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INTEREST IN READING: A TEST OF KINTSCH'S MODEL

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Interest in Reading: A Test of Kintsch's Model

by

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Introduction

Bettleheim (1982) in his book "On Learning to Read" suggested that lack of interest in reading materials is the primary cause of problems with literacy. Research has shown that those who are interested in what they are reading retain and comprehend what they read better (Asher, Hymel and Wigfield, 1978; Asher and Markle, 1974; Belloni and Jongsma, 1978; Bernstein, 1955; Carter, 1978; Frasher and Frasher, 1978; Stevens, 1980). It is not clear from these studies, however, how interest has its effect on memory and comprehension. "Interest" is usually poorly defined. What is lacking is a model of interest.

Most theories about interest include speculations or assumptions about why some things are and others are not interesting, and why interest should correlate positively with learning and comprehension. Little empirical work, however, has focused on these questions. Instead, most of the work on interest in reading has been descriptive research on what topics readers find interesting. The question of exactly why some things are found interesting by a reader while others are not needs to be explained much more fully.

The purpose of the present study is to investigate cognitive factors influencing interest in reading. The study differs from traditional reading interest studies that focused on discovering topics that evoke interest.

Instead of this approach, an attempt was made here to investigate a model proposed by Kintsch (1980) which identifies three variables that are assumed to interact to produce interest. Before the present study, this model had been only partially tested.

This study addresses the following questions within the framework of the Kintsch model: Are there cognitive factors in reading interest, and do these factors enhance learning and comprehension? Only two previous studies have explored this model, and in each of these only one of the variables was tested. Before the present study, no study had looked at the interactions of the three variables. Also, previous to this study no testing has been done exploring the effects of all three variables on learning or comprehension.

According to Kintsch, interest has both emotional and cognitive facets (Kintsch, 1980). A story event may be emotionally appealing because of its arousal potential (for example, violent or sexual events), and words or phrases in a story may also be emotionally interesting. Kintsch believes this type of interest results from different factors than does cognitive interest. A story may also be cognitively interesting because of the events it contains or because of the way in which it has been written; however the appeal in this case is not to the emotions. The focus of the present study is solely on the nature of

cognitive interest and its role in text comprehension.

Several models of cognitive processes have taken the facilitative effects of interest into account (Berlyne, 1965; Kintsch, 1980; Piaget, 1952). Berlyne (1965) emphasized the role of novelty in curiosity and learning. He showed how something with moderate novelty creates a conflict within an organism because it differs from the organism's prior experience. The result of this conflict is that the organism investigates, and then it can learn. Piaget believed that interest and learning are facilitated if an experience presented to a child has some relevance to what is already known by the child, but is also sufficiently novel to present incongruities and conflicts (Ginsburg and Opper, 1969). Both Berlyne and Piaget thus came to the conclusion that it is moderate novelty which produces interest, which then leads to learning.

Recently Kintsch (1980) has examined the concept of interest in the context of a reading model. Kintsch's interest model shows how interesting portions of a text can be better remembered by the reader than uninteresting portions. Further, the model provides a mechanism showing how interest influences comprehension, shaping the reader's understanding during the reading process as well as influencing what will be remembered. This work is seen by Kintsch as an extension of his and van Dijk's earlier theory of text comprehension (Kintsch and van Dijk, 1978),

which they call the KvD model.

According to the KvD model, each paragraph in a text can be represented as a list of interrelated propositions that are organized into a hierarchical text structure. Propositions are composed of two or more words or concepts. One of these words or concepts serves as a predicate, specifying a relationship between the remaining word, words, concept, or concepts, which are called the argument (or arguments). Connected, ordered lists of propositions represent the meaning of a text. Comprehension is a process that leads to the acquisition of information from the text. The comprehender saves, deletes, or constructs propositions as he reads. The resulting list of propositions, called the macrostructure, is what is remembered by the reader.

In the KvD model, story comprehension is regarded as a special case of text comprehension. When any type of text is read the comprehension process is controlled by a schema that is specific for that type of text. The story schema operates when one reads a story. The story schema contains knowledge about the conventional (culturally specific) structure of stories and also general knowledge needed to interpret the actions of a narrative. The schema is used during the comprehension process to organize input from the story. Without a schema the reader would not only be unable to organize the incoming information, but also would

have no way of distinguishing which information should be placed in the macrostructure (should be remembered).

The concept of the role of a schema in comprehension is not unique to the KvD theory, but is widely accepted and has been the subject of much recent research. An early study of memory (Bartlett, 1932) suggested that a story schema is used as a set of retrieval cues. When something in a story cannot be recalled, Bartlett suggested, the schema is used to reconstruct what might have occurred at that point. This explanation arose from Bartlett's finding that stories are distorted in recall to conform to a conventional story schema. He also found an increasing regularization of irregular stories over time. As time passed, the recalled stories became more like the idealized schema.

According to schema theory (Rumelhart and Ortony, 1977; Anderson, 1977), a schema provides a framework during encoding that directs attention to relevant aspects of the incoming material, and helps keep track of events in a story. The schema also allows the reader to judge when some part of the story is complete and ready to be stored or when it is incomplete and so should be held until more material is encoded. Evidence for the idea that schemata provide a framework which aids comprehension has been provided by studies such as that of Bransford and Johnson (1972), who found that subjects who were given a passage

theme in the form of a title or picture before reading an ambiguous passage recalled significantly more of the the concepts presented in the text than did those who were not given a theme, or those who were given the theme after having read the passage.

A second function that a schema serves in comprehension is to allow readers to fill in gaps (or slots) not specifically stated in the text. The reader uses the schema to make inferences that are necessary for comprehension. Support for this has come from studies such as that of Sulin and Dooling (1974), in which all subjects read the same biographical passage, but half were given the name of a famous person and told that the passage was about this person. These subjects identified as having been in the passage some information that was true of the famous person, but had not actually been included in the passage.

According to the earlier KvD model (Kintsch and van Dijk, 1978), which did not include interest as an important factor, the comprehension process is controlled by a schema that is specific for each type of text, so that a story schema controls comprehension when a story is being read. Kintsch's new work (Kintsch, 1980) adds to the story comprehension process some new schemata that operate on a parallel level with the story schema in controlling comprehension. These schemata reflect the special interests of the reader. In this way cognitive interest

becomes a factor determining what will be remembered from a text. In terms of Kintsch's theory, interest schemata as well as the story schema control which propositions will be included in the macrostructure (summary) of a story. This means that some propositions may be remembered that are not relevant to the story schema, thus accounting for propositions being included in the macrostructure even though they may not fit into the story schema.

According to Kintsch (1980), interest schemata can be triggered by the text. Words and propositions in the text may act as cues in the selection of schemata to control comprehension. This explains why some texts may be comprehended even though they are read without a clearly specified control schema. Cues in the text may also change the reader's perception of the organization of the story.

Kintsch's theory deals only with cognitive interest. He assumes the cognitive interest of a text to be a function of the cognitive interest of its subunits (phrases, sentences, paragraphs). The cognitive interest of each of the subunits results from an interaction between three factors: (1)prior knowledge of the subject matter, (2)predictability of the text, and (3)postdictability, or the ability of the text unit to fit into the text as a whole and make sense. The different cognitive components may operate to a greater or lesser degree in different text types. Interest in a story, Kintsch believes, results

primarily from events which are moderately predictable but still make sense (are postdictable).

Kintsch (1980) describes the relationship between prior knowledge and interest in the following way. When a misfit occurs between a reader's expectations (based on prior knowledge) and the text, interest can result. Kintsch assumes that cognitive interest is low with little prior knowledge but increases as more is known, and then drops off as the text no longer tells the reader anything new. According to Kintsch (1980), interest peaks when there is neither too much nor too little prior knowledge. This is identical to the position of both Berlyne (1965) and Piaget (1952).

According to Kintsch (1980), comprehension of a story is controlled not only by the story schema, but by one or more other schemata as well. These schemata contain information which is not part of the story schema, but belongs to schemata for many other different kinds of prior knowledge possessed by the reader. These schemata may or may not become activated during reading, depending upon whether they are cued by words in the text. If these schemata are not cued, the information they contain cannot be used by the reader to make the text more predictable. A text which contains few cues will thus be very unpredictable to the reader. When cues to specific knowledge are provided, the reader should find the text

more predictable.

Kintsch assumes an inverted U-shaped curve to be present with respect to the relationship between predictability and interest. If a text is completely predictable to the reader it will inspire low cognitive interest, and if the reader has no expectations as to how the text will continue low interest will also result. Interest, Kintsch believes, peaks when predictability is moderate.

The third factor, postdiction, can occur only if the new information supplied by a unit can be meaningfully integrated into the text. Postdiction is operating if unpredictable events, no matter how surprising they are, fit into the text and make sense to the reader when the text has been completed.

This model predicts a positive relationship between cognitive interest and comprehension. Kintsch suggests that units which are cognitively interesting cue the reader to make use of interest schemata which direct what will be retained in the macrostructure, shaping the comprehension process and helping to control what will be remembered about the story.

Kintsch's model of interest has the advantage of being operationalizable. Because of this it is uniquely useful in exploring the relationship of interest and reading

comprehension, which to date has not been well studied. Conditions can be imposed to vary the degree of prior knowledge, predictability, and postdictability. Although prior knowledge (Walker, 1981) and predictability (Walker and Kintsch, 1982) have been manipulated in separate studies, the interactions of prior knowledge, predictability, and postdictability in determining interest have not previously been studied. Since it is proposed that the three variables interact, it is important that this be done.

The study presented here investigated Kintsch's theory that interest results from an interaction between prior knowledge, predictability, and postdictability. Each of these factors was manipulated and their effect on interest, learning, and comprehension was examined.

Review of Literature

The literature review covers several areas of research. First, there are studies which used interest as an independent variable in order to determine whether (topic) interest had an effect on comprehension. Results generally indicate a positive effect; these previous studies, however, suffer from the lack of a model to explain how topic interest achieves its beneficial effect.

The topic interest literature, which is reviewed next, is primarily descriptive. Information has been gathered about the reading choices of readers of different ages, sexes, etc. This literature does not provide an adequate operational model of interest, and so fails to provide an explanation of what makes various texts on the same topic differentially interesting to the same reader. It does, however, seem to provide some support for Kintsch's interest model, in that it shows a long history in which children expressed interest in topics with which they were already familiar. Prior knowledge is thus supported in this literature as a factor affecting interest.

Next, research on the role of prior knowledge in reading is discussed. This literature demonstrates that having a prior structure for incoming information improves retention of that information. It also explains the function of the story schema in reading comprehension. It

leaves unanswered, however, the question of why some things are remembered that are not relevant to the story schema. According to Kintsch this can be explained as being the result of interest, which has an effect on what is learned.

Next, the role of interest in all types of learning is discussed. Berlyne's research, as well as that of others, explains the effect of relative novelty (unpredictability) on organisms. A model is presented which explains how interest (or "subjective uncertainty") is the result of novelty in the environment. Interest itself then gives rise to exploratory behavior, which results in learning. Kintsch's model thus appears to be a specific example of this more general theory, one in which it is applied to reading behavior.

Finally, Kintsch's theory of reading comprehension is discussed, placing his interest model in the context of the reading comprehension process. The two studies which have partially tested his interest model are presented.

Interest and Comprehension

Most of the existing knowledge about what readers find interesting has been developed primarily from descriptive research focusing on what children read. A few studies have demonstrated that performance is enhanced when interest is higher (Asher, Hymel, and Wigfield, 1978; Asher and Markle, 1974; Belloni and Jongsma, 1978; Bernstein, 1955; Carter, 1978; Frasher and Frasher, 1978; Stevens, 1980). These studies are the most pertinent here; however some of the descriptive work will also be discussed as it not only constitutes the main body of work on reading interests but it also lends support to the interest model in which prior knowledge is a factor.

The following studies resulted in the finding that students who are interested in what they are reading demonstrate better comprehension than those who are not interested. A problem with this literature is that vague definitions of interest resulted in vague findings that interest did indeed have a beneficial effect; however no mechanism is advanced to account for this effect.

Early work on the effect of topic interest on comprehension was done by Bernstein (1955). Two stories were adapted for use in the study so that they were equal in readability. Based on descriptive research on what was interesting to children of that age, one of the stories was considered to be interesting and one boring. The story

designated interesting contained action, suspense, a crisp writing style, and a teen-aged hero. The other story, consisting of adapted paragraphs from "The House of Seven Gables," contained long, dull descriptions and very little human action. Groups of pupils read the stories and rated them for interest. The more interesting story resulted in higher comprehension scores. High interest was also found to be associated with higher reading speed.

Belloni and Jongsma (1978) wanted to determine if better comprehension would result if low achieving students were given material to read that interested them. Materials were 12 short stories, three in each of the following categories: 1)interesting to both boys and girls, 2)interesting to girls, 3)interesting to boys, and 4)interesting to neither sex. These categories were based on descriptive research by Norvell (1973). The interests of the subjects were determined in individual interviews during which the subjects thumbed through the stories, read titles and abstracts, and finally selected the stories they most and least wanted to read. They read the stories in group sessions, and then took a cloze test composed of a section of the story they had read which had every fifth word deleted. The low achieving seventh graders comprehended the high interest passages significantly better than they comprehended the low interest passages. Results similar to these have been obtained with different populations by Estes and Vaughan (1973), and Pauk (1973).

Asher and Markell (1974) had children rate the interest value of twenty-five photographic slides. The subjects were later given six passages to read, three of which were about the individual's highly-rated topics, and three which corresponded to topics which had been rated low in interest. The passages were in cloze format. It was found that the performance of fifth grade boys was strongly enhanced by the interest level of the material, but that fifth grade girls' performance was only slightly affected. On low interest material and on a school-administered reading achievement test, boys peformed significantly worse than girls. On high interest material, the sex difference was eliminated.

Because the results of the Asher and Markle (1974) study might have been due to an effect of the contrast between the three more and three less appealing topics in the passages, Asher, Hymel, and Wigfield (1978) performed another study also using the picture-rating technique, but gave the subjects either all high-interest cloze passages or all low-interest cloze passages. Children reading the high interest material comprehended more than children reading the low topic interest material.

Stevens (1980) had high and low ability readers rate their interest in twenty-five topics using both a picture rating technique (similar to the one used by Asher and Markell) and also a verbal method in which the students

rated their interest in word cues. They were then given passages of higher and lower interest according to their ratings. Stevens found that higher interest materials significantly facilitated the reading comprehension of higher ability students. The comprehension of lower and middle ability readers was not affected by the varying interest conditions. No effect for sex was found in this study.

A problem with the studies cited above is that they do not contain operational definitions of interest; thus more attention needs to be paid to what makes something interesting. In the next section the descriptive literature on reading interest, primarily topic interest, will be reviewed. Reasons will be given why it is inadequate to be useful as a variable.

Descriptive Research on Interest

The focus of the majority of research on reading interest has been on describing the topics that are found interesting by different groups of readers. The method used most often in these studies is to classify reading material into categories. The classification is either by topic, theme, literary form, type of main characters, and/or some combination of these factors. Preferences of the subjects are then inferred from the number of choices reported by them within each category. Data are also often collected on such reader characteristics as sex, age, reading ability, race, and socioeconomic status (SES).

For the puposes of the present study, it is useful to regard the topic interest literature as demonstrating that prior knowledge (on the topic of the material) has an effect on interest. This is indicated by the many cases where topics are found to be sex specific, SES group specific, etc. For example, prior to 1970 most of the research reported interests in terms of sex preferences. Findings reported that older children chose "sex appropriate" topics. Also, both sexes have been found to prefer stories with characters of their own sex as the main protagonist. The emphasis in this review of topic interest is on those studies which show differences in interest between groups with different prior experiences. The reason these studies have been included is that they give

support to a model of interest in which prior knowledge is one of the components of interest.

In the first known reading interest study, Ballock (1897) asked 1,500 pupils in grades five through high school to indicate their preferences for "stories of adventure, of travel, of great men, of great women, love stories, ghost stories and war stories." These or very similar categories of reading interest were used in the early interest research and they are still used today. Not only do these categories lack specificity, but there is the possibility of multiple categorization of the same title.

