CONGRUITY AND ELABORATION IN CHILDREN'S AND ADULTS' FREE AND CUED RECALL

by

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APPROVAL PAGE

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Experiments with adult subjects have shown that congruity among the elements of an encoded event provides a better basis for free and cued recall of the elements than does incongruity (Craik & Tulving, 1975; Schulman, 1974). In addition, the degree of elaboration, or complexity, of the encoded event has been found to be directly related to free and cued recall, provided the elements of the event form a congruous relationship (Craik & Tulving, 1975). The present experiments were conducted to assess the effects of congruity and complexity on the memory performance of first- and fifth-grade children and of college students.

Subjects were shown cards containing sentence frames (i.e., sentences with one word missing) and were shown, on separate cards, target words that either did or did not make sense when inserted into the sentence frames. Subjects were required to judge whether or not the target words were congruous with the sentence frames. The sentence frames varied from short, simple sentences to long, complex sentences. Half of the sentence frames in Experiment 2 described a complementary relationship with

the target word (e.g., "Empty the garbage") and half of the sentence frames described a similarity relationship with the target (e.g., "Trash is like garbage"). The sentence frames in Experiments 1 and 3 were identical and did not bear any specific type of relationship with the targets. First and fifth graders were subjects in Experiments 1 and 2; college students were subjects in Experiment 3.

Immediately after the sentence-frame orienting task, a previously unannounced free recall test for target words was given. Following free recall, the sentence frames were presented for cued recall of the target words.

Although older subjects recalled more targets than younger subjects in free and cued recall, the pattern of results was similar across age groups and across experiments. In general, free recall was equal for targets that were congruous and targets that were incongruous with their sentence frames. There were no consistent effects of complexity in free recall. Cued recall was better when sentence-frame cues were congruous with their targets than when they were incongruous, and cued recall increased with greater sentence frame complexity whether targets and frames were congruous or incongruous. The complementary-similarity manipulation in Experiment 2 failed to reveal any interesting developmental trends.

A two-stage retrieval process was posited to explain these results. Stage 1 consists of retrieval of the context of an event, while Stage 2 represents the redintegration of an element of the context when the context has been retrieved. Stage 1 may be easier for bizarre or humorous incongruous contexts than for congruous contexts, while Stage 2 may be easier for a congruous element-context relationship. The Stage 1 advantage for incongruity could balance the Stage 2 advantage for congruity and produce equal levels of free recall for congruously encoded and incongruously encoded elements. In cued recall, Stage 1 is bypassed when the experimenter provides context cues, and the advantage at Stage 2 for congruity results in higher levels of cued recall for targets that are congruous with their contexts.

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TABLE OF CONTENTS

CHAPTER Page

LIST OF TABLES

LIST OF FIGURES

Page

CHAPTER I

INTRODUCTION

Current theories of memory for verbal material are concerned with the effects of various types of processing (encoding) on memory performance (Craik & Lockhart, 1972; Craik & Tulving, 1975; Schulman, 1975). In several memory experiments with adult subjects, orienting tasks have been used in incidental memory paradigms to control the type of processing that occurred (Craik & Tulving, 1975; Hyde & Jenkins, 1969, 1973; Johnston & Jenkins, 1971; Till & Jenkins, 1973; Walsh & Jenkins, 1973). The rationale behind this approach is twofold. First, the performance of a given type of orienting task is assumed to constrain subjects to encode the material in a manner qualitatively consistent with the nominal requirements of the orienting task. Second, because subjects are unaware that their memory for the material will be tested, they should be unlikely to engage in idiosyncratic, strategy-based types of encoding that could alter or obscure the effects of the orienting task. Thus, nominally semantic orienting tasks, such as requiring the subject to rate words on a pleasantness scale, to generate synonyms of the words,

or to determine whether the words fit logically into sentence frames, are considered to produce mnemonic consequences dependent upon semantic encoding operations. Likewise, nominally nonsemantic tasks, such as requiring the subject to determine whether the words contain a given letter, to count the number of letters, or to generate rhymes, are assumed to produce mnemonic consequences dependent upon sensory encoding operations.

Studies employing the orienting-task/incidental-memory paradigm have demonstrated that encoding a word's meaning (semantic encoding) yields better subsequent recall than does encoding the word's sensory (e.g., acoustic, orthographic) features (Hall & Geis, 1975; Hyde & Jenkins, 1969, 1973; Till & Jenkins, 1973; Walsh & Jenkins, 1973). Similar results have been obtained for free and cued recall with first-, third-, and fifth-grade children (Geis & Hall, 1976b; Hall & Geis, 1976). As these experiments have provided sufficient evidence that semantic processing is usually superior to sensory-perceptual processing, additional demonstration experiments are not likely to be highly enlightening. As Schulman states,

> Mnemonically, it is ordinarily better to find meaning in an experience than merely to note its surface features. Only if such were not the case would it be news, and yet the literature pointing out the advantages of semantic to structural processing continues to grow (1975, p. 50).

A more promising direction for memory research may be a determination of the mnemonic values of various types of semantic encoding. Does the encoding of synonyms or superordinates of a target word provide a better basis for recall than the encoding of words that share a complementary (functional) relationship? Is the encoding of a word's denotation mnemonically superior to the encoding of its connotation? Although some evidence concerning these questions has emerged (e.g., Geis & Greenberg, 1975; Schulman, 1975), much remains to be discovered about the relationship between the type of semantic encoding and subsequent memory performance.

An additional consideration for memory research involves the effects of the degree of stimulus elaboration on memorability. Craik and Tulving (1975) contended that the degree to which perceivers elaboratively encode an event is directly related to their memory for that event. Elaboration of an event can take many forms, but, in general, the term refers to any type of stimulus enrichment. Elaboration can be minimal, such as encoding a synonym of a word, or extensive, such as creating an entire story or sequence of events around a word. Thus, stimulus elaboration occurs when something is added to the stimulus event, and elaboration can vary from simple, minimal elaboration to complex, extensive elaboration.

According to Craik and Tulving (1975), the greater the stimulus elaboration, the greater the durability and/or retrievability of the memory trace.

The degrees-of-elaboration approach can also be described in terms of elaboration of the context of an event and subsequent memory for aspects of the context. Memory for any part of an event sometimes depends on memory for other parts of the event. The aspect of the event that the person is trying to remember can be referred to as the target, with all other aspects of the event constituting context for the target. Remembering any part of the context of an event can serve to redintegrate the target (Horowitz & Prytulak, 1969). The degrees-of-elaboration approach maintains that an elaborate context provides a better basis for memory of the target than does a simple context. The reasoning may be that, if any element of the context has a tendency to redintegrate the target, then many context elements supply more chances for redintegration than do few elements.

Craik and Tulving (1975, Experiment 7) tested their assumptions concerning the relationship between elaboration and memory by experimentally inducing various degrees of elaboration prior to free and cued recall. College subjects were shown sentence frames, i.e., sentences with a word missing, and then were asked whether

target words fitted the sentences. To vary the degree of elaboration, the sentence frames were short, of moderate length, or long. Examples of simple, moderate, and complex sentence frames, respectively, are: "She cooked the _____," "The _____ frightened the children," and "The great bird swooped down and carried off the struggling _____." Craik and Tulving found that free and cued recall (cues being the sentence frames) increased with increasing frame complexity only when the target word fitted, or was congruous with, the sentence frame. When the target word did not fit the sentence frame, neither free nor cued recall varied with changes in the degree of complexity of the sentence frame. Craik and Tulving (1975, Experiment 7) argued that when

> a presented word does not fit the sentence frame, the subject cannot form a unified image or percept of the complete sentence, the memory trace will not represent an integrated meaningful pattern, and the word will not be well recalled. In the case of positive responses, such coherent patterns can be formed and their degree of cognitive elaboration will increase with sentence complexity (p. 284).

Schulman (1974) had previously observed that a congruous encoding context provided a better basis for memory than an incongruous context. His college subjects were asked questions of superordination or attribution about target words. The target words were printed in upper-case letters in the otherwise lower-case sentences.

Half of the questions were congruous, e.g., "Is a CORKSCREW an opener?" and half were incongruous, e.g., "Is SPINACH ecstatic?" Congruity yielded superior free recall, cued recall, and recognition of target words than did incongruity.

Thus, memorability is a function of at least three factors that should be the subject of future memory research: (a) various types of semantic encoding, (b) differing degrees of stimulus elaboration, and (c) congruity between a target word and its encoding context. It is not yet known whether the memory performance of children is affected by these factors to the same extent as is the memory performance of adults; furthermore, there is the possibility that these factors control memory performance differently for children of different ages (i.e., a factor X age interaction). Neither the effects of various types of induced semantic encoding nor the effects of the degree of induced elaboration have been extensively examined developmentally, and the role of congruity in children's memory has been investigated in only one study.

Hall and Geis (1976) found that congruity provided a better basis than incongruity for the free recall of third and fifth graders, but not for first graders. The task required children to answer a question about each

of several target words. When the correct answer to the question was yes, such as "Is it part of a house?" for the target word roof, the target and question were considered to form a congruous, integrated unit. When the correct answer to the question was no, such as "Is it something you sing?" for the target word roof, there was an incongruous relationship between the target and the question. A possible explanation of the superiority of congruous over incongruous encoding (i.e., the congruity effect) involves the subject's use of an indirect retrieval strategy. While a direct retrieval strategy would be just an attempt to recall the target words, an indirect strategy could involve attempts to remember the questions that had been asked about the words. Memory for the questions might facilitate memory for the targets about which the questions had been asked. A subject who uses an indirect retrieval strategy is essentially generating his own retrieval cues.

If such indirect retrieval is employed, the congruity effect should appear, because recall of the target word should be facilitated to a greater extent when the question that is remembered formed a congruous unit with the target word at encoding (Hall & Geis, 1976). That is, when the question and the target form a coherent, integrated unit, remembering the question should be more

likely to redintegrate or reinstate the target word than when the target and question form a non-integrated, incongruous unit. In the Hall and Geis (1976) experiment, there seemed to have been an increase with age in the spontaneous use of indirect retrieval strategies, because the congruity effect occurred in the free recall of third and fifth graders but not in the free recall of first graders. When the experimenter provided the key word from a question as a retrieval cue, the congruity effect occurred for first as well as for third and fifth graders. Even young children apparently can use part of a congruous unit to help them remember the other part of the unit, but only older children spontaneously adopt the indirect retrieval strategy of generating their own retrieval cues.

The present experiments were concerned with the effects of the three factors that have been discussed; i.e., the type of semantic encoding, the degree of elaboration, and congruity, on children's memory performance. In Experiment 1, the latter two factors were manipulated; in Experiment 2, all three factors were involved. In both experiments, sentence frames, similar to those used by Craik and Tulving (1975), varied in length to effect different degrees of complexity and, hence, elaboration. Congruity and incongruity refer to the relationship between the target word and the sentence

frame given for that word, i.e., whether the word did or did not make sense in the sentence frame. In Experiment 2, the two types of induced semantic encoding entailed complementary and similarity relationships between target words and sentence frames. The complementary-similarity shift will be described in the introduction to Experiment 2.

Subjects for Experiments 1 and 2 were first and fifth graders. The selection of children at these ages was based, in part, on the evidence that optional, strategy-based memory techniques often emerge between the first and fifth grades (Geis & Hall, 1976a). If the congruity effect in free recall, for example, is dependent on retrieval strategies, the effect should occur for fifth graders but not for first graders. In addition, the complementary-similarity shift that is involved in Experiment 2 occurs during this age range. Experiment 3 was a replication of Experiment 1, but with college students as subjects.

CHAPTER II

EXPERIMENT 1

In Experiment 1, the free and cued recall of first and fifth graders was tested following orienting tasks for a list of words. The purpose of Experiment 1 was to assess the mnemonic consequences of the congruity of encoding and the elaboration of encoding.

Method

Subjects. Subjects were 24 first and 24 fifth graders, with equal numbers of males and females at each grade. The generally middle-class children attended public schools in Winston-Salem, North Carolina.

Materials. Two lists of 24 common one- and two-syllable words were printed in black letters on 3-in. X 5-in. white cards, one word per card. These words were the target words for which recall was tested. The sentence frames were typed on separate 3-in. X 5-in. white cards, one sentence frame per card. The sentence frames did not bear any specific type of relationship to the target words (as did the sentence frames in Experiment 2). The targets and sentence frames for Experiment 1 are shown in Appendix A. A white, 4-in. X 6-in. card containing a random array of numbers was used for the

filler task that followed free recall. The experimenter recorded the children's answers to questions and their oral recall on pre-coded data sheets. The number of words in the sentence frames defined the differences in complexity for simple, moderate, and complex frames. For each level of complexity, the mean number of words per sentence frame was calculated. The means and standard deviations of the number of words per sentence frame for the three levels of complexity are shown in Table 1.

Design. The design was a 2 X 2 X 2 X 3 X 2 factorial, with the between-subject factors of grade (first and fifth), list (list 1 and list 2), and sex (male and female), and the within-subject factors of complexity (simple, moderate, and complex) and congruity (congruous and incongruous). The design is depicted in Figure 1.

For subjects of each sex within each grade, each of the six types of sentence frame, i.e., the six combinations of the three levels of complexity and two levels of congruity, appeared equally often at each serial position. Within each block of six target words, each of the six types of sentence frame appeared exactly once, and the order of sentence frames within each of the blocks was determined randomly. Six random orders of target words were used for each of the two lists, with the restriction that words were assigned to serial positions in such a way

Table 1

Means and Standard Deviations of Numbers of Words in Sentence Frames of Experiment 1

Congruity	Complexity		
	Simple	Moderate	Complex
List 1			
Congruous			
Mean	3.21	6.25	13.3
Std. Dev.	.93	1.20	1.0
Incongruous			
Mean	3.42	6.46	13.5
Std. Dev.	1.10	1.25	1.4
List 2			
Congruous			
Mean	3.08	6.29	14.6
Std. Dev.	.72	1.16	1.3
Incongruous			
Mean	3.08	6.21	14.3
Std. Dev.	.97	1.18	1.6

		Sentence Frames					
		Congruous			Incongruous		
		Simple	Moderate	Complex	Simple	Moderate	Complex
First Grade	List 1 Male						
	List 1 Female						
	List 2 Male						
	List 2 Female						
Fifth Grade	List 1 Male						
	List 1 Female						
	List 2 Male						
	List 2 Female						

Figure 1. Design of Experiment 1.

that all six of the sentence frames that were to accompany each of the target words were used equally often during the experiment.

Procedure. In general, the procedure was to present a sentence frame to the child and then to show the child one of the target words. The experimenter held one of the sentence-frame cards in front of the child and read it out loud, saying "blank" for the blank in the frame. While still holding up the sentence-frame card, the experimenter held up the appropriate target word for that frame and said the target word aloud. Then, the experimenter read the sentence frame with the target word substituted for "blank."

The child's task was to decide whether the word on the card "made sense" in the sentence frame. The sentence-frame task was subject-paced, in that the rate of presentation depended on each child's response latency in answering the questions about the targets and frames. Children were tested individually. After the 24 words and sentence frames had been seen and responded to by the child, a previously unannounced free recall test for the target words was given. Following the two-minute free-recall task, children were shown a card containing numbers and were asked to point to all the 7's, 4's, 3's, etc., for 30 seconds. Then the instructions for cued recall were given, and the sentence frames were shown and read, one at a time,

for cued recall of the target words. The sentence-frame cues were given in the same order as they had been given during the orienting task prior to free recall. Twenty seconds were allowed for the child to respond to each cue.

It is possible that children who had not ever seen the target words could, nevertheless, guess the correct target word under the condition of cued recall. In other words, children may not have been remembering part of a previously seen context in cued recall; they may have been guessing words that fitted the sentence frames given as cues. To assess guessing in cued recall, children who had finished performing the memory tasks with List 1 were shown the sentence frames that corresponded to List 2 target words, and children who had previously seen List 2 words and sentence frames were given the sentence frames that corresponded to List 1 target words. A yoking procedure was used in which a child who saw and recalled List 1, for example, received the same List 2 sentence frames, in the same order, as a child who saw and recalled List 2.

All children received pretraining on the orienting task. The pretraining materials are shown in Appendix A with the other sentence frames used in Experiment 1. If the child correctly answered all four questions about each of the first two pretraining words, pretraining was concluded and the experiment was begun. If any errors were

made on the eight questions, four additional questions were asked about the third pretraining word. In the experiment proper, only one sentence frame was presented for each target word. One male and one female graduate student were experimenters. The complete instructions for all phases of Experiment 1 are shown in Appendix B.

Results

The children had little difficulty answering the orienting questions correctly. Almost all of the children performed perfectly on the first two pretraining trials. First graders correctly answered 95% and fifth graders correctly answered 98% of the orienting questions. No child missed more than 3 of the 24 questions.

Free recall. An analysis of variance was performed on the free recall data, with grade, list, and sex as between-subject factors, and congruity and complexity as within-subject factors. Fifth graders performed significantly better than first graders on the recall task, F (1,32) = 13.80, MSe = .60.[1] More List 1 words than List 2 words were recalled, F (1,32) = 4.83, MSe = .60, but the list factor did not interact with any other factor. Neither the main effect of congruity nor the main effect of complexity was significant (Figure 2).

[1]The rejection region is that of $p<.05$ for all tests. MSe refers to the mean square error term used for an F.

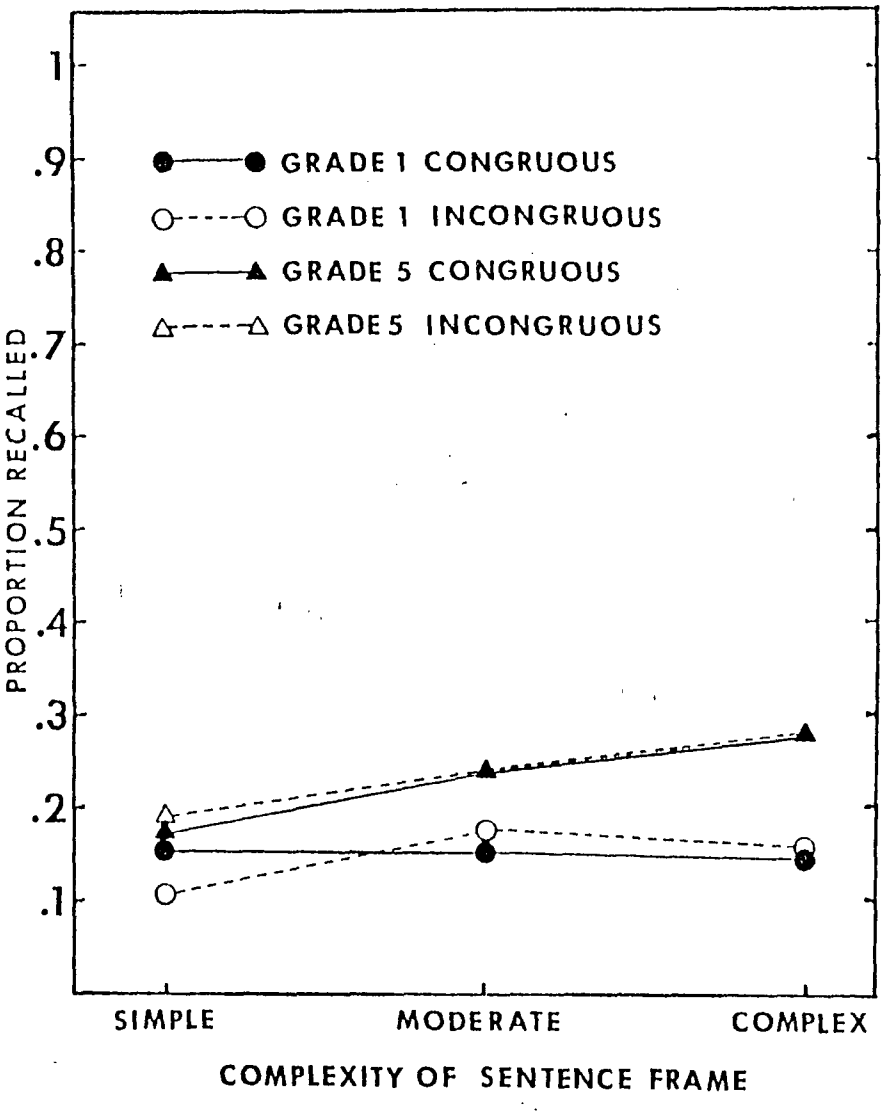

Figure 2. Free recall for Experiment 1 as a function of grade, congruity, and complexity.

