AN ABSTRACT OF THE THESIS OF

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in Psychology presented on May 10, 1985

Title: The Effects on Free Recall of Grade Level, Type of Transformation, and Type of Stimulus

Abstract approved: Christopher A. Joseph

The variables affecting the human memory and free recall have been extensively studied using adult subjects. Published studies comparing adults and children are very limited in number. The purpose of this thesis was to determine whether there are differences between adults and children in their free recall of various forms of stimuli. It was predicted that the adult population would be able to correctly recall more stimuli than children as the result of the type of stimuli (pictures, simple words, complex words) presented, and as a result of the cognitive transformation performed on the stimuli (imagining as pictures or describing in words).

One hundred and twenty subjects, sixty elementary school-age children brom Butcher Children's school and sixty undergraduate and graduate students from Emporia State University, participated in the experiment. The subjects were tested in groups of five or less. The subjects were introduced to the stimulus items and then were administered an interim control activity for two minutes. The subjects were then instructed to recall as many items as they could on a response sheet. The recall period lasted five minutes. Following the recall period, the subjects were asked to rate on a scale of one to seven their performance on the experimental tasks.

The results indicated that adults recalled more stimuli than children and that picture recall was superior in comparison with complex words. The results indicate that children are not able to handle the various forms of stimuli as adults do. Children tended to concentrate on each item as a separate task rather than perceiving the experiment as a whole function.

THE EFFECTS ON FREE RECALL OF GRADE LEVEL, TYPE OF TRANSFORMATION , AND TYPE OF STIMULUS

A Thesis

Presented to

the Department of Psychology

EMPORIA STATE UNIVERSITY

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Brenda M. McGowin

May 1985

Approved for the Major Department

Approved for the Graduate Council

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to Dr. Christopher A. Joseph for helping me in the preparation of my thesis. His influence, guidance, patience, and understanding will always be remembered and utilized in my future career as a psychologist. I would also like to extend my appreciation to Dr. Joseph Barto and Dr. Loren Tompkins, the other members of my thesis committee for their concern and added support.

All of my love goes out to my parents, who made it possible for me to go to college, to John, who is always there when I need him for support and understanding, and finally, my sister Audrey, who has been supportive and has helped me to never lose my objectivity.

TABLE OF CONTENTS

APPENDICES Page

LIST OF TABLES

TABLE Page

CHAPTER 1

INTRODUCTION

In the study of human memory, free recall and the variables affecting it have been extensively studied using adult subjects. There is a dearth of studies comparing adults and children. Information pertaining to the effects of developmental factors on human memory is one of a multitude of unexplored concepts in the area of free recall.

Recognition and verbal recall are higher for pictures than for their labels. A single picture provides different types of information, such as spatial location and composition, that are differentially retained. A flat serial position function is obtained in picture recognition, in contrast to the U-shaped serial position in word recognition. Picture recognition is disturbed by visual but not verbal interpolated tasks. Although these results suggest that pictorial and verbal materials are stored in different ways, other evidence suggests that they are stored the same way under certain conditions in that verbal free recall for both pictures and labels shows a serial position function and that verbal recall for pictures is disturbed by an interpolated verbal task. Several experiments have indicated that pictures are stored in a common pool of semantic information

to which both pictorial and verbal inputs contribute. It is concluded that (1) pictorial materials are encoded simultaneously into visual, verbal, and semantic codes and (2) the human information-processing system is flexible enough to adjust the relative weights of these types of encoding according to task characteristics (Hakoda, 1981).

Various research has been performed in the area of free recall of pictures as opposed to words with the adult population. Findings indicate that recall of pictures is higher, and this discrepancy in free recall of pictures as opposed to words is well established. Recent findings reveal that free recall is affected by the form in which stimuli are presented, the manner of stimulus presentation, the form of recall, the number of times the stimuli are presented and recalled, the instructions to the subjects, the delay between presentation and recall, and the kinds of transformations performed on the stimuli (Joseph & Joseph, 1980; Joseph & Cowan, 1981; Joseph, Joseph, & Beasley, 1982; Joseph, McKay, & Joseph, 1982). It is unknown whether or not the variables affect children's free recall in the same manner as that of adults. Studies showing the effects of free recall with adults, including a classic experiment conducted by Ducharme and Fraisse (1965), reveal the superiority of picture stimuli over word stimuli in recall. Current research had repeatedly demonstrated that subjects presented with picture stimuli remember significantly more

stimulus items than subjects presented with the same stimuli in the form of words (Joseph & Joseph, 1980). Studies of this kind have yet to be performed with elementary school children.

