To the Graduate Council:

I am submitting herewith a dissertation written by Karen Michelle Coop entitled "The Use of Induced Imagery to Increase Reading and Listening Comprehension for Learning Disabled Students." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

Michael Johnson, Co-Chairman

Harvey Kaufman, Co-Chairman

We have read this dissertation
and recommend its acceptance:

Accepted for the Council

Vice Chancellor
Graduate Studies and Research

THE USE OF INDUCED IMAGERY TO INCREASE READING AND LISTENING COMPREHENSION FOR LEARNING DISABLED STUDENTS

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Karen Michelle Coop

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ABSTRACT

The purpose of this study was to investigate the practical significance of the use of an induced imagery strategy to increase the reading and listening comprehension of children with visual-spatial skills superior to verbal skills as demonstrated on the Wechsler Intelligence Scale for Children-Revised. The subjects were 9 to 11 year old boys identified as "Learning Disabled" by certified assessment specialists in the Metropolitan Nashville School System.

Subjects completed a paired-associate task proposed in past research to discriminate between students whose reading comprehension skills would increase with a visual imagery strategy. In addition, a single subject, multiple baseline design was used to demonstrate the effect of practice in generating descriptive visual images while completing either a reading or listening comprehension task.

Results suggest no significant effect for the imagery strategy for the reading comprehension task and only a possible effect for the listening comprehension task. Observational data however, suggested that the reading task was less compatible with an imagery strategy than the listening task. The paired-associate task was not a predictive instrument for these students.

Possible variables which might account for the differential effect of imagery with listening and reading comprehension were discussed.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	Introduction	1
	A. Review of the Literature	2
	Visual Imagery as a Verbal Facilitator	2
	Cognitive Characteristics of Poor Readers	15
	Reading, Reading Difficulties, and the Possible Role of Visual Imagery in Reading Comprehension	32
	B. Summary and Justification For Research	45
	C. Research Design	46
	D. Hypotheses	48
II.	The Experiments	49
	A. Experiment I	49
	Method	49
	Results and Discussion	51
	B. Experiment II	58
	Method	58
	Results and Discussion	66
	C. Experiment III	78
	Method	78
	Results and Discussion	81
III.	General Discussion	100
	A. Conclusions	100
	B. The Ineffectiveness of Imagery as a Facilitator of Reading Comprehension	101
	C. Implications for Further Research	110
List of References		113
Appendixes		120
	Appendix A Subject Information	121
	Appendix B Description and Examples of Spache Reading Diagnostic Scales and Levin's Paired-Associate Task	128
	Appendix C Story and Question Information	131
	Appendix D Imagery Intervention Material	165
Vita		176

LIST OF TABLES

TABLE		PAGE
1.	Number of Correct Word and Picture Associations on the Levin Paired-Associate Task	52
2.	Mean Number of Correct Word and Picture Associations by Different Performance Groups	53
3.	Spearman's Rank Correlations Between WISC-R and Paired-Associate Task	54
4.	Spearman's Rank Correlations Between Word Recognition Skills on Spache Versus Paired-Associate Task and WISC-R Scales	56
5.	Average Number of Correct First Responses Under the Baseline Condition	73
6.	Pearson Product-Moment Correlations Between Decoding Errors and Correct Responses to Reading Comprehension Questions	74
7.	Revusky's RN Statistic Applied to Listening Comprehension Results	85
8.	Mean Number of Correct Responses to Listening Comprehension Questions Before and After Intervention	87
9.	Mean Number of Error Types Under Baseline and Intervention Conditions	92
10.	Percentages of Relative Increase in Performance Compared to First Three Stories	95
11.	Percentage Means of Relative Increase in Performance for Different Treatment Conditions	96
12.	Word Selection Percentage by Third Grade Students on Clozure Exercise	133

LIST OF FIGURES

	FIGURE	PAGE
1.	Multiple Baseline Schedule Used in Experiment II	63
2.	Number of Correct First Responses to Reading Comprehension Questions Before and After Intervention	67
3.	Reading Comprehension Performances and Hypothetical Data Illustrating A Significant Behavioral Change	69
4.	Number of Correct First Responses and Elaborated Responses to Reading Comprehension Questions	71
5.	Multiple Baseline Schedule Used in Experiment III	80
6.	Number of Correct First Responses to Listening Comprehension Questions Before and After Intervention	82
7.	Number of Correct First Responses and Elaborated Responses to Listening Comprehension Questions	90
8.	Number of Factual Errors on Listening Comprehension Questions	94
9.	A Picture Pair from the Levin Paired-Associate Task	129
10.	A Sample Page from the Student Response Booklet for the Levin Paired-Associate Task	130

CHAPTER I

INTRODUCTION

The purpose of this study was to investigate the role of visual imagery as a possible facilitator of reading comprehension for a specific population. The population of concern is 9 to 11 year old boys classified as "learning disabled" who have difficulty with reading tasks and have WISC-R profiles suggesting greater visual-spatial skills than verbal skills.

