SODERQUIST, LINDA DANIELS. Congruity of Semantic and Acoustic Encoding in Children's Memory. (1976) Directed by: Dr. Mary Fulcher Geis. Pp. 48.

The present study was a replication and extension of the Hall and Geis (1976) study. Two experiments were conducted in which first and fifth graders were presented word lists in an incidental memory paradigm. Qualitatively different encoding operations were induced in the children by requiring them to answer questions about the words. Semantic and acoustic encoding were constrained for different words by asking questions about either the meaning or the sound of the words. Each word was presented in either a congruous encoding context (i.e., yes was the correct answer) or an incongruous one (i.e., no was the correct answer).

In Experiment 1, free recall for 24 words was tested after the words and questions were presented; and, after a five-minute delay, cued recall was also tested. The cue presented for each target word was a key word in the orienting question that had been asked about the word.

In Experiment 2, recognition memory for 36 words was tested after the words and questions were presented.

From the Hall and Geis study, it was expected that fifth-grade children would free-recall words with congruous encoding contexts better than words with incongruous contexts, but this congruity effect would not be present

in the first graders' free recall. The results, however, showed that the congruity effect was obtained at both grades. In cued recall and recognition, it was expected that both first graders and fifth graders would have superior memory for words with congruous encoding contexts compared to memory for words with incongruous encoding contexts. It was found, however, that fifth-graders' cued recall was facilitated relatively more by congruity than the first graders'. There was no congruity effect in the recognition data.

It was predicted that free recall, cued recall, and recognition for semantically processed words would exceed that for acoustically processed words at both age levels. The results in general supported this prediction, although there was some evidence in cued recall that congruous acoustic encoding and incongruous semantic encoding produce similar performance.

CONGRUITY OF SEMANTIC AND ACOUSTIC ENCODING IN CHILDREN'S MEMORY

by

Linda Daniels Soderquist

A Thesis Submitted to
The Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Greensboro
1976

Approved by

Mary Fulcher Ellis
Thesis Adviser

APPROVAL PAGE

This thesis has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Thesis Adviser Mary Fulcher Geis

Committee Members J. Allen Watson

Linda Smith

August 11, 1976
Date of Acceptance by Committee

ACKNOWLEDGMENTS

I would especially like to thank Dr. Mary Fulcher Geis, who chaired my advisory committee; her patient help and skilled supervision made this research an exciting learning experience. I would also like to express my appreciation to committee members Dr. Kendon Smith and Dr. James Watson for their advice and consideration.

I would like to express appreciation to Lexie Daniels for her support, to Susan Harter for assistance in preparing materials, to Kathy Rice and Betty Self for assistance in testing the children, and to Elizabeth Crabtree for assistance in preparing the manuscript.

Special gratitude goes to the children at Fair Grove School who participated in the study.

Finally, I would like to thank Dr. David Soderquist, whose encouragement and support have been of inestimable value.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

In research on adult memory, there has been a decided shift in interest from memory's structural components to memory's control and encoding processes (Jenkins, 1974; Schulman, 1975). Current models of human memory suggest that a presented stimulus leads to the perceptual/cognitive response of encoding. Encoding involves forming an internal representation of the nominal stimulus which becomes the functional stimulus. Structural multi-store approaches of information-processing theories, such as that of Atkinson and Shiffrin (1968), have been discarded by many researchers but the control processes such as encoding, discussed in these theories are now emphasized in memory research.

Levels-of-Processing Theory

As an approach alternative to multi-store theories, Craik and Lockhart (1972) proposed a one-store, levels-of-processing theory in which the durability of a memory trace is hypothesized to be positively related to the elaborateness or depth of processing. According to Craik and Lockhart, encoding the sensory-physical features of a

stimulus is a shallow level of processing which results in memory traces that decay rapidly. Stimulus enrichment through semantic processing and cognitive elaboration represents a deep level of processing and produces more durable memory traces. The memory trace, viewed as the by-product of perceptual analysis, can be maintained in consciousness by continued processing at any depth. When processing of the functional stimulus stops, the rate of forgetting for the stimulus will be directly related to the depth or level of processing. According to Craik and Lockhart, a central processor determines which stimuli will be encoded and how deeply they will be processed.

Craik and Lockhart (1972) state:

> We will argue that the coding question is more appropriately formulated in terms of the processing demands imposed by the experimental paradigm and the material to be remembered. In some paradigms and with certain material, acoustic coding may be either adequate or all that is possible. In other circumstances processing to a semantic level may be both possible and advantageous. (p. 674)

> If the memory trace is viewed as the by-product of perceptual analysis, an important goal of future research will be to specify the memorial consequences of various types of perceptual operation. (p. 681)

Researchers in adult memory have followed Craik and Lockhart's suggestion that orienting tasks within an incidental learning paradigm be used as an experimental method for direct control over subjects' encoding operations. The performance of a given orienting task is assumed to

constrain the subject to encode the material according to the requirements of the orienting task. Because subjects are unaware that memory will be tested, they are unlikely to engage in processing other than the type prescribed by the orienting task. For example, semantic orienting tasks, such as requiring the subject to place words in a category, to rate words on a pleasantness scale, or to determine whether words fit a sentence frame, constrain the subject to semantic encoding strategies. Memory performance after such semantic orienting tasks is interpreted to indicate the mnemonic consequences of semantic encoding. Orienting tasks, such as requiring the subject to count the number of letters in a word, to determine whether a particular letter appears in a word, or to identify rhymes, yield estimates of the mnemonic consequences of sensory encoding. Several such experiments have been conducted with adults, and the results were consistent with Craik and Lockhart's contention that encoding a word's meaning (semantic encoding) yields better subsequent recall than encoding the word's sensory (acoustic, orthographic) features (Craik & Tulving, 1975; Hyde & Jenkins, 1969, 1973; Johnston & Jenkins, 1971; Till & Jenkins, 1973; Walsh & Jenkins, 1973).

Congruity

Craik and Tulving (1975) in experimentally exploring the levels-of-processing framework accepted the basic notion that the durability of the memory trace is a function of the depth of processing; however, they concluded that Schulman's (1974) principle of congruity is a necessary addition to the levels-of-processing framework:

> Memory performance is enhanced to the extent that the context, or encoding question, forms an integrated unit with the word presented. A congruous encoding yields superior memory performance because a more elaborate trace is laid down and because in such cases the structure of semantic memory can be utilized more effectively to facilitate retrieval. (p. 168)

Schulman (1974), using an incidental memory situation, asked college students questions to which they could answer yes or no. Questions with the correct answer yes were considered congruous, and questions with the correct answer no were considered incongruous. Specifically, college subjects were required to answer questions of attribution and superordination such as:

Is a CORKSCREW an opener? (congruous question)

Is a DUNGEON a scholar? (incongruous question)

Is a TWINGE sudden? (congruous question)

Is SPINACH ecstatic? (incongruous question)

Independent groups answered the questions, and then their memory for the upper-case words or the lower-case adjectives was tested without forewarning. Schulman found that under

conditions of free recall, cued recall, and recognition memory words were more readily remembered if linked with congruous questions.