Other studies (Sampson, 1970; Paivio, 1971, Wittrock & Goldberg, 1975) have tested subjects' ability to recall stimuli presented in the form of word labels. Researchers consistently found recall of pictures to be superior to that of word stimuli. The double-encoding hypothesis (Paivio, 1971) is the most widely recognized interpretation for the superiority of picture stimuli over verbal stimuli in free recall. It remains that there are no existing experimental studies that the double-encoding hypothesis is valid with children. According to the double-encoding hypothesis, the picture of a familiar object elicits both figural and verbal encoding while words elicit only verbal encoding. It is assumed that this dual encoding of stimuli expedites free recall because the subject has both figural and verbal material from which to draw during the recall process.

The double-encoding hypothesis (Paivio, 1971) is probably the most widely accepted explanation for the picture superiority. Kaplan, Kaplan, and Sampson (1968) delineate the following double-encoding process:

> . . . when a subject views the picture of an object, he tends to think of its name as well, when he views the name of an object, he does not tend to think of the picture or image of the object. This double coding

> would help explain the superior recall for pictures . . . (p. 74)

Further elaboration on the hypothesis was yielded by Paivio and Csapo (1973):

> The approach distinguishes between nonverbal imagery and verbal symbolic processes, which are assumed to involve independent but partially interconnected systems for encoding, storage, organization, and retrieval of stimulus information. The imagery system is specialized for dealing with nonlinguistic information stored in the form of images, that is, memory representations corresponding to concrete things. The verbal code refers to stored representations corresponding most directly to linguistic units. (p. 177)

Empirical support for the Paivio and Csapo position was provided by Sperry (1968). Sperry studied epileptic patients who had undergone forebrain commissuratomy in hopes of reducing the intensity of epileptic convulsions. On the surface, patients' behaviors gave no indication of cognitive or perceptual effects resulting from the removal of tissues connecting brain lobes. However, Sperry discovered definite effects that were behaviorally camouflaged and compensated for without the patients' awareness. Sperry believed that the human brain possesses a "major lobe" which controls speech and writing, serving as a main language and calculation center, and a "minor lobe" which has little language or

calculation ability, and is mostly concerned with nonverbal ideation. More specifically, Sperry (1968) stated:

> visual material projected to the right half of the field (left hemisphere system of the typically right handed patient) can be described in speech and writing in an essentially normal manner. However, when the same visual material is projected into the left half of the field, and hence the right hemisphere, the subject consistently insists that he did not see anything or that there was only a flash of light on the left side. The subject acts as if he were blind or agnostic for the left half of the visual field. If, however, instead of asking the subject to tell you what he saw, you instruct him to use his left hand to point to a matching picture or object presented among a collection of other pictures or objects, the subject has no trouble as a rule in pointing out consistently the very item that he just insisted he did not see. (p. 725)

The results of Sperry's work therefore indicate the existence in the brain of separate verbal and figural centers. Additional support for that idea was provided by results of studies in which subjects were presented mixed combinations of word and picture stimuli, and upon recall, were easily able to remember which stimuli were presented in word form, and which were presented in picture form (Madigan, 1974; Kaplan, Kaplan, & Sampson, 1968; Sperry, 1968). Madigan (1974) believed that such ease of discrimination was

due to a kind of representational storage in terms of symbolic modality. Sperry's research did not include work conducted with elementary school children, nor was a child variable present in a study which pertained to Galvanic Skin Response (GSR) readings (Kaplan, Kaplan, & Sampson, 1968). This study, which maintained support for the double-encoding hypothesis, recorded the Galvanic Skin Response readings of subjects being presented word and picture stimuli. The authors detected different levels of arousal in subjects depending upon the type of stimulus (word or picture) presented. Maintaining that under the word stimulus condition, GSR results predicted both word and picture recall, while the results of GSR of pictures did not, the authors interpreted these data to indicate that both words and pictures were encoded verbally, but only pictures were encoded both verbally and visually.