The literature reviewed in this section includes (1) experimental studies concerning imagery as a verbal facilitator, (2) a discussion of the cognitive characteristics of poor readers, and (3) a brief overview concerning the complexity of the reading task, the nature of reading difficulties, and the possible benefit of an imagery stratagy for a specific population of poor readers. The goal of this reveiw is to integrate evidence from these different fields of study which suggest that the specific population of poor readers having high visual but low verbal skills might benefit from an imagery strategy to increase reading comprehension.

The literature review will be followed by a summary and justification for the study undertaken. This chapter will also include the specific hypotheses to be investigated.

The three experiments which make up the experimental portion of this dissertation are presented consecutively. A general discussion is included as the final chapter in the study.

A. REVIEW OF THE LITERATURE

Visual Imagery as a Verbal Facilitator

The use of imagery as a facilitator of verbal learning has been studied by many investigators and has a long history in psychology. Seen as of great importance to the founders of psychology as a science, Galton, Wundt, Titchner, the study of imagery came into disfavor for several decades with Watson's attempt to purge psychology of "mentalistics events". Over the past twenty years however, the study of imagery has again gained respectability. Bugeleski credits Mower (1960) as being the first major researcher to "speak of imagery without feeling as if he were uttering obscenities". The rennaisance of interest in imagery which spread in the '60's included many of the reasearchers who still lead this field of study today. Richardson published "Mental Imagery" in 1969, and articles from Allen Paivio at Western Ontario, William Rohwer at Berkley and Gordon Bower at Stanford began to attract growing attention.

Paired Associate Investigations

Until recently the majority of studies concerning imagery and verbal learning have concentrated on paired-asscoiate learning tasks (Paivio (1969), Milgram (1967), Reese (1967), Rohwer (1970), etc.).

In a 1972 review, Joel Levin summarized the various types of investigations conducted utilizing paired-associates with a four cell model contrasting the "Methods of Strategy Evocation", either induced or imposed, and the "Nature of the Strategy" either verbal of imagery.

		Nature of Stategy	
		Verbal	Imagery
Method of Evocation	Imposed		
	Induced		

The majority of work with imagery and paired-associate learning has been with different verbal and pictorial stimuli imposed on the learner. An example of an imposed verbal strategy would be the manipulation of the semantic or syntactic properties of the material. Paivio (1969, 1971, and others) has done extensive studies demonstrating that the more concrete a word pair is, the more likely it is to be recalled. Levin describes imposed pictorial strategies as those "in which characteristics of the learning materials are made more or less imageable along either a concrete-abstraction or a dynamic-static dimension" (p. 2). Dilly and Paivio 1968, and Rohwer 1970 are examples of studies using this type of strategy.

Levin summarizes the years of study of imposed verbal and pictorial imagery strategies by arranging the stimuli materials into a hierarchial "tree" of imagery facilitation. On the verbal side of the tree it has been fairly well established that 1) concrete noun pairs embedded in meaningful English sentences are more easily remembered than 2) concrete noun pairs in prepositional phrases, which are more easily recalled than 3) the same pairs embedded in conjunctive phrases or with no accompanying context; which in turn are more easily remembered than 4) abstract noun pairs which in turn are more easily remembered than 5) nonsense syllables. (Goss & Nodine, 1965; Paivio, 1969; Robwer, 1967; and others.)

On the imagery side of the "tree" 1) animated pairs of familiar objects involved in dynamic interaction are more easily recalled than 2) the same pairs in static interaction, which are more easily learned than 3) familiar objects placed adjacent to one another, which are easier to recall than four pictures of adjacent pairs, or five pictures of unfamiliar pictures pairs, (Iscoe & Semler, 1964; Rohwer, Lynch, Sucuki & Levin, 1967).

Induced imagery strategies refer to strategies which are "induced" in learners before the learning task, usually in the form of of an instructional set by the experimenter. Here the materials to be learned are not presented in differing forms but the subjects are requested to generate verbal or pictorial mnemonics which will aide in learning the task before them.

Levin argues that the distinction between imposed and induced strategies is important because to gloss over the differences in methodology results in controdictory findings.

Recently a number of experimenters have turned from laboratory studies of paired-associates to the study of imagery in connected discourse. Here the distinction between imposed and induced imagery strategies takes on importance because of the difference in the practical applications of research findings. While research into the effects of imposed imagery strategies may guide decisions concerning the optimum way of presenting instructional material, induced strategies offer the opportunity of teaching learning strategies which could apply to any given task.

In a 1971 theoretical paper Levin argues,

> While the "Imposed" approach caters to individual and group differences through the presentation of differentially effective organizations, the "induced" approach promises the greatest educational payoff beyond the confines of the well-organized text-book, the

> optimally sequenced teaching machine, and the multi talented teacher. Equipped with efficient induced strategies, the child will be less dependent on the quality of stimuli in his enviorment, for he will be capable of reorganizing, elaborating, and concretizing relatively disorganized, unelaborated and abstract materials. (p. 6)

William Rohwer makes a similar point in "Images as Pictures in Childrens' Learning" (1970), when he states,

> The child cannot always count upon the world to offer up the information in optimal ways: therefore, he should be equipped to transform information himself into a form that renders it maximally memorable. (p. 402)

The benefit of induced imagery strategies then, lies in the ability of the user to apply his or her trained skill to materials in many independent learning situations. It is the possibilty of an induced imagery strategy which was the focus for this research.