Schulman argued that "the words of an incongruous query are encoded as unconnected semantic units, while the words of a congruous query are relationally encoded" (1975, p. 51). From this perspective, superior retention resulted in Schulman's study when the question and the target word could be processed as an integrated unit.

Redintegration

Horowitz and Prytulak's (1969) redintegration theory provides one possible explanation for the congruity effect obtained by Schulman. Horowitz and Prytulak described redintegrative memory as a kind of memory where the "stimulus is actually part of the response" (1969, p. 519). They stated that a whole unit can be reinstated by recalling the most salient fragment. Horowitz and Prytulak defined the criterion for calling a task redintegrative as the probability that a subject who recalls part of a unit will recall the whole unit.

Schulman (1974) has shown that congruous questions about words lead to better memory for the words than incongruous questions. Recall of a word is enhanced when the encoding question forms an integrated unit with the presented word. Schulman's studies suggest that a context of

congruous encoding can be used more effectively than incongruous encoding for redintegration. Redintegration is, therefore, more likely to occur when a congruous encoding context is provided.

Memory Research for Children

Hall and Geis (1976) conducted a children's memory experiment that was similar in design to the previously cited adult research. Subjects were first, third, and fifth graders who were presented an 18-word list. In an incidental memory paradigm, qualitatively different encoding operations were induced in the children by requiring them to answer questions about the word list. Semantic, acoustic, and orthographic encoding were constrained for different words by asking questions about the meaning, sound, and letters of the word, respectively. For example, if the target word were TABLE, the child could be asked, "Is it furniture?" (semantic question), "Does it sound like able?" (acoustic question), or "Does it have the letter B?" (orthographic question).

In free recall, across age levels, semantically processed words were better remembered than acoustically or orthographically processed words; recall for the latter two did not differ. The correct answer for half of the orienting questions was yes (congruous encoding context), and, for the other half, the correct answer was no

(incongruous encoding context). For third and fifth graders, free recall for words whose question provided a congruous encoding context (e.g., ROOF: "Is it part of a house?") exceeded that for words whose question provided an incongruous encoding context (e.g., ROOF: "Is it something you sing?"). For first graders, however, there was no difference.

After free recall, half of the children were cued with the key word or letter from the orienting question for each word (e.g., if the word were ROOF and the question "Is it part of a house?", the cue was HOUSE; if the word were SPOON and the question "Does it sound like TENT?", the cue was TENT). At all age levels, cues from congruous orienting questions were more effective than cues from incongruous questions; and overall, semantic cues were more effective than acoustic or orthographic cues.

Hall and Geis speculated that the apparent superiority of congruous over incongruous encoding may result from the subject's use of an indirect retrieval strategy. An indirect strategy could involve remembering the questions that had been asked about the words. In accordance with the congruity effect, recall of the target word would be facilitated if the subject adopted the strategy of trying to recall the questions and if the questions and the targets formed an integrated unit. The effect occurred only in the free recall of third and fifth graders; thus the results

suggest that first graders do not spontaneously generate their own retrieval cues. That is, they do not try to recall the question. When the experimenter provided the key word from a question, as a retrieval cue, however, the congruity effect occurred even for first graders as well as third and fifth graders. Thus, according to Hall and Geis, even first graders can use a congruous unit to redintegrate the entire unit; but only older children spontaneously adopt the indirect retrieval strategy of generating their own retrieval cues.

Present Research

Experiment 1 was an attempt to replicate the Hall and Geis (1976) findings concerning the developmental effects of congruity in free and cued recall. The experiment was designed to eliminate some of the methodological problems of the earlier research. To demonstrate that the Hall and Geis results were not specific to their particular set of materials, different word lists and orienting questions were used. The orthographic task was omitted, so that only the acoustic task represents a shallow, sensory type of processing. Semantic and acoustic encoding were constrained by requiring the children to answer questions about the meanings and rhyming sounds of the words, respectively. The congruity of the encoding context was manipulated by the nature of the correct answer to the orienting questions; an orienting question whose correct answer is <u>yes</u> was assumed

to provide a congruous encoding context, and an orienting question whose correct answer was no was assumed to provide an incongruous encoding context. Unlike the Hall and Geis study, each child was presented the words and their appropriate questions twice before the unannounced memory tests. In this way, overall levels of recall were enhanced, and the possibility (perhaps present in the Hall and Geis study) that floor effects may mask the effects of the manipulations was reduced. Omission of the orthographic task reduced the possibility of floor effects. A final refinement of the Hall and Geis design was the assessment of the empirical guessing rate for the cues. First- and fifth-grade children were tested.

If Hall and Geis's (1976) notions concerning congruity and redintegrative memory processes in children are correct, the following outcomes were to be expected:

(a) In free recall, older children would remember words with congruous encoding contexts (yes as the correct answer) better than words with incongruous encoding contexts (no as the correct answer). This congruity effect would not be present in the younger children's free recall, i.e., first graders' free recall of words with congruous encoding contexts and incongruous encoding contexts would be similar.

(b) In cued recall, both younger and older children would show superior memory for words that have congruous

encoding contexts compared to memory for words that have incongruous encoding contexts; i.e., the congruity effects would be present in cued recall at both age levels.

(c) From levels-of-processing theory, it was also predicted that free and cued recall for semantically processed words would exceed that for acoustically processed words, at both age levels.

In Experiment 2, the levels-of-processing framework and the congruity principle were extended to children's recognition memory. As in the first experiment, type of encoding (semantic and acoustic) and congruity of encoding context were manipulated. It was expected that:

(a) Recognition memory for semantically processed words would be superior to that for acoustically processed words, at both age levels.