The Grade X Sex X Complexity interaction was significant, F (2,64) = 3.27, MSe = .51. Newman-Keuls analyses indicated that there were no consistent effects of grade and complexity for either male or female subjects. Additional analyses were possible, but only those analyses considered theoretically interesting were performed.

Guessing. An analysis of variance was performed on the number of words correctly guessed in the procedure that followed cued recall. A correct guess occurred when the child supplied a word for the blank in the sentence frame that was the same as the target word that the child's yoked subject saw with that sentence frame prior to free recall. The factors involved in the preceding free recall analysis of variance were included in the present analysis.

Children guessed words that were congruous with the sentence frames more often than words that were incongruous with the sentence frames, F (1,32) = 353.69, MSe = .27. The children did not guess any words that were incongruous with the sentence frames; to do so would have been to violate their instructions to make up a word that fit the sentence frame they were given. Guessing was better for more complex sentence frames, F (2,64) = 8.92, MSe = .63. A Newman-Keuls test showed that guessing for complex frames was better than guessing

for moderate frames, guessing for moderate frames was better than that for simple frames, and guessing for complex frames was better than that for simple frames (see Figure 3).

A significant Complexity X Congruity interaction indicated that the effect of complexity was present only for congruous sentence frames, since no words were guessed for incongruous frames, F (2,64) = 8.92, MSe = .63. First graders guessed as well as fifth graders, F (1,32) = .01, MSe = .27. No other outcomes were significant.

Cued recall. In light of the significant improvement in guessing with increasing sentence frame complexity, an improvement in unadjusted cued recall scores with an increase in sentence frame complexity would have been uninterpretable, as cued recall and guessing would have been confounded. Each child's cued recall data sheet was identical to the guessing data sheet of the yoked partner. Words that were guessed by one child were taken out of consideration in calculating the cued recall of the other child. The resulting scores were the proportion correct for each of the six combinations of the three levels of complexity and two levels of congruity. For example, if Child A recalled 3 of 4 possible simple-congruous words and Child B guessed one

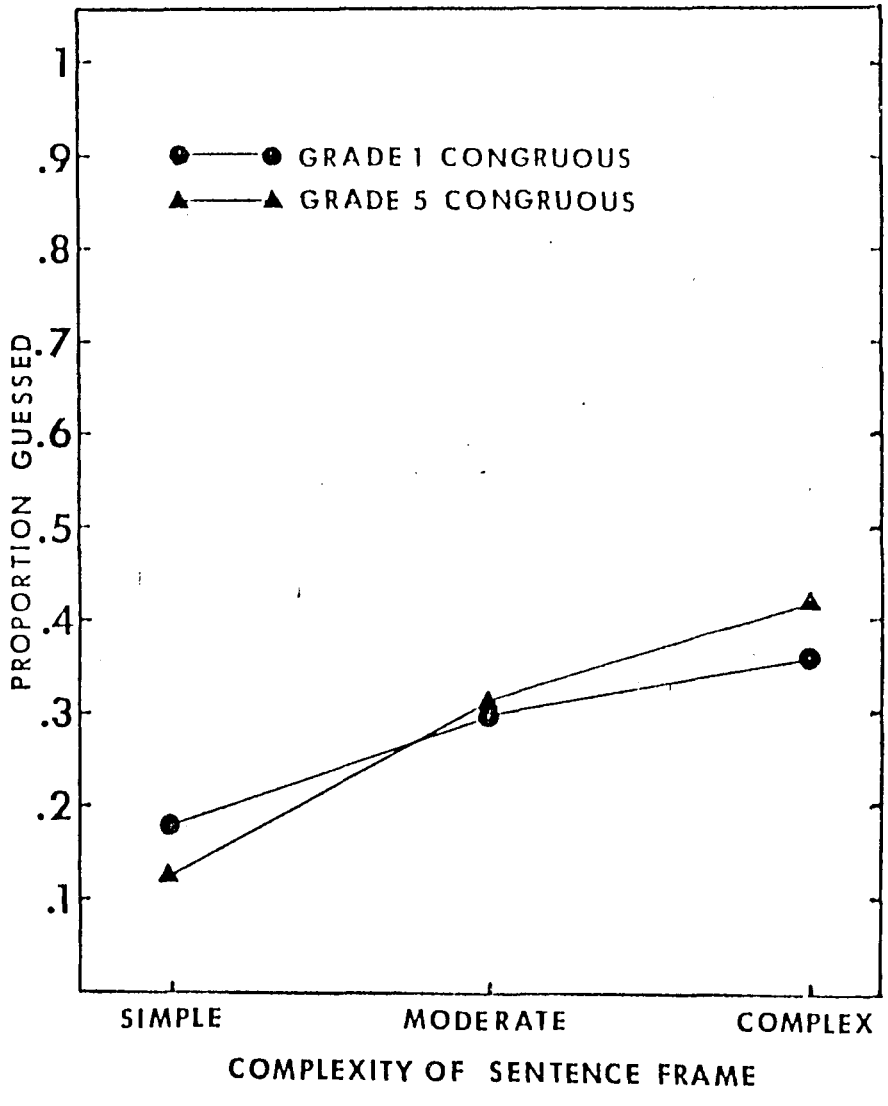

Figure 3. Guessing for congruous sentence frames in Experiment 1 as a function of grade and complexity.

of the words that Child A had recalled, then the proportion correct for Child A for simple-congruous would have been 2 of 3 or .67. Prior to the analysis of variance on the adjusted cued recall scores, an arcsin transformation was performed to stabilize the variance of the proportions (Winer, 1971). The analysis of variance included the same factors as the preceding analyses of variance.

In cued recall, fifth graders again recalled more words than first graders, F (1,32) = 14.85, MSe = .91; congruous frames yielded higher recall than incongruous frames, F (1,32) = 52.54, MSe = .70; and recall improved with increasing sentence frame complexity, F (2,64) = 17.78, MSe = .61 (see Figure 4). A Newman-Keuls analysis found that the significant main effect of complexity was due to the significantly greater recall associated with moderate and complex sentence frames than for simple frames; moderate and complex frames led to equal recall. The List X Congruity interaction was significant, F (1,32) = 4.79, MSe = .70. For each list, however, congruity yielded better recall than incongruity, as indicated by a Newman-Keuls test. No analysis of variance was performed to compare free and cued recall directly, but Figure 5 has been included to show the relative levels of free and cued recall and the different effects of congruity in the two situations.

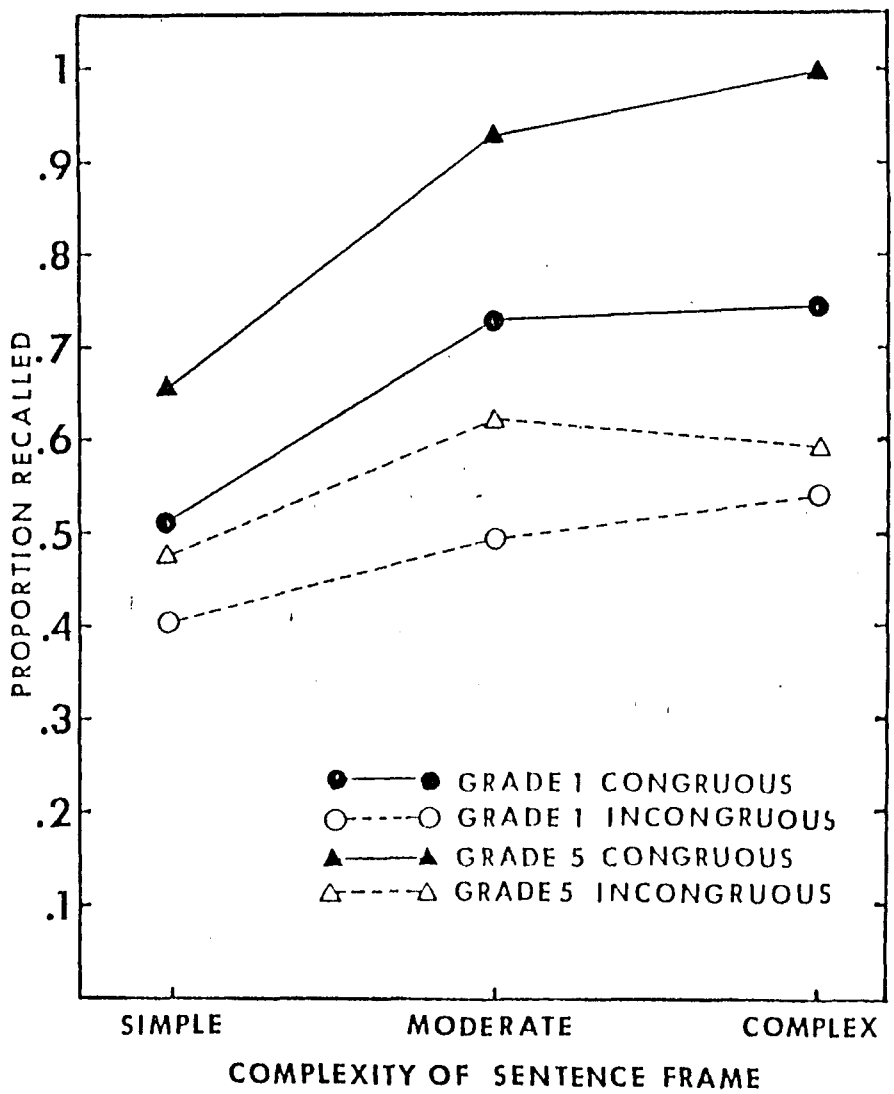

Figure 4. Cued (Adjusted for Guessing) recall in Experiment 1 as a function of grade, congruity, and complexity.

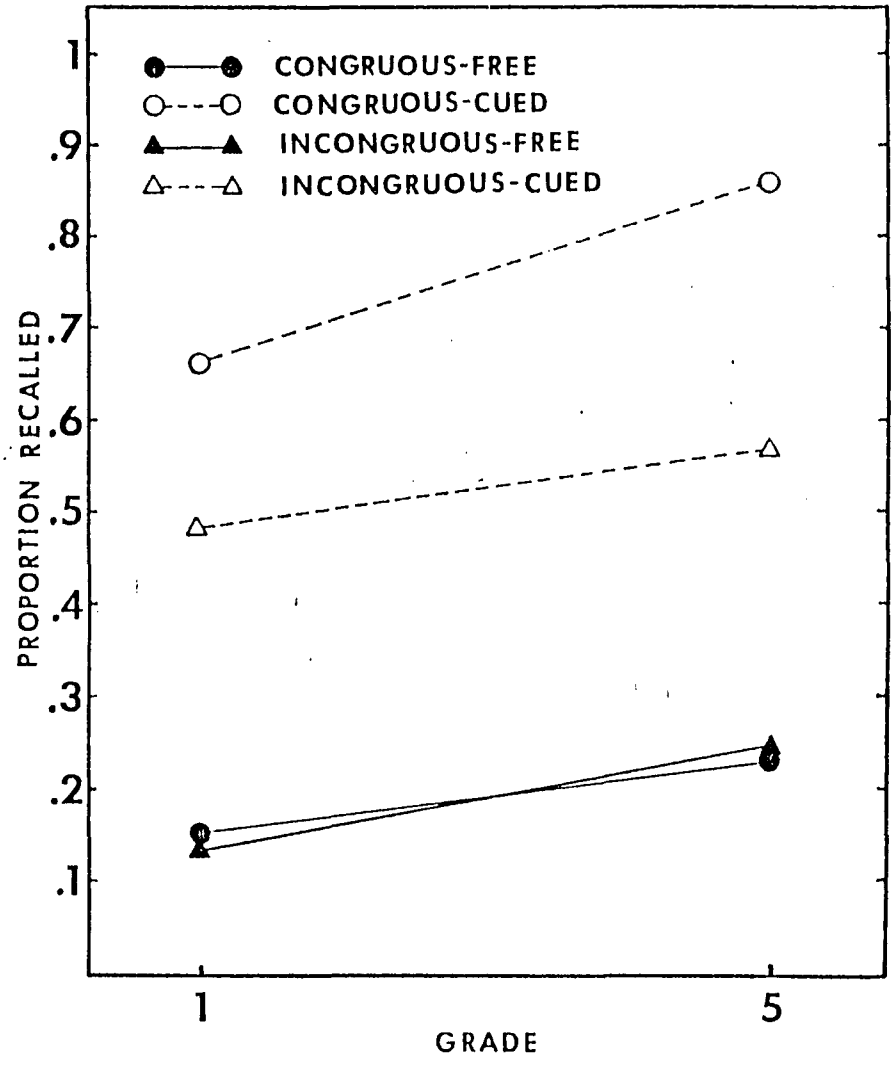

Figure 5. Cued (Adjusted for Guessing) and free recall for Experiment 1 as a function of grade and congruity.

A word that was recalled in free recall should have been more likely than a non-recalled word to be recalled in cued recall. Probabilities were calculated for the two relevant situations: (a) the probability of cued recall of a word, given that the word was recalled in free recall, p(CR|FR); and (b) the probability of cued recall of a word, given that the word was not recalled in free recall, p(CR|$\overline{\text{FR}}$). For first graders, these probabilities were .74 and .59 respectively, and, for fifth graders, the probabilities were .84 and .69 respectively.

Serial position. Two separate analyses of variance were performed to test for serial position effects in free and cued recall. The serial positions used in the analyses represented combined positions, with serial positions 1, 2, 3, and 4 corresponding to words 1-6, 7-12, 13-18, and 19-24, respectively. Although the combining procedure was not an absolute necessity, all of the six types of sentence frame having appeared equally often at each actual serial position (across subjects), the procedure simplified the analysis and interpretation of the serial position effects. Furthermore, primacy and recency, the two characteristics usually discussed in serial position analyses, refer to memory for the first several and the last several serial positions in the list;

the present analyses merely combined serial positions prior to a statistical test rather than afterwards.

In free recall, the serial position main effect was significant, F (3,138) = 28.29, MSe = .17. As can be seen in Figure 6, the effect was due to a pronounced recency effect. Because the adjusted cued recall scores did not equally represent all serial positions, the unadjusted cued recall scores were used in the serial position analysis for cued recall. The main effect of serial position was significant, F (3,138) = 4.44, MSe = .16 (see Figure 6). As in free recall, recency effects were responsible for this significant serial position effect.

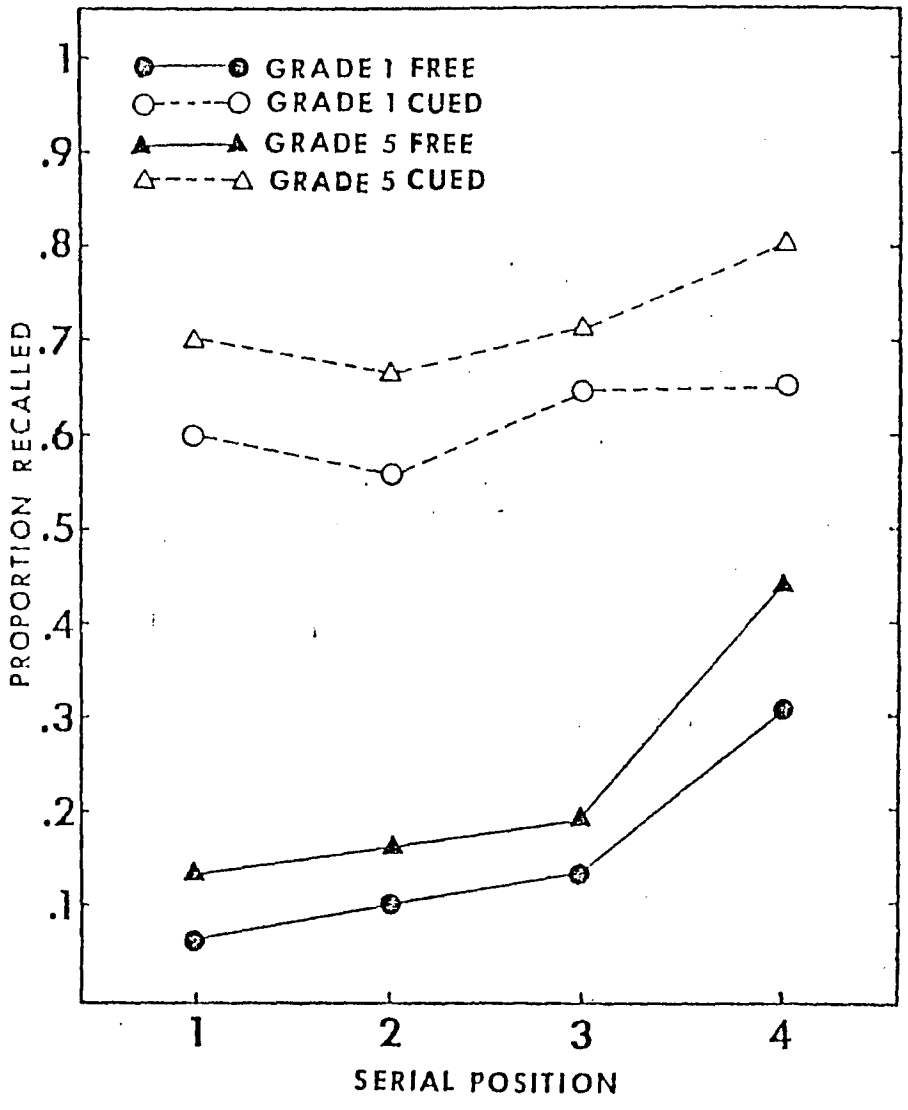

Figure 6. Cued (Not Adjusted for Guessing) and free recall in Experiment 1 as a function of grade and serial position.

CHAPTER III

EXPERIMENT 2

There is evidence from word association and classification studies that children's encoding tendencies shift from complementary to similarity relationships between the first and fifth grades (Denney, 1974). A complementary relationship between two words indicates a functional relationship between the words, as in apple-eat. Children who respond to a word with a complementary association or who group together items that share a complementary relationship, may be indicating that their phenomenological world is one of direct interaction with their environment, i.e., an object is defined by what the child can do with it or what it can do to the child. A similarity relationship may involve synonyms or superordinates of a stimulus word; it is a relationship such as knife-dagger or knife-weapon. Similarity may also refer to conceptual relatedness, such as apple-orange. Although complementary responding may result from direct experience with the world, similarity responding may develop only with increasing social transmission of knowledge through reading and conversation. In the latter case, there seems to be a need or pressure for children to develop knowledge of synonyms and superordinates so they can become adept at both receiving

and transmitting information. The increase with age in similarity encoding may be due to the increase with age in the extent to which the child gains knowledge through social transmission.