The remainder of this chapter will be confined to the use of induced imagery as a learning strategy.

Induced Imagery and Prose

Researchers have demonstrated that inducing imagery in subjects can increase their memory for passages they read.

In an indirect test of induced imagery's effect on recall, Anderson and Hidde (1971) asked college students to rate either the pronouncability or the imagery vividness of 30 sentences (presumably contrasting the effectiveness of subvocalizations with attempts to create visual images of the presented sentences). In a surprise recall test, the imagery rating group remembered more sentences and sentence parts that the pronouncabilty rating group.

In a more direct investigation that same year, Anderson and Kulhavy conducted an experiment in which high school seniors were given a written

passage either with or without instructions to visualize what they were reading. Subjects in both experimental groups were asked to what extent they had used mental images to remember what they had read. Some subjects in the imagery instruction group admitted to not actually using imagery to a great extent while some students in the control group commented that they had used mental imagery extensively. Although the instructions to use imagery were not significant as a main effect, a significant relationship was found between subects reported frequency of imagery throughout the passage and the amount of information recalled about it. Those subjects who reported having used imagery extensively recalled more of what they had read than those who reported using little or no imagery.

Feeling that firmly established reading strategies among college students may have interfered with abilty or inclination to use an imagery strategy, Kulhavy and Swenson utilized 6th grade students for a similar study in 1975. They worked with students in four experimental groups; imagery versus non-imagery instructions and immediate versus delayed testing for recall. Results indicated that the difference between imagery and non-imagery groups for recall was in the expected direction, with the imagery instruction group remembering more of the passage than the controls, but the difference between groups was not statistically significant. When delayed test and immediate test groups were pooled, however, there was statistically significant (P .05) superior performance by imagery instructed students.

Lesgold, McCormick, and Golinleoff (1975) trained third and fourth graders to construct pictures corresponding to stories they read. They eventually phased out the pictures until the students were making only mental images of the

passages. After a four week training period these students could remember significantly more information on some stories than could the control group who had received parallel training in answering questions about what they had read. This relationship held for only some of the experimental stories however.

Pressley (1976) demonstrated that the training session with 8-year olds did not need to be as long as four weeks. He gave children practice at forming mental images and supplied feedback by demonstrating examples of good images. Controls received a parallel training with the same materials. The training took only 20 minutes. All children were then given a lengthly passage to read. Those children who received the imagery training instruction were able to answer more short answer question than those who had not.

Rasco, Tennyson, and Boutwel (1975) had fourth and fifth graders read 400 and 500 word passages. Student groups were instructed to form mental images, use pictures to aide in mental images, read an illustrated version of the passages, or to simply read the passage carefully. Both the imagery strategy and the picture facilitation increased performances on a recall test.

Kerst and Levin, in a 1973 study classified fourth graders on the basis of reading ability and presented them with stories in either printed or pictorial form. In addition, half of the readers given the printed version of the stories were instructed to think of a picture in their minds for each sentence they read. Students with poor reading comprehension skills but adequate vocabularies answered significantly more questions correctly when given imagery instructions than similiar readers without instructions to use imagery (86% versus 60%).

These studies are encouraging, and certainly point to the posssiblity of inducing imagery as a learning strategy. But as Pressly points out in a 1977

review, the disturbing factor in research studies such as those above is that while demonstrated effects were statistically significant, none were very large. For example, in the Lesgold McCormick and Golinleoff (1975) study, imagery subjects recalled 44% of the text, whereas controls recalled 31%. In Pressly (1976), imagery accounts for only 6% of the variance. As mentioned above in Kulhavy and Swenson, there was no significant difference in the immediate post test. These differences are not strongly encouraging if what one desires is a teaching and learning stratagy which could facilitate recall to a practical degree that would significanty benefit the user.

A specific teaching strategy if utilized in an actual classroom situation, will of necessity take a considerable amount of time and effort by the instructor and students. While educators are continually being encouraged to utilize research findings in their teaching, researchers must be able to demonstrate more than a statistical significance which would go unrecognized in less rigorously controlled learning situations.

Individual Differences

Several researchers have suggested that the study of induced imagery and reading might be more fruitful if individual differences were taken into account. In Kerst and Levin (1973) for example, students who were given visual elaborations (imposed imagery) or asked to generate visual imagery (induced imagery) both exceeded controls in ability to recall paired-associates. Interestingly however, the variance in performance among students asked to generate their own images was far greater than that in the other two groups. Some children in the induced imagery group were apparently more able to take advantage of that strategy than others.

Riding and Taylor (1976) presented concrete and abstract prose passages to groups of seven year old children who had been divided on the basis of their performance on imagery measures of Riding and Taylor's design. They found that the best overall image ability was associated with superior recall, while the poorest recall was associated with poor performance on their imagery measure.

Pressley (1977) concludes,

> "It is important to pay attention to individual differences when doing imagery research. Imagery effects have been shown to be more pronounced in some subjects versus others in a task situation. Particular characteristics may determine whether or not a child can make practical use of a visual imagery strategy." (p. 615)

The combined efforts of several researchers, suggest that visual-spatial skills may be a characteristic which could discriminate between subjects who could successfully use imagery as a facilitator in cognitive tasks.