(b) The congruity effect would be obtained in the recognition memory performance of both the young and older children. This prediction and the rationale behind it were the same as those for cued recall. If even young children are not deficient in redintegrative memory processes, as Hall and Geis (1976) suggested, the presentation of a target word on the recognition test should redintegrate its encoding context, if the encoding context were congruous. This redintegration should occur regardless of the child's age and should enhance recognition memory. In other words, it was argued that the cue in cued recall was likely to

redintegrate the target if the cue is part of a congruous encoding context, and thus memory is enhanced; and, similarly, that the target in recognition memory is likely to redintegrate the encoding context if the context were congruous, and thus memory is enhanced. If the context is incongruous, such redintegrative processes would not be likely to occur. If the memory test does not involve presentation of a cue or presentation of the target word, there is no material to prime redintegration, and the child would have to adopt, as in a free recall procedure, a more active, indirect retrieval strategy of remembering part of a congruous unit to help redintegrate the other part. As suggested by Hall and Geis, young children may be deficient in this type of mnemonic activity

CHAPTER II

METHOD

Experiment 1

Design. The basic design for the experiment was a 2 x 2 x 2 x 2 factorial in which grade (first and fifth) and sex (male and female) were between-subject variables. Within-subject variables were type of orienting question (semantic and acoustic) and correct answer (yes and no). Free and cued recall for each subject were tested.

Subjects. The subjects were 32 first graders and 32 fifth graders at Fair Grove Elementary School in Thomasville, North Carolina.

Materials. There were two lists, A and B, each consisting of 24 target words (see Appendix A). In order to control for list-specific effects, and to maximize generalizability of results, half the children in both Grade One and Grade Five received each list. The word list consisted of unrelated words selected: (a) to be familiar to first and fifth graders, (b) to make it possible to construct both a semantic and acoustic question, and (c) to be similar in word frequency. List A had a mean word frequency of 38.2 and List B had a mean word frequency of 39.3 based on the word frequencies reported by Kucera and Frances (1967).

For each word, a semantic orienting question whose correct answer was yes was prepared and an acoustic orienting question whose correct answer was yes was prepared. In addition, six semantic questions and six acoustic questions whose correct answers were no, regardless of the target word with which they were paired, were constructed. These 12 questions were used as the no questions for all subjects (see Appendix B).

For each list(A and B), there were eight unique orderings of the four question/correct-answer combinations: semantic-yes (SY), semantic-no (SN), acoustic-yes (AY), and acoustic-no (AN). Within each of these orderings, for every successive unit of four input positions, there was one instance of each question/correct-answer combination. Thus, for each ordering, there were 12 words that had semantic orienting questions (half of which had yes as the correct answer, half of which had no as the correct answer), and 12 words that had acoustic orienting questions (half of which had yes as the correct answer, half of which had no as the correct answer).

Each of the eight orderings for a given list (A and B) was associated with a different randomization of the 24 words of that list; therefore, the specific question that was asked at a given input position depended upon the word that was randomly assigned to that input position. For each of the eight orderings for a given list, assignment of

the no questions to the appropriate input positions was random. The eight orderings of each list (A and B) were counterbalanced such that each of the four question/correct-answer combinations appeared equally often at each input position across children.

A similar procedure was followed in determining the ordering of the question/correct-answer combinations for the second presentation of the list. For a given child, each word had the same question with the same type orienting question and same correct answer as on the first presentation of the list; but the ordering of the words was changed. A given word did not appear in the same unit of four words as it appeared on the first presentation of the list. However, for every successive unit of four input positions, there was again one instance of each question/correct-answer combination; and, across children, each of the four question/answer combinations again appeared equally often at each input position.

Each of the eight orderings combining word, type of question, and correct answer for List A was presented to one male and to one female at Grade One and Grade Five. Each of the eight orderings of List B was presented to one male and to one female at Grade One and Grade Five. Among the 32 first graders and 32 fifth graders, therefore, half the children (16) at each grade level received List A and half received List B.

Each word from each list was printed on a separate, white 3 x 5 in. card. A data sheet indicating list order, the orienting question for each word, and yes-no responses, along with the subject's grade, birthdate, name, and sex, was prepared for each subject for the experimenter's use during presentation of the orienting tasks. Additional individual data sheets were prepared for recording cued recall. Each sheet listed the target words, the cues, and the subject's responses.

For a given child the cues were the key words in the orienting questions that the particular child had been asked. Thus, each child received cues from six semantic-yes orienting questions, six semantic-no orienting questions, six acoustic-yes orienting questions, and six acoustic-no orienting questions. There were eight orderings of the cues constructed in the similar manner to the eight orderings of each list. The cues were randomly arranged in successive units of four input positions such that each unit of four contained one cue from each type question.

Procedure. Each child was tested individually with the appropriate materials. Each word and question combination was presented twice in a continuous administration. The child therefore was instructed that he would be asked some questions about a series of words and that he would be asked some questions more than once. Three practice words were given to acquaint the child with the procedure and the types of question. The experimenter said the word aloud

while exposing each card, and the child repeated the word; while each word was exposed, the experimenter asked the child a question that could be answered with a yes or no response. The task was subject-paced since the exposed card was not removed and the next card was not presented until the child answered the question. The succeeding card was presented after the child answered, regardless of response accuracy.

The experimenter recorded the child's responses as the questions were answered. After the orienting activity was completed, each child was allowed two minutes to recall orally the words that were presented on the cards and the experimenter recorded the child's responses.

The experimenter then tested each child's cued recall. For each target word, the key word in its orienting question was used as the cue. After instructing the children in the cued recall procedure, the experimenter said the cue word for each of the 24 words. The child received 20 seconds to respond to each cue, and each response was recorded on a data sheet.

It was possible that children who had never seen the target words could nevertheless have guessed in cued recall the target word that accompanied a question during the experiment. The children may not really have been remembering part of a previously seen context, but they may have been guessing a word that fit the cue word. To evaluate the guessing rate in cued recall, children after performing the

memory tasks with List A and its corresponding questions were shown cues that correspond to List B target words, and children who had previously seen List B words and questions were given the cues corresponding to List A target words. A yoking procedure was used in which a child who saw and recalled List A, for example, received the same list B cues, in the same order, as a child who saw and recalled List B. The children were told, "I'm going to show you some clue words that go with words you haven't been shown today. When I show you a word, try to guess what other word it goes with."

Experiment 2

Design. The design was identical to that of Experiment 1 with the exception that the experiment measured recognition rather than recall.

Subjects. The subjects were 32 first graders and 32 fifth graders at Fair Grove Elementary School in Thomasville, North Carolina. Different subjects from those who participated in Experiment 1 were used.

Materials. Two word lists, AA and BB, consisting of 36 words each, and their orienting questions were derived in the same manner described for List A and B for Experiment 1 (see Appendices C and D). Randomization and ordering were completed in the same manner. As in Experiment 1, each word for each list was printed on a separate 3 x 5 in. card. Data sheets to record yes-no answers to the orienting tasks were similar to those in Experiment 1.

Two random orders of the recognition test were derived by randomly pairing words from List AA with words from List BB. The order of the words within each pair was random with the restriction that the first word in each pair could not be from the same list in more than two consecutive pairs. Also, if the same pairing appeared randomly on both test lists, a substitution was made.