According to Bousfield, Esterson, and Whitemarsh (1957), physical vividness and the compounding of stimulus elements were the primary variables involved in picture superiority in free recall. The authors found that nouns presented with colored pictures were remembered best, followed by nouns presented with non-colored pictures, which were followed by nouns presented alone. Thus, the more vivid and compound the stimuli, the easier they were to remember. A corresponding experiment executed by Paivio, Rogers, and Smythe (1968), used colored and un-colored sets of both pictures and their noun labels as stimulus items. They purposed that

if the physical vividness or compounding of stimulus elements affected recall, then recall should be better for colored words as well as colored pictures, compared to their respective uncolored conditions. It was found that in free recall, subjects actually remembered fewer colored items compared to uncolored items, although the color effect was not statistically significant. The subjects recalled significantly more picture items than word items, and the author concluded that the picture superiority was due to factors other than physical vividness and compounding of stimuli. These findings are evident with mature adults but there are no studies on the effects of these variables with younger subjects.

The effects on recall of cognitive transformations of word and picture stimuli were explored by Fischler and Puff (1971). Sixteen nouns were presented (as words or as simple drawings) to subjects who either wrote the verbal labels for recalled items or drew simple pictures of the items. This resulted in four combinations of stimulus-recall conditions: pictures recalled as pictures, pictures recalled as words, words recalled as pictures, and words recalled as words. Results showed no significant difference in ease of recall among the four conditions, suggesting that cognitive transformations had no effect on recall.

The effect on free recall was examined in a study by Joseph and Joseph (1980) when transformed nouns were presented auditorily. Nouns were presented via tape

recording, and subjects were instructed to transform the nouns into printed words, pictures, or mental images. Significantly more items were recalled after having been transformed into pictures, as opposed to items transformed into printed words. However, as a form of recall, drawing pictures was significantly inferior to printing words. In addition to these findings, there was no significant difference in recall between words, pictures, and a control activity when subjects were instructed to imagine the nouns in printed or drawn conditions, rather than actually printing or drawing the items. The researchers concluded that some sort of physical presentation of stimuli may be necessary in order for cognitive transformations to have a significant effect on free recall. These findings were supported by Joseph, McKay, and Joseph (1982).

In a study done by Joseph and Cowan (1981) it was found that the concreteness of the transformations and the form of the presented stimuli were not crucial variables influencing free recall because there were no significant differences if the stimuli were presented visually or auditorily, or whether subjects imagined, traced, or penciled their responses. That conclusion was reinforced by Joseph, McKay, and Joseph (1982), and Joseph, Joseph, and Beasley (1982).

Very recently, a study (Joseph, Waln, & Stone, 1984), was conducted in order to explore the effects on free recall of pictures and various types of word stimuli in conjunction with the variables of gender and type of transformation

performed on the stimuli. This study attempted to describe fully in words the picture stimuli that were presented, because a picture's simple word label obviously is not equivalent in complexity to the picture itself. It was found that the type of presented stimulus (word or picture) affects recall, and the results indicated that more stimuli in the picture form were remembered than both types of word stimuli. The results support the double-encoding hypothesis.

It is obvious that there is adequate representation of studies pertaining to adults and their ability to recall, but research on the topic of memory and recall with children is a neglected area of exploration.

Studies on recall with children indicate that when recalling, the child is most likely to do so in terms of perception or sensory images. For example, five-year olds used more sensory imagery and adults used more conceptual imagery in a test of remembering similar sentences. This process is known as iconic representation, meaning a mental picture or image (Smart & Smart, 1967).

Piaget's (Muuss, 1967) stages indicate that the maturing human organism goes through various stages of cognitive development. The memory processes are undoubtedly influenced by the stages of cognitive development. Just how the stages of cognitive development affect free recall is not known.

The purpose of this study was to determine whether there are differences between adults and children in their

free recall of various forms of stimuli. It was predicted that the adult population would be able to recall more stimuli than children as the result of the type of stimulus (pictures, simple words, complex words) presented, and as a result of the cognitive transformations performed on the stimuli (imagining as pictures or describing in words).

CHAPTER 2

METHOD

Subjects

The subjects consisted of 60 college students from Introductory Psychology classes at Emporia State University and 60 subjects from Butcher Children's School. The elementary students ranged in age from seven to eleven.