Although the complementary-similarity shift seems to be a reliable developmental phenomenon, at least in semantic memory tasks such as word association and classification, little is known about the relative mnemonic values of complementary and similarity encoding in episodic memory tasks. It is possible that one type of encoding is better than the other, regardless of the age of the child; perhaps complementary encoding requires more stimulus elaboration than does similarity encoding, and, therefore, complementary encoding would be mnemonically superior. Alternatively, it may be that complementary encoding would be mnemonically superior for young children, whose predominant form of encoding is on a complementary basis, while similarity encoding would be better for older children, whose predominant mode of encoding is on a similarity basis. Thus, the mnemonically optimal type of constrained encoding for children at a given age may depend on the typical, or preferred, type of encoding of children at that age. Experiment 2 examined these possibilities with first and fifth graders being used as subjects. The

factors of complexity and congruity that were manipulated in Experiment 1 were also included in the design of Experiment 2.

Method

Subjects. Subjects were 32 first and 32 fifth graders, with equal numbers of males and females at each grade. The children attended the same schools as the children in Experiment 1; no child was in both studies.

Materials. The two lists of words used in Experiment 1 were also used in the present experiment. For half of the children at each grade, the 24 sentence frames had a complementary relationship with the target words; the remaining children were given sentence frames that had a similarity relationship with the target words. For each child in each of these groups, half of the sentence frames were simple and half were complex. Half of the simple and half of the complex sentence frames formed a congruous relationship with the target words, while the remaining sentence frames formed an incongruous relationship with the targets. The use of two, instead of three, levels of complexity allowed more observations for each level of complexity. The targets and sentence frames used in Experiment 2 are shown in Appendix C, and the means and standard deviations of the number of words in the sentence frames are shown in Table 2.

Table 2

Means and Standard Deviations of Numbers of Words in Sentence Frames of Experiment 2

Congruity	List 1 Frames		List 2 Frames	
	Simple	Complex	Simple	Complex
Complementary				
Congruous				
Mean	3.96	10.2	3.25	10.0
Std. Dev.	1.19	1.9	1.15	2.6
Incongruous				
Mean	3.79	8.8	3.08	8.6
Std. Dev.	1.18	1.5	1.02	1.5
Similarity				
Congruous				
Mean	5.08	9.42	4.96	9.38
Std. Dev.	1.32	1.77	.95	1.17
Incongruous				
Mean	5.13	9.54	4.79	9.25
Std. Dev.	1.08	1.32	.72	1.15

Design. There were two differences between the present experiment and Experiment 1. First, there were two, instead of three, levels of sentence frame-complexity in Experiment 2. Second, sentence frames in Experiment 2 had either a specifically complementary or similarity relationship with the target words, instead of the general, nonspecific type of relationship that characterized the frames in Experiment 1. Thus, the design is a 2 x 2 x 2 x 2 x 2 x 2 factorial, with the between-subject factors of grade (first and fifth), list (list 1 and list 2), task (complementary and similarity), and sex (male and female), and the within-subject factors of complexity (simple and complex) and congruity (congruous and incongruous). The design is depicted in Figure 7.

Procedure. The procedure in Experiment 2 was identical to the procedure in Experiment 1.

Results

Children had no difficulty answering the orienting-task questions. Pretraining rarely exceeded two trials. First graders correctly answered 96% of the orienting-task questions in the complementary condition and 94% of the questions in the similarity condition. Fifth graders correctly answered 99% and 95% of the complementary and similarity questions, respectively.

Free recall. The free recall scores were subjected

				Sentence Frames			
				Congruous		Incongruous	
				Simple	Complex	Simple	Complex
Complementary	First Grade	List 1	Male				
			Female				
		List 2	Male				
			Female				
	Fifth Grade	List 1	Male				
			Female				
		List 2	Male				
			Female				
Similarity	First Grade	List 1	Male				
			Female				
		List 2	Male -				
			Female				
	Fifth Grade	List 1	Male				
			Female				
		List 2	Male				
			Female				

Figure 7. Design of Experiment 2.

to an analysis of variance. Between-subject factors were task (complementary and similarity), grade (first and fifth), list (list 1 and list 2), and sex (male and female); within-subject factors were congruity (congruous and incongruous) and complexity (simple and complex). The significant main effect of task indicated that recall was greater for complementary than for similarity encoding, F (1,48) = 7.52, MSe = .83; fifth graders recalled more words than first graders, F (1,48) = 19.26, MSe = .83; and congruous encoding resulted in greater recall than incongruous encoding, F (1,48) = 4.18, MSe = .84. The main effect of complexity was not significant. Limitations on the generality of the three significant main effects were suggested by the significant Task x Grade x Congruity interaction, F (1,48) = 8.19, MSe = .84. Newman-Keuls analyses yielded the following results: (a) recall in the complementary condition was significantly greater than recall in the similarity condition only for fifth graders when the encoding was incongruous, (b) congruity produced significantly greater recall than incongruity only for fifth graders in the similarity condition, and (c) the recall of fifth graders was significantly greater than the recall of first graders only in the complementary condition for incongruous encodings (see Figures 8 and 9).

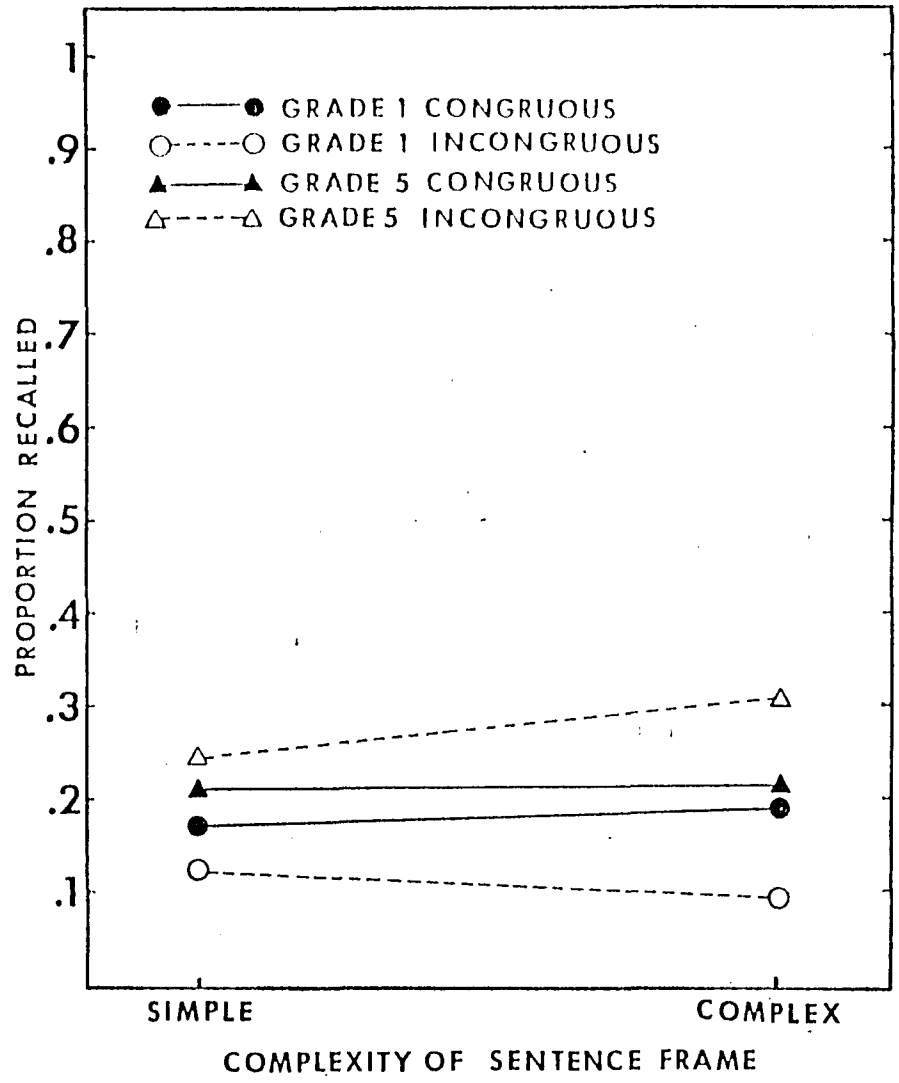

Figure 8. Free recall for the complementary task in Experiment 2 as a function of grade, congruity, and complexity.

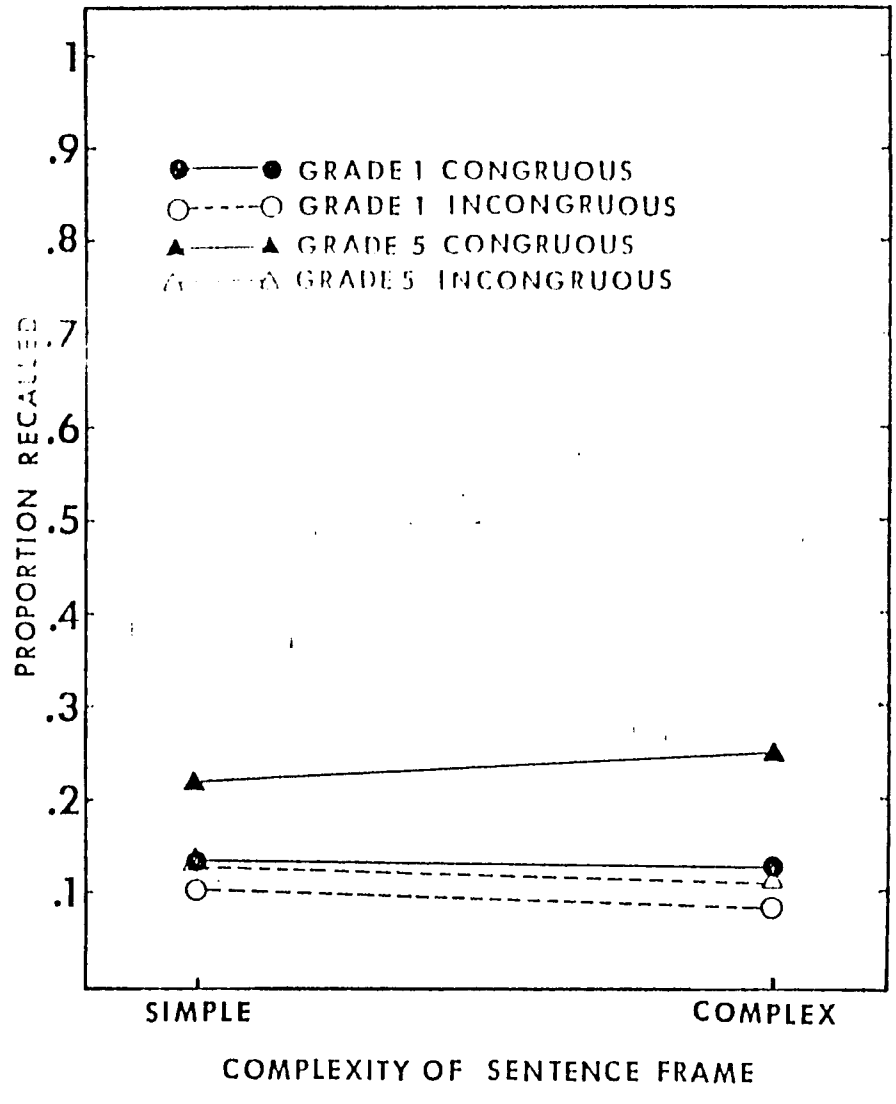

Figure 9. Free recall for the similarity task in Experiment 2 as a function of grade, congruity, and complexity.

Guessing. An analysis of variance was conducted on the guessing performance in Experiment 2. The factors in the analysis were the same as those in the free recall analysis. Fifth graders correctly guessed more words than first graders, F (1,48) = 5.36, MSe = .66; more correct guesses were made for List 2 than List 1, F (1,48) = 6.88, MSe = .66; and more words were guessed correctly for congruous than for incongruous frames, F (1,48) = 776.82, MSe = .72. Only one word was guessed correctly for the incongruous sentence frames; thus, the congruity factor interacted with the other significant factors; main effects of these other factors were due to the guessing for congruous sentence frames and not for the incongruous frames. The significant Task x List x Sex interaction, F (1,48) = 4.67, MSe = .66, was not analyzed further because this result did not suggest anything of theoretical importance. The significant Task x Complexity interaction, F (1,48) = 6.24, MSe = .64, indicated that complex frames led to better guessing than did simple frames in the complementary condition, but that simple frames led to better guessing than complex frames in the similarity condition (see Figure 10). Guessing did not vary across tasks, F (1,48) = 1.52, MSe = .66, nor across levels of complexity, F (1,48) = .39, MSe = .64.

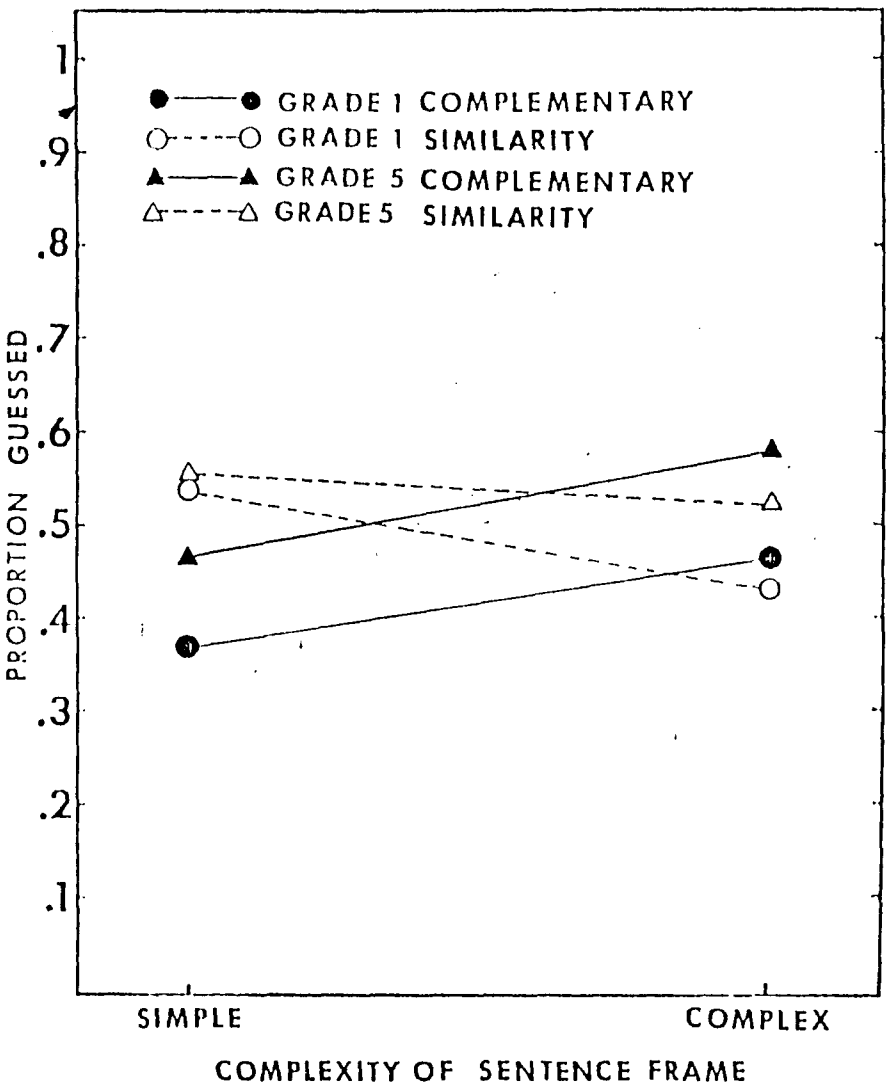

Figure 10. Guessing for congruous sentence frames in Experiment 2 as a function of grade, complexity, and task.

Cued recall. An analysis of variance that included the same factors as the previous two analyses was performed for cued recall. As in Experiment 1, the scores were adjusted for guessing and subjected to an arcsin transformation prior to the analysis of variance. Several main effects were significant, but significant interactions restricted the interpretation of some of these main effects. Significant main effects included task, with complementary yielding higher cued recall than similarity, F (1,48) = 10.58, MSe = .93; grade, with fifth graders superior to first graders, F (1,48) = 6.64, MSe = .93; congruity, with congruous frames resulting in more recall than incongruous frames, F (1,48) = 89.48, MSe = .85; and complexity, with complex frames causing higher recall than simple frames, F (1,48) = 4.27, MSe = .37 (see Figures 11 & 12).

A Task x Congruity interaction indicated that cued recall increased with increasing complexity in the complementary condition but decreased with increasing complexity in the similarity condition, F (1,48) = 5.33, MSe = .85. The two significant fifth-order interactions that limited the interpretation of the main effects were a Task x Congruity x Complexity x Grade x Sex interaction, F (1,48) = 4.84, MSe = .43 and a Task x Congruity x Complexity x List x Sex interaction, F (1,48) = 4.36,

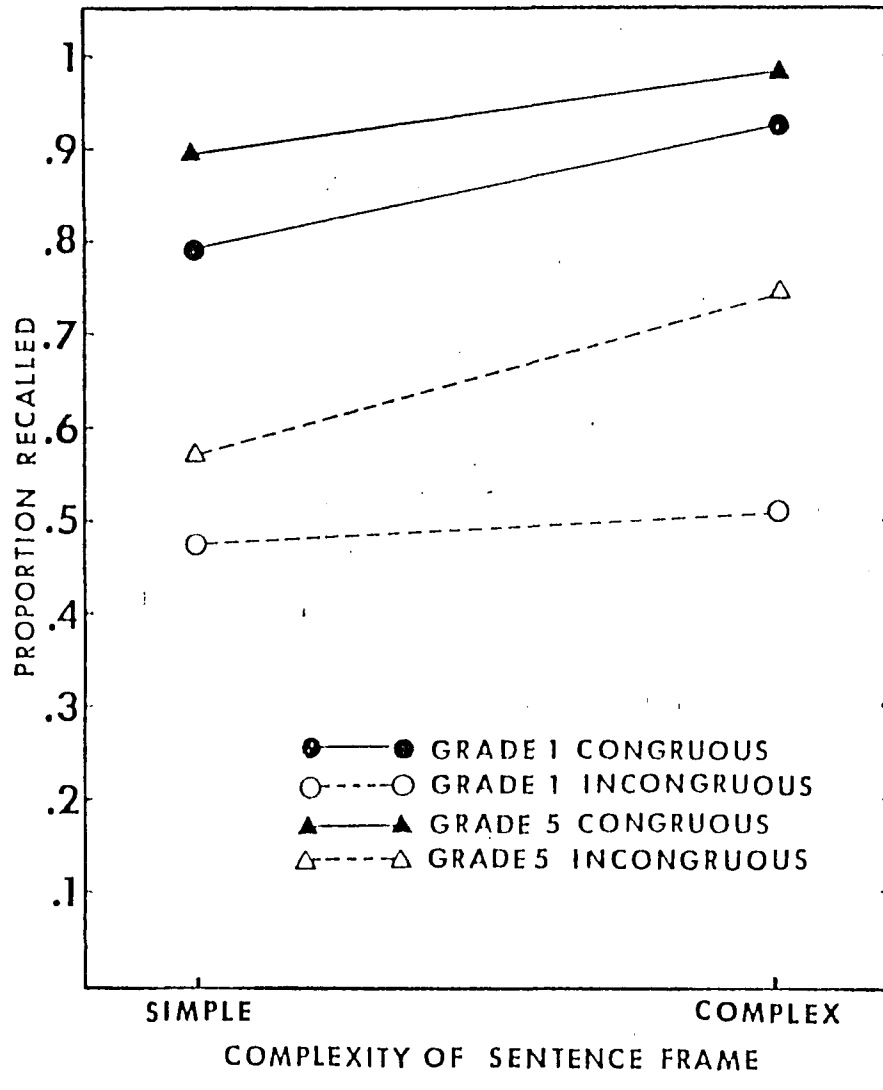

Figure 11. Cued (Adjusted for Guessing) recall for the complementary task in Experiment 2 as a function of grade, congruity, and complexity.