Procedure. The procedure for Experiment 1 was followed with the exception that 36 words with orienting tasks were presented rather than 24 words and each word was presented only once. After the words were presented there was a five-minute delay interval during which the child was asked to work arithmetic problems at his own pace. Each child was then administered the 36-item recognition test. The experimenter showed the child the pairs on each card and read the words to the child. The child was instructed to select the word, in each pair, that he was presented earlier and the experimenter recorded the child's response on a data sheet.

CHAPTER III

RESULTS

Experiment 1

Since the main effect of experimenter and list, and their interactions, were not significant in preliminary analyses, the data were collapsed across these variables. Separate 2 x 2 x 2 x 2 analyses of variance, with the between-subject factors of grade and sex and the within-subject factors of orienting task and yes-no response, were performed on the free recall and cued recall raw data. It should be noted that guessing rates were calculated, and the mean number of correct guesses per subject was .94 words for the first graders and 1.03 words for the fifth graders. Since guessing rates were low, score adjustments were not made prior to the analyses. Means are reported below as proportions to permit comparison of the results across experiments.

Free recall. Three main effects were the only significant outcomes in the free recall data: grade, F (1,60) = 10.82, $p < .01$; task, F (1,60) = 29.16, $p < .01$; and yes-no response, F (1,60) = 4.32, $p < .05$. The fifth graders recalled .34 of the words that were presented to them, while the first graders recalled .25 of the words that were presented to them. Recall was greater for words

having semantic orienting questions (mean proportion recall = .35) than for words having acoustic orienting questions (mean proportion recall = .24). The children recalled .32 of the words that had an orienting question with the correct response yes, and they recalled .28 of the words that had orienting questions with the correct answer no. As the interaction between Grade and Yes-No response was not significant, this congruity effect was present in the free recall of both age groups.

Cued recall. The same main effects were significant in the cued recall data: grade, F (1,60) = 20.97, $p < .01$; task, F (1,60) = 157.05, $p < .01$; yes-no response, F (1, 60) = 217.68, $p < .01$. Fifth-graders' performance was again superior to that of first-graders' (mean proportion cued recall of .57 compared to .41), and memory for semantically processed words again exceeded that for acoustically processed words (mean proportion cued recall of .67 compared to .31). Also, as in the free recall data, cued recall was better for words whose orienting questions had yes as the correct answer (mean proportion cued recall, .67) than for words whose orienting questions had no as the correct answer (mean proportion cued recall, .31).

These main effects should be considered with respect to two significant interactions shown in Figures 1 and 2: Grade X Yes-No response, F (1, 60) = 7.62, $p < .01$; and Task X Yes-No response, F (1, 60) = 14.43, $p < .01$.

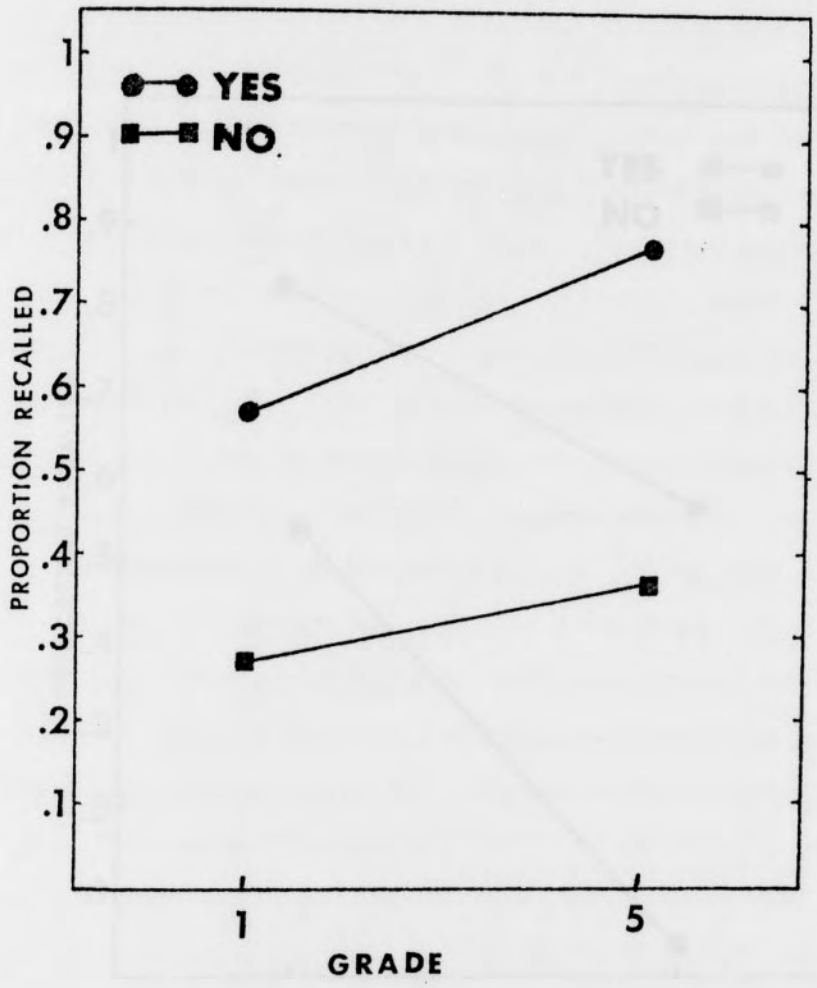

Figure 1. Mean proportion cued recall as a function of grade and yes-no response.