Researchers have consistently recorded sex differences in the reading preferences of boys and girls. Moray (1978), in a review of research of the reading interests of children in the intermediate grades, concluded that preferences varied with sex at each age and grade level, with much overlap. She reported that sex appeared to be a more important factor in determining reading choices than intelligence, race, grade, or economic level, although some of the studies she presented found that reading achievement, intelligence, and socioeconomic level have some influence on the reading interest of intermediate grade children. Moray maintained that although research supports the idea of broad reading categories that are of interest to the majority of pupils in intermediate grade levels, it is also true that each student has his/her own

pattern of reading interests.

Some investigators have reported that sex differences in reading interest exists less in the primary grades, but appear by the age of nine or ten (Tibbitts, 1974). King (1967) found few differences up through eight years of age, but after eight boys were found to read more nonfiction than girls. She also found that girls read books considered to be of interest to boys, but that boys ordinarily do not read books considered to be of interest to girls.

Developmental effects have frequently been found in this research. Moray (1978), in a review of research of the reading interests of children in the intermediate grades, concluded that preferences varied at each age and grade level. King (1967) found few differences up through eight years of age. McKenzie (1976) found that differences in reading interests between boys and girls appeared in the fourth grade and increased in the fifth and sixth grades.

As with other reading interests, preferences for sex of protagonist have been studied primarily through data about book selections or reading materials. In a study of narrative factors associated with reading interests, Yoder (1978) concluded that sex of protagonist was the most potent factor influencing reading choices among adolescents in grades ten through twelve, although the effect was less for girls. He also found that setting was a significant

factor for determining interest for males but not for females. Young children have also demonstrated preferences for characters of the same sex (Rose, Zimit, & Blum, 1972).

Clarke (1974) identified differences in reading interests and preferences of Indian, black, and white adolescents. A reading interest inventory was administered. Fifteen areas of significant differences were found between ethnic groups in reading interest, with more differences between black and white students than between blacks and Indians, or between Indians and whites. Six significant differences were found related to the education of parents of boys, with most differences found between low and high education levels. Community size had some effect, but the quantity of reading materials available had no effect.

Also investigated (Dulin and Duran, 1977) were the reactions of ninth graders to names of characters in story passages. In nine of ten comparisons, the groups' mean levels of responses were favorable for surnames such as Goodman and Kute, and unfavorable for surnames such as Baddman and Homelee.

Since the descriptive interest literature contains findings that are contradictory, it presents problems when it is used in research. For example, Meisel and Glass (1970) reported that basal reader content did not reflect the reading interest of intermediate students; Pieronek

(1980), however, found that current basal readers did fairly represent known student interests.

Lynch-Brown (1977) noted conflicting results obtained from two methods of collecting data in order to evaluate childrens' reading interest. Results of reactions to a reading interest inventory composed of annotated titles were compared with results obtained when children examined actual books. The books used were from three interest categories: realistic fiction, fanciful fiction, and science. In the titles-only group, realistic fiction was the most popular of the three categories, science the least. Realistic fiction was chosen significantly less when actual books were examined, and science was more popular than it had been in the titles-only group.

At least two serious problems are inherent in studies in which books selected or read are used to determine reader preferences. Any variation in the number of books available across categories will result in a selection bias in favor of the interest categories represented by the most books, and, consequently, will result in incorrect inferences about the group's preferences. There is also the possibility that children may try to give what they believe to be the "right answer" instead of a more honest one.

Another problem associated with inferring preferences from books selected or read relates to the issue of whether the attributes responsible for interest in the book are actually those cited by the researchers. For example, McKenzie (1976) found "disorders, illnesses, and death" to be the most preferred topic among adolescents. This category included books (for example, the popular sports story "Brian's Song") which could have been classified into other categories that might have more accurately represented the attributes responsible for the popularity of the books.

Studies designed to investigate the relationship of pupil interests and reading are longstanding and numerous; there is, however, a problem of drawing generalizations from studies which often lack communality of design, procedure, or terminology. The interpretation of reading interest research data places emphasis on the commonalities among groups rather than on the individuality of interests. Subjects have been grouped by age or grade, by intelligence, by achievement, by sex, by socioeconomic status, or by cultural and ethnic labels.

The methods used in reading interest research include having the children select pictures (Ford and Koplgay, 1968), draw pictures (Kirsch, Pehrsson, and Robinson, 1976), write sentences (Boning and Boning, 1957), answer group oral questionnaires (Emans, 1968; Nelson, 1966;

Pittman, 1966), or choose from lists of topics (Norvell, 1958). Interviews possess several disadvantages. The interviewers may be poorly trained, interviewer bias may be interjected, and in some cases variation in responses may make it difficult to analyze the data. Subjects may respond with a response which they feel is more appropriate than the true response. In addition, the interview is also time-consuming (Robinson and Weintraub, 1973), and interview questions and procedures may be incompletely reported (Carter, 1978).

A survey procedure, using lists of story or book titles or topics, is frequently used. This procedure has the disadvantage of using forced choice responses that are limited and may cause the individual to make a choice on a question to which he or she really has no response. There is also the possibility that the child will try to respond with "the right answer", or that lists may be conducive to cursory treatment by the subject.

In the preceding review, better reading performance was associated with high topic interest material, indicating a relationship between interest and comprehension. This literature, however, provides no explanation for this relationship. A model of how interest works is needed. Without a model, the information obtained in the research is of limited use.

Further, the topic interest literature fails to explain why different texts on the same topic are not always equally interesting, or why different individuals have different interests. These questions are not addressed in this literature. A better explanation of why some things are interesting to a reader while others are not needs to be provided.

The topic interest literature is useful to the present research because it can be interpreted as providing support for the contention that prior knowledge is an influential factor in interest. There are many examples among these studies of children chosing topics familiar to them. For example, Moray (1978), in a review, found that sex was a more important determinant of reading choice for adolescents than was intelligence, race, grade, or economic level. Yoder (1978) found that sex of a protagonist was the most potent factor influencing reading choices among adolescents. Clarke (1974) found fifteen areas of significant differences in the reading preferences of Indian, black, and white adolescents. Other studies produced similar findings, indicating that the prior knowledge of the reader affects interest.

Despite the previously discussed problems with research methods, this literature generally gives support to the interest model proposed by Kintsch (1980), attributing a role to prior knowledge in interest.

Clarifying research, however, is badly needed. An operational definition of interest would be extremely helpful to researchers and educators. The present study investigates the effects of three cognitive variables in order to develop a more precise definition of interest.

The Role of Prior Knowledge in Comprehension

According to Kintsch's (1980) model, prior knowledge is one of the components of interest. Many other theories give a prominent role to prior knowledge in the comprehension process. For example, schema theories of reading (Rumelhart and Ortony, 1977) assume that the structure of knowledge in memory determines whether and how new information is stored.

Recent research on the effect of prior knowledge on comprehension has focused on how prior knowledge is ordered and used. Kintsch (1980) suggested that interest schemata (growing out of the prior knowledge of the reader) influence comprehension and memory. It has also been suggested that prior knowledge has its effect by allowing the subjects to make better elaboration of the facts to be learned (Anderson, 1976) or to process the material more deeply (Craik and Lockhart, 1972). In an interactive model of reading (Frederikson, 1979), the text and the reader interact during reading, which means that the reader uses his or her prior knowledge to facilitate comprehension of a text. Schema theory (Rumelhart and Ortony, 1977; Anderson, 1977) suggests that schemata provide a framework for classifying concepts presented in texts.

Schema theories and others (for example the frame theory of Minsky, 1975, and the script theory of Schank and Abelson, 1977) have in common the idea that knowledge is organized into chunks of related information which direct comprehension. A wide range of instances, differing in detail, are subsumed under a single, comprehensive schema which contains the elements necessary to or common to instances and allows variability in other elements. These knowledge structures are believed to play a role in comprehension, inference making, and memory.

Mandler and Johnson (1977) use the term "story schema" to refer to a set of expectations about the internal structure of stories that facilitates encoding and retrieval. These story schemata are constructed on the basis of knowledge about the sequencing of events in stories (obtained from experience with stories) and knowledge about causal relations and various kinds of action sequences (obtained from general experience). The schema acts as a framework during encoding, performing several functions. It directs attention to various aspects of the input, it provides a summary that increases predictability for the rest of the story, and it helps the reader know when parts of a story are complete enough to be stored.

Bartlett (1932) suggested that readers develop schemata of what stories are like. In his research, he found that stories which deviated from culturally shared schema were distorted in recall. According to Bartlett, the central meaning of a prose passage is stored in memory in schematic form. From this underlying theme, recall of the words is accomplished by an active process of reconstruction. In this process, the reader's prior knowledge is used, leading to errors caused by thematic intrusion. Some of the recall errors that readers make, such as omissions, distortions, and other changes in memory, can be accounted for within the framework of readers using a story schema as a set of retrieval cues. When there is a problem in recall, the schema can be used to reconstruct what might have occurred. This framework also explains the increasing regularization of an irregular story over time, resulting from recall approximating an idealized, instead of the actual, form of the input. Bartlett reported that with longer retention intervals, these thematic errors increased. As the schema became more dominant, specific details were lost.

The key ideas of the story schema concept were first proposed by Propp, a Russian linguist, in 1920 (Propp, 1968). These have since been elaborated by others (e.g., van Dijk, 1972). Stories are built around "actors" and "functions", i.e. major story-relevant actions that change a story from one state into another. There is a

requirement for continuity on the actor's part, but the actions may change throughout the story. The order of actions cannot be fixed, however the category to which an action belongs forms a fixed sequence consisting of an exposition, followed by a complication, followed by a resolution. In the exposition, the setting and the main characters of a story are introduced. The complication consists of a remarkable or interesting event, an unexpected twist in the plot. The resolution returns the story to a stable state, leaving no unresolved events.

Wittrock, Marks, and Doctorow (1975) found that familiar, rather than unfamiliar, stories facilitated the learning and recall of new vocabulary for fifth and sixth graders. Wittrock later (1977) developed a generative model of reading comprehension. It involves the active construction of meaning for text through the use of schematic memory and prior knowledge.

Many experiments have demonstrated effects attributed to the operation of schematic knowledge structures, often using the same general paradigm (Bransford and Johnson, 1972; Dooling and Mullet, 1973; Smith, Adams, and Schorr, 1978). The method of this paradigm provides subjects with a set of sentences to remember. These sentences do not appear to form a comprehensible unit. Some subjects, the informed group, get additional information such as a topic sentence, picture, or title, which allows the seemingly

unrelated sentences to be understood as a coherent body of information about a familiar topic. The subjects in the uninformed group are then tested in some way for memory of the presented information. The usual finding is that the subjects who received the integrating cue remember the presented information better (Bransford and Johnson, 1972; Bower, Black, and Turner, 1979) and show greater difficulty in rejecting items that are not actually presented but are still consistent with the integrated interpretation (Bower, Black, and Turner, 1979; Thorndyke, 1977).

Bransford and Johnson (1972) performed four experiments to test the theory that subjects who received appropriate prior knowledge would comprehend a passage easily and would demonstrate good recall, while subjects who did not have access to the appropriate prior knowledge would find the passage difficult to understand and recall. Prior knowledge was provided in the form of a picture that supplied information about the context underlying the stimulus passage. The passage itself described events that might happen, given the context as a conceptual base.

In their first study fifty subjects were assigned to one of five groups: a No Context group 1, who heard only the passage; a Context Before group, who were shown the picture before reading the passage; a Context After group, who saw the picture after having read the passage; a Partial Context group, who were shown a picture before the

passage was presented which contained all the objects in the appropriate context picture, but in which the objects constituted an inappropriate contextual base for the passage; and a No Context group 2, who heard the passage twice (in order to assess the effects of repetition in the absense of context). It was expected that the Context After group would have lower comprehension and recall scores than the Context Before subjects because contextual information was assumed to be necessary for the processing of the passage information.

Mean comprehension ratings, based on a seven-point comprehension rating scale filled out by the subjects, and mean number of ideas recalled by group, defined as either individual sentences, basic semantic propositions, or phrases, were used to compare the Context Before condition with each of the other four conditions. The comprehension ratings were found to be significantly higher in the Context Before condition than in each of the other four. The subjects in the Context Before condition also recalled significantly more ideas than did subjects in any of the other conditions. When compared to the first No Context condition, hearing the passage twice, receiving the context after and receiving the partial context before increased comprehension slightly but had little effect on recall.

The difference in recall between the Context Before and the Context After groups indicates that subjects could not augment their memory at recall by guessing or generating ideas from the picture. Retrieval cues were equally available in both the Context Before and Partial Context conditions; however, the Partial Context group did not have appropriate information about the relations among the concrete elements and so could not make use of the retrieval cues. Comparison of the second No Context group and the Context Before group showed that it was more beneficial to receive the context than it was to spend additional time trying to learn the passage.

The other three experiments employed materials containing contexts that were assumed to be part of the pre-experimental knowledge of the subjects. Some of the subjects were given a cue, i.e. a topic for the passage, that was intended to activate a suitable context.

In Experiment II the conditions consisted of a No Topic group, who heard a passage and received no additional information; a Topic After group, who received the topic after hearing the passage; and a Topic Before group, who received the topic prior to the presentation of the passage. In Experiment III there was a Topic After and a Topic Before group, and in the fourth experiment there were No Topic, Topic After, and Topic Before conditions.

In Experiment II comprehension ratings and recall were found to be significantly higher in the Topic Before condition than in either the No Topic or the Topic After condition. In the third experiment, both the comprehension ratings and the recall scores were significantly higher in the Topic Before than in the Topic After condition. In the fourth experiment the Topic Before comprehension ratings were significantly higher than those in the No Topic group but there was no significant difference between ratings of the Topic Before and Topic After groups. Recall was significantly higher for the Topic Before group than that of both the No Topic and Topic After group.

These studies support the idea that schemata provide a framework facilitating comprehension. Bransford and Johnson feel that knowledge of the topic facilitates retention by doing more than functioning as a mnemonic device. When the theme is viewed only as a mnemonic device, subjects would score higher in recognition tests on theme-related words because they would be matching test words to the theme, and would score higher in recall because of a reconstructive process in which the theme is seen as a mediating schema for generating lexical matches or associations. Bransford and Johnson see the critical role of the topic to be, instead, that of helping learners create contexts that can be used to comprehend the passages while the learners are being exposed to the passages. They feel it was not having been given the topic that enabled

their Topic Before group to score better on comprehension and recall, but the context (prior knowledge) which the topics enabled the subjects to utilize.

A schema allows readers to make inferences when information needed for comprehension has not been explicitly stated in the text. The reader uses prior knowledge to fill in gaps. A study that demonstrates this was done by Sulin and Dooling (1974). They had subjects read a short biographical passage. The passages were the same for all of the subjects, except that for half of the subjects the main character was a famous person, while for the other half the main character was given a fictitious name. It was assumed that those subjects reading the version with the famous main character would have a more richly elaborated schema to work with, since they would have information in working memory not specifically required by the passage. These subjects were expected to make more false positive errors on a subsequent recognition test.

In the recognition test, a "key sentence" was presented that had not occurred in the original passage. For half of the subjects this key sentence was high in thematic relatedness, for the others it was low in this dimension. It was hypothesized that the subjects who had read about the famous main character would make more false positive errors in the high, rather than in the low,

thematic key sentence. The length of the retention interval was also varied, with the recognition test being administered either after five minutes or one week.

For the first experiment, the dependent variable was a score made up of correctness of judgement and degree of the subject's confidence in his/her judgement. The subjects who read about a famous main character were found to have significantly lower scores on identifying the key sentence as false than did those who read about a fictitious character. The main effect of interval on the key sentence was also significant, with performance after five minutes being superior to that after a one week retention period; the thematic effect, however, did not become more pronounced at the longer retention interval. In the famous-main-character condition performance was poorer when the key sentence was high in thematic relatedness, with the opposite found in the fictitious condition. For the other sentences (old sentences, which were both in the text and in the test), the main effect for time interval was significant.

A second study replicated the first with some minor methodological changes. All main effects for the key sentences replicated the findings of the first study. Unlike findings from the first experiment, the main character effect was significantly greater at the longer retention level. The predicted main-character [x]

type-of-key-sentence interaction, obtained in the first experiment, did not reach statistical significance. The predicted thematic effect on the key sentence was only obtained for the one week retention interval. The findings of these two experiments strongly support the idea that subjects make inferences based on prior knowledge.