Design

a 3x2x2 between subjects design was used with the dimensions being grade level, type of stimulus (pictures, simple words, or complex words), and type of cognitive transformation (describing stimuli in words or imagining stimuli as pictures).

Materials and Instrumentation

The stimuli or pictures and words were apportioned individually on 3"x5" cards. The picture stimuli consisted of twenty-four drawings of easily identifiable objects or concepts (see Appendix B). For each of the pictures there was also a 3"x5" card bearing a simple word label. The stimuli in their simple word forms were: HAT, SHEEP, CAR, GLASS OF WATER, TREE, JUDGE, SNAKE, AIRPLANE, PRISONER, CHAIR, GLOVE, DOLL, CIRCLE, COAT, HAMMER, CARROT, CLOCK, LION, CAR WRECK, BEE, BROKEN ARROW, MONKEY, BANANAS (see Appencix C). A third set of twenty-four 3"x5" cards yielded

the stimuli in their complex word forms (see Appendix D). The complex word stimuli included simple word labels and complete verbal descriptions of the pictures. The complex word descriptions were developed by submitting the picture stimuli repeatedly to subjects, instructing them to list in words the attributes of the pictures until there was virtually unanimous agreement that the list totally described the pictures.

Procedures

The testing procedure was done on a small group of five basis. When the subject entered the testing situation, he/she was informed that he/she was participating in an experiment, but he/she was not told the nature of the experiment. A general instruction sheet (see Appendix E) was given to the subject and he/she was asked to read the instructions silently to him or herself. The examiner then read aloud one of the following series of specific instructions to the subject:

PICTURE/IMAGE AS PICTURE: Twenty-four pictures will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then imagine it as a picture.

PICTURE/DESCRIBE IN WORDS: Twenty-four pictures will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then describe the item in words.

SIMPLE WORDS/IMAGINE AS PICTURE: Twenty-four words or phrases will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then imagine it as a picture.

SIMPLE WORDS/SAY ALOUD: Twenty-four words or phrases will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then say the word aloud.

COMPLEX WORDS/IMAGINE AS PICTURE: Twenty-four items will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then imagine it as a picture.

COMPLEX WORDS/SAY ALOUD: Twenty-four items will be presented visually with up to fifteen seconds between each presentation. Your task will be to look at the item presented, then say the words aloud.

After the twenty-four items were presented to the subject, he/she engaged in an interim control activity for two minutes (see Appendix F). The subject was given a typed sheet instructing him or her to "Begin at 300 and write backwards by twos. Continue to do so until you are told to stop."

The subject was then instructed to write on a prepared sheet (see Appendix G) as many of the items as he/she could recall. The recall period lasted five minutes. Following the recall period, the subject was asked to rate on a scale

of 1 to 7, his or her own performance on the task of being able to imagine the pictures (see Appendix H).

Data Analysis

A three-way between-subjects analysis of variance was used to analyze the data collected. Tukey's test for unconfounded means was used to determine differences between interaction means. A strength of association measure (ω^2) was calculated in order to determine how much of the variance was accounted for by the significant results.

CHAPTER 3

RESULTS

The purpose of this chapter was to present the results of a statistical analysis that was conducted on the data. A three-way between subjects analysis of variance was used to determine any significant differences between experimental groups (see Tables 1 and 2).

The type of stimulus presented to the subjects (pictures, simple words, or complex words) accounted for a significant difference in the number of stimuli recalled, F (2,119) = 20.80, $p < .01$. The Tukey's test indicated that picture recall (mean = 11.82) was significantly higher ($p < .01$) than the complex words condition (mean = 7.55). There was no significant difference between picture and simple word conditions (mean = 9.45). There was a significant difference in the number of stimuli recalled as a result of grade level, F (1,119) = 64.35, $p < .01$). The college level recalled more items (mean = 11.78) as opposed to the elementary children (mean = 7.43). The third factor, type of transformation, also resulted in a significant main effect, F (1,119) = 38.93, $p < .01$). Imagining the stimuli in the form of a picture (mean = 11.30) resulted in higher recall scores than describing the stimuli in words (mean = 7.92). There were no significant interaction effects.