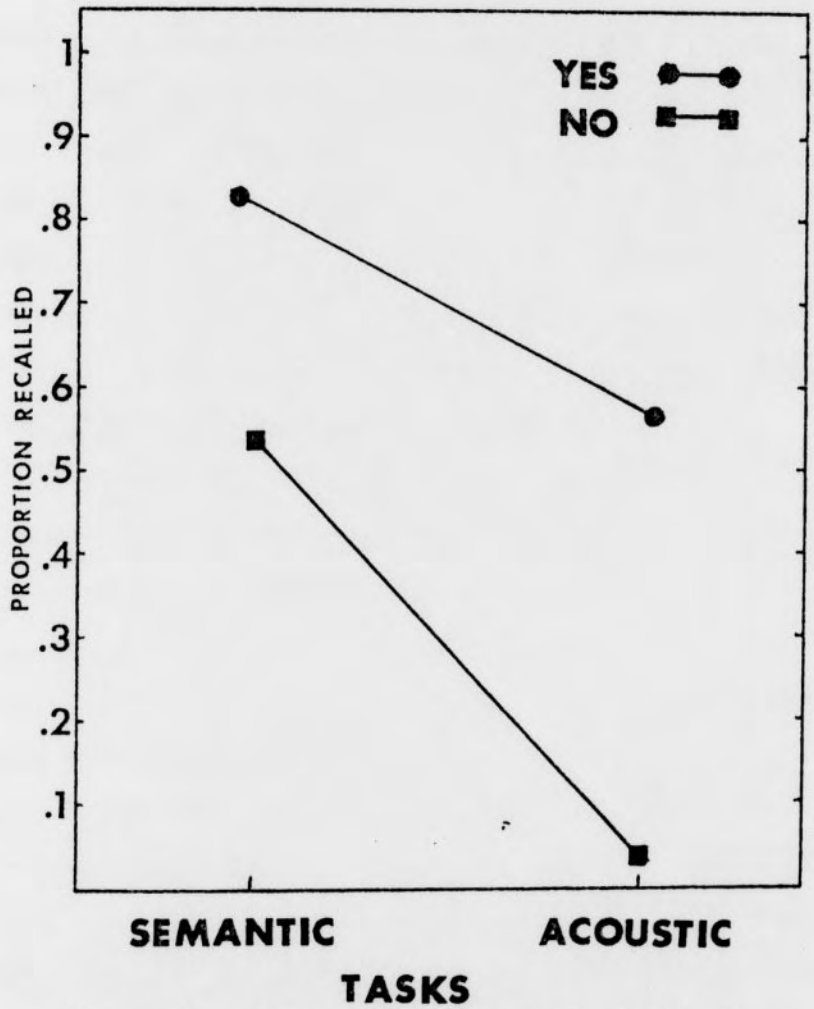

Figure 2. Mean proportion cued recall as a function of orienting task and yes-no response.

A Newman-Keuls post-hoc analysis of the Grade X Yes-No response interaction revealed that the first graders' recall was significantly less than the fifth graders' at each level of response ($p < .01$ for level yes; $p < .05$ for level no). Performance was significantly better with orienting question/correct answer-yes than with orienting question/correct answer-no ($p < .01$). The mean proportion recalled for first graders was .56 at the yes level compared to .27 at the no level and for fifth graders was .78 compared to .35. The interaction seemed to be due to the relatively greater enhancement of fifth-graders' cued recall by yes answers than first-graders' recall.

A Newman-Keuls post-hoc analysis of the Task X Yes-No response interaction revealed that means for the acoustic task were significantly less than the means for the semantic task at each of the response levels ($p < .01$). The means for the no level of response were significantly less than the means for the yes level of response at each orienting task level ($p < .01$). Mean proportion cued recall for the semantic task (.52) at the no level and mean proportion cued recall (.56) for the acoustic task at the yes level were not, however, significantly different according to a Newman-Keuls post-hoc analysis. Thus, acoustic congruous questions and semantic incongruous questions resulted in similar levels of cued recall performance.

Experiment 2

A 2 x 2 x 2 x 2 x 2 analysis of variance, with the between-subject factors of grade, sex, and list and the within-subject factors of orienting task and yes-no response, was performed on the recognition data.

Two of the three main effects found in Experiment 1 were also significant in Experiment 2: grade, F (1, 56) = 14.83, $p < .01$; and task, F (1,56) = 9.87, $p < .01$. Fifth-graders' performance was again superior to that of the first-graders' (mean proportion recognition of .97 compared to .93), and memory for semantically processed words again exceeded that for acoustically processed words (mean proportion recognition of .96 compared to .93).

These two main effects must be considered with respect to several significant interactions: an interaction of Grade X Sex, F (1, 56) = 4.50, $p < .05$; an interaction of Task X Yes-No response, F (1, 56) = 5.44, $p < .05$; and an interaction of Grade, Sex, and Yes-No response, F (1, 56) = 8.55, $p < .01$.

A Newman-Keuls post-hoc analysis of the Grade X Sex interaction revealed that the females' mean recognition scores were not significantly different across grade levels (mean proportion recognized was .94 as compared to .96); but fifth-grade males' recognition exceeded first-grade males'

recognition (mean proportion = .92 compared to .98, $p < .01$). Furthermore, first-grade females' performance exceeded that of first-grade males (mean proportion = .94 compared to mean proportion = .92), while at grade five the opposite outcome was obtained (mean proportion = .98 for fifth-grade males compared to .96 for fifth-grade girls).

Post-hoc analysis of the Grade X Sex X Yes-No response interaction indicated that the pattern of results in the Grade X Sex interaction ($p < .05$) applied only when questions were incongruous (orienting question/correct answer-no); for congruous questions (orienting question/correct answer-yes) there was no significant difference at each grade level between males and females (see Figure 3).

A Newman-Keuls post-hoc analysis of the Task X Yes-No response interaction revealed that recognition for the semantic orienting question/correct answer-yes was greater than for the acoustic question/correct answer yes (mean proportion recognition = .97 compared to .92, $p < .05$). There was no significant difference between semantic question/correct answer-no and acoustic question/correct answer-no (mean proportion recall, .95 compared to .94).

An interaction of Grade X Sex X List X Task, $F(1, 56) = 5.04$, $p < .05$, will not be discussed.

