very possibly, these expectations are as strong as the schemata for story structure illustrated in this study.

Summary

The experiment conducted in this study investigated the effect of story structure on recall. According to speculations presented in the first chapter, a receiver's schemata, or expectations for the incoming information, would interact with the stimulus message and effect the way the message was recalled. To test this, certain elements that previous research had found to be part of a common schema for stories were used in the stimulus material. The

placed into four different groups. Each group heard a different story structure condition. The conditions were cause deleted, consequence deleted, incongruent, or unaltered. The group that heard the unaltered stories served as a baseline

for data analysis. All three of the remaining groups were compared with the baseline group.

The results indicated that the structure of a story does interact with the receiver's story schema and influences how the story is recalled. All three manipulations caused statistical significance at or beyond the .05 level. The study did not however, completely support the notion that inferences are made with as much confidence as any other form of recall. The findings of the study are summarized below.

1. The deletion of a cause node prodiced an inferred cause in recall.
2. The deletion of a consequence node produced an inferred consequence in recall.
3. The effect on recall of the deletion of the cause node is stronger than the effect of the deletion of the consequence node.
4. A consequence which is incongruent caused subjects to infer congruent consequences in an attempt to keep the message congruent.
5. The inferences made when a story node was incongruent were made with as much confidence as recall of congruent information, thus indicating that the subjects were not aware that they were making the story congruent by making inferences.

6. The inferences of a missing consequence node were made with less confidence than the recall of a node actually in the story, thus indicating that the subjects were aware that they were making inferences.

BIBLIOGRAPHY

Aaronson, D. and Scarborough, H. S. Performance Theories for Sentence Coding: Some Quantitative Models. Journal of Verbal Learning and Verbal Behavior, 16, 1977, 227-303.

Adams, M. J. and Collins, A. A Schema -- Theoretic View of Reading. In R. Freedle (Ed.), New Directions in Discourse Comprehension, Norwood, N. J.: Ablex, 1979.

Barclay, J. R. Comprehension and Sentence Memory. Cognitive Psychology, 4, 1973, 229-254.

Bartlett, F. C. Remembering, Cambridge, England: Cambridge University Press, 1932.

Binder, A. Further Considerations on Testing the Null Hypothesis and the Strategy and Tactics of Investigating Theoretical Models. Psychological Review, 1963, 70, 107-115.

Bobrow, D. G. and Norman, D. A. Some Principles of Memory Schemata. In D. G. Bobrow and A. Collins (Eds.), Representation and Understanding, New York: Academic Press, 1975.

Bransford, J. D.; Barclay, J. R.; and Franks, J. J. Sentence Memory: A Constructive Versus Interpretive Approach. Cognitive Psychology, 3, 1972, 193-209.

Bransford, J. D. and Franks, J. J. The Abstraction of Linguistic Ideas: A Review. Cognition, 1, 1972, 211-249.

Cairns, H. S. and Cairns, C. E. Psycholinguistics: A Cognitive View of Language. New York: Holt, Rinehart and Winston, 1976.

Collins, A. Processes in Acquiring Knowledge. In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), Schooling and the Acquisition of Knowledge. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977, 339-363.

Craik, F. I. M. and Lockhart, E. S. Levels of Processing: A Framework for Memory Research. Journal of Verbal Learning and Verbal Behavior, 11, 1972, 123-136.

Craik, F. I. M. and Tulving, E. Depth of Processing and the Retention of Words in Episodic Memory. Journal of Experimental Psychology: Gen., 104, 1975, 268-294.

Epstein, W. Recall of Word Lists Following Learning of Sentences and Anomalous and Random Strings. Journal of Verbal Learning and Verbal Behavior, 8, 1969, 20-25.

Fisher, R. A. The Design of Experiments. Edinburgh: Oliver & Boyd, 1949.

Fitch, M. E.; Gorcyca, D. A.; and Goss, L. B. A Developmental Approach to Sentence Reconstruction. Paper presented to the International Communication Association, May, 1979.

Freedle, R. and Hale, G. Acquisition of New Comprehension: Schemata for Expository Prose by Transfer of a Narrative Schema. In Freedle, R. O. (Ed.), New Directions in Discourse Processing, Norwood, N. J.: Ablex, 1979.