In order to determine how much of the variance the significant results accounted for, a strength-of-association measure (ω^2) was calculated. Stimuli differences accounted for 13% of the population variance; group age difference accounted for 24%; type of transformation differences accounted for 14%.

The subjects rated themselves on their performance. The only significant effect occurred as a result of the type of stimuli used. The ratings were done on a one to seven scale with a score of one meaning very poorly and a score of seven meaning very well. The mean rating for pictures was 4.38; the mean rating for complex words was 3.45; the mean rating for simple words was 4.77. There was a significant difference ($p < .05$) between the simple word and complex word ratings. As indicated by the means, simple words were rated higher than the complex words. There was no significant difference found between ratings of picture performance and complex word performance.

A strength-of-association measure (ω^2) was calculated in order to determine how much of the variance was accounted for by the significant results. Rating differences, as a result of type of stimuli, accounted for 9% of the population variance.

CHAPTER 4

DISCUSSION

A thorough review of the literature indicated that there were studies which involved memory and free recall with adults, but there were no published studies which compared adults and children using the variables of words and pictures, and type of transformation in the area of free recall.

Data for this study was collected in groups of five or less. Each group was asked to sit in a semi-circle and be attentive to the administrator. While in the semi-circle, the General Information Sheet and the Interim Control Activity Sheet were presented to the subjects. When the recall sheet was administered, all subjects were separated to ensure that there was no copying of answers. This was necessary, especially for the child subjects, in order to enhance the validity of this test.

The results show that adults recalled more stimuli overall than children. One explanation for these findings may be that children were unable to handle tasks as well as adults. The novelty of a child variable in this study indicates a definite need for further refinement of the assessment instruments.

It was found that on the General Instruction Sheet (Appendix E), and the Interim Control Activity Sheet (Appendix F), the child tended to concentrate on the separate tasks rather than perceiving the experiment as a whole function. When each child was asked to rate themselves as to how well they performed the recall task, they generally became confused about the entire concept of rating themselves. Piaget's (Muuss, 1967) theory supports these findings. His view of the development of rules of transformation indicate a progression from the sensory motor stage which utilizes rules of action, to the preoperational stage, to the concrete stage in which representation and reversibility are gradually developed, to the formal operations stage in which rules of an abstract nature are acquired to give the mature human a wide flexibility in manipulating his environment. It is suggested that when data is collected from children in future studies of thisnature, that all tasks and instructions be simplified to enable the child to have a clearer understanding of what he/she is supposed to do.

Due to the type of stimulus used, it was found that there was a trend in favor of more items being recalled as a result of picture form for both the students and the children, but it was not significantly higher than simple words, although it was significantly higher than complex words. Previous studies have demonstrated a consistent superiority for picture recall in comparison to simple word recall. The fact that this consistent finding was not supported in this

study with children reflects the importance of considering developmental level as a pertinent variable in memory research. The double encoding hypothesis, perhaps, needs to be modified to exclude children. More research is needed to clarify these results.

The attitudes of the adult subjects were generally cooperative, although the children became restless and frustrated, probably due to the length, subject matter, and task involved of the test. This greatly reduced the concentration of each group as a whole. Future studies should endeavor to control for the detrimental experimental condition effects on children due to the complexities of the task demands placed on them.

TABLES

Table 1

Analysis of Variance Source Table

Source	df	SS	MS	F
A (Type of Stimulus)	2	367.0117	183.5059	20.8022*
B (Grade Level)	1	567.6758	567.6758	64.3516*
C (Transformation)	1	343.4063	343.4063	38.9285*
AB (Stimuli x Grade Level)	2	32.5508	16.2754	1.8450
AC (Stimuli x Transformations)	2	40.2188	20.1094	2.2796
BC (Grade Level x Transformations)	1	0.0078	0.0078	0.0009
ABC (Stimuli x Grade Level Transformations)	2	27.0039	13.5020	1.5306
Total	119	2330.5938		

* Significant at .01 level

Table 2

Analysis of Variance Source Table

Source	df	SS	MS	F
A (Type of Stimulus) 6.4281	2	36.9500	18.4750	6.4281*
B (Grade Level) 1.6701	1	4.8000	4.8000	1.6701
C (Transformation) 0.0116	1	0.0334	0.0334	0.0116
AB (Stimuli x Grade Level) 0.3740	2	2.1499	1.0750	0.3740
(Grade Level) x ... formations) 0.2897	1	...	...	...
ABC (Stimuli x Grade Level x Transformations) 0.6292	2	3.6167	1.8083	0.6292
Total	119	359.2002		