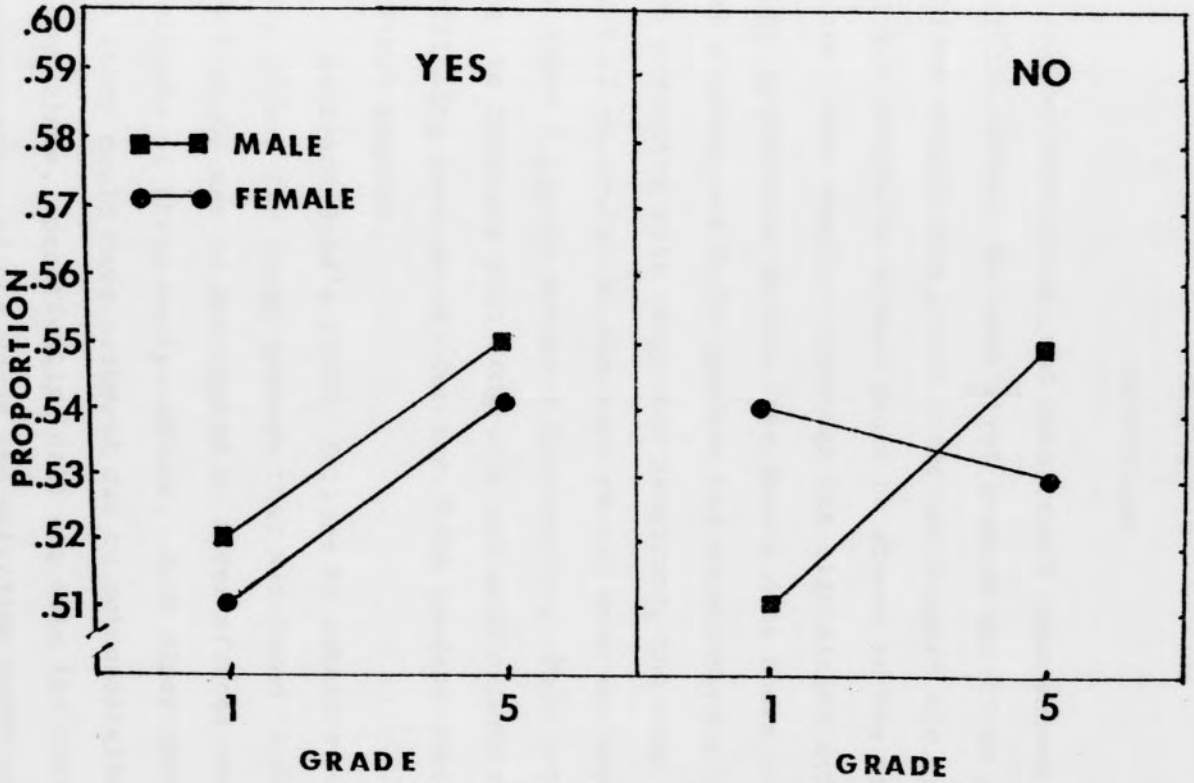

Figure 3. Mean proportion correct recognition as a function of grade, sex and yes-no response.

CHAPTER IV

DISCUSSION

The free recall and cued recall data showed a strong congruity effect for both first graders and fifth graders. The free recall data, thus, does not support the prediction that the congruity effect would be absent in the first-graders' free recall. Although the significant main effect of yes-no response in the free recall data shows that both first graders and fifth graders had superior recall for words presented with congruous questions, the same main effect of congruity in the cued recall data was accompanied by a Grade X Yes-No response interaction. This interaction seems to indicate that congruity was more effective in facilitating cued recall for the fifth graders than for the first graders.

Hall and Geis's (1976) failure to obtain the congruity effect for first graders that was found in the present study may be attributed to floor effects masking the effects of their manipulations. Such floor effects in their study could have occurred due to methodological problems since, specifically, Hall and Geis included only one presentation of the words and orienting questions and included an orthographic orienting task along with the semantic and acoustic tasks. In the present study,

refinements, such as presentation of each word and its orienting task twice and omission of the orthographic task, enhanced the overall levels of recall. Another explanation for the difference in results is that the Hall and Geis study was conducted in the fall and the present study took place in the spring. Thus, the children at both grade levels were older in the present study than in the Hall and Geis study.

As previously stated, the interaction of Grade X Yes-No response in cued recall shows that fifth-graders' recall benefited more from congruity than the first-graders' recall. In the introduction, it was suggested that, in cued recall, the presentation of a cue redintegrates the target word if the cue (encoding context) were congruous with that target. Thus, the present results raise the possibility that fifth graders may be superior to first graders in using the redintegration process for cued recall.

On the other hand, in free recall, where both first and fifth graders benefited similarly from congruity, all of the children may have engaged in an indirect retrieval strategy. If the memory test does not involve presentation of a cue or target word, the child may adopt the more active strategy of remembering part of a congruous unit to help redintegrate the other part. Although Hall and Geis suggested that younger children may be deficient in using indirect

retrieval strategies, the present study supports the notion that both first graders and fifth graders use this type of mnemonic activity.

The prediction, based on Craik and Lockhart's levels-of-processing framework, that free recall for semantically processed words would exceed that for acoustically processed words at both age levels was supported. This finding replicates that of Hall and Geis (1976) who found that, in free recall across first, third, and fifth grades, semantically processed words were better remembered than acoustically processed words. Although a Task X Yes-No response interaction did not occur in the free recall data, a Task X Yes-No response interaction was present in the cued recall data. Within the interaction, mean cued recall for semantic encoding tasks with no responses was not different from mean cued recall for acoustic encoding tasks with yes response. Therefore, semantic tasks may not always facilitate memory performance more than acoustic tasks. In some instances, congruity may be as important as the nature of the orienting task in facilitating memory. As Craik and Tulving (1975) suggested, Schulman's (1975) principle of congruity may be a necessary addition to the levels-of-processing framework.

There is evidence in Experiment 2 that recognition memory for semantically processed words was superior to that for acoustically processed words, at both age levels, as predicted. The main effect of task indicating the

superiority of semantic processing must be qualified by the interaction that occurred, nonetheless within the Task X Yes-No interaction, the only significant difference was the superiority of semantic yes encoding over acoustic yes encoding.

The expected congruity effect was not obtained in recognition, and it is possible that ceiling effects masked the manipulations performed in Experiment 2. Recognition scores for all conditions were quite high, with mean proportions above .80 (a perfect score for a child being 1.00). Replication of the experiment with longer word lists is thus apparently needed. Some sex effects were present in the recognition data, and future research should be designed so that the effects of the sex variable can be considered in the analyses.

In summary, the free recall of both first and fifth graders was similarly facilitated by congruity, but the cued recall of fifth graders benefited more from congruity than the cued recall of first graders. These results were interpreted as evidence that children, even as young as first grade may use an indirect retrieval strategy for free recall but fifth graders may be better able than first graders to use a congruous cue to redintegrate target material. Although the cued recall data suggested that the congruity principle may sometimes be as important as the nature of the orienting task in determining memory

BIBLIOGRAPHY

Atkinson, R. C., & Shiffrin, R. M. Human memory: A proposed system and its control processes. In K. W. Spence and J. T. Spence (Eds.), The psychology of learning and motivation: Advances in research and theory (Vol. 11). New York: Academic Press, 1968.

Craik, F. I. M., & Lockhart, R. S. Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 671-684.

Craik, F. I. M., & Tulving, E. Depth of processing and the retention of words in episodic memory. Journal of Experimental Psychology: General, 1975, 104, 268-293.

Hall, D. M., & Geis, M. F. Congruity of encoding in children's redintegrative memory. Paper presented at the meeting of the Southeastern Conference on Human Development, Nashville, April 1976.

Horowitz, L. M., & Prytulak, L. S. Redintegrative memory. Psychological Review, 1969, 76, 519-531.

Hyde, T. S., & Jenkins, J. J. Differential effects of incidental tasks on the organization of recall of a list of highly associated words. Journal of Experimental Psychology, 1969, 82, 472-481.

Hyde, T. S., & Jenkins, J. J. Recall for words as a function of semantic, graphic, and syntactic orienting tasks. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 471-480.

Jenkins, J. J. Remember that old theory of memory? Well forget it! American Psychologist, 1974, 29, 785-795.