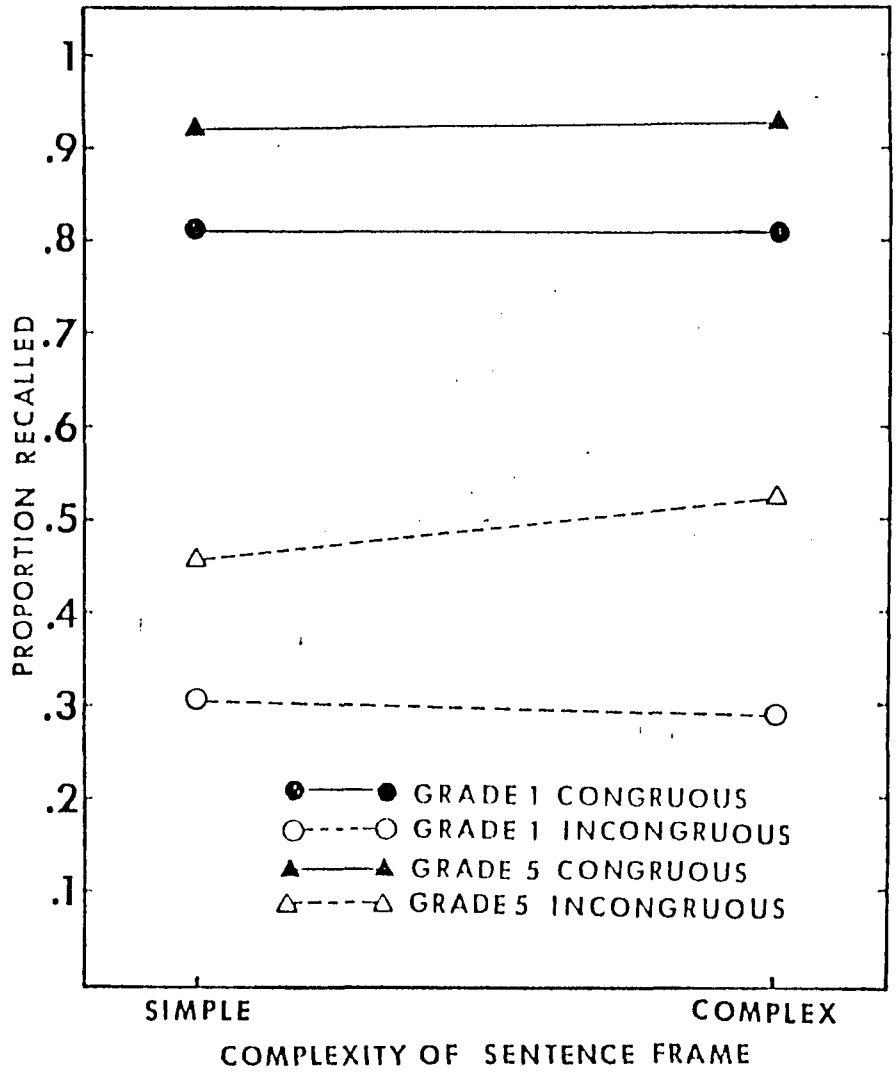

Figure 12. Cued (Adjusted for Guessing) recall for the similarity task in Experiment 2 as a function of grade, congruity, and complexity.

MSe = .43. Newman-Keuls post hoc tests were made for each theoretically important factor (i.e., task, congruity, complexity, and grade) at each level of all other factors involved in the interaction. The generality of the effect of any particular factor was assumed to be indicated by the proportion of the specific comparisons that were significant. Following this procedure, it was determined that the congruity effect (i.e., congruous greater than incongruous) was the only result that could be interpreted with confidence as a general main effect. For example, in analyzing the first of the two interactions, congruity yielded significantly greater recall than incongruity in 13 of 16 post hoc comparisons. The highest such proportion for any other factor was 3 of 16. The significant main effects that had to be considered as limited in generality resulted from the consistency in the direction of the results. In other words, even when the individual post hoc comparisons failed to reach significance, the means were in the same direction.

Although no analysis was performed to compare free and adjusted cued recall, Figure 13 is included to show the differences in the patterns of results in free and cued recall. The graph is a compilation of several of the previous graphs, but the complexity variable has been omitted to show the congruity effects more clearly.

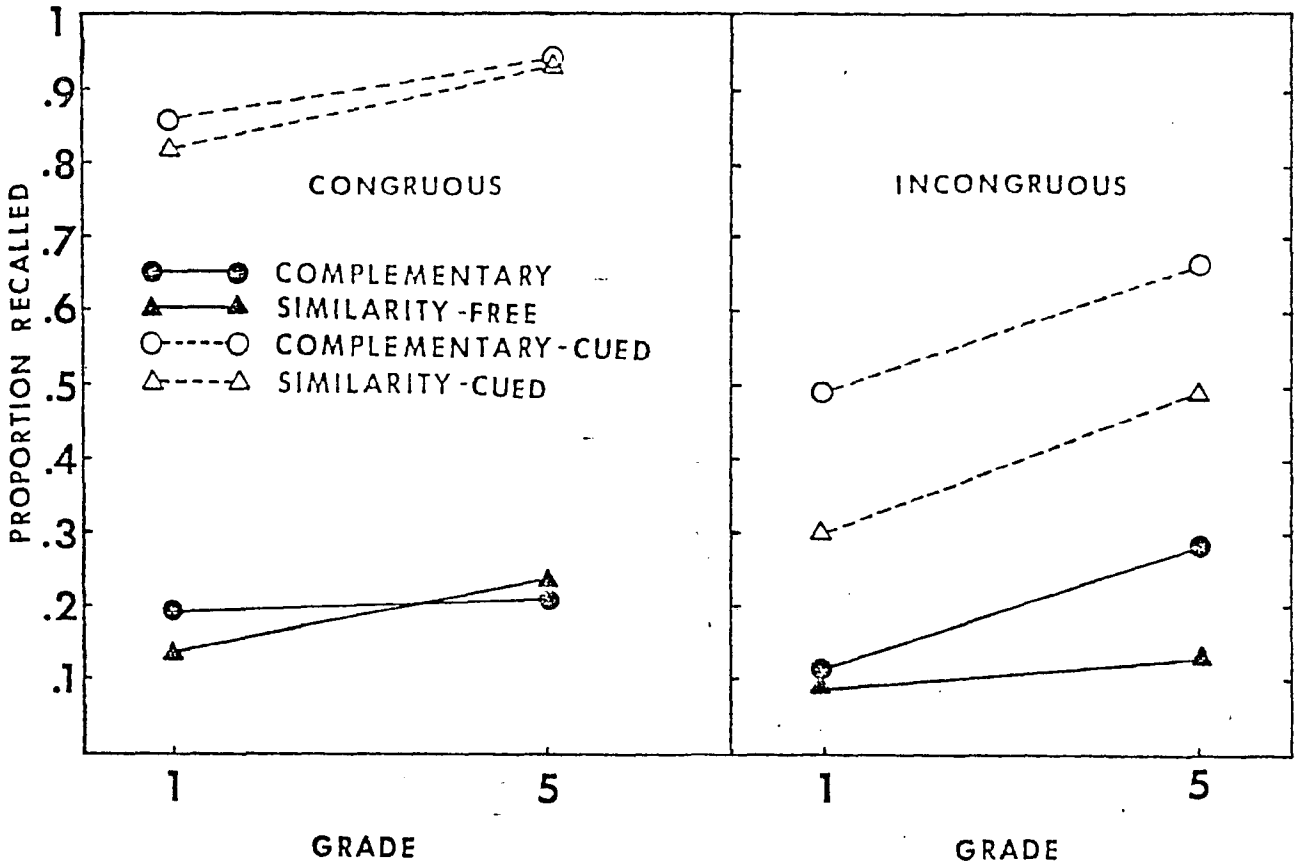

Figure 13. Cued (Adjusted for Guessing) and free recall for Experiment 2 as a function of task, grade, and congruity.

There appeared to be a facilitative effect of prior free recall on subsequent cued recall. The probabilities that indicated this effect were the probability of cued recall given free recall, or p(CR|FR), which was .84; and the probability of cued recall given that the word was not free recalled, p(CR|$\overline{FR}$), which was .68.

Serial position. Serial position effects were analyzed separately for free and cued recall. Recency effects produced a significant main effect of serial position in free recall, F (5,300) = 45.19, MSe = .12 (see Figure 14). Unlike the results in Experiment 1, there were no significant effects of serial position in unadjusted cued recall scores in Experiment 2, F (5,300) = 1.33, MSe = .11 (see Figure 15).

Discussion of Experiments 1 and 2

The results of Experiments 1 and 2 were generally consistent in that the congruity and complexity variables produced significant effects in cued recall but failed to yield significant effects in free recall. Cued recall was better when sentence frames and their targets formed a congruous relationship than when the relationship was incongruous, but free recall was approximately the same in the congruous and incongruous conditions. Cued recall was better for targets with long sentence frames, whether or not the sentence frames were congruous with their targets. Free recall of targets did not vary with

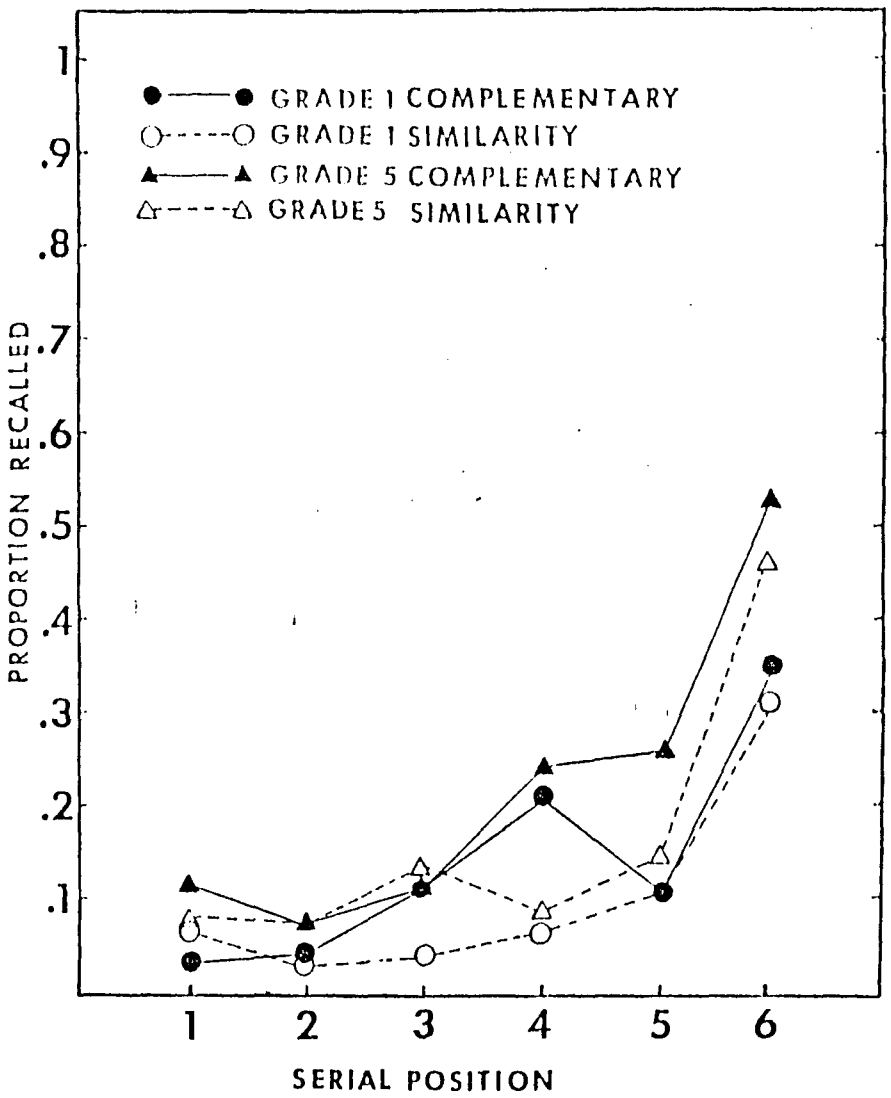

Figure 14. Free recall for Experiment 2 as a function of task, grade, and serial position.

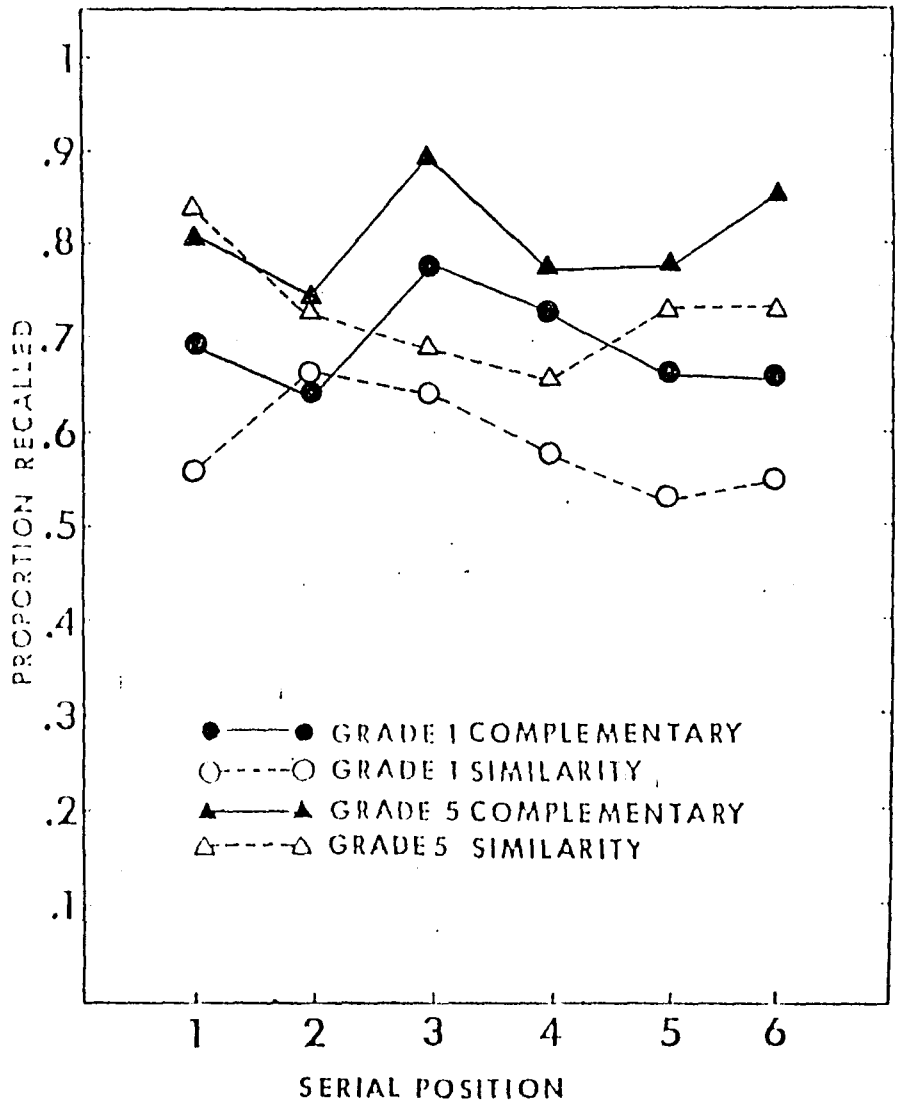

Figure 15. Cued (Not Adjusted for Guessing) recall for Experiment 2 as a function of task, grade, and serial position.

the complexity of sentence frames.

The complementary and similarity sentence frames in Experiment 2 yielded equal levels of free and cued recall when targets and sentence frames were congruous. When targets and sentence frames were incongruous, free and cued recall were usually better in the complementary condition than in the similarity condition. The superiority of incongruous-complementary encoding may have been due to differences in the type of incongruity in the complementary and similarity conditions. Although incongruous complementary sentence frames were incongruous with their targets, the sentence frames were internally congruous (e.g., "The _AXE_ played music when he turned it on"). In the similarity condition, a sentence frame was sometimes incongruous with itself, or internally incongruous (e.g., "A stale, rotten _AXE_ is like a long, exciting book"). Although the problem of inconsistency could have been alleviated if the same adjectives had been used at the beginning and end of the sentence frame, as was done for the congruous frames in the similarity condition, children may have had difficulty in overlooking the repetition in the frame and realizing that the target was really incongruous with the frame. For example, if "A long, exciting _AXE_ is like a long, exciting book" had been used, a child

could have erroneously reasoned that the word made sense in the blank because both the book and the axe were long and exciting. Whenever possible, sentence frames that minimized the internal incongruity were constructed, but it proved impossible to avoid including several internally incongruous sentence frames in the similarity condition. The extra incongruity resulted in poorer free and cued recall than was the case in the incongruous-complementary condition. The sentence-frame problems made comparisons of the mnemonic value of complementary and similarity encoding inappropriate--but an even worse problem was avoided: If the same adjectives had been repeated in the incongruous frames, children may have encoded the incongruous situations as being congruous and comparisons of congruity and incongruity would have been inappropriate.

Some of the results described by Craik and Tulving (1975, Experiment 7) differed from the present findings. Craik and Tulving observed that a congruous relationship between sentence frames and targets resulted in greater free recall than did an incongruous relationship between sentence frames and targets. Congruity and incongruity led to equal levels of free recall in the present experiments. In addition, Craik and Tulving found increases in both free and cued recall to be associated with increases in sentence frame complexity when the

sentence frames and targets were congruous but not when they were incongruous. In the present experiments, free recall did not vary with sentence frame complexity for either congruous or incongruous relationships, and cued recall increased with increasing sentence-frame complexity in the congruous and incongruous conditions.

There were several methodological differences between the present experiments and Craik and Tulving's experiment (1975, Experiment 7) that may have been partially responsible for the differences in results. The methodological differences were as follows: (a) the word lists in the present experiments contained 24 words, but the lists used by Craik and Tulving contained 60 words, (b) 2 minutes were given for free recall in the present experiments, while 8 minutes were allowed in the Craik and Tulving experiment, (c) the orienting task was subject-paced in the present experiments, but in the Craik and Tulving experiment a target word was shown for 1 second and subjects were instructed to respond as quickly as possible. Lists of 24 words were used in the present experiments because children may not have been able to pay close attention to the task throughout presentation of a 60-word list like the ones used by Craik and Tulving. Two minutes proved to be a sufficient interval for free recall; most

words that were remembered were recalled during the first minute, and very few words were recalled even during the second minute. The procedural difference that is likely to have resulted in different results concerned the pacing of the orienting task. In the present experiments, the orienting task was subject-paced; children were not instructed to answer quickly. This procedure was followed to prevent children from answering too rapidly to be accurate and to ensure that the targets and sentence frames were not processed too superficially. In the Craik and Tulving experiment, the 1-second target presentation time and the stress on rapid responding may have caused subjects to encode targets and sentence frames differently than they would have if they had been able to respond at their own pace.