* Significant at .01 level

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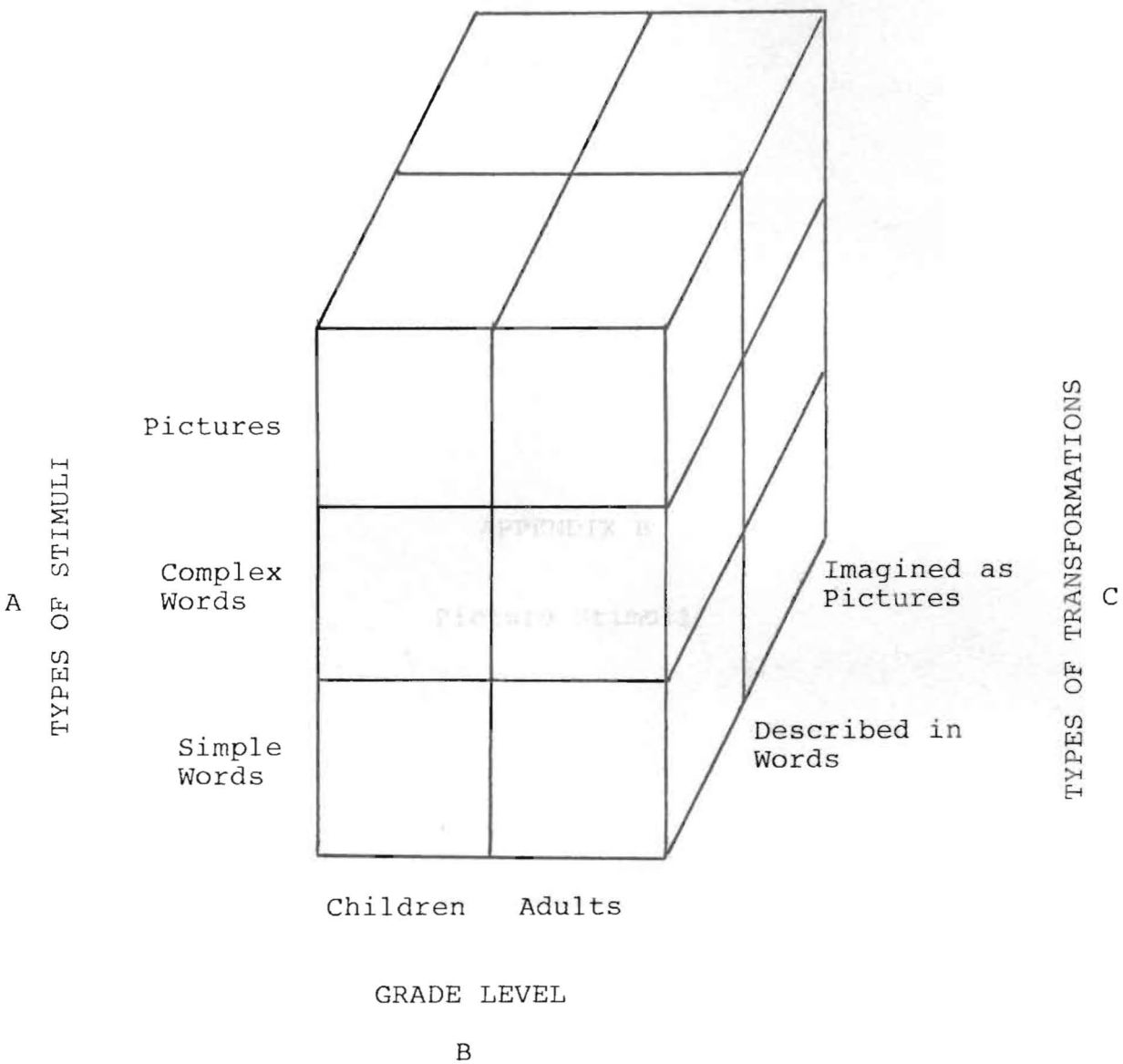
APPENDICES