Schustack and Anderson (1979) gave subjects 42 short biographies, some of which had parallels to well known individuals. Half of the characters based on actual models were studied with the appropriate model explicitly named; the other half were not named. Memory was tested in a recognition task in which some of the subjects were given the identity of the famous person. Subjects judged whether a sentence had appeared in a character's biography. Best recognition resulted when a famous person was identified both when the biographies were read and at the test. In a second experiment a famous name was beneficial only when facts in the biography were true of that famous person. The results indicated that the recognition advantage of informed subjects does not operate through tagging of the information already in memory, but rather is a consequence of having information in memory.

Morris, Stein, and Bransford (1978) found that after stereotypical information was presented, recall was better. Recall was twice as good when the prior information, such as the adjective "fat", was related to the event, as in

"The fat man got stuck".

In several studies Royer (Royer and Cable, 1976; Royer and Perkins, 1977) presented evidence that information that can be related to previously learned material is either better stored in a previously established knowledge structure or, having been stored, is easier to retrieve than information that cannot be easily related to previously learned material. It is assumed that there is a mechanism in the cognitive system that directs the storage of incoming information.

Royer, Perkins, and Korngold (1978) tested the hypothesis that the same prose passage could be stored in different memory locations as a function of whether the passages could be related to previously acquired knowledge. Subjects were informed of the identity of a character (famous or fictitious) either before or after reading the passage. In the famous person before condition, more incorrect recognitions were made of higher thematic sentences than was the case in the other groups.

Royer, Lynch, Douglas, and Hambleton (1982) gave psychology and nonpsychology texts to subjects with three levels of expertise in psychology. They found that the group with the highest prior knowledge read the passages faster. The subjects were asked to judge whether sentences on a test were new or had been seen in the passages they had read, either verbatim or paraphrased. Performance on

this task improved as the degree of prior knowledge increased. In a second experiment, subjects in a psychology course read psychology and nonpsychology passages at the beginning and end of a semester. Performance on a judging task increased on the psychology passages, but not on the nonpsychology passages.

Pichert and Anderson (1977) asked college students to read and rate the significance of ideas in passages. Some of the subjects were given an orientation from which to read the story. It was found that this orientation influenced which information the subjects judged to be significant, which in turn affected what was learned and remembered.

Anderson, Reynolds, Schallert, and Goetz (1977) gave physical education and music education students passages that were ambiguous. The results showed that the subjects gave each passage only one interpretation, and did not consider alternative possibilities; that interpretation was significantly related to background experience.

Spilich, Vesonder, Chiesi, and Voss (1979) gave subjects who were high and low in knowledge about baseball a taped account of half an inning of play and then had them write accounts of it. It was found that the high knowledge subjects recalled more information that was goal related than the low knowledge subjects, that they recalled information in the correct order more than low knowledge

subjects, and that they selected information as having possible importance more frequently. Information and actions not related to the goal structure were recalled more frequently by low knowledge individuals.

Besides adding bias to the input, prior knowledge can also increase memory for textual information. Brown, Smiley, Day, Townsend, and Lawton (1977) found that children in the group that was provided with related background information through instruction not only included more additions that were not in the text than did the non-instructed group, but they also retained more information from the text.

Shallert (1976) provided half of her subjects with information pertinent to an ambiguous passage. This group retained more of both the instruction and the text than did a group who were not given pertinent information.

Miller and Kintsch (1980) found reading time longer and recall generally less extensive for an expository paragraph that required knowledge assumed to be generally known to the subjects, but which turned out to be unknown. This poor performance was attributed to lack of an appropriate knowledge base that impeded comprehension.

Prior knowledge has been shown by Chi (1976) and DeGroot (1965) to increase short term memory capacity. In these studies, expert chess players retained in short term

memory many more positions of chess pieces on the board than did novices. When the pieces were placed illogically, the difference disappeared. Chi and DeGroot proposed that larger chunks can be stored in short term memory when prior knowledge is higher. Support for this concept was provided in a study by Johnston (1982) who found that prior knowledge accounted for significant variance in short term memory after accounting for the effects of decoding speed. In this study prior knowledge was found to have an effect on two components of reading comprehension: short term memory capacity and decoding speed. Johnston found that the speed at which a reader can process words relating to a given content area is strongly related to the extent of the reader's relevant prior knowledge.

In their comprehension model, Kintsch and van Dijk (1978) presented a model assuming an automatic cyclical process that checks for argument overlap in a proposition as the proposition becomes available. If there is no argument overlap, a search of long term memory must be initiated. These searches and also the construction of inferences are demanding on cognitive resources. According to Kintsch and van Dijk (1978), prior knowledge influences each of these processes, and so increases the amount of cognitive resources available for other processes involved in comprehension.

The research on the role of prior knowledge and schemata indicates that comprehension depends upon the availability of prior knowledge. The theory to be tested here proposes that prior knowledge, in addition to its direct effect on comprehension, also has an effect on the interest of the reader, which then has an effect on comprehension. There are no studies in the prior knowledge literature which explored the relationship between interest and prior knowledge.

Another question not addressed by this literature is why some things are remembered from reading a story which are not relevant to the story schema. It is Kintsch's hypothesis that interest offers an explanation for this problem.

Theories About Interest

In this section theories about interest, primarily that of Berlyne, are discussed. The presence of moderate novelty, or unpredictability, is shown to result in a search for more information. Something in the environment is moderately novel when it differs slightly from prior experience. This research supports the inclusion of both the prior knowledge and predictability factors in the interest model proposed by Kintsch (1980).

In a 1957 study of variables related to human perceptual curiosity, Berlyne (cited in Berlyne, 1960) utilized visual incentives differing in degree of relative uncertainty. The subjects were allowed to respond as often as they wanted to brief exposure of cards showing various patternings of simple geometric figures. Frequency of response was directly related to the asymmetry, irregularity, or complexity of figures, and inversely related to their redundancy. Berlyne concluded that situations which are characterized by uncertainty, complexity, novelty, and ambiguity induce a state of tension. The goal of exploration and information searches which result in the acquisition of knowledge is to alleviate this tension.

Learning information for the purpose of passing an exam or reaching a vocational goal, for example, is motivated extrinsically. Learning for the satisfaction of knowing or for the reduction of uncertainty is intrinsically motivated. Intrinsic motivation is derived from interaction between the task and the individual, and is the result of qualities inherent both in the task and in the organism. Intrinsic types of motivation were regarded by Murray (1951) as the need to know and understand, and by Maslow (1954) as the need for self conceptualization.

Berlyne (1971) formulated a model that is easily made quantifiable. Thus both manipulation for experimental purposes and measurement of results are possible. Berlyne suggested that intrinsic motivation is directed towards the search for information, in order to reduce a heightened level of arousal resulting from a lack of adequate information needed to select an appropriate response.

Exploratory behaviors are activities in which sense organs are brought into contact with objects or events that are not inherently beneficial or noxious. Organisms spend much time and energy engaging in exploratory behaviors. Until about 1950, this kind of behavior was largely ignored in theoretical and experimental literature. Previous to this time it had generally been thought that all behavior is motivated by the prerequisites of survival. Early neobehaviorists, physiological psychologists, and

psychoanalysts assumed that the goals toward which animals and humans strive have inherent or learned connections with biological gratification and relief. Accumulation of knowledge about the conditions under which exploratory behavior occurs and also its early appearance in the life of the organism led to a new approach.

Moruzzi and Magoun (1949) demonstrated the existence of an arousal system (the reticular activating system, or RAS) which is activated at the same time as the more specific sensory tract which transmits external stimulation directly to the cortex. The RAS works through a second set of fibers and transmits energy through a diffuse network (reticulum) of fibers (located in the midbrain) to the cerebral cortex.

The degree to which directly projected stimulation will be received by the cortex, acted upon, and possibly translated into motor activity is affected by the activity in the RAS. The greater the arousal level produced by the RAS, the more pronounced the level of activity that can be induced in the cerebral cortex. It has also been found that nerve fibers sometimes fire spontaneously, so that stimulation may originate without an external stimulus.

Spontaneous activity is constantly present in the central nervous system and the sense organs are constantly bombarded with stimuli which initiate excitatory processes within the brain. The only way in which the brain can

perform the prime function of selecting adaptive responses is to select some processes to be completed while holding others back. In order to determine whether a process should be given priority, the brain depends on information about conditions inside and outside the organism. Some of this information enters through sense organs and some of it has been stored after having been deposited during previous learning.

The central nervous system is designed to cope with environments that produce an optimal rate of influx of stimulation, information, and challenge to its capacities. This rate varies with individuals, being dependent upon personality, culture, psychophysiological state, and recent or remote experience. The central nervous system will not perform at its best in an environment that overstresses it, and, at the other end of the scale, prolonged subjection to a monotonous environment is also detrimental to a variety of psychological functions (Berlyne, 1966).

In 1961 Jones, Wilkenson, and Braden (cited in Berlyne, 1966) found that persons confined in a dark room with a minimum of stimulation pressed buttons in order to make patterns of colored spots of light appear. They preferred those buttons which offered the most variety and unpredictability. This and similar behaviors are classified by Berlyne (1966) as "diversive" exploration, as distinguished from "specific" exploratory responses, which

occur at any time in response to specific stimuli. When an organism seeks out stimulation regardless of source or content, Berlyne (1966) defines this activity as diversive exploration. Diversive exploratory behavior is especially strong after the subject has spent hours in an environment that is highly monotonous or devoid of stimulation. Specific exploratory responses are the most pertinent for the study proposed in this paper.

When an organism is disturbed by a lack of information, it is likely to resort to specific exploratory responses which supply or intensify stimulation from sources which can provide the information which is lacking. Curiosity, or interest, is thus a condition of discomfort due to the inadequacy of information. It motivates specific exploratory responses.

In a series of experiments, Berlyne (1966) investigated the role of novelty, or unpredictability, in the stimulus. In one experiment, he presented pairs of animal pictures on a tachistoscope. The picture displayed on one side was always the same, while the other was changed in every trial. The subjects were found to spend a decreasing amount of time inspecting the recurrent pattern and an increasing amount of time looking at the changing pattern.

In another series of experiments (Berlyne, 1966), he found that the subjects spent more time looking at the member of the pair which was the more complex. He found that exploration time reached a peak and then declined as complexity became extreme; however the point at which this occurred varied between individuals. In other experiments referred to by Berlyne (1966) it was found that infants preferred more complex patterns to less complex ones, and that novelty, surprisingness (disparity between stimulus event and expectation), and regularity or irregularity of form also influenced infantile exploration.

Berlyne (1960) suggests that specific exploratory responses, learned or unlearned, are likely to result from an aversive condition or a condition of heightened drive due to lack of information (subjective uncertainty). This condition, which he calls "perceptual curiosity", is apt to result from exposure to novel, surprising, highly complex, or ambiguous stimulus patterns. Experiments designed to investigate this point (Berlyne, 1966) consisted of presentation of blurred pictures (to induce uncertainty). The rate at which a key was pressed to secure a picture was used as a dependent mesure. He found that replacement of the blurred picture by a clear version of the same picture was a more effective reward than the replacement of the blurred picture by an unrelated clear one or another blurred one. There was some indication that the clear picture was most rewarding when it replaced a picture with

an intermediate degree of blurredness. In other words, interest was shown to result from a moderate degree of unpredictability.

Properties of external stimuli which determine what is explored as well as its vigor fall into three groups: psychophysical properties, which are dependent upon specific physiological properties such as brightness, loudness, and color; ecological properties, which depend on association with noxious events or visceral gratification; and collative properties, which seem to exert the strongest control over exploratory behavior. Collative properties are dependent upon comparison of stimulus elements, either simultaneous stimuli or stimuli which have been percieved at different times. These are the properties which are denoted by words such as novelty, surprisingness, incongruity, complexity, variability, puzzlingness and unpredictability.

The concept of arousal level comes from developments in neurophysiology and physiology which started about 1950. Fluctuations in arousal are reflected by changes in the electrical activity of the brain, in electrical and thermal properties of the skin, in muscular tension, in the circulatory system, in the respiratory system, and in the diameter of the pupil of the eye. These changes can both be recorded and precisely measured. Exploratory responses have been connected with rises in arousal in two ways.

First, experimentation has shown that at least some forms of exploratory behavior are accompanied by psychophysiological changes, including several which are recognized indices of increased arousal. Secondly, evidence is accumulating that the collative stimulus properties (which strongly influence exploratory behavior) are capable of increasing arousal. Several experiments have shown that a stimulus gradually loses its power to evoke an orientation reaction (raise arousal) as it loses its novelty through repetition (Berlyne, 1960). Berlyne (1966) found that the intensity of the orientation reaction increases with surprisingness, complexity, and incongruity, and also that the mean amplitude of the galvanic skin response increases with degree of conflict (which is suspected by Berlyne as being the underlying factor responsible for the motivational effects of the collative variables).

Specific exploratory responses are often "epistemic" responses (Berlyne, 1966). That is, they are aimed not only at obtaining access to informational stimulation capable of dispelling momentary uncertainties, but also at the acquisition of knowledge that will be stored and can be used to guide behavior on future occasions. Exploratory behavior deals with the perception of objects or events, while epistemic behavior is directed toward reducing conflict about concepts and symbolic representations. Epistemic behavior was divided by Berlyne (1965) into three

classes: epistemic observation, consultation, and directed thinking. When conflict between competing response patterns (beliefs, attitudes, thoughts, and ideas) arouses an individual, he will search for information to reduce the conflict. He will do so by either directing his resources to the exploration of the source of the conflict in order to gain information (epistemic observation) or he may also resort to consultation (searching elsewhere for information) and he will probably engage in directed thinking (thinking with the goal of choosing a response which will successfully solve a problem and eliminate a specific conflict). Berlyne (1966) reported that several researchers have recorded variations in arousal level while subjects were thinking. These variations were influenced by degree of difficulty.

Berlyne (1965) reported investigations of the determinants of a motivational condition favoring epistemic behavior (a condition which he calls "epistemic curiosity"). He presented subjects with a series of questions and asked them to specify a certain number whose answers they would like to know. In one of these experiments, the subject matter of which was invertebrates, he found that the most curiosity was induced by the more familiar animals, by questions that subjects found surprising, and by questions that attributed to species characteristics they were unlikely to possess. He also found in two later experiments that a greater number (three

as opposed to two) of alternatives and nearness to equiprobability of the possible answers produced the greatest curiosity. These two variables are the principal determinants of subjective uncertainty. In other experiments (Berlyne, 1966) novelty, surprise, and incongruity made children ask more questions and affected their content.

Berlyne sees a moderate degree of novelty as producing exploratory responses resulting in learning. Interest is viewed as the product of a heightened arousal level that results from a lack of relevant information. It appears in situations where environmental information or previous learning is not adequate for the needs of the organism. Berlyne found that epistemic responses (resulting in the acquisition of knowledge) occur most often in situations where prior knowledge and unpredictability are present. It is his view that moderate predictability (as compared to prior experience) results in interest, which increases comprehension. Berlyne thus supplies a larger theoretical context in which to place Kintsch's interest model.

The Role of Interest in a Reading Model

The present study tests Kintsch's (1980) theory that interest in reading is the result of an interaction between the reader's prior knowledge and the predictability and postdictability of the text. This theory of interest is part of Kintsch's (Kintsch and van Dijk, 1978) larger model of comprehension, which will be discussed in this section.

Kintsch and van Dijk (1978) proposed a processing model with three sets of operations. In the first set of operations, the meaning elements of a text become organized into a coherent whole. Some of the elements are subjected to multiple processing, which results in differential retention. The full meaning of the text is condensed in the second set of operations. A third set of operations generates new texts from the reader.

The KvD model is not only descriptive, but produces output consisting of simulated protocols that can be qualitatively compared with experimental protocols. The model also yields detailed predictions of the frequencies with which propositions and inferences will appear in experimental protocols.

The KvD model is concerned only with semantic structures and does not include a full grammar (which is needed for the interpretation of input sentences and the production of output sentences). The model operates at the

level of assumed underlying semantic structures, which are characterized in terms of propositions. Propositions are composed of two or more words or concepts, one of which serves as a predicate and specifies a relationship between the remaining words or concepts, which are called arguments.

Although Kintsch and van Dijk emphasize the processing of stories, the model is applicable to all text types. Stories are used as examples because well defined control processes (story schemata) exist for them which are shared by many readers, making the collection of meaningful data possible. The model applies to listening as well as to reading.