As early as in 1953, Barratt concludes that "imagery is an important component in the solution of those tasks that involve the 'mental' manipulation of spatial relations".

Paivio, in a 1978 study, demonstrated that college students who scored higher on three "spatial-manipulation tests" (Thurstones Space Relations, a shorten form of Minnesota Paper Form Broad, and Guilford's Block Visualization Test) were better able to perform a judgement task on which subjects reported utilizing imagery. (Judging which of two digitally represented times would create the greater minute hand to hour hand angle if represented on the face of a clock.)

Labouvie-Vief, Levin, and Urberg (1975) demonstrated that fourth grade children who did well on Raven's Progressive Matrices (a visual manipulation

task) were better able to use an imagery strategy to facilitate recall than students performing poorly on the Matrices.

Several studies conducted by Joel Levin and his colleagues support the possibility of individual differences in ability to utilize imagery to increase memory for reading passages. Like the Paivio and Labouvie-Vief et al. studies, their experiments descriminate between students on the basis of ability to utilize visual information. Their work is the focus of this study.

High Picture-Low Word Learners

A 1971 study by Levin, Rohwer, and Cleary demonstrated that children could be classified reliably on the basis of their relative ability to learn paired-associates when the to be remembered items were presented visually as pictures or aurally as words.

A paired-associate list constructed of non-labled picture pairs and aurally presented word pairs was presented to elementary school children. The children were then divided on the basis of whether their paired-associate recall resulted in a relatively large or relatively small picture-word difference. It was found that this classification was fairly stable over a two day period when compared with a second parallel paired-associate task.

Levin, Devine-Hawkins, Kerst, and Guttman (1974), attempted to replicate the 1971 findings and to apply them to a prose reading task. In the first of several experiments a paired associate list of pictures and word-pairs were constructed and administered to 4th and 5th grade students. It was found that while all students were best able to recall pictures pairs, the difference between word pair recall and picture pair recall varied greatly.

Students who performed above the groups' mean for pictures were designated high picture subjects (HiPSs.) while those below the mean were designated low picture subjects (LoPSs). Within the HiPSs classification subjects were divided into two approximately equal groups on the basis of their performances on words, either as High Word (HiW) or Low Word (LoW) learners. Three groups resulted. HiP-HiW, HiP-LoW, and LoP-LoW learners. Of 13 students there were only 2 subjects who were LoP-HiW as defined above and these subjects were not included in futher analysis.

These three groups, HiP-HiW, HiP-LoW, and LoP-LoW, were found to be significantly different statistically in the predicted manner. On the picture pair items, both the HiP-HiW and HiP-LoW groups were significantly different from the LoP-LoW group but not from each other, and on the word pair items the HiP-LoW group and the LoP-LoW group were significantly different from the HiP-HiW group but not from each other. On the parallel paired-associate list administered the next day, 9 out of 12 (75%) students who were classifed as HiP-HiW learners were classified the same way on List B, 7 out of 9 (78%) of the HiP-LoW students were classified HiP-LoW students on List B, and 14 out of 20 (70%) students classified LoP-LoW on the first were also classified in the LoP-LoW categories on List B. The authors concluded that this was strong support for the stabilty of this type of classification.

A second experiment attempted to find out if these same learner type classifications would relate to prose learning tasks. Two ten sentence reading passages were constructed, appropriate for reading age levels 9-12, with with ten questions based on each passage to assess comprehension. The paired-associate learning task was presented to a group of 4th grade students. The subjects were

called out of their rooms individually the next day and asked to read the two passages. Half of the subjects were instructed "to make up pictures in their minds" about what was happening in each story as they read.

The difference among learner types were small and non-significant (p .10) when subjects were given instructions to simply read the passage. The mean number of correct answers to the 20 comprehension questions being 16 for the HiP-HiW group, 15+ for the HiP-LoW group, and 14 for the LoP-LoW group. However, when imagery instructions were given, there were significant differences between learner types (F=135.49, df=2/51, p .001). The HiP-HiW subjects and the HiP-LoW subjects both differed from the LoP-LoW subjects, though not from each other. The HiP-HiW subjects averaging 18 correct responces out of 20 questions, the HiP-LoW subjects averaging 17 out of 20 correct, the LoP-LoWs answering an average of 11 out of 20 questions correctly. The requested use of imagery strategy was not significant as a main effect across groups however, possibly because the LoP-LoW group appeared to recall less information than when no imagery instructions were given.

Levin et. al. argue that these findings strongly suggest that learning modalities or "learner types" have been isolated by this paired-associate task. While some students learn well when given information in the form of pictures or words and some students do not learn well from either type of information, for a third group of students "whether they are regarded as learners or non-learners depends on whether the materials are pictures or words". It is this third group, the HiP-LoW learners, that Levin feels can benefit most from an imagery strategy in reading. He interprets the results of this study as an indication that

when an imagery strategy is used, these students perform more like the successful HiP-HW learners than the LoP-LoW group.