Graesser, A. C.: Robertson, S. P.; and Anderson, P. A. Incorporating Inferences in Narrative Representations: A Study of How and Why. Cognitive Psychology, 13, 1981, 1-26.

Gough, P. B. Grammatical Transformations and Speed of Understanding. Journal of Verbal Learning and Verbal Behavior, 5, 1965, 492-496.

Gough, P. B. The Verification of Sentences: The Effects of Delay of Evidence and Sentence Length. Journal of Verbal Learning and Verbal Behavior, 5, 1966, 492-496.

Hayes-Roth, B. and Hayes-Roth, F. The Prominence of Lexical Information in Memory Representations of Meaning. Journal of Verbal Learning and Verbal Behavior, 16, 1977, 119-136.

Johnson, M. K.; Bransford, J. D.; and Solomon, S. K. Memory for Tacit Implications of Sentences. Journal of Experimental Psychology, 98, 1973, 203-205.

Kintsch, W. The Representation of Meaning in Memory. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1974.

Kintsch, W. and Monk, D. Storage of Complex Information in Memory: Some Implications of the Speed With Which Inferences Can Be Made. Journal of Experimental Psychology, 94, 1972, 25-32.

Kintsch, W. and Van Dijk, T. A. Toward a Model of Text Comprehension and Production. Psychological Review, 85, 5 Sept., 1978, 363-394.

Mandler, J. A Code in the Node: The Use of a Story Schema in Retrieval. Discourse Process, 1, 1978, 14-35.

Mandler, J. M. and Johnson, N. S. Remembrance of Things Passed: Story Structure and Recall. Cognitive Psychology, 9, 1977, 111-151.

Marks, L. E. and Miller, G. A. The Role of Semantic and Syntactic Constraints in the Memorization of English Sentences. Journal of Verbal Learning and Verbal Behavior, 3, 1964, 1-5.

Mehler, J. Some Effective Grammatical Transformations on the Recall of English Sentences. Journal of Verbal Learning and Verbal Behavior, 2, 1963, 346-351.

Meyer, B. J. F. The Structure of Prose: Effects on Learning and Memory and Implications for Educational Practice. In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), Schooling and the Acquisition of Knowledge. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977, 179-199.

Miller, G. A.; Galanter, E.; and Pribaum, K. H. Plans and the Structure of Behavior. New York: Holt, Rinehart, and Winston, 1960.

Neyman, J. and Pearson, E. N. On the Use and Interpretation of Certain Test Criteria for Purposes of Statistical Inference. Biometrika, 1928, 20A, 175-240.

Paris, S. G. Integration and Inference in Children's Comprehension and Memory. In F. Restle, R. Shiffrin, J. Castellan, J. Lindman, and D. Pisoni (Eds.), Cognitive Theory (Volume I). Hillsdale, N. J.: Lawrence Erlbaum Associates, 1965.

Paris, S. G. and Carter, A. Y. Semantic and Constructive Aspects of Sentence Memory in Children. Developmental Psychology, 9, 1973, 109-113.

Paris, S. G. and Upton, L. R. Children's Memory for Inferential Relationships in Prose. Child Development, 47, 1976, 660-668.

Perfetti, C. A. Retrieval of Sentence Relations: Semantic Versus Syntactic Deep Structure. Cognition, 2, 1973, 95-102.

Rubin, D. C. A Unit Analysis of Prose Memory. Journal of Verbal Learning and Verbal Behavior, 17, 1978, 599-620.

Rumelhart, D. E. Notes on a Schema for Stories. In D. G. Bobrow and A. Collins (Eds.), Representation and Understanding: Studies in Cognitive Science. New York: Academic Press, 1975.

Rumelhart, D. E. and Ortony, A. The Representation of Knowledge in Memory. In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), Schooling and the Acquisition of Knowledge. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977, 137-165.

Sachs, J. S. Recognition Memory for Syntactic and Semantic Concepts of Connected Discourse. Perception and Psychophysics, 2, 1967, 437-442.

Savin, H. B. and Perchonock, E. Grammatical Structure and the Immediate Recall of English Sentences. Journal of Verbal Learning and Verbal Behavior, 4, 1965, 348-353.

Schank, R. C. The Structure of Episodes in Memory. In D. G. Bobrow and A. Collins (Eds.), Representation and Understanding: Studies in Cognitive Science. New York: Academic Press, 1965, 237-272.