The KvD model assumes that comprehension consists of several processes which sometimes occur sequentially and sometimes simultaneously. Human limitations affect the system not in the actual processing, but rather when attention, conciousness, decisions, and memory are called for. These capacity limitations are important in the storage of information and in response production.

The surface structure of a text is interpreted as a set of propositions ordered by the semantic relations between them. Some of these relations are stated in the text, others are inferred with the aid of context specific or general knowledge. The model does not specify the details involved in knowledge use and inference processes,

only indicating when an inference occurs and what it will be.

There are two levels of the semantic structure: the microstructure and the macrostructure. The microstructure is the structure of all the individual propositions and their relations, while the macrostructure characterizes the text as a whole and contains fewer propositions. The levels are related by the macrorules, a set of specific semantic mapping rules which reduce the microstructure to the macrostructure. The rules operate under the direction of the story schema.

If readers form macrostructures under the direction of story schemata (when reading stories), scrambled stories should take longer to comprehend than conventionally ordered stories, but the resulting macrostructures should be the same. The reason for the difficulty is that extra time would be needed to reorganize the scrambled story. To test this, in 1975 Kintsch and van Dijk (cited in Poulsen, Kintsch, Kintsch, and Premack, 1979) gave twenty-four subjects two stories in either scrambled or normal order, and allowed the subjects as much time as they needed to read them. The average reading time was significantly greater for the scrambled stories than for the ordered ones. To determine if the macrostructures were equivalent, the subjects' summaries were analyzed into propositional units. A further group of twenty-eight new subjects read

the stories with limited time, giving them less time to organize their macrostructures. When reading times were subject-controlled, judges could not distinguish between the normal and scrambled version, but the summaries of the stories which had been read with limited time were much easier to sort correctly.

In order to establish coherence, an explicit text base containing some propositions that are not in the implicit text base is constructed during reading. Inferences needed to connect propositions are made on the basis of general or contextual knowledge of the facts. On the basis of the facts provided in the text, inferences are made about possible, likely, or necessary other facts. The propositions of a text base must be connected in a meaningful whole characterized by the topic, as well as related locally.

The structure of a story is schematically specified by a set of categories and a set of rules of formation and transformation. These rules, which are sometimes recursive, reduce the categories to the simplist schema. In addition, the rules may order the categories. These "macrorules" require general information for their operation, which is controlled by a schema.

If schemata play an important role in macrostructure formation, subjects reading stories that do not conform to their story schema should create more arbitrary macrostructures than would readers of stories that have a conventional story schema. To test this, Green (reported in Kintsch, 1977) gave subjects eight stories, four of which were Alaskan Indian myths which deviate from the story schema of our culture, although the episodes are internally coherent. It was found that subjects write more informative summaries when they have an appropriate schema to organize the story than when no appropriate schema is available. In another, similar experiment, a Grimm's fairy tale and another Indian story were read to subjects who then wrote protocols. These protocols were then read to another group of subjects. The same process was then repeated several times. By the fifth recall, whole episodes of the Indian story were lost.

Macrorules reduce and organize microstructural input into macrostructural information which describes the same facts from a more global point of view. Successively higher levels of macrostructure can be obtained in this way, resulting in shorter and shorter summaries. A macrostructure is implied by the microstructure from which it is derived.

Macrorules reduce propositions in three ways: by deletion, generalization or construction. The deletion rule is that a proposition may be deleted if it is not needed, either directly or implicitly, to interpret a subsequent proposition. The generalization rule is that a more general proposition may replace a sequence of propositions. The last rule allows for a sequence of propositions to be replaced by a single proposition which is normally found to be the result of the conditions, components, or consequences of the facts in the sequence.

The input to Kintsch and van Dijk's (1978) processing model is a set of propositions representing the meaning of a text. Kintsch (1974) described the process, which is not included in the model, as one of deriving the propositional list from the text. Persons using the system have been found to arrive at equivalent propositional lists (Kintsch and van Dijk, 1978). This list of propositions, called the text base, can be translated into the graphical notation of Norman and Rumelhart (1975) and other notations, any of which could be used to represent meaning in the KvD model.

The meaning of a text is thus represented by a structured list of propositions, which are composed of concepts. The concepts may be one or more words. The composition rule is that each proposition must include a predicate (or relational concept) and one or more arguments (which may be concepts or other embedded propositions).

The semantic functions of the arguments may be as agent, object, or goal. Predicates may be verbs, adjectives, adverbs, and sentence connectives. A predicate puts constraints on the nature of the argument it may take, imposed by both linguistic rules and general knowledge. These constraints are assumed to be a part of a person's semantic memory.

Kintsch and Keenan (1973) demonstrated that number of propositions in a sentence, rather than number of words, determines reading time. Reading time was found to increase monotonically with the number of propositions in the text base, although number of words remained the same.

In a text base, the propositions are ordered in the same way they are found in the text itself. One of the criteria for semantic coherence which the text base must meet is referential coherence, which in this notational system corresponds to argument overlap among propositions. This is not a necessary or a sufficient criteria linguistically, but many other textual factors are correlated with it, making it a useful indicator of coherence which can be easily and reliably checked.

Kintsch and van Dijk (1978) hypothesize that the first step in forming a coherent text base is the checking of its referential coherence. Since the text base as a whole is too large to check for referential coherence, due to the limitations of working memory, the text is processed

sequentially in chunks of propositions. The number (n) of propositions included in a chunk depends both on the surface characteristics of the text and on reader characteristics. It is accepted for further processing if there is argument overlap among all of its propositions. If gaps are found, one or more propositions are added to the text base by inference.

When a chunk of n propositions is processed, s (the capacity of the short term memory buffer) of them are selected and stored in the buffer. Only these propositions are available for connecting the new chunk with the previously processed material. If there is an overlap between the new propositions and the contents of the short term memory buffer, the input is accepted as coherent with the previous text. If not, a search is made of all the previously processed propositions. If the search is not successful, an inferential process is initiated, adding to the text base one or more propositions which connect the input and the already processed propositions.

Miller and Kintsch (1980) tested the predictions of the KvD model using ten paragraphs from various sources. Reading time and recall data were obtained from 120 subjects. Most of the texts fitted the model's recall predictions well. There was a general relationship found between goodness-of-fit values and the difficulty of the text, in which it was observed that the smaller the number

of inferences which had to be made while reading the text, the better the fit of the model. Three of the texts did not require that any reinstatement searches be made; the other texts required more. The number of reinstatements required correlated -.62 with reliability and about -.59 with total recall.

As the reader proceeds through the text, a network of coherent propositions is constructed. This network can be graphically represented. The graph is arranged in levels, with the top proposition being the one which results in the simplest structure. The propositions are represented as the nodes, and connecting lines indicate shared referents.

In each processing cycle, there are n (new input) plus s (held over in the short term memory buffer)propositions which are involved in each processing cycle. In each cycle, the propositions may be stored in long term memory and later reproduced, each with a probability, p. The value of p varies depending on the reproduction task (recall or summary) or on the length of the retention interval. A proposition is reproduced with probability p each time it participates in a cycle. Some propositions, having participated in more processing cycles, will have higher reproductive probabilities.

Kintsch and van Dijk (1978) report various experiments in which subjects read the same text at their own speed and, after varying retention intervals, were asked to write a recall protocol and then a summary of between 60 and 80 words. One group of 31 subjects were tested immediately after reading the material, another group of 32 subjects after a one month retention interval, and twenty-four others after three months. In the recall protocols, the proportion of reproductive propositions declined from 72% to 48% as the retention interval increased. As less material from the the text was reproduced, proportionately more material was added by the production processes (reconstructions and generalized statements), indicating that recall does not only reflect what is stored in memory. The picture was similar for the summaries, although not as pronounced. The summaries generally were less reconstructive than the recall protocols. Predictions by the model about the recall of individual propositions was quite good in five of the six cases. In immediate recall the probability of reproducing micropropositions was about five times higher as after three months. The probability of reproducing irrelevant generalizations decreased in the same manner, but the liklihood that macropropositions would be produced changed very little with delay. The forgetting rate for micropropositions was about four times greater than for macropropositions.

Kintsch, Kozminsky, Streby, McKoon and Keenan (!975) gave subjects texts which contained the same number of propositions but differed in number of word concepts used as arguments of the propositions, so that there was a short and a long version of the texts. They found that reading times were longer and recall was less for the texts with many word concepts, indicating that texts with many different word concepts require more processing, irrespective of the number of propositions. The probability that a word concept was recalled increased as a function of the number of repetitions of that concept.

Whether a proposition will undergo multiple processing depends on the nature of the strategy which selects the propositions to be held over. A good strategy would select propositions already connected to many others, as these are most likely to be relevant. More recent propositions might be expected to be relevant to the next input cycle. Also, propositions which belong to high levels of the text base hierarchy have been found to be recalled better than are propositions low in the hierarchy (Kintsch and Keenan, 1973; Kintsch, Kozminsky, Streby, McKoun, and Keenan, 1975).

A number of factors might influence s, the short term memory capacity; there are differences between individuals. Perfetti and Goldman (1976) showed that good readers can hold more of a text in memory than can poor

readers, although the different types of readers did not differ on a conventional memory span test. This indicates that the differences in performance may not be due to actual capacity differences. Instead, the short term memory capacity may depend on the difficulty of the text (to the individual), since the size of the buffer presumably depends mainly on the amount of resources that must be devoted to other aspects of processing (perceptual decoding, syntactic or semantic analyses, inference generation, and other macro-operations). The size of the reader's buffer should decrease as the automaticity of these processes decreases and the number of required inferences increases. Thus, prior knowledge affects the short term memory capacity (s).

If a topic is not familiar to a reader, a frame will not be available in which to organize and interpret a propositional sequence in order to make inferences from it. Short term memory will become overloaded because the reader is trying to hold too many propositions in it at one time, in order to try to organize the information.

Prior knowledge also affects n, the number of propositions accepted per cycle. Unfamiliar material has to be processed in smaller chunks than does familiar material, so n should be inversely related to familiarity. If the complexity of the surface form is increased while the underlying meaning remains the same, the size of the

processing chunks should decrease. Kintsch and Monk (1972) and King and Greeno (1974) found that this does occur.

Kintsch and Monk (1972) gave subjects either a simple or a complex version of paragraphs, each containing the same number of propositions but differing in the directness with which they were expressed. Both versions had the same number of inferences which needed to be made. It was found that subjects needed more time to read the complex versions, and the likelihood that correct inferences were made did not differ. When reading time was restricted, more errors in making correct inferences were made, indicating that making inferences does require additional time.

The value of p, the probability that a proposition will be stored in long term memory, also depends upon prior knowledge. For a more familiar text, fewer resources are required for other aspects of processing, so that more resources are available to store propositions in memory. (The value of p should vary primarily, however, with the task demands such as length of text).

Kintsch (Kintsch and Vipond 1978) feels that the number of resource-consuming operations (long term memory searches and inferences) that would be required to read a text can be determined, and that each one of these individual operations disrupts the comprehension process and adds to the difficulty of reading. If these operations

are not performed, retrieval of the text base will be poor. Texts which require many operations which make high demands on resources will result in increased reading time or in low scores on comprehension tests.

In Kintsch's model (Kintsch and van Dijk, 1978), readability is not a property of the text alone. The factors related to readability depend on the input size per cycle (n), the short term memory capacity (s), and the nature of the selection strategy used. Kintsch and Vipond (1978) found that readability of some texts changed as a function of the short term memory capacity and the size of input chunks.

Macro-operators delete or generalize all micropropositions (obtained from the text base) which are relevant or redundant. They also function to construct new, inferred propositions. The propositions which are produced by the macro-operators, and also those reproduced from the text base, are called macroprositions, and they represent the gist of the text in the macrostructure. A proposition which is deleted from the macrostructure may be stored in memory and later recalled.

The operation of the macro-operators is controlled by the reader's goals, which are generally represented as the schema. Which micropropositions (or generalizations of micropropositions) are to be considered relevant is determined by the schema.

Text comprehension is assumed to be controlled by a specific schema. In some situations, the controlling schema may not be detailed or predictable. If the reader's goals are vague or the text lacks a conventional structure, different readers might produce different schemata. Stories, however, are highly conventionalized text types which, if processed in accordance with their conventions, result in specific, well-defined schemata which are shared by members of a cultural group. These schemata specify both the schematic categories of the texts as well as the information in each section relevant to the macrostructure. In order for the reader to be able to make predictions about what should be included in the macrostructure, he must have an understanding of the appropriate schema. Story schemata have been studied by Kintsch (1977), Kintsch and Greene (1978), Poulsen, Kintsch, Kintsch, and Premack (1979), van Dijk (1977), and in the "story grammar" approach by Mandler and Johnson (1977), Rumelhart (1975), and Stein and Glenn (1977).

A second type of reading situation with well-defined schemata occurs when the reader has a special purpose. Hayes, Waterman, and Robinson (1977) studied the relevance judgements of subjects who read a text with a specific problem solving set. They found that the text did not have to be conventionally constructed, since the special purpose schema (established by task instructions, special interests, etc.) could override the schema which ordinarily

would have controlled the processing.

Recall or summarization protocols which result from applying the procedures described in this section are not merely replicas of memory representation of the original texts. They are themselves texts which satisfy the general textual and contextual conditions of production and communication. Redundant information is excluded from them, and they contain information consisting of reconstructively added details, explanations, and other features resulting from output constraints which characterize production.

In their model, van Dijk and Kintsch (1978) have regarded summaries as expressions of the macrostructure of texts. For stories, the macrostructure is formed on the basis of the story schema, a set of expectations about the conventions observed within a culture in writing stories. The prototypical story in our culture consists of one or more episodes, each in an exposition-complication-resolution format. All the material in a story can be assigned to one of these three narative categories. The schema also requires that the events of a story be temporally and causally connected, and imposes a number of other constraints (van Dijk and Kintsch, 1978).

According to the Kintsch and van Dijk (1978) processing model of comprehension, the information in a text is reduced in accordance with the goals, beliefs, and prior knowledge of the reader. Macrostructures organize information and provide global coherence. This is accomplished by the use of a system of reduction rules, called macrorules. These macrorules, however, do not show the strategies which the reader used to generate the macrostructure. Interest or elaboration might be cues signalling macrostructural relevance (Kintsch, 1980; Schank, 1978). If the reader is using an interest strategy to create a macrostructure, he will select the interesting (to him) portions of the text as the basis for its macrostructure.

To test this hypothesis, Walter and Kintsch (1982) used neutral objects and made them interesting or uninteresting by putting them into surprising or unsurprising contexts. Subjects read a short text which contained a reference to the target object. In the "basic" condition, the object was briefly mentioned and appeared in an unsurprising context. In the "interest" condition, the object was found in a surprising environment. There was also an "elaborated" condition, in which the object was discussed more but still appeared in an unsurprising context. The subjects then wrote one or two sentences of their own to indicate how the story would continue. Ratings were taken to assess the extent of the interest and

surprise of the subjects.

The sentences written by the subjects were examined to see if the target element was in them, in which case it was regarded to have been macrorelevant. It was hypothesized that interesting (surprising) and elaborated elements would be more frequently selected as macrorelevant by the 60 introductory psychology students.

The subjects were divided up into six groups, with three levels of text variation (basic, elaborated, and surprising) and two levels of text setting (the peaks of the Rocky Mountains and downtown Manhattan). Two boys were described walking in these settings and coming across either a mountain goat or a bus, which was surprising or not depending upon the setting.

Subjects rated the stories for surprise and interest. Differences between the mean surprisingness rating of the basic (mean=2.7) and elaborated (mean=2.9) variations were not significant. The mean of the surprising variation (6.7), however, was significantly greater than that of the other two versions. No significant difference was found in the mean interest rating of the basic (mean=3.4) and elaborated (mean=3.6) versions, but the surprising texts had a significantly greater mean (5.9). The proportion of subjects who included the target item in their continuation was .35 in the basic version, .70 in the elaborated version, and .95 in the surprising version. These

differences were significant.

In experiment 2, the surprise and the elaborated conditions were less extreme than they had been in the first experiment. Otherwise, the experiments were the same. The mean surprisingness ratings of the three conditions differed in the same direction as in the first experiment, but none of the effects were significant. There were no significant effects for the interest ratings. The proportion of subjects who mentioned the target item in their continuation was .25 in the basic condition, .50 in the elaborated condition, and .55 in the surprising variation. The difference was significant when the elaborated and the surprising versions were combined and compared to the basic version.