In this study and several others Levin argues that it is for this group (HiP-LoW) of readers that "aptitude treatment interactions" are relevant. The way in which the material to be learned is presented greatly effects whether the student is considered a successful or unsuccessful learner. Considering individual differences in aptitude or "learner type" may lead researchers and educators to a teaching/learning strategy utilizing imagery that facilitates learning to a degree that is not only statistically significant but also makes a practical and perhaps even crucial difference for a specific population of learners.

In differentiating learner types along a verbal/visual dimension Levin continues a line of investigation common to research concerning imagery as a learning facilitator. But by suggesting a specific group of learners who may perform below average norms on verbal tasks, appearing to be poor learners in general, but who have the ability to perform above average norms on visual tasks, Levin describes a learner of pressing interest to a much wider range of researchers. Educators, physiologists, nuerologists, physicians, and psychologists have all directed their attention to a small group of learners with these general characteristics. The term "learning disabilty" is used by so many researchers to refer to such varying groups of learners that it is not possible, even after years of attempt, to clearly define the term with unanimous agreement. But most investigators would agree that students who apprear to do well in many learning situations, (especially tasks appearing to require visual-spatial skills, like math) but have great difficulty learning written language are among those learners now labled "learning disabled". Levin's premise that an imagery strategy may

greatly benefit high-picture, low word learners may be of direct relevance to this learning disabled population.

In the Levin, Devin-Hawkins, Kerst and Guttman (1974) study, Levin is not working with students with severe reading difficulties. When a comparison of the three learner types was made prior to imagery instructions there was no significant difference between the reading ability of the three groups.

The real benefit of an alternative learning strategy however, would be among students who do read significantly less well than their peers. It is to this population Levin directs his speculation regarding aptitude treatment interactions, and to this population that a facilitating imagery strategy would be of real value. One question which arises from the Levin et al. study is whether there is, in fact, a population of poor readers having a similar learning style, or being of a similar "learner type" as the high picture-low word learners isolated in his study.

A review of the literature concerning poor or retarded readers strongly suggest that there is a large sub-population within this group which does have skill patterns similar to Levin's High Picture-Low Word learner group. The general conclusions from a large group of studies is that at least a portion of poor readers have average or superior visual-spatial skills but poor verbal (auditory) or sequencial skills.

Smith (1977) argues that one of the most common WISC-R profiles for students currently labled learning disabled is one in which Performance Scale Scores (thought to relate to visual-spatial skills) exceed Verbal Scale Scores significantly. If Levin's theory for high-picture,low-word learners could be generalized to students who are high visual-spatial, but low verbal learners then

this group of students may be able to benefit significantly from an imagery intervention to increase reading comprehension.

The design of the experiments in this dissertation are closely based on the Levin et. al. (1974) study in an attempt to broaden his findings to include this learning disabled population. The remainder of this review will attempt to draw together supporting information from related fields of study which suggest the possibilty of imagery being a successful facilitator for this specific population of poor readers. In concluding this review, a research design based on the Levin, Devin-Hawkins, Kerst, and Guttman study and influenced by the research cited below will be presented.

Cogntive Characteristics of Poor Readers

WISC-R Profiles and Poor Readers

The impetus for much of the research concerning the attributes of poor readers came from studies investigating the relationship between reading and performance on the Wechsler Intelligence Scale for Children. Initally researchers hoped to isolate a WISC profile which would be characteristic of the poor reader. This would make it possible to identify children who were "at risk" of experiencing reading difficulty at an early age.

Early research on this topic was marred by the mixing of male and female subjects in some studies, not specifying the confidence levels of the statistics used in others, generalizing across wide ranges, and varying the criterion for the subject population in terms of IQ, reading level, and type reading measures administered.

The variables considered and the sophistication of the research designs used changed greatly over two decades. In 1952, Graham conducted a post-hoc analysis of records, concerning both males and females from ages 8 to 16, drawn from the files of his university's diagnostic center. The students had been referred to the center for widely varying reasons over a period of many years. His conclusions disregarded age, sex, and emotional stability of the subjects whose WISC profiles were examined. In contrast, Belmont and Birch (1966), in a well respected study, conducted a county wide screening and simultaneous testing of 150 males between the ages of 9 and 11.

C.B.Huelsman presents an excellant review of the search for WISC patterns among poor readers in his 1970 article "The WISC Subtest Syndrome of Disabled Readers". He concludes that despite the differences in methodology "a review of the studies suggests that a pattern is relatively well established."

Out of 23 studies Huelsman reviews, 20 were incorporated into a pattern analysis. From this analysis Huelsman proposes the following conclusions:

1. "A disabled-reader pattern would include low scores in Information, Arithmetic and Coding subtest" (the first two being part of the "verbal" section of the WISC-R and the Coding subtest considered by many researchers to be more of a verbal task than performance). Low scores for these three subtest were found in 16, 20, and 19 of the twenty studies respectively. Low scores in the Digit Span subtest (a verbal subtest) and a high score in Picture Completion (a visual-spatial test) appeared in 12 and 10 of the twenty studies respectively.

2. High Performance IQ scores, generally accepted as tapping visual/spatial and visual-motor skills, in relation to verbal IQ scores appeared in about 60% of the disabled readers.

3. Evidence from these studies support the possibility that the relationship between Verbal and Performance IQs might show "sub-classifications of disabled readers; high Performance IQ-low Verbal IQ, high Verbal IQ-Low Performance IQ, or equal Performance and Verbal IQ".