Schank, R. C. Identification of Conceptualizations Underlying Natural Language. In R. C. Schank and K. M. Colby (Eds.), Computer Models of Thought and Language. San Francisco: Freeman, 1973.

Schank, R. C. and Abelson, R. Scripts, Plans, Goals, and Understanding. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977.

Slobin, D. I. Grammatical Transformations and Sentence Comprehension in Childhood and Adulthood. Journal of Verbal Learning and Verbal Behavior, 5, 1966, 219-227.

Spiro, R. J. Remembering Information from Text: The "State of Schema" Approach. In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), Schooling and the Acquisition of Knowledge. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977, 137-165.

Stein, N. L. and Glenn, C. G. An Analysis of Story Comprehension in Elementary School Children. In R. Freedle (Ed.), New Directions in Discourse Comprehension, Norwood, N. J.: Ablex, 1979.

Taylor, S. E. and Croker, J. Schematic Bases of Social Information Processing. In E. T. Higgins, P. Hermann, and M. P. Zanna (Eds.), The Ontario Symposium on Personality and Social Psychology (Volume I). Hillsdale, N. J.: Lawrence Erlbaum Associates, 1980.

Thorndyke, P. A. and Hayes-Roth, B. The Use of Schemata in the Acquisition and Transfer of Knowledge. Cognitive Psychology, 11, 1979, 82-106.

Tulving, E. and Thomson, D. M. Encoding Specificity and Retrieval Processes in Episodic Memory. Psychological Review, 80, 1973, 352-373.

Waller, T. G. Children's Recognition Memory for Written Sentences: A Comparison of Good and Poor Readers. Child Development, 47, 1976, 90-95.

Warren, W. H.; Nicholas, D. W.; and Trabasso, T. Event Chains and Inferences in Understanding Narratives. In R. Freedle (Ed.), New Directions in Discourse Comprehension, Norwood, N. J.: Ablex, 1979, 23-51.

Winer, B. J. Statistical Principles in Experimental Designs, New York: McGraw Hill Book Company, 1979.

STIMULUS MATERIAL

APPENDIX A

Unaltered

NICK'S CRISIS

Nick Young has worked as manager of the information services division of World Business Machines (WBM) for twelve years. His department's ratings have always been superior, and he is well liked by everyone with whom he works.

WBM has planned to make some personnel changes in the information services division so they can keep up with the changes in the high-technology industry and to conserve energy. All of the personnel changes will be subject to strict adherence to Affirmative Action guidelines.

Even though Nick and Jason Cole, his boss, agree that the changes will be good for the organization, Jason wants all of the plans kept quiet until the details have been finalized.

When Nick returned to his office he excitedly told his executive assistant, Wayne, about the proposed changes. At the next coffee break, Wayne accidentally mentioned that some big personnel changes were in the works while he chatted with a group of supervisors.

Nick's subordinates soon began to talk and rumors about lay offs began to spread. Morale began to drop and tardiness and absenteeism rose sharply. Work began to pile up and work quality dropped.

Nick had to begin spending all of his time writing personnel reports. He became very dissatisfied with his job.

Unaltered

Jason picked up on Nick's signals and called Nick into his office for some counseling.

Unaltered

THE BIG BITE

Rachel Ruddy, a 50-year-old professional mid-manager at the City Bank of New Rochelle, had considered for quite some time having some extensive dental work. Although she made a point of having yearly checkups and cavities filled, she felt her appearance was affected by a badly discolored incisor, misaligned teeth, and noticeable fillings.

Her first step was to ask her regular dentist, Dr. Luke, about possible improvements. He explained his procedure to her. The first phase, taking an impression, would cost $75. The $75 would be subtracted later if she chose to have the work done.

After Rachel had the $4,900 work done on her teeth, she received the bill. However, she found that the $75 diagnostic fee had not been deducted. When Rachel protested the bill, the doctor's billing secretary maintained that Rachel misunderstood the initial fee and the doctor had already subtracted the fee.

Rachel was very angry about the misunderstanding about the bill and decided to change dentists.