Johnson, C. D., & Jenkins, J. J. Two more incidental tasks that differentially affect associative clustering in recall. Journal of Experimental Psychology, 1971,

Kucera, H., & Francis, N. Computational analysis of present-day American English. Providence: Brown University Press, 1967.

Schulman, A. I. Memory for words recently classified. Memory and Cognition, 1974, 2, 47-52.

Schulman, A. I. Encoding processes and the memorability of events. In A. Kennedy and A. Wilkes (Eds.), Studies in long term memory. New York: Wiley, 1975.

Till, R. E., & Jenkins, J. J. The effects of cued orienting tasks on the free recall of words. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 489-498.

Walsh, D. A., & Jenkins, J. J. Effects of orienting tasks on free recall in incidental learning: Difficulty, effort, and process explanations. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 481-488.

APPENDICES

APPENDIX A: Lists A & B--Experiment 1

List A

	Target Word		Target Word
1.	peach	18.	curtain
2.	spoon	19.	wagon
3.	pillow	20.	crowd
4.	rope	21.	dress
5.	mask	22.	cave
6.	nest	23.	book
7.	dime	24.	gun
8.	candle		
9.	pencil		
10.	star		
11.	bridge		
12.	puzzle		
13.	math		
14.	key		
15.	bench		
16.	flag		
17.	mile		

List B

	Target Word
1.	spider
2.	ax
3.	glue
4.	purse
5.	joke
6.	tooth
7.	nap
8.	thread
9.	fever
10.	cat
11.	clay
12.	drum
13.	chalk
14.	rose
15.	gate
16.	nut
17.	milk
18.	ghost
19.	grass
20.	truck
21.	box
22.	turtle
23.	table
24.	ball

APPENDIX B: Orienting Questions--Experiment 1

List A--Acoustic-Yes Questions

	Target Word	Question		Cue Word
1.	peach	Does it sound like	each?	each
2.	spoon	"	dune?	dune
3.	pillow	"	billow?	billow
4.	rope	"	hope?	hope
5.	mask	"	task?	task
6.	nest	"	best?	best
7.	dime	"	time?	time
8.	candle	"	sandal?	sandal
9.	pencil	"	tinsel?	tinsel
10.	star	"	tar?	tar
11.	bridge	"	ridge?	ridge
12.	puzzle	"	muzzle?	muzzle
13.	math	"	path?	path
14	key	"	fee?	fee
15.	bench	"	wrench?	wrench
16.	flag	"	rag?	rag
17.	mile	"	tile?	tile
18.	curtain	"	certain?	certain
19.	wagon	"	dragon?	dragon
20.	crowd	"	bowed?	bowed
21.	dress	"	less?	less
22.	cave	"	pave?	pave
23.	book	"	hook?	hook
24.	gun	"	run?	run

List B--Acoustic-Yes Questions

	Target Word	Question		Cue Word
1.	spider	Does it sound like	wider?	wider
2.	ax	"	tax?	tax
3.	glue	"	true?	true
4.	purse	"	verse?	verse
5.	joke	"	poke?	poke
6.	tooth	"	truth?	truth
7.	nap	"	lap?	lap
8.	thread	"	led?	led
9.	fever	"	lever?	lever
10.	cat	"	fat?	fat
11.	clay	"	day?	day
12.	drum	"	crumb?	crumb
13.	chalk	"	talk?	talk
14.	rose	"	chose?	chose
15.	gate	"	fate?	fate
16.	nut	"	jut?	jut
17.	milk	"	silk?	silk
18.	ghost	"	host?	host
19.	grass	"	pass?	pass
20.	truck	"	luck?	luck
21.	box	"	knocks?	knocks
22.	turtle	"	hurdle?	hurdle
23.	table	"	fable?	fable
24.	ball	"	all?	all

List A--Semantic-Yes Questions

	Target Word	Question	Cue Word
1.	peach	Is it fruit?	fruit
2.	spoon	Is it something used to mix?	q mix
3.	pillow	Is it like a cushion?	cushion
4.	rope	Is it something to jump?	jump
5.	mask	Is it part of a costume?	costume
6.	nest	Is it made of straw?	straw
7.	dime	Is it money?	money
8.	candle	Does it have a flame?	flame
9.	pencil	Is it used to write?	write
10.	star	Is it in the sky?	sky
11.	bridge	Is it something to cross?	cross
12.	puzzle	Does it have pieces?	pieces
13.	math	Does it have numbers?	numbers
14.	key	Is it for a lock?	lock
15.	bench	Is it like a seat?	seat
16.	flag	Is it something on a pole?	pole
17.	mile	Is it a distance?	distance
18.	curtain	Is it for a window?	window
19.	wagon	Is it something to push?	push
20.	crowd	Is it like a group?	group
21.	dress	Is it for a girl?	girl
22.	cave	Is it like a tunnel?	tunnel
23.	book	Is it something to read?	read
24.	gun	Is it something to shoot?	shoot

List B--Semantic-Yes Questions

	Target Word	Question	Cue Word
1.	spider	Does it have a web?	web
2.	ax	Is it used to chop?	chop
3.	glue	Is it like paste?	paste
4.	purse	Is it a handbag?	handbag
5.	joke	Is it funny?	funny
6.	tooth	Is it something to brush?	brush
7.	nap	Is it sleep?	sleep
8.	thread	Is it used with a needle?	needle
9.	fever	Is it part of being sick?	sick
10.	cat	Does it have fur?	fur
11.	clay	Is it something to shape?	shape
12.	drum	Is it part of a parade?	parade
13.	chalk	Is it used on a board?	board
14.	rose	Is it a flower?	flower
15.	gate	Is it part of a fence?	fence
16.	nut	Is it something to crack	crack
17.	milk	Is it something to drink?	drink
18.	ghost	Is it creepy?	creepy
19.	grass	Is it something to mow?	mow
20.	truck	Is it something to drive?	drive
21.	box	Is it a container?	container
22.	turtle	Is it slow?	slow
23.	table	Is it furniture?	furniture
24.	ball	Does it bounce?	bounce

Acoustic-No Questions

1.	actor	Does it sound like actor?
2.	packet	Does it sound like packet?
3.	shelf	Does it sound like shelf?
4.	vent	Does it sound like vent?
5.	watch	Does it sound like watch?
6.	umbrella	Does it sound like umbrella?

Semantic-No Questions

1.	candy	Is it made of candy?
2.	mitten	Is it like a mitten?
3.	jewelry	Is it jewelry?
4.	rake	Is it used to rake?
5.	diaper	Does it have a diaper?
6.	buckle	Is it a buckle?