Huelsman speculates that much of the research between 1952 and 1966 was inconclusive because investigators treated disabled readers as if they were one class. His position here is in strong agreement with Levin's own urging to look at the specific abilities of poor readers, and the High Verbal IQ-Low Performance IQ, High Performance IQ-Low Verbal IQ, and equal Verbal and Performance IQ grouping is conceptually similar to Levin's HiP-HiW, HiP-LoW, and LoW-LoP catorization.

Huelsman concludes his review with a damning criticism for those who would find a single reading disabled profile. He emphasizes that while groups of disabled readers do show high Performance IQ's and low Information, Arithmetic and Coding subtest scores, many individual disabled readers show no elements of this pattern and few disabled readers, if any, show the complete pattern. (The difference between what is characteristic for the group vs. what is of practical importance for the individual is an issue which is of importance to the rationale of this study and will be discussed again later in this paper.) Huelman suggests that the effort to find the disabled reader profile in WISC tests is misguided. Instead, he argues research would be more profitably directed toward "defining the possible significance of differences in WISC scores rather than toward pattern identification which seems relatively useless".

Huelsman's suggestions of differentiating among different types of poor readers, controlling variables such as sex and background, and looking for the

possible significance of WISC performance, does appear to have been the emphasis in this line of research after Belmont and Birch's 1966 study.

Several investigators have suggested that a factor analytic approach to the WISC subtests reveals three or possibly four different factors rather than the two factor verbal/performance categorization for the WISC Scales. In 1968, Bannatyne argued that the subtests of "genetic dyslexic readers" (a term frought with controversy and interpreted here as simply poor readers with average IQ scores) could best be understood in terms of spatial, conceptual, and sequential performances.

Rugel (1974) reviewed 25 past research articles concerning disabled readers (largely the same studies as in Huelsman's review) in terms of Bannatynes three factors. He maintains that the deficit poor readers display in subtests grouped as sequential, can best be explained in terms of deficits in short term memory and attentional processes for sequences of non-meaningful auditory and visual stimuli.

Rugel argues that the apparent superiority of disabled readers in the spatial category in his review supports the premise that strength in the visual-spatial area is characteristic of a large population of disabled readers.[1]

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[1]As a cautionary note it be should mentioned that the relationship between poor reading skills and the High Performance-Low Verbal WISC-R profile may be purely one of correlation rather than causation.

In a 1967 study James Reed investagated the relationship of Performance (PIQ) and Verbal IQ scores to reading difficulty in a manner similar to that suggested by Huelsman. Instead of beginning with poor readers however, Reed administered the WISC-R and a reading achievment test to all children in grades 1 and 5 in three schools. At both levels the children were then divided into three groups. Group 1 consisted of children whose Verbal IQ (VIQ) was greater than thier Performance IQ (PIQ) by ten points or (HV-LP). Group 2 consisted of children whose PIQ exceeded their VIQ by 15 points or more, (HP-LV) and Group 3 (PIQ=VIQ) included children whose VIQ did not differ from their PIQ by more

Rourke, Young and Flewelling (1971) began their study by dividing subjects into three groups on the basis of WISC performances rather than on reading ability. Groups of 9 to 14 year old males with high Performance Low Verbal, Equal Performance and Verbal, or Low Performance and High Verbal scale were compared on reading, math, spelling, auditory perception tasks, and visual perception tasks. Rourke et al. found that the High verbal-Low Performance group was superior to that of the Low Verbal-High Performance group on reading, spelling, and auditory discrimination tasks while the reverse was demonstrated on visual memory and spatial visualization tasks. The Performance=Verbal group performed at a level approximately intermediate between the other two groups.

The WISC-R Performance of elementary school students appears in the above studies to relate to specific cognitive processes. Whether one accepts the three factor or the two factor division of tasks, the conceptual-sequential tasks found primarily on the Verbal scale of the WISC-R appear to correlate with reading and spelling achievement. Large groups of poor readers with average

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than 2 points. Out of 285 students tested at each grade level, 89 first graders and 98 fifth graders could be categorized in this manner.

Reed found that at age 6 the differences in reading scores among the three groups was not significant. But at age 10 the differences among the adjusted means did show a statistically significant difference. Group 1, the HV-LP group, was significantly superior to Group 2 and 3, but Group 2 (HiP-LoV) and Group 3 (PIQ-VIQ) were not significantly different from each other. Using a regression coefficient based on fullscale IQ scores Reed argued that the differences in the reading achievement of Group 1 was a result of superior reading to the level predicted for the HiV-LoP group. He maintained on the basis of these findings that although retarded readers may tend to have the High Performance-Low Verbal profile, the profile could not be said to necessarily cause reading difficulty.

intelligence tend to have higher visual-spatial skills and Performance Scale scores on the WISC-R than verbal-sequential skills, and Verbal Scale scores.