The degree to which the content of a text is related to the reader's knowledge may be understood, in terms of Kintsch's (1980) theory, to be the extent to which the propositions in a text, directly or through inference, match the reader's knowledge. According to Kintsch, a plot of interest against the relatedness of text propositions and the reader's knowledge would look like an inverted U function. When the text propositions and the reader's knowledge are totally unrelated, the text should be incomprehensible and therefore not interesting. When a sufficient number of text propositions are known to the reader, interest can operate and comprehension can occur.

When the text is comprehensible but redundant to the reader, the text is again uninteresting. Interest also may result when the text contains information that is not only new, but answers questions, clears up confusions, or fills in gaps in the reader's knowledge.

Walker (1981) gave one group of 24 introductory psychology students information about passenger services on 19th century railroads. A second group was given information about locomotives. Both groups later read 10 articles related in different ways to the knowledge acquired during training. Half of the articles dealt with locomotives and half with passengers. One of the five articles was constructed so as to be redundant with the training information, another to be incomprehensible, a third to provide related but new information, a fourth to answer questions or clarify ambiguities, and a fifth to provide information which conflicted with the training information. The training was done by presenting the material on a CRT terminal. It consisted of 57 screens. In order to assure that the subjects would find the redundant text familiar, an adjunct question was placed in the training text after the initial presentation of the targeted material.

Walker used highly technical texts as the material for the incomprehensible texts in this study. Incomprehensibility in a text can result from inadequate

background knowledge, bad writing style, or poor organization of the text. Unanswerable adjunct questions, requiring information not provided, were placed in the text. The missing information was provided in the clarifying text.

The conflicting information text was made by inserting adjunct questions in the training text that required the reader to assert the falsehood of certain information. The experimental text later presented this information as true.

Before the presentation of the experimental material, the subjects were given multiple choice quizzes for each training text in order to assess training effectiveness and, for half of the subjects, baseline knowledge for both training topics. The experimental session, held the next day, consisted of the ten texts and five questions to be rated on a 7-point rating scale. The subjects rated the experimental materials on familiarity, interest, understandability, clarification, and match-to-knowledge. Two experiments were discussed together. Although it was not done on a computer, the second experiment was identical to the first except that conflict ratings were also gathered and all the subjects recieved baseline tests only for their training topics. There were 40 subjects in the second experiment.

In the results, the largest bivariate correlation found was that between interest and understandability. When the incomprehensible texts were dropped from the analysis, the correlation dropped, showing that the magnitude of this correlation was due to the large range of understandability of the texts. Incomprehensible texts were judged uninteresting by the subjects, demonstrating that understandability is a necessary condition for interest. The texts which were judged comprehensible were not always judged interesting, indicating that, while it is necessary, understandability is not sufficient to explain interest.

The correlation of the clarification and interest ratings was the second largest among the variables. It was found that the more clarification a text gave, the more interesting it was judged.

Conflict was not found to be related to interest. Walker's explanation for this was that when propositions in a text conflict with the reader's knowledge, impartial and unemotional conflicts produce interest. However, if a reader has a large emotional investment in his prior beliefs, the impact on interest might depend on an individual's ability to cope with ambiguity, uncertainty, or cognitive dissonance.

From his results, Walker concluded that the degree to which a text is related to the reader's knowledge affects interest. As relatedness increases, so does interest, until it reaches a point where interest decreases as relatedness continues to grow.

Measures of comprehension or of learning were not taken in this study, since it was not designed to explore the question of causal relations between interest and these variables. There is, however, a relationship between interest and processing. Incomprehensible texts, which were found to be uninteresting to the subjects, cannot be semantically encoded since the concepts they present are not held by the reader. At the other end of the interest spectrum, where the content of the text is already known to the reader, there is no need for deep semantic processing and few of the reader's resources are required in this case also. In the middle of the relatedness continuum, relevant prior knowledge is used to enable inferencing, requiring the reader to allocate substantial processing resources. Interest thus peaks at the same time as processing, especially inferencing.

Kintsch (1980) assumes cognitive interest to be determined by the interaction of three factors: 1)prior knowledge, 2)predicatability, 3)postdictability. He sees cognitive interest as a nonmonotnic function of prior knowledge. It is low with no or little knowledge,

increases as more is known, and then decreases again when the reader's knowledge reaches the point where the paragraph no longer tells him anything new. The uncertainty a paragraph generates in the reader is also nonmonotonic: if a continuation is completely predictable, it should have low cognitive interest, and if there are no expectations at all about how the text is to continue, this is not very interesting either. Somewhere in between, where specific conflicting expectations exist, interest is considered to peak. Readers must also be able to construct a coherent macrostructure in which each unit is meaningfully related to others. If this is possible, the text is said to be postdictable, which is considered to be a necessary condition for interest.

How these three components of cognitive interest combine is at present considered uncertain by Kintsch (1980). Different components might dominate in different text types. Interest in a story, he believes, derives mainly from the unpredictable but well motivated turn of events. Predictability and postdictability are thus more important components of cognitive interest in a story than is prior knowledge.

It can be seen, however, that prior knowledge plays a large role in this model. If a text is interesting because it is unpredictable and hence surprises the reader, this implies that a reader must have had enough knowledge about

the situation to form expectations. Similarly, the ability to postdict, or to determine after the fact that a given text passage properly fits into its context, requires the reader to make knowledge based inferences. If the reader does not know anything about what is being read, cognitive interest will be very low since he/she has no way of forming expectations and can't tell whether he/she is dealing with a coherent whole. Being able to postdict also means to find a place for the new information in the total knowledge structure. If there is no relevant knowledge structure, or if information with too large a deviation from it is encountered, the new knowledge cannot be integrated.

The KvD model (Kintsch and van Dijk, 1978) describes the story comprehension process as being under the control of a story schema. Kintsch (1980) adds to this control structure a number of other schemata, so that comprehension is jointly determined. One type of schema derives from personal goals. An appropriate passage in a story activates a subgoal and leads to the construction of a new control schema. The macrostructure of a story generated by a reader thus may include not only items which are relevant to the story schema itself, but also propositions constructed or selected under the control of subsidiary schemata. In the absence of an appropriate personal goal, schemata can be established through special task demands. Kintsch (1980) believes that many reading tasks are

probably controlled by multiple schemata.

Kintsch (1980) points out that propositions which do not immediately fit into the control schema are sometimes remembered by the reader. These, Kintsch (1980) says, are items that the reader finds interesting. These items deviate from expectations, but the nature of the deviation itself tells the reader something of importance. It invites the reader to infer a broader schema. If a turn of events is surprising to the reader, he knows that the story must be organized differently than had been expected.

In the KvD model (Kintsch and van Dijk, 1978) the control schema was assumed to operate in a top down fashion. Allowance was made for other, task specific, schemata, but they were conceived as affecting the comprehension process from above, and from outside. In his new work, Kintsch (1980) is working on the previously neglected problem of aspects of the textual information that trigger schemata from below, i.e. from the text, such as information relevant to certain personal goals or interest arousing statements. An indication of this is that many texts may be read initially without a clearly specified control schema. A reader may approach a text without a specific goal, form expectations from the text, and take the deviations from these expectations as his cue for the selection of an appropriate control schema.

This interest model fits very well into the larger KvD theory presented here. According to the KvD theory of comprehension, the information in a text is reduced in accordance with the goals, beliefs, and prior knowledge of the reader. This is consistent with the introduction of interest schemata, which influence what goes into the macrostructure, and therefore comprehension and memory. Interest may also originate from something in the text that deviates from expectations and causes the reader to infer that the story is organized differently than he had previously believed. This influences what is included in the macrostructure. Kintsch's interest model thus expands his model of comprehension to include more than one controlling schema. Some of these control schema may be activated by interest-arousing structures in the text.

Although Kintsch's (1980) model of interest has been partially tested (Walker, 1981; Walker and Kintsch, 1982), until the present study no attempt has been made to investigate the effects which occur when all three of the cognitive variables proposed by Kintsch are manipulated in one study. The present study was conceived in order to examine the result of such a manipulation.

Summary

The previous sections of this paper discussed the contributions of topic interest, prior knowledge, and predictability (novelty) to interest and/or learning. A model of reading comprehension was presented. Evidence was presented indicating that interest does have an effect on reading comprehension. It was concluded, however, that the term "interest" needed clarification. Theories were presented that explained the role played by interest in all learning; however, since these theories have never been applied to reading comprehension, no experimental testing of them could be presented. The role of prior knowledge in comprehension was discussed, but none of the theories or studies presented used interest as a variable. A processing model of reading comprehension was discussed, and an interest model was presented in the context of this comprehension model. This interest model (Kintsch, 1980) was seen to be important because it gives an operational definition to the term "interest". More study of this model was found to be necessary, since it had been only partially tested. An examination was seen to be needed of the results of the manipulation of all three of the proposed cognitive variables in one study.

Kintsch's model proposes that three cognitive variables influence whether or not a text will be found interesting. These variables are prior knowledge,

predictability, and postdictability. Conditions can be set to vary these three variables independently in one experiment. Before the present study, this had not yet been done, so the interactions of all three had never been studied. There had also been no effort to see how these three variables would contribute to scores on a conventional interest measure like an interest rating scale. Lastly, there had been no study which examined the effect of interest, as defined by Kintsch, on learning or comprehension.

In the present study, an experimental text was designed so that prior knowledge, predictability, and postdictability could be independently manipulated. In addition to the main effects of the three variables, interactions could also be examined. Five dependent variables measured the effects of the three variables and their interactions on interest, comprehension, and learning. It was expected that optimum conditions of the three variables would contribute to interest in the text.

Definition of Terms

The three dependent variables in this study are prior knowledge, predictability, and postdictability. In the present study prior knowledge is defined as prior background knowledge, such as knowledge of the setting of the story. The levels of prior knowledge in this study are moderate prior knowledge (a city setting) and low prior knowledge (a forest setting).

Predictability is defined in this study as the availability for use by the reader of cues in the text. These cues are used by the reader to access schema. Levels of predictability in this study are moderate predictability (in which cues in the text make schema moderately available), and low predictability (in which cues in the text are more general, making schema less accessible).

Postdictability is defined in this study as whether the text as a whole makes sense. In the postdictable condition the subjects read a fable with a moral that was related to the story. In the nonpostdictable condition, the subjects read a moral with a fable which made no sense in the context of the fable. The moral was the last line of the fable but could not be integrated with the rest of the text, thus making the fable nonpostdictable.

There were three dependent variables in this study: interest, learning, and comprehension. Interest was measured by the use of an interest rating scale which was filled out by the subjects, and also by a behavioral measure of interest. The behavioral measure of interest was a choice, given to each of the subjects, as to whether they wanted another, similar story.

Learning was defined as the number of propositions which the subjects included in their summaries. Comprehension was measured by a comprehension rating scale which was filled out by the subjects. Comprehension was also measured by a judgement, based on the subjects' summaries, as to whether they understood the point of the story.

Hypotheses

The hypotheses investigated were:

1. Subjects in the moderate prior knowledge condition have higher interest than those in the low prior knowledge condition.

This result was expected because of Kintsch's (1980) theory that moderate prior knowledge (of information in a text) creates in the reader a desire to know more.

2. Subjects who read texts that are moderately predictable have higher interest than subjects in the less predictable condition.

This result was expected because of predictions (Kintsch, 1980; and Berlyne, 1966) that having no expectations leads to low interest.

3. Subjects who read texts that are postdictable have higher interest than those who read texts that are not postdictable.

This result was expected because of Kintsch's (1980) contention that something cannot be interesting if it doesn't make sense due to internal contradictions.

4. For subjects having moderate prior knowledge, moderate predictability, and postdictability, learning is greater than in conditions having all other combinations of prior knowledge, predictability, and postdictability.

This result was expected because of Kintsch's (1980) model, which predicts that interesting propositions will be remembered better.

5. For subjects having moderate prior knowledge, moderate predictability, and postdictability, comprehension is greater than in conditions having all other combinations of prior knowledge, predictability, and postdictability.

This result was expected because of Kintsch's theory that interest affects comprehension, and also because of studies which have shown that topic interest aided comprehension (Asher, Hymel, and Wigfield, 1978; Asher and Markle, 1974; Belloni and Jongsma, 1978; Bernstein, 1955; Carter, 1978; Frasher and Frasher, 1978; Stevens, 1980).

Method

In this study, Kintsch's (1980) theory that cognitive interest is affected by prior knowledge, predictability, and postdictability was investigated. The three factors were manipulated independently and their effect on interest, comprehension, and learning was measured.

The design of this study is a 2 x 2 x 2 factorial with five dependent variables. The three independent variables are prior knowledge, predictability, and postdictability. The two prior knowledge conditions are moderate and low. The two predictability conditions are also moderate and low. Postdictability is either present or not present.

Eight conditions resulted from the manipulation: (1)moderate prior knowledge, moderate predictability, and postdictability; (2)moderate prior knowledge, low predictability, postdictability; (3)moderate prior knowledge, moderate predictabilty, no postdictability; (4)moderate prior knowledge, low predictability, no postdictability; (5)low prior knowledge, moderate predictability, postdictability; (6)low prior knowledge, low predictability, postdictability; (7)low prior knowledge, moderate predictability, no postdictability; (8)low prior knowledge, low predictability, no postdictability.

The dependent variables are the Interest Rating, the Behavioral Interest Measure, the Comprehension Rating, the Comprehension Measure, and the Learning Measure. Scores on the California Achievement Test were used as a covariate in this study. A more detailed discussion of the variables follows the next section.

Subjects

The subjects were ninty-five fifth graders from four New York City public schools located on the east side of Manhattan between 19th and 82nd Streets. Fifth graders were chosen because they are old enough, according to Piaget (Ginsburg and Opper, 1969), to be able to take into account the outcomes and intents of a person's behavior. The populations of the schools were mixed. Two of the schools had a majority of middle class students and two had a majority of minority students.

About half of the population of fifth graders in these schools participated in the present study. These were the students for whom permission to participate was obtained from teachers and parents, and whose reading test scores were available. Subjects were randomly assigned to each condition and were tested individually by the experimenter.

Scores on standardized reading tests were obtained for all of the subjects. The reading test scores were used as a covariate in all of the analyses, in order to reduce error variation and to control for any possible group differences which might have resulted from the random assignment of the subjects. The scores of the subjects in this study on the covariate ranged from a low of 31 to a high of 69. The experimenter observed no subject who seemed to have a problem reading the experimental materials, which were at the readability level of the third grade (as determined by the Flesch, 1974, procedure).

Reading Test

As mentioned in the previous section, a covariate was used in the analyses for this study in order to control for differences among students of different reading levels. The covariate was the California Achievement Test (CAT), which is administered every year to the students in the New York City public schools. The test has three raw scores: 1) Vocabulary; 2) Comprehension; and 3) Total Score. Total Score is a combination of the Vocabulary and Comprehension scores. This was the score which was used as the covariate in the analyses, since it contained all of the information made available by the test.

Experimental Materials

The experimental materials used in this study consist of a fable that has been adapted so that there are eight versions of it. Four of the versions are set in a city, in order to provide a setting about which the subjects would have moderate prior knowledge.

According to schema and prior knowledge research, prior knowledge is knowledge possessed by a reader which interacts with the text during comprehension. A reader may be accessing a well-defined prior knowledge schema, or he or she may be accessing a less detailed or more general schema. A stronger schema has been shown to be better for learning.

In this study, the knowledge required in the moderate prior knowledge condition was part of the pre-experimental knowledge of the subjects. This was first assumed and then later validated by a pretest. It was initially assumed on the basis that the moderate prior knowledge stories take place in the context of life in a modern city, and it was reasoned that the subjects should be familiar with this setting since they are students at public schools in Manhattan. The low prior knowledge stories, based on an old fable by Aesop, are set in the woods.

In order to ascertain whether the above assumption about the subjects' familiarity with the city was valid, a pilot test was administered to the first ten subjects. They were asked to define two words found in the moderate

prior knowledge version of the story. Five multiple choice answers were supplied for each of the words. The words were "mugger" and "alley". These were the two words in the story which were most closely identified with the city setting. All ten of the subjects chose the correct answers for both of the words. It can be concluded that the subjects were indeed familiar with the aspects of the city that were presented in this story, validating the assumption that they have moderate prior knowledge about a city.