Unaltered

COMMUNICATE OR PERISH

Pilot Smith wishes to fly from Airfield Alpha to Airfield Beta. The route between Alpha and Beta is over country seldom higher than 50 feet above sea level, but Airfield Beta itself is circled by low hills which are almost 400 feet above sea level. Weather stations along the route Smith intends to fly report the ceiling, the height of the cloud layer, in written reports every 2 hours.

Smith checks the available data just prior to his departure for Beta and discovers that the last report, the 8:00 p.m. observation, only 1 hour old, states that the ceiling is unlimited all the way to the hills around Beta, at which point it is 1,000 feet. This meant flying conditions were good.

Based on the information, Smith takes off from Alpha at 9:10 p.m. in unsettled weather and heads directly for Beta. As he nears Beta, he discovers that the ceiling is much lower than he had read in the report. He is forced to fly under 500 feet to stay in visual contact with the ground since Smith has no experience flying on instruments only. Smith manages to get into Beta by slipping between hilltops and the clouds at great risk to his life.

When he gets on the ground, very frightened by the experience, he almost immediately meets the weather observer whose report led Smith to fly to Beta that evening. Smith's fear

Unaltered

rapidly turns to anger, and he berates the observer severely, telling him that he is stupid and incompetent, and the inaccurate report endangered the lives of everyone flying into Beta that night, and that he, Smith, intends to report the observer to the local authorities.

Cause Deleted

NICK'S CRISIS

Nick Young has worked as manager of the information services division of World Business Machines (WBM) for twelve years. His department's ratings have always been superior, and he is well liked by everyone with whom he works.

WBM has planned to make some personnel changes in the information services division so they can keep up with the changes in the high-technology industry and to conserve energy. All of the personnel changes will be subject to strict adherence to Affirmative Action guidelines.

Even though Nick and Jason Cole, his boss, agree that the changes will be good for the organization, Jason wants all of the plans kept quiet until the details have been finalized.

Nick's subordinates soon began to talk and rumors about lay offs began to spread. Morale began to drop and tardiness and absenteeism rose sharply. Work began to pile up and work quality dropped.

Nick had to begin spending all of his time writing personnel reports. He became very dissatisfied with his job. Jason picked up on Nick's signals and called Nick into his office for some counseling.

Cause Deleted

THE BIG BITE

Rachel Ruddy, a 50-year-old professional mid-manager at the City Bank of New Rochelle, had considered for quite some time having some extensive dental work. Although she made a point of having yearly checkups and cavities filled, she felt her appearance was affected by a badly discolored incisor, misaligned teeth, and noticeable fillings.

Her first step was to ask her regular dentist, Dr. Luke, about possible improvements. He explained his procedure to her. The first phase, taking an impression, would cost $75. The $75 would be subtracted later if she chose to have the work done.

After she received the bill, Rachel protested it but the doctor's billing secretary maintained that Rachel misunderstood the initial fee and the doctor had already subtracted the fee.

Rachel was very angry about the misunderstanding about the bill and decided to change dentists.

Cause Deleted

COMMUNICATE OR PERISH

Pilot Smith wishes to fly from Airfield Alpha to Airfield Beta. The route between Alpha and Beta is over country seldom higher than 50 feet above sea level, but Airfield Beta itself is circled by low hills which are almost 400 feet above sea level. Weather stations along the route Smith intends to fly report the ceiling, the height of the cloud layer, in written reports every 2 hours.

Based on the information, Smith takes off from Alpha at 9:10 p.m. in unsettled weather and heads directly for Beta. As he nears Beta, he discovers that the ceiling is much lower than he had read in the report. He is forced to fly under 500 feet to stay in visual contact with the ground since Smith has no experience flying on instruments only. Smith manages to get into Beta by slipping between hilltops and the clouds at great risk to his life.

When he gets on the ground, very frightened by the experience, he almost immediately meets the weather observer whose report led Smith to fly to Beta that evening. Smith's fear rapidly turns to anger, and he berates the observer severely, telling him that he is stupid and incompetent, that the inaccurate report endangered the lives of everyone flying into Beta that night, and that he, Smith, intends to report the observer to the local authorities.

Consequence Deleted

NICK'S CRISIS

Nick Young has worked as manager of the information services division of World Business Machines (WBM) for twelve years. His department's ratings have always been superior, and he is well liked by everyone with whom he works.