The Wechsler Intelligence Scale and Laterality Studies

Evidence continued to mount suggesting that many poor readers with average intelligence have average or superior spatial skills and poor verbal-sequential skills (i.e. Hunter & Johnson 1974). Sperry and Gazzaniga's work with commissurotomized (split brain) subjects was being published by this time and the spatial versus sequential distinction that was emerging in WISC-R research with poor readers was strikingly similar to the differential abilities being isolated in the lateralization of the human brain. The work of Reed and Reitan (1963) and Rourke and Teledgy (1971), helped to establish the connection between the research in these two areas.

Reed and Reitan (1963) studied adult subjects with recent lesions primarily to the right or left hemisphere. They found consistent relationships between lesions confined primarily to the right hemisphere and selective impairment on the Performance Scale of the Wechsler-Bellevue and between lesions confined primarily to the left hemisphere and selective impairment on the Verbal Scale.

Rourke and Teledgy (1971) cited Belmont and Birch (1966), Reed (1967), Rourke, Young, and Flewelling (1971), as studies "consistent with the view that Verbal IQ-Performance IQ discrepancies on the WISC-R reflect the differential integrity of the two cerebral hemispheres." To further support this contention they compared 9-to 14-year-old children with Full Scale WISC-R scores, between 85 and 115, who had been referred for a neuropsychologic evaluation because of poor academic performance. The children were divided into three groups. In Group I (PIQ>VIQ) Performance IQ scores were 10 points higher than Verbal IQ

scores. In group II (VIQ=PIQ), Verbal IQ scores were within 4 points of the Performance Scores. Group III (VIQ>PIQ) had Verbal scores at least 10 points higher than Performance scores. The groups were compared on a number of psychomotor tasks. They reasoned that if WISC-R performances did reflect cerebral integrity the Hi Performance-Low Verbal group should out perform the Hi Verbal-Low Performance group on these visual-spatial tasks. Rourke and Teledgy found that the PIQ>VIQ group was superior to the VIQ>LPQ group on 22 of the 25 measures. The difference between the two groups being greater on more difficult psychomotor tasks. Rourke and Teledgy concluded that this study, taken with the previous studies cited, provides strong support for the contention that performance on the WISC-R reflects the differential functioning of the two hemispheres. WISC-R performances with high Verbal scale scores and low Performance Scale scores exhibited relative superiority on tasks:

> thought to be subserved primarily by the left cerebral hemisphere (e.g. reading, spelling, arithmetic, speech-sounds discrimination) and relative inferiority on tasks thought to be subserved primarily by the right cerebral hemisphere (e.g. spatial visualization, visual memory, complex visual-motor coordination), whereas the opposite pattern of relative superiority and impairment characterized the performance of the high Performance Scale-low Verbal Scale Profile. (p. 882)

The possible connection between laterality of hemisphere functioning and reading difficulty was certainly not new to reading research. S. T. Orton presented his theory of incomplete dominance resulting in reading difficulties in 1937. Strephosymbolia, (perceiving objects as a reversed image) was one of the most often cited symptoms of reading difficulty. Orton reasoned that while the left hemisphere was the locus of language skills for "normal" right handed children, the right hemisphere was the locus of "mirror image perceptions", which if not suppressed by the dominant hemisphere could compete with the

major hemisphere's processing, causing internal conflict, stuttering, and/or reversals in reading or writing. (Paraphrased from Kershner's "Reading and Laterality Revisited"). Orton's contention that unilateral sidedness (eye, hand, and foot) reflected "normal" brain dominance resulted in many children being mis-labeled as minimally brain damaged or delayed in development because of "mixed" or crossed laterality and was a major reason for the disenchantment with his theories.

More recent research while not emphasizing Orton's concern for the mirror image of the less dominant hemisphere, does support a connection between differential hemisphere processing and reading ability.

Differential Processing in the Cerebral Hemispheres - Background Information

In order to understand the implications of research findings which point to differential processing of the cerebral hemispheres as an aspect of reading difficulty, it is important for the reader to be familiar with some previous research. General findings from research concerning the specialized functioning of the two hemispheres indicate that in right handed individuals the right hemisphere appears to excell in processing information in visual terms, while the left hemisphere excells in verbal-sequential processing. Robert Nebes in his 1974 review, "Hemispheric Specialization in Commissurotomized Man", presented an excellent summary of the research efforts in "split brain" experiments.

He noted that research with commissurotomy patients has confirmed the already well established superiority of the left hemisphere for language and this hemisphere has been found proficient in all language skills. (Gazzaniga and Sperry 1967).

The language ability of the right hemisphere in commissurized subjects is far less clear.[2] The role of the left hemisphere in apparent right hemisphere abilities appears to be a question in almost every area of verbal skill. Gazzaniga and Hillyard (1971) for example, demonstrated that subjects could not correctly identify by a head nod, pictures illustrating passive and active voice, future and past tense, or single and plural number when presented to the left visual field. Since subjects were able to correctly identify the orally presented names of objects presented to the left visual field, Gazzaniga argued that the right hemisphere was unable to recognize relationships between subject object, or verb. Nebes points out however, that another possibility is that the left hemisphere is activated by the auditory verbal input in order to analyze the speech. This activation may interfere with right hemisphere functioning (the dominant hemisphere suppressing the minor hemisphere). Nebes suggests this may mean the command was executed by the right hemisphere without interference because the left hemisphere had to process its own incoming information. Nebes cites several other situations in which inhibition of the right hemisphere by the left may account for results obtained.