APPENDIX A

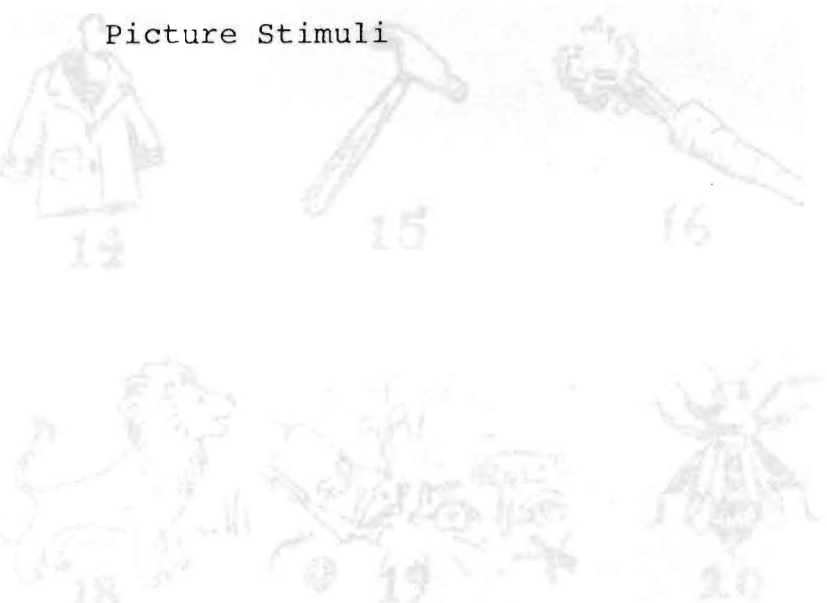
Factorial Design

3 X 2 X 2 Analysis of Variance



APPENDIX B

Picture Stimuli

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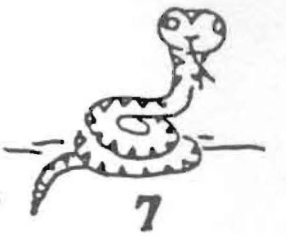
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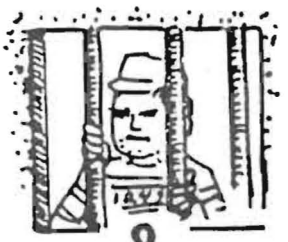
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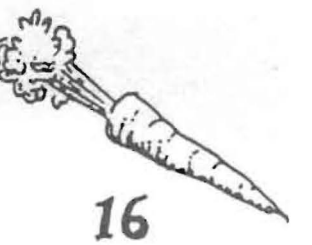
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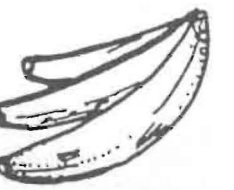
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APPENDIX C

Simple Word Stimuli

HAT -1-	SHEEP -2-	CAR -3-	GLASS OF WATER -4-
TREE -5-	JUDGE -6-	SNAKE -7-	AIRPLANE -8-
PRISONER -9-	CHAIR -10-	GLOVE -11-	DOLL -12-
CIRCLE -13-	COAT -14-	HAMMER -15-	CARROT -16-
CLOCK -17-	LION -18-	CAR WRECK -19-	BEE -20-
BROKEN ARROW -22-	BABY -22-	MONKEY -23-	BANANAS -24-