WBM has planned to make some personnel changes in the information services division so they can keep up with the changes in the high-technology industry and to conserve energy. All of the personnel changes will be subject to strict adherence to Affirmative Action guidelines.

Even though Nick and Jason Cole, his boss, agree that the changes will be good for the organization, Jason wants all of the plans kept quiet until the details have been finalized.

When Nick returned to his office he excitedly told his executive assistant, Wayne, about the proposed changes. At the next coffee break, Wayne accidentally mentioned that some big personnel changes were in the works while he chatted with a group of supervisors.

Nick's subordinates soon began to talk and rumors about lay offs began to spread. Morale began to drop and tardiness and absenteeism rose sharply. Work began to pile up and work quality dropped.

Consequence Deleted

THE BIG BITE

Rachel Ruddy, a 50-year-old professional mid-manager at the City Bank of New Rochelle, had considered for quite some time having some extensive dental work. Although she made a point of having yearly checkups and cavities filled, she felt her appearance was affected by a badly discolored incisor, misaligned teeth, and noticeable fillings.

Her first step was to ask her regular dentist, Dr. Luke, about possible improvements. He explained his procedure to her. The first phase, taking an impression, would cost $75. The $75 would be subtracted later if she chose to have the work done.

After Rachel had the $4,900 work done on her teeth, she received the bill. However, she found that the $75 diagnostic fee had not been deducted. When Rachel protested the bill, the doctor's billing secretary maintained that Rachel misunderstood the initial fee and the doctor had already subtracted the fee.

Consequence Deleted

COMMUNICATE OR PERISH

Pilot Smith wishes to fly from Airfield Alpha to Airfield Beta. The route between Alpha and Beta is over country seldom higher than 50 feet above sea level, but Airfield Beta itself is circled by low hills which are almost 400 feet above sea level. Weather stations along the route Smith intends to fly report the ceiling, the height of the cloud layer, in written reports every 2 hours.

Smith checks the available data just prior to his departure for Beta and discovers that the last report, the 8:00 p.m. observation, only 1 hour old, states that the ceiling is unlimited all the way to the hills around Beta, at which point it is 1,000 feet. This meant flying conditions were good.

Based on the information, Smith takes off from Alpha at 9:10 p.m. in unsettled weather and heads directly for Beta. As he nears Beta, he discovers that the ceiling is much lower than he had read in the report. He is forced to fly under 500 feet to stay in visual contact with the ground since Smith has no experience flying on instruments only. Smith manages to get into Beta by slipping between hilltops and the clouds at great risk to his life.

Incongruent

NICK'S CRISIS

Nick Young has worked as manager of the information services division of World Business Machines (WBM) for twelve years. His department's rating have always been superior, and he is well liked by everyone with whom he works.

Because of energy shortages in the paper industry, and because of new developments in the high-technology industry, WBM plans to make some significant modifications in the information services division. Any personnel changes resulting from these modifications will be subject to strict adherence to Affirmative Action guidelines.

Nick and his boss agree that the changes will be good for the organization and the employees. Nick's boss has asked Nick to avoid discussing any of these planned changes until all of the details have been finalized. However, Nick's Administrative Assistant didn't maintain the confidentiality and leaked to one of the workers that "some big changes were going to take place, and they had something to do with Affirmative Action."

Nick's subordinates begin to talk. Rumors are spread about lay offs. Morale begins to drop noticeably. Tardiness and absenteeism rise sharply. Work begins to pile up, and work quality starts to drop.

Nick becomes very dissatisfied with his job; his boss picks up on Nick's signals and calls Nick into his office to

Incongruent

tell him the whole idea was stupid and that his promotion had been cancelled.

Incongruent

THE BIG BITE

Rachel Ruddy, a 50-year-old professional mid-manager at the City Bank of New Rochelle, had been considering for quite some time having some extensive dental work. Although she made a point of having yearly checkups and cavities filled, she felt her appearance was affected by a badly discolored incisor, misaligned teeth, and noticeable fillings.

Her first step was to ask her regular dentist, Dr. Luke about possible improvements. He explained his procedure to her. The first phase, taking an impression, would cost $75. The $75 would be subtracted later if she chose to have the work done.

After Rachel had the $4,900 work done on her teeth, she received the bill. However, she found that the $75 diagnostic fee had not been deducted. When Rachel protested the bill, the doctor's billing secretary maintained that Rachel had misunderstood the initial fee and the doctor had already subtracted the fee.