It is also possible that the results of the present experiments differed from those of Craik and Tulving because first- and fifth-grade children were subjects in the former experiments, whereas college students were subjects in the latter experiment. To test this possibility, Experiment 1 was repeated, but college students were subjects instead of first and fifth graders. Thus, Experiment 3 was performed to determine whether the differences in results between the present experiments and Experiment 7 of Craik and Tulving were due to methodological or to population differences.

CHAPTER IV

EXPERIMENT 3

The results of Experiments 1 and 2 indicated that there were effects of congruity and complexity in cued recall, but not in free recall. The failure to find congruity and complexity effects in free recall may have been due to the use of children as subjects; Craik and Tulving (1975, Experiment 7) obtained significant effects for these variables in free recall with college subjects. Experiment 3 was conducted to determine whether or not college subjects would yield significant effects for congruity and complexity within the paradigm of Experiment 1.

Method

Subjects. Subjects were 12 male and 6 female college students enrolled in summer term introductory psychology classes at the University of North Carolina at Greensboro. The subjects fulfilled a course requirement by participating.

Materials. The materials used in Experiment 1 were also used in Experiment 3.

Design. The design was simpler than the design of Experiment 1, due to the exclusion of several of the

between-subject factors. The design of the present experiment was a 2 X 3 X 2 factorial, with the between-subject factor of list (list 1 and list 2) and the within-subject factors of complexity (simple, moderate, and complex) and congruity (congruous and incongruous).

Procedure. The procedure was identical to the procedure followed in Experiments 1 and 2, with the exception that only one pretraining trial (four questions about one target word) was given in Experiment 3.

Results

All of the subjects answered the pretraining questions correctly. The college students performed as proficiently as the children had in the previous studies by answering 98% of the orienting questions correctly.

Free recall. An analysis of variance was performed on the free recall scores, with congruity, complexity, and list as factors in the analysis. The main effect of complexity was significant, F (2,32) = 4.02, MSe = .18, as was the interaction between complexity and congruity, F (2,32) = 3.51, MSe = .15. Inspection of Figure 16, however, reveals that the interaction is not the same type of interaction found by Craik and Tulving (1975, Experiment 7). In the Craik and Tulving study, recall increased with increasing complexity for congruous, but not for incongruous, sentence frames. The interaction

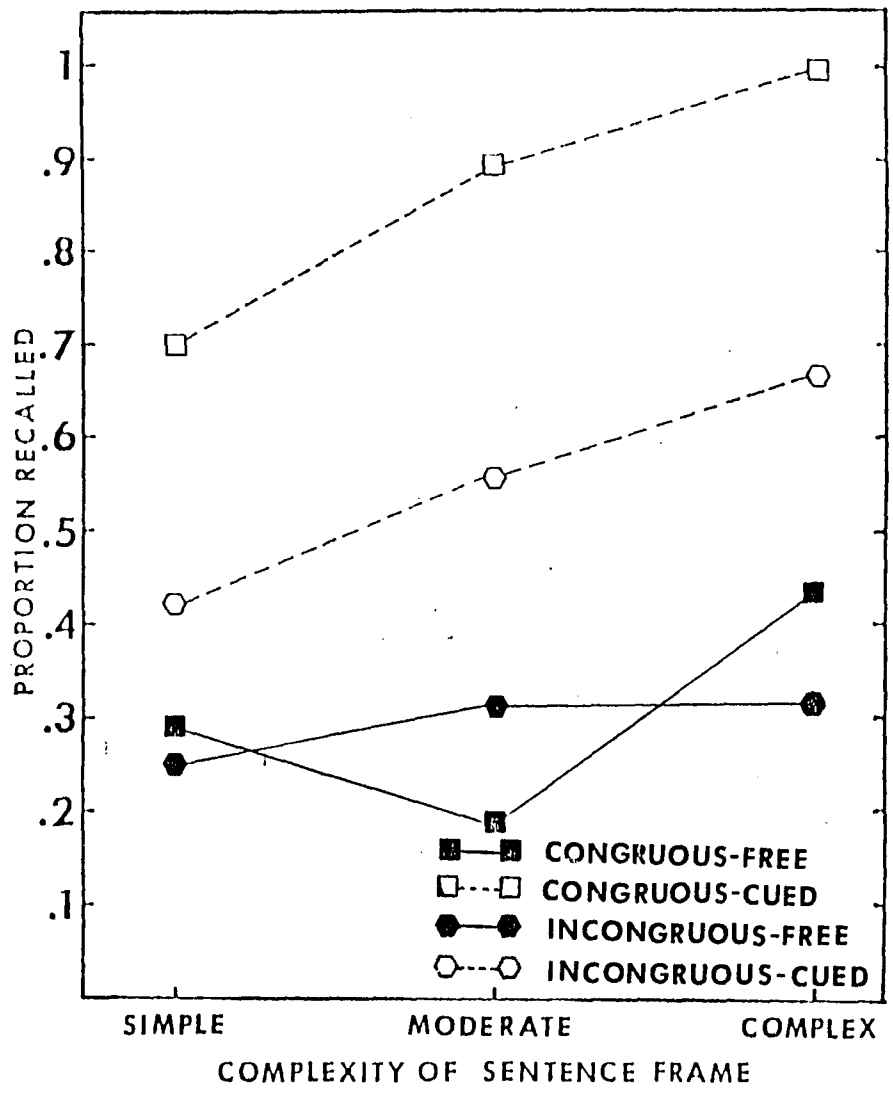

Figure 16. Cued (Adjusted for Guessing) and free recall in Experiment 3 as a function of congruity and complexity.

observed in the present study does show a lack of change in recall for incongruity at various levels of complexity; the recall of congruously encoded targets is lowest for moderately complex frames, intermediate for simple frames, and highest for complex frames. Newman-Keuls analyses determined that the only significant individual comparison was the superiority of complex-congruous over moderate-congruous. Although this significant comparison seems similar to the effect found by Craik and Tulving, the result is caused as much by the low level of moderate-congruous recall as by the high level of complex-congruous recall. Furthermore, none of the congruous vs. incongruous differences was significant at any level of complexity.

Guessing. An analysis of variance including complexity, congruity, and list as factors was performed on the guessing scores. No correct guesses were made for incongruous frames, resulting in a large statistical difference for the congruity variable, F (1,16) = 277.06, MSe = .14. The list main effect was significant, F (1,16) = 7.93, MSe = .14, as was the main effect of complexity, F (2,32) = 24.54, MSe = .28. The proportions guessed correctly in the congruous sentence frame condition for simple, moderate, and complex sentence frames were .07, .33, and .50, respectively. The List X Complexity and

the List X Complexity X Congruity interactions were significant, F (2,32) = 8.27, MSe = .28 in both cases. Newman-Keuls analyses indicated that guessing for congruous frames in List 1 was greater for complex than for simple frames; for List 2, congruous-frame guessing was significantly lowest for simple frames, but guessing for moderate and complex frames did not differ.

Cued recall. The analysis of variance on adjusted cued recall scores, which were proportions that were subjected to an arcsin transformation, yielded a significant main effect of congruity, with congruous frames leading to higher target recall than incongruous frames, F (1,16) = 91.04, MSe = .29. There was also a significant main effect of complexity, F (2,32) = 24.17, MSe = .29. Newman-Keuls analyses showed that moderate and complex frames led to equal levels of cued recall, but both moderate and complex frames led to better recall than simple frames. The interaction between congruity and complexity was not significant; recall increased with increased complexity for both congruous and incongruous sentence frames (see Figure 16).

Recalling a target word in free recall seemed to increase the likelihood of cued recall of that word. The probability of cued recall given free recall, p(CR|FR), was .85; and the probability of cued recall

given that the word was not recalled in free recall, $p(CR|\overline{FR})$, was .65. The facilitating effect of prior free recall on subsequent cued recall has thus been observed in all three of the present experiments.

Serial position. Serial position was a significant factor in free recall, F (3,48) = 33.68, MSe = .16, but not in unadjusted cued recall, F (3,48) = 1.40, MSe = .17 (see Figure 17). As is shown in Figure 17, the significant main effect of serial position in free recall was due to strong recency.

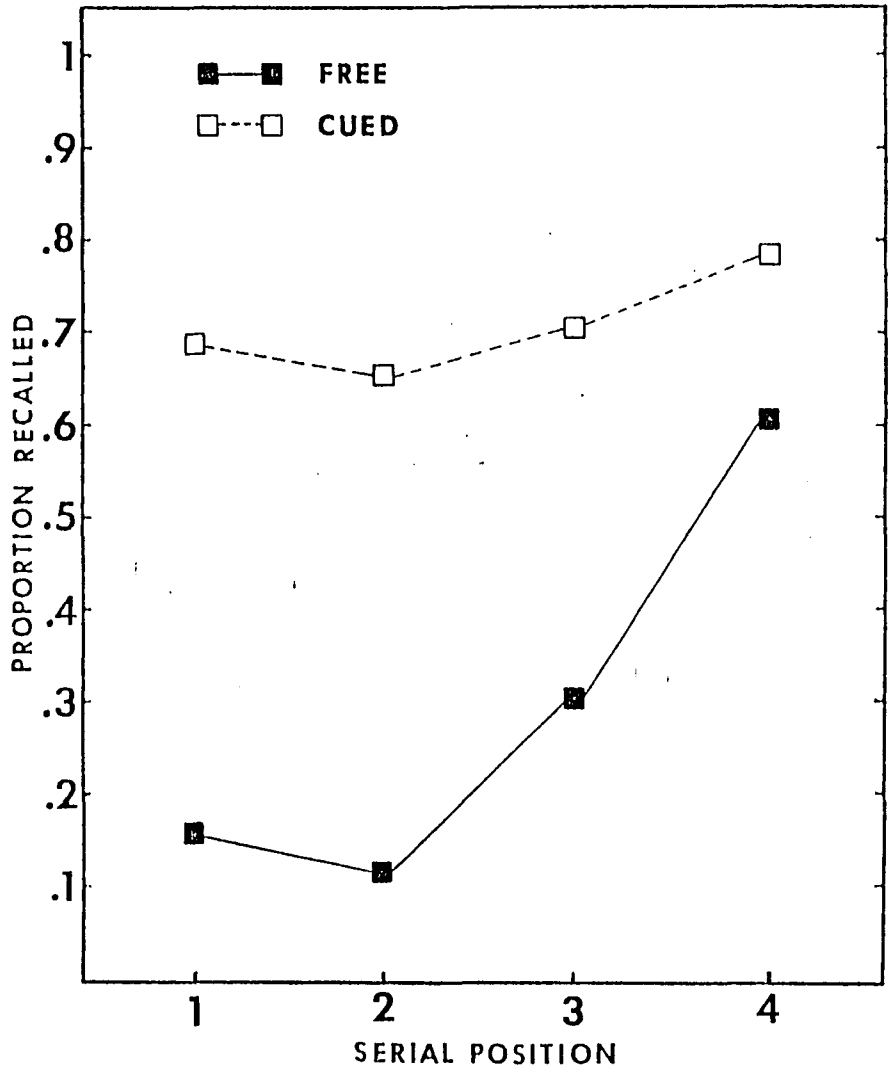

Figure 17. Cued (Not Adjusted for Guessing) and free recall in Experiment 3 as a function of serial position.

CHAPTER V

DISCUSSION

The results of Experiments 1 and 2 differed from the results of a related experiment by Craik and Tulving (1975, Experiment 7). First, Craik and Tulving found that free recall was greater for targets that were congruous with their sentence frames than for targets that were incongruous, whereas in the present studies, free recall was equal for congruously and incongruously encoded targets. Second, Craik and Tulving observed that more complex sentence frames resulted in greater free and cued recall than did less complex sentence frames for congruously encoded, but not incongruously encoded, targets. In the present experiments, complexity did not exert consistent effects in free recall, and increasing complexity facilitated cued recall whether targets were congruous or incongruous with their sentence frames.

Experiment 3 was performed to determine whether the differing results were due to the use of children as subjects in Experiments 1 and 2, instead of the college students used by Craik and Tulving. The performance of college students in Experiment 3 indicated that differences in subject populations were not responsible for differences in results. The results obtained in Experiment 3 were

consistent with the results of Experiments 1 and 2. Methodological differences probably were responsible for the differing results of the present studies and the experiment by Craik and Tulving.

The methodological differences that may have been responsible for the observed differences in results concerned the pace of the orienting task. In the present experiments, subjects were allowed 20 seconds to decide whether a target word did or did not make sense when inserted into a sentence frame. Although subjects usually responded within 2 or 3 seconds, they were not hurried even when they required the entire 20 seconds to respond. The target word and its sentence frame were shown to subjects until they responded. In the Craik and Tulving experiment, target words were presented for only 1 second, and subjects were instructed to respond as quickly as possible. These methodological differences may have led to differences in the type of encoding that occurred for the targets and sentence frames, especially when the target and its sentence frame were incongruous. The ease of retrieval of targets in free and cued recall may depend on the type of encoding that takes place when the targets and sentence frames are presented. Before discussing how the methodological differences between the present experiments and the experiment of Craik and Tulving

may have yielded the observed differences in results, a two-stage retrieval process will be described to provide a basis for the explanation of the different results.

The notion of redintegrative memory suggests that retrieving part of the context of an event facilitates retrieval of the entire event (Horowitz & Prytulak, 1969). The redintegrative retrieval process needs to be described more specifically, however, if the effects of congruity and incongruity on retrieval are to be explained. Thus, it may be helpful to characterize redintegrative memory as a two-stage process, with Stage 1 consisting of retrieval of context and Stage 2 consisting of retrieval of a target element once the context has been retrieved. The context for the target consists of the aspects of an event that were encoded along with the target. The target is actually one of many elements of the context that could be redintegrated by context retrieval; it is referred to as the target only because it is the element of the event that the subject is asked to remember.

Stage 2 retrieval of a target element is probably easier when the target and its context share a congruous relationship than when the context is not related to the target. In cued recall, Stage 1 retrieval is largely bypassed by the experimenter's provision of context cues (i.e., the sentence frames that accompanied targets),

and a Stage 2 advantage for congruity should result in better cued recall for targets that are congruous with their context cues than for targets that are incongruous with their contexts. In the present experiments and in the experiment by Craik and Tulving, cued recall was better in the congruous than in the incongruous condition. In free recall, both stages of retrieval occur when the subject uses a redintegrative retrieval strategy, such as trying to remember sentence frames to facilitate memory for targets. There is evidence from the present experiments that Stage 1 retrieval may have been easier for incongruously encoded than for congruously encoded targets.

Subjects were asked whether the words that made sense in the sentence frames (i.e., were congruous) were easier or harder to recall in free recall than the words that did not make sense in the sentence frames. The responses of the children were not particularly enlightening, but the college students provided some useful information. In describing which types of words were easier to remember, 10 of the 18 college subjects indicated that incongruously encoded words were easier to remember than congruously encoded words. They described the incongruity as "funny," "ridiculous," "odd," "nonsense," and "out of place." Of the remaining 8 subjects, 2 had no

opinion, 3 indicated that the congruous words were easier, and 3 suggested that the "familiar" congruous combinations (e.g., "the grass is green") and the extremely ridiculous combinations (e.g., "The spider drove a train") were easiest to recall, but that the relatively uncommon congruous situations and the non-humorous incongruous situations were hardest to recall. For cued recall, responses were distributed equally among the categories mentioned above, and most subjects remarked that they found cued recall to be quite easy regardless of the type of sentence frame given as a cue.

The remarks of the college students suggest that a very incongruous context is often humorous and, consequently, easy to retrieve. An extremely incongruous context, in the words of one college subject, "Stands out in memory." It is as if some aspect of the incongruity effects a type of von Restorff effect for the incongruous context, highlighting this context against the dull backdrop of less bizarre, more commonplace contexts.

The free recall data in the present experiments showed that congruity and incongruity led to equal levels of recall. A retrieval was probably more likely to contain the target if the target and context were congruous than if they were incongruous. If the retrieved context did not already contain the target, Stage 2,

retrieval of the target, was more likely if the target was congruous with the context than if it was incongruous. It is plausible, however, that more incongruous than congruous contexts were retrieved in free recall, as should have been the case if Stage 1 of retrieval was easier for incongruous contexts. Thus, incongruity may be superior to congruity in facilitating Stage 1 of the retrieval process, but congruity may be superior to incongruity in facilitating Stage 2 of retrieval and in making it likely that the retrieved context will contain the target. One possible result of such a balance of advantages could be equal levels of free recall for congruously and incongruously encoded targets.

It is also possible that subjects in the present experiments were not engaging in redintegrative retrieval strategies, i.e., were not trying to remember sentence frames to facilitate free recall of targets. Although it is quite possible that first graders did not use such indirect retrieval, the comments of several fifth graders and the majority of the college students indicated that these subjects were trying to remember the sentence frames to aid their recall of targets.

The results of the present experiments may have differed from the results of the Craik and Tulving experiment because the emphasis on fast responding in

the latter experiment prevented subjects from forming images of the incongruous situations. Since the humorous aspect of incongruity may depend, to some extent, on the formation of an incongruous image, subjects who are required to respond quickly may not encode the incongruous situations as ridiculous or funny. In the present experiments, subjects often laughed aloud when targets were incongruous with sentence frames. In the Craik and Tulving experiment, incongruity may have provided a poor basis for free and cued recall because subjects were not given time to form images of the incongruous situations. Subjects in the present experiments were given time to form images and to appreciate the humor in the incongruous situations, and the incongruity provided a good basis for Stage 1 of retrieval.

The findings of the present experiments also differed from those of Craik and Tulving with regard to the effects of the complexity variable. Whereas Craik and Tulving found that free recall increased with increasing sentence-frame complexity for congruously encoded, but not incongruously encoded, targets, no change in free recall as a function of changes in the level of complexity was observed in the present experiments. Although the greater recall for greater complexity was statistically significant in the Craik and Tulving experiment, the

actual differences in the levels of recall were small; the complexity effect in free recall may prove difficult to replicate.

In the present experiments, cued recall increased with increased sentence-frame complexity whether the targets and sentence frames were congruous or incongruous. In the Craik and Tulving experiment, cued recall increased with increased complexity only when targets and sentence frames were congruous. If pressure to respond quickly during the orienting task prevented subjects from forming images of the incongruous situations, it is possible that Stage 2 retrieval was hindered. An image of an incongruous situation could serve as a link between a target and its context that would facilitate redintegration of the target upon retrieval of the context. An active image, in which the target is pictured as interacting with its context (e.g., "cereal can fight"), provides a strong link between the target and its context. If subjects in the Craik and Tulving experiment had been allowed enough time to form such images, cued recall might have increased with increasing complexity for incongruous, as well as for congruous, situations. In the present experiments, cued recall did increase with increasing complexity whether targets and frames formed an incongruous relationship or a congruous one.