Two of the moderate prior knowledge versions are less predictable than the other two (see next paragraph), as are two of the low prior knowledge versions.

How predictable a text is to a reader depends upon the relationship between the text and the general knowledge of the reader. The closer the match between the text and the reader's expectations, the more predictable the text will be to him/her. However, if a text does not provide adequate cues to the reader's knowledge, the reader cannot access it. In this study, there were two levels of predictability (moderate predictability and low predictability) in each of the two prior knowledge versions. The versions differed in that the specificity of some of the nouns, verbs, and other parts of speech were varied (See Appendix E). For example, in the low prior knowledge condition there were two moderately predictable

versions. One of these was postdictable and the other was not postdictable. There were also two less predictable versions in the moderate prior knowledge conditions, one in each postdictable condition. The moderately predictable versions contain the word "bear" where the less predictable versions use the word "animal." In the moderate prior knowledge versions, the words "mugger" and "stranger" replace "bear" and "animal".

The less specific versions thus have cues which access more general schemata, and so these versions are less predictable than the more specific, moderately predictable, versions. It was expected that the less predictable versions would create less interest and less learning than the moderately predictable versions. This effect for specificity has been found. Anderson (1976) found that better recall resulted when one, two, or three words were used to modify a noun phrase. Anderson equated specificity and predictability. He did not, however, use interest as a variable in his study.

According to Kintsch (1980), if a text is not postdictable the reader will not be able to construct a coherent macrostructure in which each text unit has its place and is meaningfully related to other sections of the text. Postdictability, or how well the parts of the text hold together when one has finished reading, depends upon whether the elements in a text fit into a schema.

In this study, after the subjects read a version of the fable, half of them were provided with the appropriate moral for the fable, while the other half of the subjects received an inappropriate moral. The moral were introduced by the words "This story shows you that..." In the postdictable version, the sentence continued "a friend in need is a friend indeed." In the nonpostdictable condition, the sentence continued "clothes make the man."

The inappropriate moral contained misleading information, since "clothes make the man" made no sense in the context of the story. It was expected that the misleading moral would have an adverse effect on interest and learning, since it might cause the reader to adjust his comprehension of the fable.

There are thus a total of eight versions of the experimental fable. These experimental fables were of equal word length (191 words) and readability (third grade level, as determined by the Flesch, 1974, proceedure).

Subjects were asked to read the fable at their own rate and signify when they had finished. The fable was then collected.

Recall Protocols

After the fable had been collected, the subject was asked to summarize the story orally. The summaries were recorded on tape. The tape recorder was placed on the desk in front of the subject. Instructions emphasized that the subject should try to recall as much as possible and not worry about whether the words were the same as those used in the story. There was no time limit imposed on the subjects. The recall protocols were scored for number of propositions (See Appendix B). The number of correct but not necessarily verbatim propositions contained in the subject's recall protocol was used as the measure of learning in this study.

Rating Scales

After the subject had finished dictating the recall protocol, he or she was then given a sheet of paper on which there were two rating scales. The first question on which the subjects were asked to make a rating judgement was "How interesting did you think this story was? Please check the sentence that shows how you feel." There then followed five choices, each with a space for a check. The choices were: "This was one of the most interesting stories I ever read," "I thought this story was interesting," "This story was all right," "This story wasn't very interesting," and "This was one of the most boring stories I ever read." This was one measure of interest used in this study.

The subjects were then asked "How easy was it to understand this story? Please check the sentence that shows how you feel." The five choices were: "This story was very easy to understand," "This story was easy to understand," "This story was not especially hard or easy to understand," "This story was hard to understand," and "This story was very hard to understand." This was one measure of comprehension used in this study.

Interest Measure

After the subjects had dictated the recall protocols and rated the stories for interest and comprehension, they were asked if they would like another story to read. It was explained that the story was similar to the one they had already read. If the subject said yes, they were given an additional story, which they took with them. If the subject did not want another story, no attempt was made to persuade him or her. The experimenter recorded whether or not the second story was taken by the subject. This was then used as a measure of interest in the experimental story.

Comprehension Measure

As a second measure of comprehension for this study, a judgement was made as to whether or not the subject understood the point of the story. This judgement was

based on the recorded summary of the subject. The experimenter read the summaries and made the judgements. In making these judgements, the experimenter did not know to which condition the subject belonged. Those subjects who expressed the idea that one of the characters had deserted the other one were judged to have understood the point of the story. (For a more detailed description, see Appendix C.)

Summary

The independent variables in this study were prior knowledge (2 levels), predictability (2 levels), and postdictability (2 levels). Eight conditions resulted from this manipulation. The dependent variables were learning, comprehension, and interest. There were two measures of comprehension (a rating scale, which measured subjective comprehension, and the comprehension judgement). Number of propositions recalled was used to measure learning. There were two measures of interest (the rating scale and an offer of another fable to read).

Results

Effects of prior knowledge, predictability, and postdictability on dependent measures were examined by analysis of covariance and logistic regression. Analysis of covariance was used to examine the data because it was thought that there might be variance which was the result of reading ability. This variance due to reading ability might obscure differences due to the experimental conditions. For this reason, it was decided to collect scores on a reading test to be used as a covariate.

Two of the dependent variables were dichotomous; these were analyzed using logistic regression. Analysis of covariance can be used only in those instances where the dependent variables are considered to be continuous, but not with dichotomous dependent variables. Logistic Regression may be used with dichotomous dependent variables. Logistic Regression is analagous to an analysis of covariance, in that the effect of several independent variables on the dependent variable can be examined, with a corection for a covariate. In this study, the dichotomous dependent variables were the Behavioral Interest Measure and the Comprehension Measure. The Interest Rating, the Comprehension Rating, and the Recall Measure are continuous dependent variables, and were examined by the use of analysis of covariance.

The independent variables in this study were Prior Knowledge, Predictability, and Postdictability. The covariate was the total score on a reading achievement test.

Dependent Variables

The interest dependent measures were the Interest Rating (a scale filled out by the subjects), and the Interest Behavioral Measure (whether the subjects took another story). Comprehension was measured by the Comprehension Rating (a scale filled out by the subjects), and by the Comprehension Measure (a judgement, based on subjects' recorded summaries of the stories, as to whether the subjects understood the point of the story). Learning was measured by the Recall Measure (number of propositions in the subject's summary).

Covariate

Scores on the California Achievement Test were used as the covariate in these analyses. This test was taken by the subjects earlier in the year in which this experiment was performed. The score used was called the Total Score, and consisted of a combination of Vocabulary and Comprehension scores. This variable did not contribute to the analyses with the two interest dependent variables, since the significance levels equalled .980 on the Interest Rating and .737 on the Behavioral Interest Measure. This means that reading ability of the subject was not related to interest.

Reading ability was, however, found to be related to comprehension and learning. The covariate contributed to the analyses with the comprehension and learning dependent variables. The significance of the covariate in the Comprehension Rating analysis was .018, and in the Comprehension Measure (whether or not the subject understood the point of the story) the significance of the covariate was .044. The significance of the covariate in the Learning Measure (number of propositions recalled) was .001.

Interest Rating

The means of the Interest Rating for the eight experimental conditions (which result from the possible combinations of prior knowledge, predictability, and postdictability) are presented in Table 1. In this table, the lower the mean, the stronger the expressed interest.

The results of the analysis of covariance for the Interest Rating can be found in Table 2. A significant ($p = .021$) main effect was found for the predictablity variable, showing that those who were in the moderate predictability condition expressed significantly more interest than did those in the low predictability condition. No other main effects were found for the Interest Rating, and no interaction effects were found.

Behavioral Interest Measure

The means for the Behavioral Interest Measure (whether the subjects did or did not take an additional story which was offerred to them by the experimenter) are presented in Table 3. A higher score on this measure means that more subjects in this condition took the second story when it was offered. A mean of 1.00 signifies that all of the subjects in that condition took the story.

The results of the logistic regression on the Behavioral Interest measure can be found in Table 4. A significant main effect ($p = .029$) was found for predictability. Those subjects in the moderately predictable condition were significantly more likely to have taken the second story. Thus on both of the measures of interest, one behavioral and the other a self-rating by the subjects, predictability was found to have the same effect.

A three way interaction between all three independent variables: prior knowledge, predictability, and postdictability was also found to be significant ($p = .029$) in this analysis (see Figure 1). It was found that in all of the conditions in which at least two of the variables were at the optimal level, performance was significantly better than when only one or none of the variables was at optimal level. Four groups demonstrated significantly more interest than the four remaining groups. The four groups

in which more interest was shown were: 1)the moderately predictable, moderate prior knowledge, postdictable condition; 2)the moderately predictable, moderate prior knowledge, nonpostdictable condition; 3)the moderately predictable, low prior knowledge, postdictable condition, and 4)the low predictability, moderate prior knowledge, postdictable condition. The addition to moderate predictability of either prior knowledge or postdictability thus lead to more interest. When predictability was low, only the combination of the other two variables led to more interest. No other main or interaction effects were found for this variable.

Recall Measure

As a measure of recall, a count was made of the number of propositions contained in subjects' summaries of the experimental material. The subjects dictated their summaries into a tape recorder, and the experimenter transcribed them.

The means for the number of propositions which the subjects included in their summaries can be found in Table 5. The range of possibilities for these scores is one through thirty-seven. None of the subjects included all of the thirty-seven propositions in their summary.

The analysis of covariance for number of propositions (the Learning Measure, Table 6) revealed a main effect ($p = .026$) for predictability. More propositions were included in the summaries of the subjects in the moderate predictability conditions than were in the summaries of those in the low predictability conditions.

The analysis of covariance for number of propositions also revealed a significant interaction ($p = .025$) between predictability and postdictability. In a post hoc Scheffe Test, it was determined that the interaction effect was the result of the comparison between the four nonpostdictable groups. In this interaction, the two moderately predictable, nonpostdictable groups remembered significantly more propositions than did the two nonpostdictable groups with low predictability ($F = 10.148$). The critical value for a test at the .05 level of probability was $F = 8.16$. There was no comperable interaction between the four postdictable groups. In this case, the F value was .004, which was not significant.

No other main or interaction effects were found for this variable; there was, however, a related finding. At the end of all of the stories a moral was included, preceded by the words "This story teaches you that..." Half of the subjects received a postdictable moral ("A friend in need is a friend indeed."), and the other half of the subjects received a moral which did not postdict ("Clothes

make the man."). Significantly more subjects who received the postdictable moral included the moral in their summaries than did those who received the nonpostdictable moral ($p = .002$).

Comprehension Measure

The comprehension measure is a judgement, based on the subjects' summaries, of whether they understood the point of the story. (See Appendix C for the criterion on which this judgement was based.) The means can be found in Table 7. A higher mean indicates that more of the subjects in that group understood the point of the story.

There were significant main effects for both predictability ($p = .006$) and postdictability ($p = .022$) in the logistic regression analysis (Table 8) for this measure. More subjects in the moderate predictability conditions comprehended the point than did subjects in the low predictability conditions. In the postdictable conditions, more subjects comprehended the point than did subjects in the nonpostdictable conditions.

Comprehension Rating

The mean for the Comprehension Rating can be found in Table 9. The lower the mean, the easier the story was to comprehend, according to the subjects' ratings.

Main effects for predictability ($p = .042$) and for postdictability ($p = .002$) were found for this dependent measure in the analysis of covariance (Table 10). Subjects in the moderate predictability conditions rated the story as being easier to comprehend than did subjects in the low predictability conditions. Subjects in the postdictable conditions also rated the story as easier to comprehend than did subjects in the nonpostdictable conditions. Thus, on both of the dependent variables for comprehension (the Measure and the Rating) predictability and postdictability were both significant and produced the same effects. There were no other main or interaction effects found for this variable.

Correlations Between Dependent Variables

Pearson correlation coefficients for the dependent variables can be found in Table 11. There were six significant positive correlations between the five dependent variables. Correlations between interest and comprehension dependent variables showed significant positive correlations between the Interest Rating and the Comprehension Rating ($p = 0.001$), and between the Interest Rating and the Comprehension Measure ($p = 0.044$). The two interest measures (the Interest Rating and the Behavioral Interest Measure) were significantly positively correlated ($p = 0.019$).

The Comprehesnion Measure and the Comprehesnion Rating were also significantly positively correlated ($p = 0.043$). There was a significant positive correlation between the Comprehension Rating and the Learning Measure ($p = 0.000$), and between the Comprehesnion Measure and the Learning Measure ($p = 0.002$).

These significant correlations indicate that interest and comprehension were positively related in this study. Comprehension and Learning also had a significant positive correlation. The two measures of interest were significantly positively related to each other, as were the two comprehesnion measures. These results are thus internally consistent as well as being consistent with expected results.

Hypotheses

Although the results in this study support the model (Kintsch, 1980) tested here, most of the five proposed hypotheses were not supported. A brief summary is presented here; a detailed discussion of the support or nonsupport for each hypothesis will be presented in the Discusssion section.

The first hypothesis predicted that subjects in the moderate prior knowledge condition would have higher interest ratings than would those in the low prior knowledge condition. This prediction was not supported. The second hypothesis predicted that subjects who read texts which were moderately predictable would have higher interest ratings than subjects in the low predictability condition. This hypothesis was supported by the results on both interest measures.

The third hypothesis predicted that subjects who read texts that were postdictable would have higher interest scores than did subjects who did not read postdictable texts. This hypothesis was not supported. The fourth hypothesis predicted that for subjects in the moderate prior knowledge, moderate predictability, and postdictable condition, learning would be greater than in the other conditions. This hypothesis was not supported.

The fifth hypothesis predicted that for subjects in the the moderate prior knowledge, moderate predictability, and postdictable condition, comprehension would be better than in the other conditions. This hypthesis was not supported, however the subjects in the moderate prior knowledge, moderate predictability, and postdictable condition did score as high or higher as any of the other groups on the Comprehension Measure. The score was, however, significantly higher than only three of the conditions, and not significantly different than the other four. A similar pattern occurred on the Comprehension Rating, where the ratings of the moderate prior knowledge, moderate predictability, and postdictable group were significantly higher than four of the other conditions, and not significantly different from the other three groups.

Summary

In this study, there were three independent variables (prior knowledge, predictability, and postdictability), one covariate (the total score on a reading examination), and five dependent variables (two for interest, two for comprehension, and one for learning). The covariate had no effect on the interest dependent variables and had significant effects on all of the learning and comprehension dependent variables, indicating that reading ability was related to comprehension and learning, but not to interest.

A significant main effect for predictability was found on both the Interest Rating (scored by the subjects), and on the Behavioral Interest Measure (a judgement based on summaries which were dictated by the subjects). On both measures, subjects in the moderately predictable conditions did better than those in the less predictable conditions. In addition, a three-way interaction among all of the independent variables was found on the Behavioral Interest Measure.

For the Learning Measure (number of propositions included in the summary dictated by the subject), a significant main effect was found for predictability. Subjects in the moderately predictable conditions did better than those in the less predictable conditions. An interaction between predictability and postdictability was

also found. In addition, subjects were found to have remembered the postdictable moral more often than they remembered the nonpostdictable one.

In both of the measures used to measure comprehension, one a self-rating of comprehensibility and one a judgement of the student's comprehension of the story (based on his or her dictated summary), both predictability and postdictability were found to have significant effects. On both measures, those in the moderately predictable conditions did significantly better than those in the less predictable conditions, and those in the postdictable conditions did significantly better than those in the nonpostdictable conditions.

Significant positive Pearson correlation coefficients were found between the Interest Rating and the Comprehension Rating, the Interest Rating and the Comprehension Measure, and the Interest Rating and the Behavioral Interest Measure. Significant positive correlations were also found between the Comprehension Rating and the Comprehension Measure and between the Comprehension Rating and the Learning Measure. The Comprehension Measure was also significantly positively correlated with the Learning Measure. These correlations are both internally consistent and consistent with the model proposed by Kintsch (1980).

Discussion

The purpose of this study was to examine variables that might affect interest in reading. It was decided to test a new model (Kintsch, 1980) which proposed that interest in reading is affected by three variables: prior knowledge, predictability and postdictability. These three variables had never been examined in one study, and it was not clear from the model whether there would be separate effects on the dependent variables, or whether the effects of the three independent variables would be interactive. The two studies that had tested this model (Walker, 1981; and Walker and Kintsch, 1982) each examined only the main effect of one of the variables. Since according to Kintsch's model each of the three variables contributes to interest, it was decided to hypothesize a separate effect on interest for each of the independent variables. In this way, it was felt, it would be possible to look at the effects of each of the variables on interest.