Rachel shrugged her shoulders and set up an appointment with a specialist Dr. Luke recommended to do the needed dental work.

Incongruent

COMMUNICATE OR PERISH

Pilot Smith wishes to fly from Airfield Alpha to Airfield Beta. The route between Alpha and Beta is over country seldom higher than 50 feet above sea level, but Airfield Beta itself is circled by low hills which are almost 400 feet above sea level. Weather stations along the route Smith intends to fly report the ceiling, the height of the cloud layer, in written reports every 2 hours.

Smith checks the available data just prior to his departure for Beta and discovers that the last report, the 8:00 p.m. observation, just 1 hour old, states that the ceiling is unlimited all the way to the hills around Beta, at which point it is 1,000 feet. This meant flying conditions were good.

Based on the information, Smith takes off from Alpha at 9:10 p.m. in unsettled weather and heads directly for Beta. As he nears Beta, he discovers that the ceiling is much lower than he had read in the report. He is forced to fly under 500 feet to stay in visual contact with the ground since Smith has no experience flying on instruments only. Smith manages to get into Beta by slipping between hilltops and the clouds at great risk to his life.

When he gets on the ground, very frightened by the experience, he almost immediately meets the weather observer whose faulty report led Smith to fly to Beta that evening. Smith

Incongruent

invited the weather observer to have a beer with him and thanked him for his fine work.

DEPENDENT MEASURE

APPENDIX B

Here are a few questions over the three case studies you heard in class last time. Please circle the answer you feel is correct. After answering each question, indicate how confident you are in your answer by circling the number which most closely reflects your degree of confidence.

EXAMPLE:

When Mary went to the desk, she

a. reread the letter.

(b.) wrote a quick reply.

c. doodled absentmindedly.

d. Story doesn't say.

Not Confident 1 2 3 (4) 5 Very Confident

NICK'S CRISIS

1. When Nick's boss calls him into the office, he

   a. counsels Nick.

   b. informs Nick of the information leak.

CQ

   c. tells Nick to tell the employees about the policy change.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

2. World Business Machines was making changes to

   a. outdo the competition.

   b. add new technical innovations.

   c. meet Affirmative Action requirements.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

3. Employee problems were caused by

   a. Nick's disagreement with his boss.

   b. Nick's strange behavior.

CA

   c. a leak by Wayne during a break.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

4. In the conversation between Nick and his boss, the boss

   a. discussed Nick's unhappiness.

   b. angrily told Nick that he would not get a promotion.

IC

   c. suggested that Nick get a new assistant.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

THE BIG BITE

1. Rachel had dental work done because

   a. she wanted to enhance her appearance.

   b. she wanted to do business with the dentist.

   c. she liked the dentist's frankness about the cost.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

2. Rachel discussed her bill with the billing secretary because

   a. the dentist did not subtract the $75 fee.

   b. the bill was not itemized.

CA

   c. she felt the bill was much lower than the doctor had estimated.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

3. When a misunderstanding developed between Rachel and her dentist, she

   a. decided to have him remove the dental work.

   b. decided to have further dental work done by the specialist.

IC

   c. decided to retain an attorney.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

4. Because Rachel was unhappy with her dentist, she

   a. decided to pay all but $75 of the bill.

   b. decided to cease doing business with Dr. Luke.

CQ

   c. decided to follow Dr. Luke's recommendation.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

COMMUNICATE OR PERISH

1. Pilot Smith took off for Beta because

   a. he wanted to meet the weather reporting crew.

   b. he needed to make a cross country flight.

CA

   c. the weather report indicated good flying conditions.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

2. When Smith arrived at Beta, he

   a. checks the current weather report.

   b. berates the weather man.

CQ

   c. collapses from the strain of the flight.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

3. Smith's flight from Alpha to Beta

   a. was done without reading the weather bulletins.

   b. was done by following instrument readings.

   c. was extremely dangerous because of low clouds.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident

4. When Smith meets the weather reporter, he

   a. purposely ignores him.

   b. vents his frustration and anger.

IC

   c. buys him a beer out of appreciation.

   d. Story doesn't say.

   Not Confident 1 2 3 4 5 Very Confident