Additional experiments are needed to clarify the effects of congruity and complexity on the memory performance of children and adults. The effects of time parameters and the concreteness of materials on the encoding of incongruity should be investigated in an attempt to explain the role of imagery in redintegrative memory for incongruity. Induced congruity and complexity may not be entirely equivalent to subject-generated congruity and complexity. The effects of elaboration on memory may be stronger if the subject is doing the elaborating instead of having the experimenter provide the elaboration. Requiring subjects to provide words that fit or do not fit into sentence frames may result in different types of memory performance than requiring subjects to respond to words that someone else has generated. Whether congruity and complexity are experimenter-generated or subject-generated, these variables appear to be important determinants of memory performance and, thus, should be the focus of future research.

CHAPTER VI

SUMMARY

Experiments with adult subjects have shown that congruity among the elements of an encoded event provides a better basis for free and cued recall of the elements than does incongruity (Craik & Tulving, 1975; Schulman, 1974). In addition, the degree of elaboration, or complexity, of the encoded event has been found to be directly related to free and cued recall, provided the elements of the event form a congruous relationship (Craik & Tulving, 1975). The present experiments were conducted to assess the effects of congruity and complexity on the memory performance of first- and fifth-grade children and college students.

Subjects were shown cards containing sentence frames (i.e., sentences with one word missing) and were shown, on separate cards, target words that either did or did not make sense when inserted into the sentence frames. Subjects were required to judge whether the target words were congruous with the sentence frames. The sentence frames varied from short, simple sentences to long, complex sentences. Half of the sentence frames in Experiment 2 described a complementary relationship with

the target word (e.g., "Empty the garbage") and half of the sentence frames described a similarity relationship with the target (e.g., "Trash is like garbage"). The sentence frames in Experiments 1 and 3 were identical and did not bear any specific type of relationship with the the targets. First and fifth graders were subjects in Experiments 1 and 2, while college students were subjects in Experiment 3.

Immediately after the sentence-frame orienting task, a previously unannounced free recall test for target words was given. Following free recall, the sentence frames were presented for cued recall of the target words.

Although older subjects recalled more targets than younger subjects in free and cued recall, the pattern of results was similar across age groups and across experiments. In general, free recall was equal for targets that were congruous and targets that were incongruous with their sentence frames. There were no consistent effects of complexity in free recall. Cued recall was better when sentence frame cues were congruous with their targets than when they were incongruous, and cued recall increased with greater sentence frame complexity whether targets and frames were congruous or incongruous. The complementary-similarity manipulation in Experiment 2 failed to reveal any interesting developmental trends.

A two-stage retrieval process was postulated to explain these results. Stage 1 of the process would consist of retrieval of the context of an event, and Stage 2 would represent the redintegration of an element of the context when the context has been retrieved. Stage 1 may be easier for bizarre or humorous incongruous contexts than for congruous element-context relationship. The advantage for incongruity at Stage 1 could balance the advantage for congruity at Stage 2 and produce equal levels of free recall for congruously encoded and incongruously encoded elements. In cued recall, Stage 1 is bypassed when the experimenter provides context cues, and the advantage for congruity at Stage 2 results in higher levels of cued recall for targets that are congruous with their contexts.

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APPENDIX A

TARGETS AND SENTENCE FRAMES USED IN EXPERIMENT 1

Pretraining

CLOCK (target)

LOOK AT THE _____.

CHEW THE _____.

LOOK AT THE _____ ON THE WALL IN THE CLASSROOM.

CHEW THE TASTY _____ BEFORE YOU SWALLOW IT.

BABY

THE _____ WAS LITTLE.

THE _____ WAS BENT.

THE CUTE _____ WAS VERY LITTLE AND HAD NO HAIR ON HIS HEAD.

THE _____ WAS BENT, PUT IN AN ENVELOPE, AND MAILED.

KING

THE _____ IS FRIENDLY.

THE _____ HAS FOUR LEGS.

THE _____ IS FRIENDLY TO ALL OF THE PEOPLE THAT LIVE IN HIS LAND.

THE _____ HAS FOUR LEGS, A LONG TAIL, AND A LOT OF FUR.

Orienting Task--List 1

DRESS

Simple-Congruous (SC): THE _____ IS PRETTY.

Moderate-Congruous (MC): THE FRILLY WHITE _____ IS PRETTY.

Complex-Congruous (CC): THE FRILLY WHITE _____ WITH THE BIG BUTTONS ON THE SLEEVES IS PRETTY.

Simple-Incongruous (SI): THE _____ IS TIRED.

Moderate-Incongruous (MI): THE YAWNING _____ IS TIRED AND SLEEPY.

Complex-Incongruous (CI): THE YAWNING _____ IS SO TIRED AND SLEEPY IT WILL TAKE A NAP ON THE SOFA.

CAR

SC: HE DROVE THE _____.

MC: HE DROVE THE SMALL _____ TOO FAST.

CC: HE DROVE THE SMALL _____ TOO FAST AROUND THE SHARP CURVE.

SI: HE ATE THE _____.

MI: HE ATE THE CHEWY _____ FOR SUPPER.

CI: HE ATE THE CHEWY _____ WITH MUSTARD AND KETCHUP FOR SUPPER AT OUR HOUSE.

DOG

SC: THE _____ LEARNED A TRICK.

MC: THE _____ LEARNED TO ROLL OVER AS A TRICK.

CC: THE FRIENDLY _____ LEARNED TO BEG, SHAKE HANDS, AND ROLL OVER AS TRICKS.

SI: THE _____ READ A BOOK.

MI: THE _____ READ A LONG, EXCITING BOOK.

CI: THE _____ READ A LONG, EXCITING BOOK ABOUT A BANK ROBBERY AND A TRAIN WRECK.

GIFT

SC: SHE GOT A _____.

MC: SHE GOT A NICE _____ ON HER BIRTHDAY.

CC: SHE GOT A NICE _____ FROM HER HUSBAND AND HER THREE CHILDREN ON HER BIRTHDAY.

SI: SHE SANG A _____.

MI: SHE SANG A SAD _____ TO THE PEOPLE.

CI: SHE SANG A SAD _____ TO THE PEOPLE AT THE EVENING CONCERT IN THE PARK.

STOVE

SC: SHE PUT IT INTO THE _____.

MC: SHE PUT THE APPLE PIE INTO THE HOT _____.

CC: SHE PUT THE DELICIOUS APPLE AND CHERRY PIES INTO THE HOT _____ FOR AN HOUR.

SI: THE _____ WAS DANCING.

MI: THE _____ WAS DANCING AROUND THE ROOM.

CI: THE EXCITED _____ WAS DANCING AND HOPPING WITH HIS PARTNER ALL AROUND THE ROOM.

DRAW

SC: I CAN _____ A PERSON.

MC: I CAN _____ A PERSON WITH ARMS AND LEGS.

CC: I EASILY CAN _____ A TALL, FAT PERSON WITH A HEAD, BODY, ARMS, AND LEGS.

SI: I MADE A _____.

MI: I MADE A _____ WITH SCISSORS.

CI: I MADE A BIG _____ WITH MY SHINY NEW PAIR OF SCISSORS AND RULER.

GUN

SC: HE PICKED UP THE _____.

MC: HE PICKED UP THE LONG, HEAVY _____.

CC: HE QUICKLY PICKED UP AND AIMED THE LONG, HEAVY, BLACK _____ AT THE TARGET.

SI: HE PUT THE _____ IN HIS BOWL.

MI: HE PUT THE _____ IN HIS BOWL OF VANILLA ICE CREAM.

CI: HE PUT THE LEFTOVER _____ IN HIS BOWL OF VANILLA ICE CREAM ALONG WITH THE PINEAPPLE.

FLOWER

SC: PUT THE _____ IN THE VASE.

MC: PUT THE RED _____ IN THE TALL VASE.

CC: PUT THE PRETTY RED _____ IN THE TALL WHITE VASE WITH THE OTHERS.

SI: THE _____ SWEPT THE FLOOR.

MI: THE _____ SWEPT THE FLOOR AND DUSTED THE FURNITURE.

CI: THE BUSY _____ SWEPT THE KITCHEN AND DINING ROOM FLOORS AND DUSTED THE FURNITURE.

PILLOW

SC: THE _____ WAS SOFT.

MC: THE SOFT _____ WAS MADE OF FEATHERS.

CC: THE SOFT _____ WAS MADE OF FEATHERS AND WAS ON THE BED NEXT TO THE CHILD.

SI: THE _____ DRANK A COKE.

MI: THE _____ DRANK A COKE AND ATE CRACKERS.

CI: THE BIG THIRSTY _____ SLOWLY DRANK A COKE AND ATE SOME CHEESE CRACKERS.

RAG

SC: I USED A _____.

MC: I USED A _____ TO WIPE UP THE WATER.

CC: I USED AN OLD, DIRTY _____ TO WIPE UP THE SPILLED WATER ON THE DESK.

SI: THE _____ WAS NOISY.

MI: THE CARDBOARD _____ WAS VERY NOISY.

CI: THE CARDBOARD _____ WAS VERY NOISY AND KEPT ME FROM THINKING ABOUT BASEBALL.

GARBAGE

SC: TAKE THE _____ OUTDOORS.

MC: PLEASE TAKE THE CAN OF _____ OUTDOORS.

CC: PLEASE TAKE THE CAN FULL OF SMELLY _____ OUTDOORS TO THE END OF THE STREET.

SI: PRACTICE THE _____.

MI: PLEASE PRACTICE THE _____ FOR TWO HOURS.

CI: PLEASE PRACTICE THE HARD _____ ON THE PIANO FOR TWO HOURS IMMEDIATELY AFTER SCHOOL.

AXE

SC: THE _____ IS SHARP.

MC: THE NEW _____ IS VERY SHARP.

CC: THE SHINY NEW _____ IS VERY SHARP AND CAN CUT DOWN A LARGE PINE TREE.

SI: THE _____ PLAYED MUSIC.

MI: THE _____ PLAYED MUSIC WHEN HE TURNED IT ON.

CI: THE TRANSISTOR _____ PLAYED LOUD ROCK MUSIC WHEN HE TURNED IT ON AT NIGHT.

GLUE

SC: I USED SOME _____.

MC: I USED SOME _____ ON THE PIECES OF PAPER.

CC: I USED SOME STICKY _____ ON THE THREE PIECES OF PAPER TO MAKE THEM STAY TOGETHER.

SI: IT RAINED _____.

MI: IT RAINED _____ LAST SATURDAY.

CI: IT RAINED _____ ALL DAY LONG LAST SATURDAY AT THE FAMILY PICNIC.

WRITE

SC: SHE CAN _____.

MC: SHE CAN _____ VERY WELL.

CC: SHE CAN _____ THE ALPHABET AND ADD NUMBERS VERY WELL FOR HER AGE.

SI: _____ A RUG.

MI: SHE CAN _____ A RUG ON THE FLOOR.

CI: SHE CAN _____ A RUG ON THE FLOOR WITH HER HAND OVER HER EYES.

MONEY

SC: I HAVE SOME _____.

MC: I HAVE SOME _____ IN THE BANK.

CC: I HAVE A LOT OF PAPER _____ IN THE BIG BANK IN THE CITY.

SI: THE _____ TOOK A SHOWER.

MI: THE DIRTY _____ TOOK A LONG SHOWER.

CI: THE DIRTY _____ TOOK A LONG SHOWER AFTER WORKING IN THE YARD ALL AFTERNOON.

SHOVEL

SC: THE _____ WAS ON THE GROUND.

MC: THE OLD RUSTY _____ WAS ON THE GROUND.

CC: THE OLD RUSTY _____ WAS LYING ON THE WET GROUND IN THE BACK YARD.

SI: THE _____ WALKED TO SCHOOL.

MI: THE _____ WALKED TO SCHOOL EVERY MORNING.

CI: THE _____ WALKED A MILE TO SCHOOL EVERY MORNING TO GET SOME EXERCISE.

THROAT

SC: HE HAS A SORE _____.

MC: HE HAS A SORE _____ THAT HURTS.

CC: HE HAS A BAD SORE _____ THAT HURTS SO MUCH HE COULD NOT PLAY OUTSIDE.

SI: HE WALKED ON THE _____.

MI: HE WALKED ON THE _____ TWICE YESTERDAY.

CI: HE WALKED ACROSS TOWN ON THE _____ TWICE YESTERDAY TO VISIT HIS FRIEND.

SPIDER

SC: THE _____ WAS CREEPY.

MC: THE BLACK AND YELLOW _____ WAS CREEPY.

CC: THE BIG BLACK AND YELLOW _____ WAS SO CREEPY I RAN AWAY SCREAMING.

SI: THE _____ DROVE A TRAIN.

MI: THE _____ DROVE A TRAIN FOR A LIVING.

CI: THE 40 YEAR OLD _____ DROVE A POWERFUL TRAIN FOR A LIVING EVERY DAY OF THE WEEK.

WIND

SC: THE _____ IS STRONG.

MC: THE CHILLY _____ IS VERY STRONG.

CC: THE CHILLY SPRING _____ IS SO VERY STRONG IT KNOCKED MY HAT OFF.

SI: HOLD THE _____ IN THE JAR.

MI: HOLD THE ORANGE _____ IN THE GLASS JAR.

CI: HOLD THE ORANGE PLASTIC _____ IN THE GLASS JAR AND THEN PUT THE LID ON.

CUP

SC: FILL THE _____.

MC: FILL THE _____ WITH WATER.

CC: FILL THE _____ TO THE TOP WITH ICE COLD WATER BECAUSE I REALLY NEED IT.

SI: THE _____ WAS FISHING.

MI: THE _____ WAS FISHING IN THE OCEAN.

CI: THE _____ WAS FISHING FOR SHARKS IN THE OCEAN AND CAUGHT A LARGE ONE.

LION

SC: THE _____ JUMPED.

MC: THE _____ JUMPED WHEN HE HEARD ME.

CC: THE SHAGGY OLD _____ JUMPED WHEN HE HEARD ME COMING NEAR THE CAGE.

SI: THE _____ TALKED ON THE PHONE.

MI: THE _____ TALKED TO MY SISTER ON THE PHONE.

CI: THE ANGRY _____ TALKED FOR AN HOUR TO MY OLDER SISTER ON THE PHONE.

GO

SC: _____ OVER THERE.

MC: _____ OVER THERE TO GET SOME WATER.

CC: _____ OVER THERE TO THE WATER FOUNTAIN TO GET YOURSELF A DRINK OF WATER.

SI: _____ THE LIGHT.

MI: _____ THE LIGHT ON YOUR FACE.

CI: _____ THE BRIGHT FLASHLIGHT ON YOUR FACE SO I CAN SEE WHO YOU ARE.

COMB

SC: THAT IS MY _____.

MC: THAT IS MY _____ THAT I ALWAYS USE.

CC: THAT IS MY _____ THAT I ALWAYS USE TO STRAIGHTEN MY CURLY BLONDE HAIR.

SI: I ROLLED UP THE _____.

MI: I ROLLED UP THE THICK LEATHER _____.

CI: I ROLLED UP THE THICK LEATHER _____ AND PUT IT AWAY WHERE NOBODY ELSE COULD FIND IT.

STOOL

SC: MOVE THE _____.

MC: MOVE THE _____ TO THE TABLE.

CC: MOVE THE _____ TO THE TABLE AND YOU CAN USE IT WHILE WE EAT OUR MEAL.

SI: SALT THE _____.

MI: SALT THE _____ SO IT WILL BE GOOD.

CI: SALT THE _____ JUST THE RIGHT AMOUNT SO IT WILL TASTE GOOD TO EVERYONE WHO IS EATING IT.

List 2

PITCH

SC: _____ SOME MORE.

MC: _____ SOME MORE SO I CAN CATCH.

CC: _____ TO ME SOME MORE SO I CAN LEARN TO CATCH WITH MY GLOVE BETTER.

SI: _____ THE HOUSE.

MI: _____ THE BRICK HOUSE TO ME.

CI: _____ THE RED BRICK HOUSE TO ME SOME MORE SO I WILL KNOW WHAT IT LOOKS LIKE.

MOUNTAIN

SC: HE CAN SEE THE _____.

MC: HE CAN SEE THE HIGH BEAUTIFUL _____.

CC: HE CAN SEE THE HIGH BEAUTIFUL _____ IN THE DISTANCE EVEN THOUGH IT IS FOGGY.

SI: I MADE THE _____.

MI: I MADE THE _____ WITH MY TEETH.

CI: I MADE THE DEEP _____ IN MY LEFT HAND WITH MY TWO FRONT TEETH.

JUMP

SC: A GRASSHOPPER CAN _____.

MC: A GREEN GRASSHOPPER CAN _____ HIGH AND FAR.

CC: A GREEN GRASSHOPPER CAN _____ HIGH AND FAR ALL THE WAY ACROSS THE SIDEWALK.

SI: CABBAGE CAN _____.

MI: CRISP CABBAGE CAN _____ VERY QUICKLY.

CI: CRISP CABBAGE CAN _____ VERY QUICKLY ALL THE WAY ACROSS THE BRICK SIDEWALK.

BELL

SC: THE _____ WAS RINGING.

MC: THE LOUD CLANGING _____ WAS RINGING.

CC: THE LOUD CLANGING _____ WAS RINGING DOWN THE HALLWAY WHEN WE WENT TO CLASS.

SI: THE _____ HAD A BRANCH.

MI: THE _____ HAD A LONG CROOKED BRANCH.

CI: THE _____ HAD A LONG CROOKED BRANCH GROWING FROM IT THAT TOUCHED THE GROUND.

FIGHT

SC: I WANT TO _____.

MC: I WANT TO _____ THE MEAN BOY.

CC: I WANT TO _____ THE MEAN BOY DOWN THE STREET SO HE WILL STOP CALLING ME NAMES.

SI: CEREAL CAN _____.

MI: CEREAL CAN _____ IF SOMEONE LEAVES IT OPEN.

CI: CEREAL CAN _____ IF SOMEONE FORGETS AND LEAVES IT OPEN IN THE PANTRY ALL SUMMER LONG.

NEEDLE

SC: THE _____ IS SHARP.

MC: THE SEWING _____ IS LONG AND SHARP.

CC: THE SHINY SEWING _____ IS LONG AND SHARP ENOUGH TO HURT IF YOU STEP ON IT.

SI: I DRANK THE _____.

MI: I DRANK THE _____ FOR BREAKFAST.

CI: I DRANK THE DELICIOUS INSTANT _____ FOR BREAKFAST AND LUNCH EVERY DAY LAST WEEK.

BAG

SC: THE _____ WAS RIPPED.

MC: THE GROCERY _____ WAS RIPPED IN HALF.

CC: THE BROWN GROCERY _____ WAS RIPPED IN HALF ON THE BOTTOM AND EVERYTHING WAS SPILLING OUT.

SI: I SPANKED THE _____.

MI: I SPANKED THE _____ WITH A PADDLE.

CI: I SPANKED THE NAUGHTY _____ REALLY HARD WITH A LONG WOODEN PADDLE AND MADE HIM CRY.

APPLE

SC: THE _____ WAS RED.

MC: THE BIG SHINY _____ WAS RED.

CC: THE BIG SHINY _____ WAS RED AND LOOKED SO TASTY I JUST COULDN'T WAIT ANY LONGER.

SI: THE _____ SANG.

MI: THE _____ SANG A SONG FOR US.

CI: THE TALENTED _____ SANG A PRETTY SONG FOR US AT OUR LAST PARTY AT MY HOUSE.

FIRE

SC: I LIT THE _____.

MC: I LIT THE _____ WITH SOME MATCHES.