Examination of the results demonstrated that it would have been better to have hypothesized an interactive effect of all three of the variables on interest. In the present study, an interactive effect on interest was found for all of the three variables; however the only variable which produced a main effect on interest was predictability. Thus, although the results support Kintsch's (Kintsch, 1980) model, most of the hypotheses of the present study

were not supported.

Kintsch's model predicted interactive effects; however he stated that in a story predictability is probably the most important of the three variables. In other text types, prior knowledge might be the most important of the three. In this study, predictability was the only one of the three independent variables found to have a main effect on interest.

The first hypothesis predicted that subjects in the moderate prior knowledge condition would have higher interest than would those in the low prior knowledge condition. This prediction was not supported, either on the Interest Rating or on the Behavioral Interest Measure. Kintsch (1980) proposed that the three variables interact to provide interest. Results in the present study support this model, since a triple interaction was found on the Behavioral Interest Measure (see Figure 1). In this interaction, subjects showed significantly more interest in four conditions than they did in the four remaining conditions. In all of the conditions in which performance was significantly better, at least two of the variables were at the optimal level. In the other four conditions, only one or none of the variables was at the optimal level.

The conditions in which interest was significantly higher were: 1)the moderate prior knowledge, moderate predictability, postdictable condition; 2)the moderate prior knowledge, moderate predictability, nonpostdictable condition; 3)the moderate prior knowledge, low predictability, postdictable condition; and 4)the low prior knowledge, moderate predictability, postdictable condition. It can be seen that, out of the four conditions in which significantly more interest was demonstrated, three were moderate prior knowledge conditions. In the fourth condition in which subjects demonstrated significantly more interest, prior knowledge was low, but both of the remaining variables were at their optimal level. This seems to indicate that prior knowledge contributes to, but is not sufficient for, interest in a story. In a condition in which the prior knowledge is not adequate, the reader needs both moderate predictability and postdictability to be interested.

It should be noted that, in all four of the groups in which significant interest was generated, at least two of the three independent variables were always at the optimal level. The groups that demonstrated less interest, on the other hand, had either none or only one of the variables at the optimal level. This seems to indicate that, in order to produce more interest, at least two of the variables should be at the optimal level.

The second hypothesis predicted that subjects who received texts which were moderately predictable would have higher interest than subjects in the low predictability conditions. This hypothesis was supported by the results on both of the interest measures, indicating a strong effect for predictability. On the Interest Rating, there was a significant main effect for predictability. Subjects rated stories more interesting when they were moderately predictable. On the Behavioral Interest Measure, subjects who received the moderately predictable stories were more likely to ask for the second story than were those who received stories which were low on predictability. Thus, on both measures of interest (one behavioral and the other a self-rating by the subjects), moderate predictability was shown to produce more interest than did low predictability. This supports the prediction of Kintsch (1980) and also the results of Walker and Kintsch (1982).

The third hypothesis predicted that subjects who received texts that were postdictable would have higher interest scores than did subjects who did not. This hypothesis was not supported. There was no interest main effect found for postdictability, either on the Interest Rating or on the Interest Measure (whether the subjects took a second story when it was offered). A possible explanation of this lack of results is that the story was postdictable until the last sentence. Subjects may have been expressing the interest they felt when reading most of

the story when they rated the nonpostdictable stories interesting or requested another story even though they had been in the postdictable condition.

It was stated earlier that in formulating hypotheses for this study it was not clear from Kintsch's (1980) model whether interactive effects should be expected when the material was a story, as Kintsch felt that prior knowledge would not have as large an effect as the other two variables. In formulating the fourth and fifth hypotheses it was decided to measure the effect of the interaction of all three variables on the dependent variables, which were measures of comprehension or recall.

The fourth hypothesis predicted that for subjects in the moderate prior knowledge, moderate predictability and postdictable condition, learning would be greater than in the other conditions. This hypothesis was not supported, as the subjects in the moderate prior knowledge, moderate predictability and postdictable condition did not remember more propositions than did subjects in all of the other groups. In the analysis of covariance for this variable, however, there was found to be a significant main effect for predictability. Subjects who received the moderately predictable stories remembered more propositions than did subjects who received stories with low predictability. As previously stated, Kintsch (1980) predicted that, in a story, predictability would have the strongest effect of

all of the variables. This indicates that, in a story, being able to make a moderate amount of predictions while reading the story is more interesting to a reader than being able to make very few predictions.

There was also a significant interaction effect found in the analysis of covariance which assessed this hypothesis. The interaction was between predictability and postdictability. Subjects in the nonpostdictable, moderately predictable conditions remembered significantly more propositions than did subjects in the nonpostdictable, less predictable conditions. In the absence of postdictability, and with prior knowledge playing no part, predictability made a significant contribution to learning. When the stories were postdictable, however, predictability made no significant difference.

An interesting result in this study was that only one of the forty-seven subjects who received the nonpostdictable story mentioned the moral (which did not postdict), while ten (out of forty-eight) mentioned the moral in the postdictable condition. This difference was significant. It demonstrates that if something is not postdictable, the subjects will not remember it, as was proposed by Kintsch (1980). There was no main effect for postdictability, however, possibly because subjects ignored the nonpostdictable moral.

The fifth hypothesis predicted that for subjects in the moderate prior knowledge, moderate predictability and postdictable condition, comprehension would be better than in the other conditions. There were two dependent variables used to test this hypothesis: the Comprehension Measure (which was a judgement, based on the summaries dictated by the subjects, as to whether the subjects understood the point of the story), and the Comprehension Rating (on which the subjects rated the understandability of the story they read). The fifth hypothesis was the result of a decision to look for the interactive effects of the three independent variables, instead of proposing that separate effects of each of them on comprehension should be expected. As in the fourth hypothesis, where a similar decision was made, the hypothesis was not supported but there is some indication of a trend in the predicted direction. The subjects in the moderate prior knowledge, moderate predictability and postdictable condition on the Comprehension Measure did score as high or higher than all of the other conditions, but this score was only significantly higher than three of the conditions. There was no statistically significant difference between the scores in the five highest scoring conditions, although all five were significantly higher than the other three conditions.

A similar pattern occurred in the Comprehension Rating, where the moderate prior knowledge, moderate predictability and postdictable group tied for second place in rating the story easiest to understand. The ratings of this group were significantly higher than four of the eight groups, and not significantly different from the other three groups. Thus, on both the comprehension dependent variables, the fifth hypothesis was partially supported.

It is clear that both predictability and postdictability did have a large effect on both the Comprehension Measure and the Comprehension Rating. In both of the dependent measures used to test the fifth hypothesis (the Comprehension Measure, based on the subjects' summaries, and the Comprehension Rating, based on their own ratings of the comprehensibilty of the story they read) significant main effects were found for both predictability and postdictability. Subjects who received the moderately predictable stories were more likely to understand the point of the story, and also rated the story easier to understand than subjects who received the stories with low predictability. The subjects who received the postdictable stories also were more likely to understand the point of the story and to rate it easier to understand than subjects who received the story which was not postdictable. Thus, two of the components of interest (predictability and postdictability) had the same effects on two very different measures of comprehension.

Prior knowldege did not contribute to the support of either the fourth or fifth hypothesis. The first hypothesis, which predicted that subjects in the moderate prior condition would have higher interest scores than would those in the low prior knowledge condition, was also not supported. Kintsch (Kintsch, 1980) stated:

> How these three components of cognitive interest combine is at present uncertain. Note, however, that different components might dominate in different text types. In a descriptive text, say a science textbook, the first factor -- giving the reader just the right amount of new information -- appears to be crutial, while very few specific expectations about the text are raised. Interest in a story derives mainly from the unpredictable but well motivated turn of events; conflicting expectations are aroused in the reader about where it is all going and what will happen next.

The analysis of the correlations between the dependent variables produced results which showed that interest was significantly positively correlated with comprehension, both in the Comprehension Rating and the Comprehension Measure. The two interest measures were significantly positively correlated, so that self-rated interest and behavioral interest were found to be related. There were also significant positive correlations between the comprehension measures, so that self-rated comprehension and judged comprehension were shown to be related. Significant positive correlations were also found between learning and both of the comprehension measures. These results indicate a positive relationship between interest and comprehension,

as was predicted by Kintsch's model. The results also show that the different measures of interest were related, as were the different measures of comprehension.

This study tested a model (Kintsch, 1980) that has not been well investigated. No previous study had included prior knowledge, predictability, and postdictability. Decisions were made, when formulating the hypotheses for this study, whether to predict an interaction effect on the dependent variables, or whether to predict individual effects for each independent variable. This was not clear from Kintsch's model. Thus, although most of the hypotheses were not completely supported, the results do support and clarify the model.

Summary

The results in this study were markedly consistent. On separate measures of the same constructs identical main effects of predictability and/or postdictability were found. The covariate, as it logically should, had no effect on the interest measures, but had a very significant effect on the Comprehension and Learning Measures. This suggests that while reading ability may be very strongly related to learning and comprehension, it does not seem to be related to interest. This indicates that any reader, even a poor one, can be interested in a story. The predicted triple interaction resulting in increased interest was found on the Behavioral Interest Measure. Most of these effects, although predicted by Kintsch, have never been investigated.

On both measures of interest, predictability was found to have a significant main effect, indicating that it has a strong effect on interest in a story. This supports the prediction of Kintsch (1980), and also the results of Walker and Kintsch (1982). Kintsch (1980) also predicted an interactive effect of prior knowledge, predictability, and postdictability. This was found on the Behavioral Interest Measure. The results in the present study therefore support Kintsch's model of interest.

Predictability also had a strong effect on how many propositions the subjects remembered, and an interaction was found here between postdictability and predictability. Predictability thus strongly influenced both interest and learning.

Both predictability and postdictability had positive effects on comprehension. Prior knowledge did not; however Kintsch (1980) stated that he did not expect a strong effect for prior knowledge in a story. Thus, the two components of interest which Kintsch expected would result in more interest in a story (and therefore more comprehension) did indeed produce better comprehension.

Pearson correlation coefficients were found to be positive and significant between the Interest Rating and the Comprehension Rating, and between the Interest Rating and the Comprehension Measure. This indicates that interest, as expressed in the Interest Rating, was significantly correlated with self-rated comprehension and with whether the subject was able to understand the point of the story. Other significant correlations were found between the two interest measures, between the two comprehension measures, and between the Comprehension Rating and the Learning Measure. These significant positive correlations indicate that the measures in this study are consistent with each other and with Kintsch's (1980) model.

Limitations and Future Recommendations

There were several limitations in this study that could be remedied in future research. One limitation is that only two levels were provided in this study to measure prior knowledge and predictability. Both of these variables were proposed by Kintsch (1980) to have a U-shaped relationship with interest, so that providing high prior knowledge and high predictability conditions could have resulted in more information. A future study could provide three levels of prior knowledge and predictability.

In order to avoid a ceiling effect, the behavioral interest measure could be improved by giving the subjects a choice between two stories. They could have been told that one story was similar to the one they had read while one was a different kind of story. A future study could provide subjects with this choice.

Another possible limitation in this study was that all of the characters in the fable were male. Some researchers have found that readers prefer to read about characters of their own sex (Yoder, 1978), so it is possible that there might have been an effect on the female subjects. A future study could use both male and female characters.

Another limitation in this study can be found in the way the hypotheses were proposed. All of the effects which could possibly have resulted from the model proposed by Kintsch (1980) should have been included in the hypotheses of this early study. A future study on this subject will have more information on which to base hypotheses.

Educational Implications

Educators have taken for granted the concept that if students are interested in what they are reading, they will learn more. A large body of knowledge, the object of which has been to discover what topics are interesting to children, has been collected over many years. But topics cannot be the only component of interest, since reading material on the same topic can be differentially interesting. The factors affecting this difference, making one thing more interesting than another, are the subject of this study.

Experiments have shown that those who are interested in what they read demonstrate better comprehension (Asher, Hymel, and Wigfield, 1978; Asher and Markle, 1974; Belloni and Jongsma, 1978; Bernstein, 1955; Carter, 1978; Frasher and Frasher, 1978; Stevens, 1980). In order for this information to be useful to researchers and educators, it is necessary to understand more about what makes something interesting.

Kintsch (1980) presented a model in which interest is the product of the interaction of three factors: prior knowledge of the subject matter, predictability of the text, and postdictability. In the present study, the three factors were indeed found to interact to produce a desire in the subjects to read another, similar story. This indicates that educators would profit by including

predictability of the text and postdictability, as well as prior knowledge of the subject matter, in their attempt to provide interesting materials to their students.

In this study prior knowledge of the setting was not found to be an important factor affecting interest; however that was predicted by Kintsch (1980). The material used in this study was fiction. In a story, according to Kintsch, prior knowledge of the subject matter plays a less important role in eliciting interest in the reader than do predictability and postdictability. Educators should keep in mind, however, that prior knowledge of the subject matter may play a large part in producing interest in nonfiction materials.

In this study, level of predictability of the text was found to have a significant effect on how interesting the subjects thought the story was, and on whether they wanted to read another, similar story. It also had a positive effect on how many propositions subjects remembered from a story, how well the subjects understood the story, and how well they thought they understood the story. The educator should keep in mind that students, if given reading material with a moderate level of predictability, will be more interested and learn more. A moderate level of predictability is that level at which the reader is somewhat surprised by the contents of the reading material, but not to the extent that they become confused. The

educator should try to provide material that helps readers achieve this kind of relationship between themselves and the text.

The third variable, postdictability, refers to whether the reading material makes sense as a whole. This factor was found to significantly interact with prior knowledge and predictability to produce enough interest in the subjects so that they wanted to read another, similar, story. It also interacted with predictability to produce more learning, and by itself it was found to produce better comprehension and better perceived comprehension in the subjects. These results contain a message for the educator: reading material which does not make sense to the reader will produce less interest, less learning, and less comprehension.

Appendix A

Table 1

Means for Interest Rating*

	Predictability			
	Low		Moderate	
	Postdictability		Postdictability	
	Yes	No	Yes	No
Prior Knowledge				
Low				
M	2.58	2.58	2.50	2.42
sd	0.79	0.66	0.67	0.99
Mod				
M	2.58	2.73	2.17	1.92
sd	0.90	0.65	0.72	0.67

*1 = "This was one of the most interesting stories I ever read."

2 = "I thought this story was interesting."

3 = "This story was all right."

4 = "This story wasn't very interesting."

5 = "This was one of the most boring stories I ever read."

Table 2

ANCOVA for Interest Rating with Reading Test as Covariate

Source	df	SS	MS	F	Sig
Reading Test	1	0.000	0.000	0.000	0.985
Prior Knowledge(K)	1	0.761	0.761	1.276	0.262
Predictability(U)	1	3.299	3.299	5.532*	0.021
Postdictability(P)	1	0.071	0.071	0.119	0.731
K x U	1	1.447	1.447	2.427	0.123
K x P	1	0.004	0.004	0.006	0.938
U x P	1	0.267	0.267	0.447	0.506
K x U x P	1	0.161	0.161	0.269	0.605
Error	86	51.286	0.596		

Table 3

Means for Behavioral Interest Measure[a]

	Predictability			
	Low		Moderate	
	Postdictability		Postdictability	
	Yes	No	Yes	No
Prior Knowledge				
Low	0.67	0.83	1.00*	0.83
Mod	0.92*	0.73	0.92*	1.00*

a

1 = Took Another Story

0 = Did Not Take

*

Means with * are not significantly different from each other, but are significantly different from means without *.