APPENDIX C: Word Lists AA and BB--Experiment 2

Word List AA

	Target Word
1.	peach
2.	spoon
3.	pillow
4.	rope
5.	mask
6.	nest
7.	dime
8.	candle
9.	pencil
10.	star
11.	bridge
12.	puzzle
13.	math
14.	key
15.	bench
16.	flag
17.	mile
18.	curtain
19.	wagon
20.	crowd
21.	dress
22.	cave
23.	book
24.	gun
25.	king
26.	snow
27.	park
28.	bike
29.	corn
30.	prayer
31.	art
32.	trash
33.	lamp
34.	night
35.	ship
36.	ear

Word List BB

	Target Word
1.	spider
2.	ax
3.	glue
4.	purse
5.	joke
6.	tooth
7.	nap
8.	thread
9.	fever
10.	cat
11.	clay
12.	drum
13.	chalk
14.	rose
15.	gate
16.	nut
17.	milk
18.	ghost
19.	grass
20.	truck
21.	box
22.	turtle
23.	table
24.	ball
25.	nail
26.	letter
27.	pool
28.	city
29.	jelly
30.	cheese
31.	stove
32.	air
33.	towel
34.	lotion
35.	mop
36.	mountain

APPENDIX D: Orienting Questions--Experiment 2

List AA--Semantic-Yes Questions

	Target Word	Question
1.	peach	Is it fruit?
2.	spoon	Is it something used to mix?
3.	pillow	Is it like a cushion?
4.	rope	Is it something to jump?
5.	mask	Is it part of a costume?
6.	nest	Is it made of straw?
7.	dime	Is it money?
8.	candle	Does it have a flame?
9.	pencil	Is it used to write?
10.	star	Is it in the sky?
11.	bridge	Is it something to cross?
12.	puzzle	Does it have pieces?
13.	math	Does it have numbers?
14.	key	Is it for a lock?
15.	bench	Is it like a seat?
16.	flag	Is it something on a pole?
17.	mile	Is it a distance?
18.	curtain	Is it for a window?
19.	wagon	Is it something to push?
20.	crowd	Is it like a group?
21.	dress	Is it for a girl?
22.	cave	Is it like a tunnel?
23.	book	Is it something to read?
24.	gun	Is it something to shoot?
25.	king	Is it something for a castle?
26.	snow	Is it weather?
27.	park	Is it for a picnic?
28.	bike	Is it something to peddle?
29.	corn	Is it on a cob?
30.	prayer	Is it something for a church?
31.	art	Is it like a picture?
32.	trash	Is it like garbage?
33.	lamp	Does it have a bulb?
34.	night	Is it dark?
35.	ship	Is it like a boat?
36.	ear	Is it something used to hear?

List AA--Acoustic-Yes Questions

	Target Word	Question
1.	peach	Does it sound like each?
2.	spoon	" dune?
3.	pillow	" billow?
4.	rope	" hope?
5.	mask	" task?
6.	nest	" best?
7.	dime	" time?
8.	candle	" sandal?
9.	pencil	" tinsel?
10.	star	" tar?
11.	bridge	" ridge?
12.	puzzle	" muzzle?
13.	math	" path?
14.	key	" fee?
15.	bench	" wrench?
16.	flag	" rag?
17.	mile	" tile?
18.	curtain	" certain?
19.	wagon	" dragon?
20.	crowd	" bowed?
21.	dress	" less?
22.	cave	" pave?
23.	book	" hook?
24.	gun	" run?
25.	king	" wing?
26.	snow	" sow?
27.	park	" lark?
28.	bike	" pike?
29.	corn	" morn?
30.	prayer	" mare?
31.	art	" tart?
32.	trash	" flash?
33.	lamp	" ramp?
34.	night	" might?
35.	ship	" lip?
36.	ear	" fear?

List BB--Semantic-Yes Questions

Target Word	Question
1. spider	Does it have a web?
2. ax	Is it used to chop?
3. glue	Is it like paste?
4. purse	Is it a handbag?
5. joke	Is it funny?
6. tooth	Is it something to brush?
7. nap	Is it sleep?
8. thread	Is it used with a needle?
9. fever	Is it part of being sick?
10. cat	Does it have fur?
11. clay	Is it something to shape?
12. drum	Is it part of a parade?
13. chalk	Is it used on a board?
14. rose	Is it a flower?
15. gate	Is it part of a fence?
16. nut	Is it something to crack?
17. milk	Is it something to drink?
18. ghost	Is it creepy?
19. grass	Is it something to mow?
20. truck	Is it something to drive?
21. box	Is it a container?
22. turtle	Is it slow?
23. table	Is it furniture?
24. ball	Does it bounce?
25. nail	Is it something to hammer?
26. letter	Is it part of the alphabet?
27. pool	Is it for a swim?
28. city	Is it like a town?
29. jelly	Is it like jam?
30. cheese	Is it yellow?
31. stove	Does it have an oven?
32. air	Is it something to breathe?
33. towel	Is it something for drying?
34. lotion	Is it something to rub?
35. mop	Is it something for the floor?
36. mountain	Is it something like a hill?

List BB--Acoustic-Yes Questions

	Target Word	Question
1.	spider	Does it sound like wider?
2.	ax	" tax?
3.	glue	" true?
4.	purse	" verse?
5.	joke	" poke?
6.	tooth	" truth?
7.	nap	" lap?
8.	thread	" led?
9.	fever	" lever?
10.	cat	" fat?
11.	clay	" day?
12.	drum	" crumb?
13.	chalk	" talk?
14.	rose	" chose?
15.	gate	" fate?
16.	nut	" jut?
17.	milk	" silk?
18.	ghost	" host?
19.	grass	" pass?
20.	truck	" luck?
21.	box	" knocks?
22.	turtle	" hurdle?
23.	table	" fable?
24.	ball	" all?
25.	nail	" bail?
26.	letter	" better?
27.	pool	" rule?
28.	city	" pity?
29.	jelly	" belly?
30.	cheese	" please?
31.	stove	" cove?
32.	air	" care?
33.	towel	" trowel?
34.	lotion	" notion?
35.	mop	" cop?
36.	mountain	" fountain?

Semantic-No Questions

1. Is it made of candy?
2. Is it like a mitten?
3. Is it jewelry?
4. Is it used to rake?
5. Does it have a diaper?
6. Is it a buckle?
7. Is it used to zip?
8. Is it a cork?
9. Is it like a calendar?

Acoustic-No Questions

1. Does it sound like actor?
2. Does it sound like packet?
3. Does it sound like shelf?
4. Does it sound like vent?
5. Does it sound like watch?
6. Does it sound like umbrella?
7. Does it sound like lace?
8. Does it sound like beard?
9. Does it sound like orphan?