CC: I LIT THE _____ WITH SOME MATCHES I FOUND ON THE GROUND NEXT TO THE STREET.

SI: I PAINTED WITH _____.

MI: I PAINTED WITH _____ ON MY BRUSH.

CI: I PAINTED A SILLY PICTURE WITH BLUE _____ ON MY BRUSH AND ON MY FACE.

MUSIC

SC: I PLAYED SOME _____.

MC: I PLAYED SOME _____ ON MY FLUTE.

CC: I PLAYED SOME ROCK _____ ON MY BLACK PLASTIC FLUTE FOR MY CLASS.

SI: THE _____ WAS DROWNING.

MI: THE _____ WAS DROWNING IN THE SWIMMING POOL.

CI: THE _____ WAS DROWNING IN THE SHALLOW END OF THE SWIMMING POOL AND NOBODY WAS HELPING.

GRASS

SC: THE _____ IS GREEN.

MC: THE _____ IN THE FRONT YARD IS GREEN.

CC: THE GREEN _____ IN THE FRONT YARD WAS JUST CUT AND IT SMELLS VERY GOOD.

SI: THE _____ WENT FOR A WALK.

MI: THE _____ WENT FOR A WALK ACROSS TOWN.

CI: THE _____ WENT FOR A WALK ACROSS TOWN AND DID NOT COME BACK FOR FIVE DAYS.

CURTAIN

SC: THE _____ IS PRETTY.

MC: THE _____ IN FRONT OF THE WINDOW IS PRETTY.

CC: THE PURPLE _____ IN FRONT OF THE WINDOW IS THE PRETTIEST ONE I'VE EVER SEEN.

SI: THE _____ ATE A HAMBURGER.

MI: THE _____ ATE A HAMBURGER WITH LETTUCE.

CI: THE HUNGRY _____ ATE A HAMBURGER WITH LETTUCE AND TOMATO AND A PICKLE ON THE TOP.

BIKE

SC: I WRECKED MY _____.

MC: I WRECKED MY _____ WHEN I HIT A POLE.

CC: I WRECKED MY _____ YESTERDAY WHEN I RAN OFF THE ROAD AND HIT A POLE.

SI: THE _____ READ A POEM.

MI: THE _____ READ A POEM ABOUT SPRINGTIME.

CI: THE _____ READ A SHORT POEM ABOUT SPRINGTIME AND SUNSHINE TO THE SMALL GROUP.

LAKE

SC: THE _____ WAS ROUGH.

MC: THE HIGH WAVES MADE THE _____ ROUGH.

CC: THE HIGH WAVES MADE THE _____ SO ROUGH THAT WE COULDN'T GO SAILING IN OUR BOAT.

SI: THE _____ SPELLED THE WORDS.

MI: THE _____ SPELLED THE EASY WORDS WRONG.

CI: THE STUPID _____ SPELLED ALL TWENTY OF THE EASY WORDS WRONG ON THE LAST TEST.

DISH

SC: THE _____ WAS ON THE SHELF.

MC: THE _____ WAS ON A HIGH KITCHEN SHELF.

CC: THE CLEAN _____ WAS ON A HIGH KITCHEN SHELF NEXT TO THE GLASSES AND THE BOWLS.

SI: THE _____ RAN.

MI: THE _____ RAN UP THE STAIRS.

CI: THE _____ RAN UP ALL THE STAIRS OF THE TALL BUILDING AND WAS TOO TIRED TO MOVE.

EAGLE

SC: THE _____ WAS IN THE TREE.

MC: THE _____ WAS AT THE TOP OF THE OAK TREE.

CC: THE BROWN AND WHITE _____ WAS AT THE TOP OF THE OLD OAK TREE IN THE FOREST.

SI: THE _____ WENT TO A RESTAURANT.

MI: THE _____ WENT TO A FANCY RESTAURANT FOR LUNCH.

CI: THE RICH _____ WENT UPTOWN TO A FANCY RESTAURANT FOR HIS LUNCH WITH HIS FRIENDS.

ICE

SC: GIVE ME SOME _____.

MC: GIVE ME SOME _____ FOR MY DRINK.

CC: PLEASE GIVE ME SOME MORE _____ TO HELP MAKE MY SOFT DRINK COLDER THAN IT IS NOW.

SI: THE _____ HAS KNOTS.

MI: THE _____ HAS TIGHT KNOTS IN IT.

CI: THE _____ HAS SOME TIGHT KNOTS IN IT THAT WILL NOT COME UNTIED WITHOUT FATHER'S HELP.

COAT

SC: I HAVE A _____.

MC: I HAVE A NEW WINTER _____.

CC: I HAVE A NEW WINTER _____ THAT HAS FUR ON THE INSIDE AND THE COLLAR.

SI: THE _____ WAS THINKING.

MI: THE _____ WAS THINKING ABOUT A PROBLEM.

CI: THE _____ WAS THINKING ABOUT HOW TO SOLVE A HARD ARITHMETIC PROBLEM.

HOG

SC: THE _____ IS FAT.

MC: THE _____ IS TOO FAT TO RUN.

CC: THE _____ IS TOO FAT TO RUN AND CAN BARELY STAND UP IN HIS PEN.

SI: I MADE MY _____.

MI: I MADE UP MY _____ SO IT WOULD BE NEAT.

CI: I CAREFULLY MADE UP MY _____ AFTER BREAKFAST SO IT WOULD BE NEAT WHEN I LEFT FOR SCHOOL.

LAUGH

SC: MAKE ME _____.

MC: MAKE ME _____ OUT LOUD.

CC: MAKE ME _____ OUT LOUD SO I WILL FEEL HAPPY AND WILL WANT TO SMILE.

SI: _____ THE MUD.

MI: _____ THE MUD FROM YOUR SHOES.

CI: _____ THE MUD FROM YOUR SHOES BEFORE YOU COME INTO THE HOUSE AND MAKE A MESS.

HAMMER

SC: PUT THE _____ AWAY.

MC: PUT THE _____ AWAY IN THE WORKBENCH.

CC: PUT THE _____ AWAY IN THE WOODEN WORKBENCH BEFORE YOU HIT YOURSELF WITH IT.

SI: THE _____ FOLDED THE DIAPER.

MI: THE _____ FOLDED THE DIAPER AND PUT IT AWAY.

CI: THE _____ FOLDED THE DIAPER AND PUT IT AWAY IN THE DRAWER WITH THE POWDER, PINS, AND SOAP.

TOWEL

SC: HAND ME THE _____.

MC: HAND ME THE SOFT RED _____.

CC: HAND ME THE SOFT RED _____ AND I WILL PUT IT IN THE BATHROOM NEXT TO THE TUB.

SI: MILK THE _____.

MI: MILK THE FOUR-LEGGED _____.

CI: MILK THE BLACK AND WHITE, FOUR-LEGGED _____ BEFORE YOU FEED THE CHICKENS.

FALL

SC: HE WILL _____.

MC: HE WILL _____ IF HE IS NOT CAREFUL.

CC: HE WILL _____ AND SKIN BOTH OF HIS ELBOWS AND KNEES IF HE IS NOT CAREFUL ON THE SLIDE.

SI: EARS CAN _____.

MI: EARS CAN _____ WHEN THEY WANT TO.

CI: EARS CAN _____ A LOT BETTER WHEN THEY TO FIND OUT A SPECIAL SECRET.

CLOSE

SC: I WILL _____ IT.

MC: I USED IT LAST SO I WILL _____ IT.

CC: I USED THE FREEZER LAST OF ALL SO I WILL MAKE SURE THAT I _____ IT.

SI: I WILL _____ THE GRAVY.

MI: I WILL _____ THE GRAVY WHEN I AM READY.

CI: I WILL _____ THE RICH BUBBLY GRAVY WHEN I AM READY TO SERVE IT TO YOU.

APPENDIX B

INSTRUCTIONS TO SUBJECTS

Orienting Task

I'm going to see how well you can answer some questions about some words and sentences. First, I'll show you and read to you a sentence that has a blank in it--like this one-- and then I will show you and read to you a word on a different card, like this one. I want you to tell me if the big word on the card makes sense if I put it in the blank in the sentence. Let's try this one (pretraining trial 1, question 1). Okay, let's try another one (etc., remainder of pretraining).

Okay, those were just for practice. Now I want you to do the same thing for a lot of words and sentences. Do you think you know what you are supposed to do? Then let's start.

Free Recall

Now I want you to tell me all the big words that you can remember that were on these (point) cards that I showed you. Go ahead, start right now.

Filler Task

All right. Now will you point to all of the 3's on this card? All the 4's? 6's? 7's? 2's? 5's?

Cued Recall

Now I'm going to show you the sentences that I showed you before to help you remember some more of the words. I want you to tell me what the word on the card was that went with the sentences that I showed you. Now, what word did I show you when you saw this sentence?

Guessing

Now I'm going to show you some sentences that you haven't seen before and I want you to tell me a word that makes sense in the blank. What word could go in the blank of this sentence?

APPENDIX C

TARGETS AND SENTENCE FRAMES

USED IN EXPERIMENT 2

Pretraining for Complementary

CLOCK

YOU TELL TIME WITH A _____.

YOU CAN CHEW THE _____.

YOU CAN TELL WHAT TIME IT IS IF YOU CAN SEE THE _____ ON THE WALL.

YOU SHOULD CHEW THE TASTY _____ BEFORE YOU SWALLOW IT.

BABY

YOU MADE THE _____ CRY.

I BENT AND FOLDED THE _____.

YOU MADE THE TINY _____ CRY WHEN YOU PICKED HIM UP.

I BENT AND FOLDED THE _____ SO HE WOULD FIT INTO MY POCKET.

KING

THE _____ IS IN THE CASTLE.

THE _____ IS IN THE PEACH.

THE FRIENDLY _____ LIVES IN THE HUGE STONE CASTLE.

THE SMALL ROUGH _____ IS INSIDE THE SOFT FUZZY PEACH.

Complementary Orienting Task--List 1

DRESS

Simple-Congruous (SC): GIRLS CAN WEAR A _____.

Complex-Congruous (CC): GIRLS CAN WEAR A _____ WHEN THEY GO TO A PARTY.

Simple-Incongruous (SI): HE WAS A TIRED _____.

Complex-Incongruous (CI): AFTER WORKING ALL DAY, HE WAS A VERY TIRED _____.

CAR

SC: I CAN RIDE IN THE _____.

CC: I CAN RIDE IN THE FRONT SEAT OF THE _____ WHEN WE GO ON TRIPS.

SI: I CAN SWIM IN THE _____.

CI: I CAN SWIM IN THE _____ UNTIL I GET TOO TIRED.

DOG

SC: I HEARD A _____ BARK.

CC: I HEARD A _____ BARK LAST NIGHT WHEN I WAS OUT IN THE YARD.

SI: I SAW A _____ FRYING.

CI: I SAW A _____ FRYING THE POTATOES FOR SUPPER.

GIFT

SC: PLEASE GIVE HER A _____.

CC: PLEASE GIVE HER A _____, SINCE IT IS HER BIRTHDAY.

SI: I SPANKED THE _____.

CI: I SPANKED THE _____ FOR MAKING TOO MUCH TROUBLE.

STOVE

SC: MOTHER LIKES TO COOK ON THE _____.

CC: MOTHER LIKES TO COOK FANCY MEALS FOR THE FAMILY ON THE _____.

SI: HE LIKES TO RUN IN THE _____.

CI: HE LIKES TO RUN SEVERAL MILES A DAY IN THE _____.

DRAW

SC: SHE WILL _____ A PICTURE.

CC: SHE WILL _____ A PICTURE OF A BOWL OF FRUIT.

SI: SHE WILL _____ A TRUST.

CI: SHE WILL _____ A TRUST IN ALL OF HER FRIENDS.

GUN

SC: DON'T SHOOT THE _____.

CC: DON'T SHOOT THE _____ INSIDE THE HOUSE.

SI: IT RAINED A _____.

CI: IT RAINED A _____ ALL OVER THE CITY.

FLOWER

SC: YOU CAN SMELL THE _____.

CC: YOU CAN SMELL THE _____ FROM ALL THE WAY ACROSS THE ROOM.

SI: YOU CAN RING THE _____.

CI: YOU CAN RING THE _____ AND I WILL ANSWER IT.

PILLOW

SC: I COULD NOT SLEEP ON THE _____.

CC: I COULD NOT SLEEP ON THE _____ BECAUSE IT WAS TOO LUMPY.

SI: I DRANK THE _____.

CI: I DRANK THE _____ BECAUSE I WAS VERY THIRSTY.

RAG

SC: USE THAT _____ TO CLEAN IT.

CC: USE THAT _____ TO CLEAN THE FURNITURE IN THE LIVING ROOM.

SI: THE _____ WENT TO A RESTAURANT.

CI: THE HUNGRY _____ WENT DOWNTOWN TO A RESTAURANT FOR LUNCH.

GARBAGE

SC: EMPTY THE _____.

CC: EMPTY THE _____ INTO THE LARGE CAN OUTSIDE.

SI: PLAY BASEBALL WITH THE _____.

CI: LET'S PLAY BASEBALL WITH THE _____ UNTIL IT GETS TOO DARK.

AXE

SC: USE THE _____ TO CHOP.

CC: USE THE _____ TO CHOP SOME WOOD FOR THE FIRE.

SI: THE _____ WAS THINKING.

CI: THE _____ WAS THINKING ABOUT AN ARITHMETIC PROBLEM.

GLUE

SC: STICK IT TOGETHER WITH THE _____.

CC: STICK THE TWO PIECES OF PAPER TOGETHER WITH THE _____.

SI: READ THE POEM WITH _____.

CI: READ THE LONG POEM ABOUT SPRINGTIME WITH A LOT OF _____.

WRITE

SC: I WILL _____ A LETTER.

CC: I WILL _____ A LETTER TO YOU WHEN I GO ON VACATION.

SI: CABBAGE CAN _____.

CI: CABBAGE CAN _____ IN THE DIRT.

MONEY

SC: DON'T SPEND THE _____.

CC: DON'T SPEND ALL OF THE _____ THE FIRST DAY AFTER YOU GET IT.

SI: GO WALK THE _____.

CI: GO WALK THE _____ SO I CAN LEAVE FOR WORK.

SHOVEL

SC: HE USED THE _____ TO DIG.

CC: HE USED THE _____ TO DIG A DEEP HOLE IN THE GROUND.

SI: HE USED THE _____ TO FISH.

CI: HE USED THE _____ TO FISH FOR CATFISH IN THE MUDDY RIVER.

THROAT

SC: IT HURTS MY _____ WHEN I SWALLOW.

CC: IT HURTS MY _____ WHEN I SWALLOW BECAUSE I HAVE A BAD COLD.

SI: I WALKED ON THE _____.

CI: I WALKED ON THE _____ WITH MY BARE FEET.

SPIDER

SC: THE _____ CAN CRAWL.

CC: THE _____ CAN CRAWL UP MY ARM AND I WILL NOT YELL.

SI: THE _____ SWEPT THE FLOOR.

CI: THE _____ SWEPT THE FLOOR AND DUSTED THE FURNITURE.

WIND

SC: THE _____ WILL BLOW.

CC: THE _____ WILL BLOW VERY HARD WHEN THE STORM GETS HERE.

SI: THE GREEN _____ IS IN A JAR.

CI: THE GREEN _____ IS IN A SMALL GLASS JAR IN THE CABINET.

CUP

SC: DON'T DRINK FROM THAT _____.

CC: DON'T DRINK FROM THAT _____, IT HAS NOT BEEN WASHED YET.

SI: DON'T PUT KNOTS IN THAT _____.

CI: DON'T PUT KNOTS IN THAT _____ BECAUSE THEY WILL NOT COME UNTIED.

LION

SC: THE _____ GAVE A ROAR.

CC: THE _____ GAVE OUT A LOUD ROAR TO SCARE AWAY THE ELEPHANT.

SI: THE _____ SPELLED THE WORDS.

CI: THE STUPID _____ SPELLED ALL THE WORDS WRONG.

GO

SC: PLEASE _____ AWAY.

CC: PLEASE _____ AWAY BECAUSE YOU ARE BOTHERING ME.

SI: _____ THE MOON.

CI: _____ THE MOON AND THE STARS AND YOU WILL ENJOY THEM.

COMB

SC: _____ YOUR HAIR.

CC: YOU WILL LOOK A LOT BETTER IF YOU WILL _____ YOUR HAIR.

SI: _____ THE ROCK.

CI: _____ THE ROCK SO YOU WILL NOT BUMP INTO IT.

STOOL

SC: SIT ON THE _____.

CC: WHEN WE HAVE SUPPER, YOU WILL SIT ON THE _____.

SI: SALT THE _____.

CI: SALT THE _____ SO IT WILL TASTE GOOD TO EVERYONE.

Complementary Orienting Task--List 2

PITCH

SC: _____ THE BALL.

CC: _____ THE BALL TO ME SO I CAN LEARN TO CATCH IT.

SI: _____ THE HOUSE.

CI: _____ THE HOUSE TO ME SO I CAN LEARN TO CATCH IT.

MOUNTAIN

SC: HE WILL CLIMB THE _____.

CC: HE WILL CLIMB THE _____ TO THE TOP EVEN IN THE SNOW.

SI: I BOILED THE _____.

CI: I BOILED THE _____ FOR TWO HOURS BEFORE I ATE IT.

JUMP

SC: I CAN _____ ROPE.

CC: I CAN _____ ROPE LONGER THAN ANY OF MY FRIENDS.

SI: PICKLES WILL _____.

CI: PICKLES WILL _____ BETTER WITH MUSTARD ON THEM.

BELL

SC: THE _____ MAY RING.

CC: THE _____ MAY RING SO SOFTLY THAT YOU WILL NOT HEAR IT.

SI: BUTTER THE _____.

CI: WHY DON'T YOU BUTTER THE _____ BEFORE YOU EAT IT.

FIGHT

SC: THEY WILL _____ THE WAR.

CC: THE ARMY WILL _____ THE WAR UNTIL THEY WIN.

SI: _____ THE HOUSE.

CI: THEY WILL _____ THE HOUSE TOMORROW MORNING.

NEEDLE

SC: SEW WITH THAT _____.

CC: SEW A SHIRT FOR YOURSELF WITH THAT _____.

SI: GO TO SCHOOL ON THE _____.

CI: GO TO SCHOOL NEXT TUESDAY ON THE BIG, OLD _____.

BAG

SC: CARRY THE _____.

CC: CARRY THE BROWN PAPER _____ TO SCHOOL WITH YOU.

SI: PRACTICE THE _____.

CI: PRACTICE THE _____ UNTIL YOU CAN DO IT PERFECTLY.

APPLE

SC: PEEL THE _____.

CC: MOTHER WILL PEEL THE _____ BEFORE YOU EAT IT.

SI: TALK TO THE _____.

CI: I WILL TALK TO THE _____ UNTIL I HAVE TO LEAVE.

FIRE

SC: THE _____ WILL BURN.

CC: THE _____ IN THE WOODS WILL BURN ALL DAY BEFORE THEY CAN PUT IT OUT.

SI: THE _____ SANG A SONG.

CI: THE _____ SANG A NEW SONG FOR EVERYONE IN THE GROUP.

MUSIC

SC: LISTEN TO THE _____.

CC: COME CLOSER TO THE RADIO AND LISTEN TO THE _____ WITH ME.

SI: SLICE IT WITH THE _____.

CI: SLICE THE SANDWICHES WITH THE SHARP _____.