Table 4

Logistic Regression for Behavioral Interest Measure with Reading Test as Covariate

Term	Chi-Square	df	Sig
Reading Test	0.11	1	0.7370
Prior Knowledge (K)	0.74	1	0.3907
Predictability (U)	5.09	1	0.0240
Postdictability (P)	0.12	1	0.7343
K x U	0.07	1	0.7966
K x P	0.12	1	0.7343
U x P	0.07	1	0.7966
K x U x P	4.75*	1	0.0293

Table 5

Means for Number of Propositions

		Predictability			
		Low		Moderate	
		Postdictability		Postdictability	
		Yes	No	Yes	No
Prior Knowledge					
	Low				
	M	12.42	8.00	10.83	13.08
	sd	5.05	3.86	5.15	4.06
	Mod				
	M	10.92	10.18	10.33	12.33
	sd	2.91	4.38	2.87	5.31

Table 6

ANCOVA for Number of Propositions with Reading Test as Covariate

Source	df	SS	MS	F	Sig
Reading Test	1	207.904	207.904	12.556*	0.001
Prior Knowledge(K)	1	0.075	0.075	0.005	0.946
Predictability(U)	1	84.729	84.729	5.117*	0.026
Postdictability(P)	1	0.316	0.316	0.019	0.891
K x U	1	2.503	2.503	0.151	0.698
K x P	1	0.270	0.270	0.016	0.899
U x P	1	86.631	86.631	5.232*	0.025
K x U x P	1	15.722	15.722	0.949	0.333
Error	86	1424.005	16.558		

Table 7

Means for Comprehension Measure*

	Predictability			
	Low		Moderate	
	Postdictability		Postdictability	
	Yes	No	Yes	No
Prior Knowledge				
Low	0.92	0.33	0.75	0.83
Mod	0.58	0.36	0.92	0.75

*

1 = Understood Point of Story

2 = Did Not Did Not Understand Point

Table 8

Logistic Regression for Comprehension Measure

with Reading Test as Covariate

Term	Chi-Square	df	Sig
Reading Test	4.05*	1	0.0441
Prior Knowledge(K)	0.26	1	0.6092
Predictability(U)	7.54*	1	0.0060
Postdictability(P)	5.26*	1	0.0218
K x U	0.91	1	0.3403
K x P	0.14	1	0.7100
U x P	3.40	1	0.0652
K x U x P	2.90	1	0.0883

Table 9

Means for Comprehension Rating*

	Predictability			
	Low		Moderate	
	Postdictability		Postdictability	
	Yes	No	Yes	No
Prior Knowledge				
Low				
M	1.33	2.75	1.58	1.92
sd	0.65	1.36	0.67	1.08
Mod				
M	1.75	2.27	1.58	1.83
sd	0.75	1.10	0.79	0.94

*

1 = "This story was very easy to understand."

2 = The story was easy to understand."

3 = "The story was not especially hard or easy to understand."

4 = "The story was hard to understand."

5 = "This story was very hard to understand."

Table 10

ANCOVA for Comprehension Rating with Reading Test as Covariate

Source	df	SS	MS	F	Sig
Reading Test	1	5.026	5.026	5.850*	0.018
Prior Knowledge(K)	1	0.055	0.055	0.064	0.801
Predictability(U)	1	3.675	3.675	4.277*	0.042
Postdictability(P)	1	8.961	8.961	10.431*	0.002
K x U	1	0.021	0.021	0.024	0.876
K x P	1	0.391	0.391	0.455	0.502
U x P	1	1.788	1.788	2.081	0.153
K x U x P	1	0.749	0.749	0.872	0.353
Error	86	73.882	0.859		

Table 11

Correlations of Dependent Variables

	Interest Rating	Comprehension Rating	Interest Measure	Comprehension Measure	Learning Measure
IR	1.000	0.315***	0.213*	0.177*	0.111
CR	0.315***	1.000	0.143	0.177*	0.404***
IM	0.213*	0.143	1.000	0.059	0.093
CM	0.177*	0.177*	0.059	1.000	0.293**
LM	0.111	0.404***	0.093	0.293**	1.000

Significance Levels

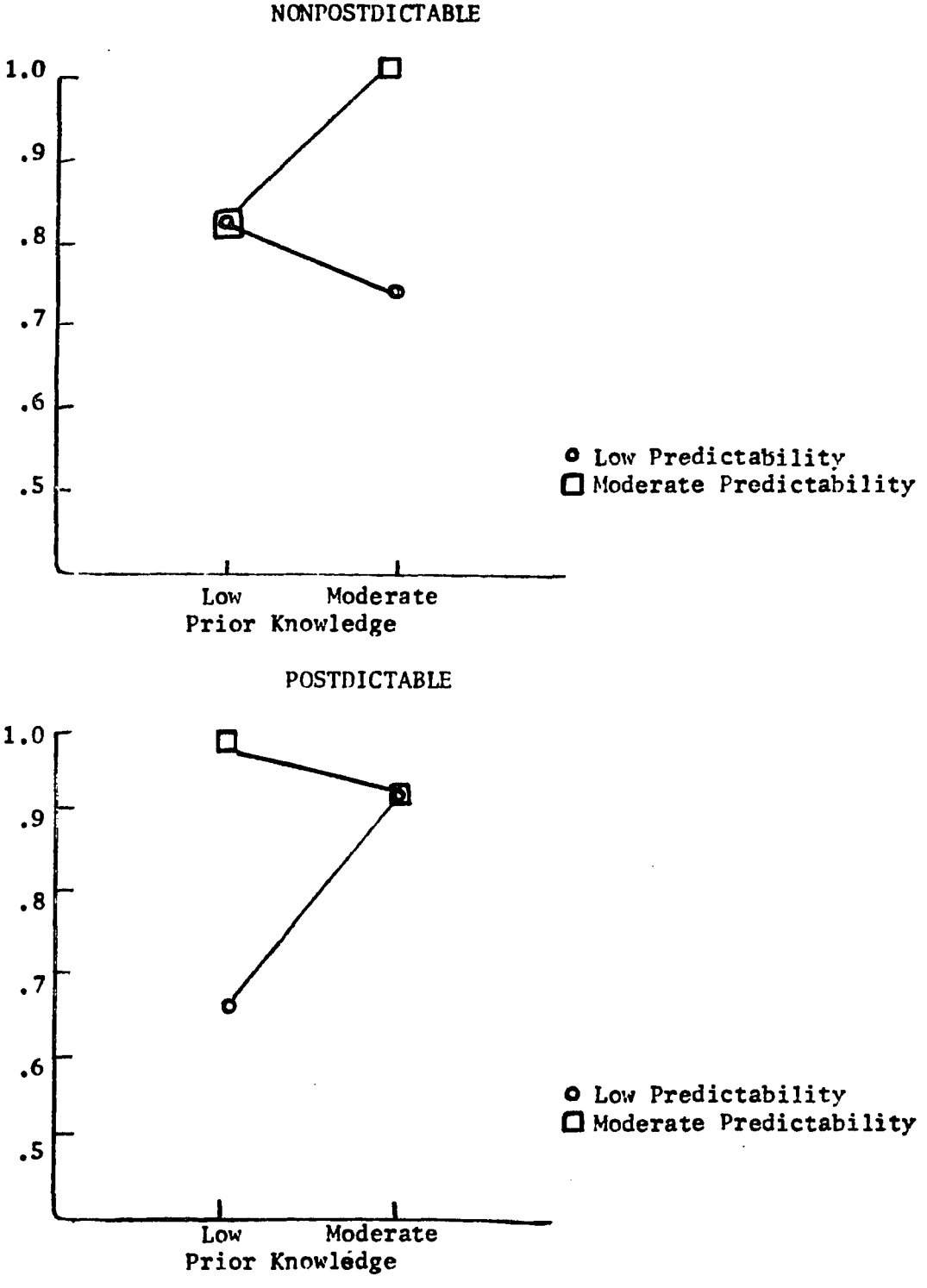
* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Figure 1

Behavioral Interest Interaction



APPENDIX B

Scoring of Protocols

The protocols were scored using Kintsch's 1974 method for analyzing a text into a string of underlying propositions that represent the meaning of the text. Propositions are composed of a predicate, or a relational concept, and one or more arguments. The arguments fulfil different semantic functions, such as agent, object, and goal. The predicates may be verbs, adjectives, adverbs, or sentence connectives.

Both the fable and all of the protocols were analyzed using this procedure. Each recall protocol was checked against the propositions of the fable, and for each propositon it was determined whether it was expressed in the original.

The number of correct, but not necessarily verbatim, propositions were used as a measure of learning. No distinction was made between verbatim or paraphrased propositions; however a proposition was only considered to have been recalled if all of its elements were present. All partial recall, inferences, and errors were ignored.

APPENDIX C

Scoring of Comprehension Measure

In order to make a judgement as to whether or not the subject had understood the point of the story, each summary that had been dictated by the subjects was transcribed. Each one was then read with the object of searching to see whether a certain criterion was met. This criterion was whether or not the subject mentioned that one of the characters in the story had been deserted by another character.

For example, the summary of the first subject was transcribed as follows:

> It's about two boys who were walking together in the streets. One boy said that they should stick together. Then they saw this mugger, So one boy ran to the alley, and the second one stood there. The mugger came, and took his wallet. Then, after he told him, he left. Then the boy came out of the alley, laughing. Then he said, "What did the mugger say?" He said that if you stand by someone, you should never run away.

This subject was judged to have understood the point of the story.

As a check on the reliability of the experimenter's judgements, a random twenty-one of the ninty-five summaries were read by an additional judge. There was initial agreement between the two judges on eighteen out of the twenty-one summaries. After discussion, all differences were resolved.

APPENDIX D

Material for Pilot Study

What is a mugger?

_A mugger is something to drink from.

_A mugger is a person who steals money from people in the street.

_A mugger is a hot day.

_A mugger is a person who is wearing a large blue hat and a raincoat.

_A mugger is a boy with a football.

What is an alley?

_An alley is a person with red hair.

_An alley is a kind of dog.

_An alley is a pail of water.

_An alley is a small street between buildings.

_An alley is something to play with.

Appendix E

Experimental Materials

Moderate Prior Knowledge, Moderate Predictability, Postdictable

One evening two boys were walking down city streets. It was dark. The first one said "I don't like the looks of this place. But there are two of us. We are friends. If we stick together nothing can happen."

At that moment a mugger suddenly appeared.

Without a thought for his friend, the first boy ran into an alley. The second boy was left alone. He threw his hands into the air. He stood still. He didn't move a muscle and didn't speak.

The mugger walked over to him. He took the boy's wallet and his change. The boy never moved. He held his breath. After a few minutes the mugger, who took a few dollars, gave a disappointed growl and walked off.

When the mugger had gone, the first boy came out of the alley.

"Well," he said, laughing. "I noticed that the mugger put his mouth close to your ear. What did he tell you?"

"He told me the truth," said the second boy. "He told me never to trust anyone who says he will stand by you, and then runs away as soon as there is trouble."

This story shows you that a friend in need is a friend indeed.

Moderate Prior Knowledge, Moderate Predictability, Nonpostdictable

One evening two boys were walking down city streets. It was dark. The first one said "I don't like the looks of this place. But there are two of us. We are friends. If we stick together nothing can happen."

At that moment a mugger suddenly appeared.

Without a thought for his friend, the first boy ran into an alley. The second boy was left alone. He threw his hands into the air. He stood still. He didn't move a muscle and didn't speak.

The mugger walked over to him. He took the boy's wallet and his change. The boy never moved. He held his breath. After a few minutes the mugger, who took a few dollars, gave a disappointed growl and walked off.

When the mugger had gone, the first boy came out of the alley.

"Well," he said, laughing. "I noticed that the mugger put his mouth close to your ear. What did he tell you?"

"He told me the truth," said the second boy. "He told me never to trust anyone who says he will stand by you, and then runs away as soon as there is trouble."

This story shows you that clothes make the man.

Moderate Prior Knowledge, Low Predictability, Postdictable

One evening two boys were moving in some streets. It was dark. The first one said "I don't like the looks of this place. But we are more than one. We are people. If we stick close nothing can happen.

At that time a stranger suddenly appeared.

Without a thought for the other, the first boy left for another spot. The second one was all alone. He threw his arms in the air. He stood still. He didn't move a part and didn't breathe.

The stranger went over to him. He took some things from the boy's clothing. The boy never moved. He held his air. After a few minutes the stranger, who took all he could, gave a disappointed growl and went off.

When the stranger had gone, the first boy came back to the street.

"Well," he said, laughing. "I noticed that the stranger put his mouth close to your ear. What did he tell you?"

"He told me one thing," said the second one. He told me never to trust one who says he will be with you, and then goes away as soon as there is something."

This story tells you that a friend in need is a friend indeed.

Moderate Prior Knowledge, Low Predictability, Nonpostdictable

One evening two boys were moving in some streets. It was dark. The first one said "I don't like the looks of this place. But we are more than one. We are people. If we stick close nothing can happen.

At that time a stranger suddenly appeared.

Without a thought for the other, the first boy left for another spot. The second one was all alone. He threw his arms in the air. He stood still. He didn't move a part and didn't breathe.

The stranger went over to him. He took some things from the boy's clothing. The boy never moved. He held his air. After a few minutes the stranger, who took all he could, gave a disappointed growl and went off.

When the stranger had gone, the first boy came back to the street.

"Well," he said, laughing. "I noticed that the stranger put his mouth close to your ear. What did he tell you?"

"He told me one thing," said the second one. He told me never to trust one who says he will be with you, and then goes away as soon as there is something."

This story tells you that clothes make the man.

Low Prior Knowledge, Moderate Predictability, Postdictable

One evening two men were walking in the woods. It was dark. The first one said "I don't like the looks of this place. But there are two of us. We are friends. If we stick together nothing can happen."

At that moment a bear suddenly appeared.

Without a thought for his friend, the first man sprang up a tree. The second man was left alone. He threw himself down on the ground. He lay flat. He didn't move a muscle and didn't breathe.

The bear went over to him. He nuzzled his head and smelled his ears. The man never moved. He held his breath.

After a few minutes the bear, who thought the man was dead, gave a disappointed growl and walked off.

When the bear had gone, the first man came down from the tree.

"Well," he said, laughing, "I noticed that the bear put his mouth close to your ear. What did he tell you?"

"He told me the truth, said the second man. "He told me never to trust anyone who says he will stand by you, and then runs away as soon as there is trouble."

This story shows you that a friend in need is a friend indeed.

Low Prior Knowledge, Moderate Predictability, Nonpostdictable

One evening two men were walking in the woods. It was dark. The first one said "I don't like the looks of this place. But there are two of us. We are friends. If we stick together nothing can happen."

At that moment a bear suddenly appeared.

Without a thought for his friend, the first man sprang up a tree. The second man was left alone. He threw himself down on the ground. He lay flat. He didn't move a muscle and didn't breathe.

The bear went over to him. He nuzzled his head and smelled his ears. The man never moved. He held his breath.

After a few minutes the bear, who thought the man was dead, gave a disappointed growl and walked off.

When the bear had gone, the first man came down from the tree.

"Well," he said, laughing, "I noticed that the bear put his mouth close to your ear. What did he tell you?"

"He told me the truth, said the second man. "He told me never to trust anyone who says he will stand by you, and then runs away as soon as there is trouble."

This story shows you that clothes make the man.

Low Prior Knowledge, Low Predictability, Postdictable

One evening two people were moving in some plants. It was black. The first one said "I don't like the looks of this place. But we are more than one. We are people. If we stick together nothing can happen."

At that time an animal suddenly appeared.

Without a thought for the other, the first one got on a plant. The second one was all alone. He put himself down on the dirt. He lay flat. He didn't move a part and didn't breathe.

The animal went over to him. He touched his top and smelled his body. The man didn't move. He held his breath.

After a few minutes the animal, who thought the man was dead, made a low sound and went off.

When the animal had gone, the first man came down off the plant.

"Well," he said, laughing. "I noticed that the animal put his mouth close to your ear. What did he tell you?"

"He told me one thing," said the second one. "He told me never to trust one who says he will be with you, and then goes away as soon as there is something."

This story shows you that a friend in need is a friend indeed.

Low Prior Knowledge, Low Predictability, Nonpostdictable

One evening two people were moving in some plants. It was black. The first one said "I don't like the looks of this place. But we are more than one. We are people. If we stick together nothing can happen."

At that time an animal suddenly appeared.

Without a thought for the other, the first one got on a plant. The second one was all alone. He put himself down on the dirt. He lay flat. He didn't move a part and didn't breathe.

The animal went over to him. He touched his top and smelled his body. The man didn't move. He held his breath.

After a few minutes the animal, who thought the man was dead, made a low sound and went off.

When the animal had gone, the first man came down off the plant.

"Well," he said, laughing. "I noticed that the animal put his mouth close to your ear. What did he tell you?"

"He told me one thing," said the second one. "He told me never to trust one who says he will be with you, and then goes away as soon as there is something."

This story shows you that clothes make the man.

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