APPENDIX D

Complex Word Stimuli

A HAT Front view-male hat-hat band-feather-groove in top-medium brim. -1-	A SHEEP Standing left side view-wooly body-hare four legs and face-tail-ear eye-nose-mouth-hoofs-background grass. -2-	A CAR Right side view-old model-two side doors with windows showing-fenders half covering the two wheels-front and rear bumpers-right headlight and tail light-patch on rear tire-hood, side of top, and part of front and rear windshields visible. -3-
A GLASS Transparent (clear)-cylinder shaped-larger at open top-approximately half filled-standing on a surface. -4-	A TREE Medium thick trunk-bushy with a lot of leaves-two main branches in a V from the trunk-branches-top of roots visible-on level ground. -5-	A JUDGE Front view-looking to his right-seen from chest up-holding wooden gavel in right hand on surface before him-wearing robe, collar, tie, bowless glasses-stern looking-mouth-nose-ear-hair thin and parted on the left. -6-
A RATTLE SNAKE Front view of head-two eyes-forked tongue out-coiled body on a surface-head erect-dark triangular markings on light background-rattle on tail. -7-	AN AIRPLANE Top view-nose pointed slightly upward to viewer's right-four propeller motors-USAF on right wing -on left wing a circled star-two wings-each side has six windows-front window-rudder-tail has dark line markings. -8-	A MAN IN JAIL Front fiew-seen from chest up in window-three bars in thick window-wearing hat-grasping bars-stern looking-mouth-nose-eyes-part of hair and left ear visible-unshaven or rough full face-horizontal striped shirt with numbers 1242 on chest. -9-
A CHAIR Front view-facing slightly to the right-wood patterned-solid wooden seat-five spaced slats on the back with a solid board at the top-four legs connected with four rungs. -10-	A GLOVE Top view-fingers pointed slightly upward to viewer's right-left handed-four fingers and thumb-three lengthwise pleats on top-stitching at seams -fur sticking out opening. -11-	A RAG DOLL Standing front view-smiling -shaggy hair-eyes-nose-mouth-dimples-eyebrows-arms hanging-wearing short sleeve blouse with a dress, jumper, or apron on top-legs-horizontally striped stockings-shoes-slip or panty showing on left leg. -12-

A CIRCLE Medium thick, dark circular ring-empty center. -13-	A COAT ON A HANGER Front view-a short coat with wide lapels-and pocket on the right side-two front buttons-strap on sleeve with button-patterned lining-draped on a triangular wire hanger-hanger hook at top with end to viewer's right. -14-	A HAMMER Side view-head pointed slightly down to the viewer's right-claw on the back for nail pulling-front of head circular with flat end for pounding nails-wood patterned handle. -15-
A CARROT Stock slanted upward to viewer's left-stock has bushy leaves at top-root is triangular cone shape, tapering to a point-root pointing right and down-patterned with circular markings. -16-	AN ALARM CLOCK Front view-two bells on top-round face-all numbers marked in position and dots indicate minutes-hands show about eight minutes before two o'clock-two front legs-standing on flat surface. -17-	A LION Right side view-standing high on four legs-head held high-bushy mane-mouth open-eye-ear-nose visible-tail curved and pointed upward-tall grass in background-four paws visible. -18-
AUTOS IN COLLISION Two autos in accident-left side of right car in view-top view of left car-fronts of both cars pushed in and dented-parts strewn around-body to right foreground below right car-tire off left car and below it and water shooting from radiator-door open on right car. -19-	A BEE Top view-head pointed up-two eyes-two veined wings-two antennae-six legs spread out-bands around body-tail stinger-thick rear legs. -20-	A BROKEN ARROW Broken and the front end is shorter than the tail-tail with feathers is pointing upward to the left-arrow-head end pointing steeper than tail upward to the right-lines suggesting impact where arrow is broken. -21-
A BABY Face view-smiling-leaning on pillows-feet pointed downward and to his left-left arm up in a wave-right arm on pillow-wearing a diaper-a little wavy hair on head-hands-eyes-nose-ears-legs-feet-bellybutton-eyebrows-dimpled. -22-	A MONKEY Smiling left side view-flat top head-standing high on four limbs grasping branch-tail pointed upward with end curled-trees in background-eye-nose-ear visible. -23-	THREE BANANAS Side view-attached together at one end-curved and pointed upward to the right-front one largest-rear smallest-bruise or ripe spots. -24-

APPENDIX E

General Instruction Sheet

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1 2 3 4 5 6

M F

Student's Name (print) _____

Instructor _____ Section _____

Thank you for participating in this research project. When we have collected and analyzed all the information, we will convey the results to your instructor so that he or she can discuss the project with you. In the meantime, please do not tell your fellow students anything about this study.

APPENDIX F

Interim Control Activity Sheet

Begin at 300 and write backwards by twos. For example 300, 298, 296, etc. Continue until you are told to stop.

APPENDIX G

Recall Sheet

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List as many of the items that were presented on the cards as you can. Continue until you are told to stop.

APPENDIX H

Subject Self Rating Sheet

Rate how well you were able to perform the activity during the time that the items were presented to you.

Very Poorly _____:_____:_____:_____:_____:_____:_____: Very Well