GRASS

SC: MOW THE _____.

CC: FATHER WILL MOW THE _____ ON SATURDAY.

SI: DRIVE THE _____.

CI: DRIVE THE _____ FOR ME WHILE I LOOK AT THE SCENERY.

CURTAIN

SC: THE _____ COVERED THE WINDOW.

CC: THE RED _____ COVERED THE LIVING ROOM WINDOW.

SI: THE _____ WASHED HIS HAIR.

CI: THE _____ WASHED HIS HAIR WITH A NEW KIND OF SHAMPOO.

BIKE

SC: PEDDLE YOUR _____.

CC: IF YOU PEDDLE YOUR _____ HARDER YOU WILL GO FASTER.

SI: DON'T MARRY THE _____.

CI: DON'T MARRY THE _____ UNLESS YOU KNOW HER WELL.

LAKE

SC: WE SWIM IN THE _____.

CC: WE LIKE TO SWIM IN THE _____ WHEN THE SUN IS OUT AND IT IS WARM.

SI: SCRATCH THE _____.

CI: IT ITCHES, SO SCRATCH THE PAINFUL _____.

DISH

SC: SHE WILL WASH THE _____.

CC: SHE WILL WASH THE ____ AFTER SHE HAS FINISHED EATING.

SI: SHE PAINTED WITH THE _____.

CI: SHE PAINTED BEAUTIFULLY WITH THE LONG THIN _____.

EAGLE

SC: THE _____ CAN FLY.

CC: THE _____ CAN FLY AROUND GRACEFULLY WAY ABOVE THE GROUND.

SI: THE _____ USED THE CAMERA.

CI: THE _____ USED THE CAMERA TO TAKE A PHOTOGRAPH.

ICE

SC: _____ WILL MELT.

CC: _____ WILL MELT IF IT STAYS OUTSIDE THE REFRIGERATOR TOO LONG.

SI: THE _____ RAN AWAY.

CI: THE _____ RAN AWAY AND WILL NOT COME BACK HOME.

COAT

SC: HIS _____ KEPT HIM WARM.

CC: HIS FUR-LINED _____ KEPT HIM WARM IN THE WINTER.

SI: THE _____ WORKED HARD.

CI: THE _____ WORKED HARD AT THE OFFICE EVERY DAY OF THE WEEK.

HOG

SC: THE _____ GAVE AN OINK.

CC: THE _____ GAVE AN OINK WHEN HE SLID INTO THE MUD.

SI: THE _____ PLAYED THE FLUTE.

CI: THE _____ PLAYED THE FLUTE IN THE BIG PARADE.

LAUGH

SC: SHE TICKLED ME AND MADE ME _____.

CC: SHE TICKLED MY RIBS AND IT MADE ME _____ SO HARD I COULD NOT STOP.

SI: I CUT OUT A _____.

CI: I CUT OUT A _____ WITH MY NEW SCISSORS.

HAMMER

SC: HIT THE NAIL WITH THE _____.

CC: HIT THE NAIL WITH THE _____ UNTIL IT IS ALL THE WAY INTO THE PIECE OF WOOD.

SI: I SALTED THE _____.

CI: I SALTED THE _____ TO MAKE IT TASTE BETTER.

TOWEL

SC: DRY YOUR HANDS ON THE _____.

CC: WASH YOUR DIRTY HANDS AND THEN DRY THEM ON THE _____.

SI: BRUSH YOUR TEETH WITH THE _____.

CI: BRUSH YOUR TEETH AND YOUR HAIR WITH THE PINK _____.

FALL

SC: DON'T _____ DOWN.

CC: DON'T TRY TO RUN TOO FAST BECAUSE YOU MIGHT _____ DOWN.

SI: _____ YOUR EAR.

CI: _____ YOUR EAR AND IT WILL WORK A LOT BETTER.

CLOSE

SC: _____ IT TIGHT.

CC: _____ IT TIGHT SO WE WILL NOT GET COLD.

SI: _____ THE GRAVY.

CI: _____ THE BROWN BUBBLY GRAVY WHEN YOU ARE READY.

Pretraining for Similarity

CLOCK

A WATCH IS LIKE A _____.

A SHOE IS LIKE A _____.

A WATCH THAT GOES ON YOUR ARM IS SORT OF LIKE A _____ THAT GOES ON THE WALL.

A NEW, WHITE TENNIS SHOE IS LIKE A SMALL, ANGRY _____.

BABY

A _____ IS LIKE A CHILD.

A _____ IS LIKE A FROG.

A CUTE LITTLE _____ IS LIKE A CUTE LITTLE CHILD.

A BIG SLIMY _____ IS LIKE AN UGLY GREEN FROG.

KING

A _____ IS SORT OF LIKE A QUEEN.

A _____ IS LIKE A PEACH.

A FRIENDLY, POWERFUL _____ IS LIKE A FRIENDLY, POWERFUL QUEEN.

A DRY, DUSTY _____ IS LIKE A SOFT, FUZZY PEACH.

Similarity Orienting Task--List 1

DRESS

SC: A SKIRT IS SORT OF LIKE A _____.

CC: A PRETTY RED SKIRT IS SORT OF LIKE A PRETTY RED _____.

SI: A BALLOON IS SORT OF LIKE A _____.

CI: A LARGE RED BALLOON IS SORT OF LIKE A DARK RUGGED _____.

CAR

SC: A _____ IS SORT OF LIKE A TRUCK.

CC: A BIG HEAVY _____ IS SORT OF LIKE A BIG HEAVY TRUCK.

SI: A _____ IS SORT OF LIKE A BATHTUB.

CI: A BIG HEAVY _____ IS SORT OF LIKE A COLD WHITE BATHTUB.

DOG

SC: A _____ CAN SOMETIMES BE A PET.

CC: A LITTLE FURRY _____ CAN SOMETIMES BE A LITTLE FURRY PET.

SI: A _____ CAN SOMETIMES BE A BANANA.

CI: A MEAN LITTLE _____ CAN SOMETIMES BE A TASTY YELLOW BANANA.

GIFT

SC: A PRESENT IS LIKE A _____.

CC: A SURPRISE BIRTHDAY PRESENT IS LIKE A SURPRISE BIRTHDAY _____.

SI: A WHALE IS LIKE A _____.

CI: A HUGE BLUE WHALE IS LIKE A BRIGHT METAL _____.

STOVE

SC: A _____ IS LIKE AN OVEN.

CC: A SQUARE, HOT _____ IS LIKE A SQUARE, HOT OVEN.

SI: A _____ IS LIKE AN UMBRELLA.

CI: A BOUNCY RUBBER _____ IS LIKE A SHINY PLASTIC UMBRELLA.

DRAW

SC: TO _____ IS LIKE TO PAINT.

CC: LEARNING HOW TO _____ IS LIKE LEARNING HOW TO PAINT.

SI: TO _____ IS LIKE TO SPANK.

CI: LEARNING HOW TO _____ IS LIKE LEARNING HOW TO SPANK.

GUN

SC: A RIFLE IS A _____.

CC: A LONG, BLACK RIFLE IS A LONG, BLACK _____.

SI: A SPOON IS LIKE A _____.

CI: A POLISHED SILVER SPOON IS LIKE A SICK ACHING _____.

FLOWER

SC: A _____ IS A PLANT.

CC: A PRETTY PURPLE _____ IS A PRETTY PURPLE PLANT.

SI: A _____ IS A ROPE.

CI: A _____ WITH WATER ON IT IS LIKE A ROPE WITH KNOTS IN IT.

PILLOW

SC: A CUSHION IS LIKE A _____.

CC: A SOFT, FLUFFY CUSHION IS LIKE A SOFT, FLUFFY _____.

SI: A POTATO IS LIKE A _____.

CI: A BROWN DIRTY POTATO IS LIKE AN OLD BROKEN _____.

RAG

SC: A CLOTH IS LIKE A _____.

CC: A DIRTY OLD CLOTH IS LIKE A DIRTY OLD _____.

SI: A LEMON IS LIKE A _____.

CI: A SMALL SOUR LEMON IS LIKE A JUICY TENDER _____.

GARBAGE

SC: TRASH IS LIKE _____.

CC: A BAGFUL OF MESSY TRASH IS LIKE A BAGFUL OF MESSY _____.

SI: A JET IS LIKE _____.

CI: A BIG, FAST JET IS LIKE A LOOSE, RATTLING _____.

AXE

SC: AN _____ IS LIKE A HATCHET.

CC: A SHARP SILVER _____ IS LIKE A SHARP SILVER HATCHET.

SI: AN _____ IS LIKE A BOOK.

CI: A STALE, ROTTEN _____ IS LIKE A LONG, EXCITING BOOK.

GLUE

SC: PASTE IS LIKE _____.

CC: STICKY WHITE PASTE IS LIKE STICKY WHITE _____.

SI: EYES ARE LIKE _____.

CI: BIG BROWN EYES ARE LIKE NICE FRIENDLY _____.

WRITE

SC: TO PRINT IS SORT OF LIKE TO _____.

CC: TO PRINT YOUR NAME IS SORT OF LIKE TO _____ YOUR NAME.

SI: TO BOIL IS LIKE TO _____.

CI: TO BOIL SOME WATER IS LIKE TO _____ SOME WATER.

MONEY

SC: PENNIES ARE _____.

CC: BROWN COPPER PENNIES ARE _____.

SI: DUCKS ARE LIKE _____.

CI: QUACKING WHITE DUCKS ARE LIKE TIRED WORN OUT _____.

SHOVEL

SC: A _____ IS SORT OF LIKE A RAKE.

CC: A LONG HEAVY _____ IS SORT OF LIKE A LONG HEAVY RAKE.

SI: A _____ IS SORT OF LIKE A WAGON.

CI: A HAPPY, EXCITED _____ IS SORT OF LIKE A SHINY RED WAGON.

THROAT.

SC: YOUR _____ IS LIKE YOUR NECK.

CC: HAVING A SORE _____ IS LIKE HAVING A SORE NECK.

SI: YOUR _____ IS LIKE YOUR ARM.

CI: YOUR LITTLE SQUARE _____ IS LIKE YOUR BIG STRONG ARM.

SPIDER

SC: A _____ IS LIKE A BUG.

CC: A BLACK SCARY _____ IS LIKE A BLACK SCARY BUG.

SI: A _____ IS LIKE A CIGARETTE.

CI: A SKINNY, NERVOUS _____ IS LIKE A SMOKY WHITE CIGARETTE.

WIND

SC: A BREEZE IS LIKE A _____.

CC: A SLOW WARM BREEZE IS LIKE A SLOW WARM _____.

SI: A CHURCH IS LIKE A _____.

CI: A BIG BRICK CHURCH IS LIKE A WET, SLICK _____.

CUP

SC: A _____ IS LIKE A GLASS.

CC: A ROUND, SMOOTH _____ IS LIKE A ROUND, SMOOTH GLASS.

SI: A _____ IS LIKE A FENCE.

CI: A BRAVE, HANDSOME _____ IS LIKE A WHITE WOODEN FENCE.

LION

SC: A TIGER IS LIKE A _____.

CC: A MEAN, FURRY TIGER IS LIKE A MEAN, FURRY _____.

SI: A YARD IS LIKE A _____.

CI: A LARGE FRONT YARD IS LIKE A DARK MUDDY _____.

GO

SC: TO _____ IS LIKE TO LEAVE.

CC: TO _____ FOR A LONG TIME IS LIKE TO LEAVE FOR A LONG TIME.

SI: TO _____ IS LIKE TO MEND.

CI: TO _____ A SOLID ROCK IS LIKE TO MEND A PAIR OF PANTS.

COMB

SC: A _____ IS SORT OF LIKE A BRUSH.

CC: A BLACK PLASTIC _____ IS SORT OF LIKE A BLACK PLASTIC BRUSH.

SI: A _____ IS SORT OF LIKE A LIGHT.

CI: A RAGGED UGLY _____ IS SORT OF LIKE A BRIGHT GLARING LIGHT.

STOOL

SC: A _____ IS LIKE A CHAIR.

CC: A TALL WOODEN _____ IS SORT OF LIKE A TALL WOODEN CHAIR.

SI: A _____ IS LIKE A MAP.

CI: A CRISP LEAFY _____ IS LIKE A COLORFUL PAPER MAP.

Similarity Orienting Task--List 2

PITCH

SC: TO _____ IS TO THROW.

CC: LEARNING HOW TO _____ IS LIKE LEARNING HOW TO THROW.

SI: TO _____ IS TO LOOK.

CI: LEARNING HOW TO _____ IS LIKE TURNING AROUND TO LOOK.

MOUNTAIN

SC: A HILL IS LIKE A _____.

CC: A TALL, STEEP HILL IS LIKE A TALL, STEEP _____.

SI: A BONE IS LIKE A _____.

CI: A DRY WHITE BONE IS LIKE A GRAY HAIRY _____.

JUMP

SC: TO HOP IS LIKE TO _____.

CC: BEING ABLE TO HOP IS LIKE BEING ABLE TO _____.

SI: TO FOLD IS LIKE TO _____.

CI: TO FOLD THE PAPER IS LIKE TO _____ THE PAPER.

BELL

SC: A _____ IS SORT OF LIKE A BUZZER.

CC: A LOUD, NOISY _____ IS LIKE A LOUD, NOISY BUZZER.

SI: A _____ IS LIKE A LOG.

CI: A SAD, UNHAPPY _____ IS LIKE A HEAVY WOODEN LOG.

FIGHT

SC: TO WRESTLE IS LIKE TO _____.

CC: TO WRESTLE WITH ANOTHER PERSON IS LIKE TO _____ WITH ANOTHER PERSON.

SI: TO SHINE IS LIKE TO _____.

CI: TO SHINE SOMETHING SMOOTH IS LIKE TO _____ SOMETHING PURPLE.

NEEDLE

SC: A PIN IS LIKE A _____.

CC: A THIN, POINTED PIN IS LIKE A THIN, POINTED _____.

SI: A TELEPHONE IS LIKE A _____.

CI: A SMALL BLACK TELEPHONE IS LIKE A SLOW, LAZY _____.

BAG

SC: A _____ IS LIKE A SACK.

CC: A BROWN PAPER _____ IS LIKE A BROWN PAPER SACK.

SI: A _____ IS LIKE A PENCIL.

CI: A LEAFY RED _____ IS LIKE A THIN YELLOW PENCIL.

APPLE

SC: AN _____ IS A FRUIT.

CC: A DELICIOUS RED _____ IS A DELICIOUS RED FRUIT.

SI: AN _____ IS A BRIDGE.

CI: A BUSY WORRIED _____ IS LIKE A SHAKY STEEL BRIDGE.

FIRE

SC: A FLAME IS LIKE A _____.

CC: A BRIGHT YELLOW FLAME IS LIKE A BRIGHT YELLOW _____.

SI: A MACHINE IS LIKE A _____.

CI: A CLANKY, SHINY MACHINE IS LIKE A BRIGHT METAL _____.

MUSIC

SC: A SONG IS LIKE _____.

CC: A SLOW, SAD SONG IS LIKE SLOW, SAD _____.

SI: A SOLDIER IS LIKE _____.

CI: A PLASTIC TOY SOLDIER IS LIKE DIRTY, GREASY _____.

GRASS

SC: WEEDS ARE LIKE _____.

CC: TALL, GREEN WEEDS ARE LIKE TALL, GREEN _____.

SI: BUTTER IS LIKE _____.

CI: SMOOTH CREAMY BUTTER IS LIKE A BIG SCARY _____.

CURTAIN

SC: A _____ IS A SHADE.

CC: A YELLOW AND GREEN _____ IS LIKE A YELLOW AND GREEN SHADE.

SI: A SUMMER IS LIKE A _____.

CI: A LONG HOT SUMMER IS LIKE A THICK FUDGY _____.

BIKE

SC: A TRICYCLE IS SORT OF LIKE A _____.

CC: A FAST RED TRICYCLE IS SORT OF LIKE A FAST RED _____.

SI: A HAMBURGER IS LIKE A _____.

CI: A HAMBURGER WITH LETTUCE AND TOMATO IS LIKE A _____ WITH ARMS AND LEGS.

LAKE

SC: A _____ IS LIKE A POND.

CC: A MUDDY, BROWN _____ IS LIKE A MUDDY, BROWN POND.

SI: A FOOTBALL IS LIKE A _____.

CI: A BROWN LEATHER FOOTBALL IS LIKE A LOUD, NOISY _____.

DISH

SC: A _____ IS LIKE A PLATE.

CC: A BLUE AND WHITE _____ IS LIKE A BLUE AND WHITE PLATE.

SI: A _____ IS LIKE A FACE.

CI: A LONG WINDING _____ IS LIKE A HAPPY, SMILING FACE.

EAGLE

SC: AN _____ IS A BIRD.

CC: A FEATHERED BROWN _____ IS A FEATHERED BROWN BIRD.

SI: AN _____ IS A FLOOR.

CI: A ROUND, ORANGE _____ IS A CLEAN, WAXED FLOOR.

ICE

SC: _____ IS SORT OF LIKE SNOW.

CC: COLD, WET _____ IS SORT OF LIKE COLD, WET SNOW.

SI: _____ IS SORT OF LIKE HAIR.

CI: MEAN, NASTY _____ IS SORT OF LIKE LONG BROWN HAIR.

COAT

SC: A _____ IS LIKE A JACKET.

CC: A FUR-LINED _____ IS LIKE A FUR-LINED JACKET.

SI: A _____ IS LIKE MACARONI.

CI: A STRONG, HEALTHY _____ IS LIKE HOT, CHEESY MACARONI.

HOG

SC: A PIG IS LIKE A _____.

CC: A FAT, UGLY PIG IS LIKE A FAT, UGLY _____.

SI: A FLAG IS LIKE A _____.

CI: A RED, WHITE AND BLUE FLAG IS LIKE A BLACK RUBBER _____.

LAUGH

SC: TO GIGGLE IS LIKE TO _____.

CC: TO GIGGLE AT SOMETHING FUNNY IS LIKE TO _____ AT SOMETHING FUNNY.

SI: TO FORGET IS LIKE TO _____.

CI: TO FORGET SOMEBODY'S NAME IS LIKE TO _____ A BROOM.

HAMMER

SC: A _____ IS SORT OF LIKE A SCREWDRIVER.

CC: A BIG HEAVY _____ IS SORT OF LIKE A BIG HEAVY SCREWDRIVER.

SI: A _____ IS SORT OF LIKE A TEACHER.

CI: A LIGHT, FRILLY _____ IS SORT OF LIKE A NICE FRIENDLY TEACHER.

TOWEL

SC: A _____ IS LIKE A FACECLOTH.

CC: A SOFT FUZZY _____ IS LIKE A SOFT FUZZY FACECLOTH.

SI: A _____ IS LIKE A BEE.

CI: AN ANGRY, UPSET _____ IS LIKE A BUSY LITTLE BEE.

FALL

SC: TO TRIP IS LIKE TO _____.

CC: TO TRIP DOWN THE STAIRS IS LIKE TO _____ DOWN THE STAIRS.

SI: TO GROW IS LIKE TO _____.

CI: TO GROW A LOT TALLER IS LIKE TO _____ IN A DITCH.

CLOSE

SC: TO _____ IS LIKE TO SHUT.

CC: TO _____ A WINDOW IS LIKE TO SHUT A WINDOW.

SI: TO _____ IS LIKE TO SPELL.

CI: TO _____ A GRAVY IS LIKE TO SPELL A WORD.