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[2]At one point, for example, it was thought that the right hemisphere had no verbal expressive language ability (Gazzaniga, Bogen and Sperry 62, Gazzaniga and Sperry 67). It was later discovered that the subject could verbalize a limited number of words presented to the left visual field (and hence, the right hemisphere) if (1) sufficient time was given and (2) the number of items were limited and their identity already known to the subject. (Gazzaniga and Hillyard, 1971). It was counter-argued however, that this ability was really the result of rapid "cross-cueing" between the hemispheres in which the left hemisphere silently recited the possible list and the right signaled when the correct word was verbalized.

Despite the difficulty in establishing what right hemisphere verbal skills are, because of the possible interference by the left hemisphere, generally it is agreed that the right hemisphere in commissurotomized man is better able to write words than to say them, and better able to identify verbal concepts and directions through pictures than through words. (Levy, Nebes, and Sperry 1970, Nebes and Sperry 1971).

The apparent preference for the visual in language tasks by the right hemisphere is consistent with findings regarding non-language ability of the two hemispheres. In a series of experiments it was demonstrated that the right hemisphere was superior to the left in solving problems involving ability to identify incomplete patterns, or find missing parts from the whole. (Nebes 1971). In addition, evidence indicates that the right and left hemispheres attempt to solve visual problems by different strategies. For example, in finding missing pieces to an object, the left hemisphere appeared to be reacting to details such as number of angles, or length of lines while the right hemisphere appeared to use the "spatially related whole". The right hemisphere was by far superior in this task.

Several experiments demonstrated that the right hemisphere was dominant over the left in decisions concerning the orientation of lines and direction of movement. Levy, Trevarthen, & Sperry, 1971; Warrington and Rabin 1970). In fact, given nonverbal stimuli, subjects invaribly identified the stimulus presented to their left visual fields when alternate forms had been simultaneously presented to both hemispheres. Nebes cites Levy (1972) as suggesting that the primary tendency is for all visual stimuli to be perceived by the right hemisphere, even words, as long as only visual recognition is required rather than

verbal transformation. This may provide a clue as to why some students might attempt to utilize right hemisphere skills to approach the reading task.

As important as the split-brain research has been to our understanding of cognitive functioning, research techniques making it possible to study the laterality of the hemispheres in intact healthy brains may be of even greater importance. The continuing research using dichotic listening and tachistoscopic techniques lends further support for the differential functioning of the two hemispheres and further demonstrates that this differentiation is on-going in the healthy intact human brain.

Kimura (1969) and White (1969) for example, illustrated through the use of tachistascopic projections that the right henmisphere was superior in its ability to locate a series of dots correctly in a spatial grid, and that the left hemisphere was superior in ability to indentify letters and words.

Geffon, Bradshaw and Wallace (1971) found a superiority for nonverbal stimuli (faces) by the right cerebral hemisphere. By careful analysis of reaction times, and the known average interhemisphere transmission time, Geffen et al. attempted to demonstrate that both hemispheres were able to process both types of information but that one hemisphere would be much more efficient than the other.

A 1973 study by Seamon and Gazzaniga not only confirmed the studies of differential functioning for the hemispheres but supplied a vital link for this study between visual imagery and lateral cerebral functioning. The experiment was intended to test the reality of visual imagery versus verbal codes in processing information (a theory to be discussed in the following section). They reasoned that if visual imagery is indeed part of the visual processing system the

dichotomy between left and right hemispheres should be evident when subjects were asked to either subvocalize a pair of words until a recognition response was elicited or to try to form a visual image putting images from both words in interaction. Their results support previously cited studies in suggesting that coding strategies are functionally related to cerebral laterality effects. Reaction times were faster for probes to the right hemisphere than the left when subjects were instructed to use relational imagery, and faster for probes to the left hemisphere than the right when instructed to use verbal rehearsal. Seamon and Gazzaniga suggest that their findings,

> argue for the inclusion of imagery, or generated visual information as part of the visual processing system. As such, generated visual information may be viewed as a coding alternative to verbal mediation. (p. 255)

To resummarize the research findings concerning the differential functioning of the cerebral hemispheres cited above, it has been established that in general among right handed males:

1. The left hemisphere excells in verbal-sequencial skills while the right hemisphere excells in visio-spatial processing.

2. The left hemisphere appears to be proficient in all verbal skills while the right hemisphere's verbal abilities is uncertain.

3. The right hemisphere is known to be most efficient in the more visual aspects of verbal learning, i.e., writing rather than speaking, recognition rather than definition, and identification of concepts through pictures rather than words.

If, as it appears, there is a relationship between cerebral functioning and WISC-R subscale performance, and a pattern of High Performance Scale (or right

hemisphere skills) scores for poor readers, how might the differential characteristics cited above be related to the reading difficulty of these students?

Differential Cerebral Processing and Reading

In a 1973 review, "Reading and Laterality Revisited," John Kershner proposed that superior verbal ability is associated with greater differentiation in one of the cerebral hemispheres for that skill. Students with average intelligence but poor reading skill, may have left cerebral hemispheres which are less differentiated for verbal processing. In a series of studies using the tachistoscope, Kershner (1970, 1971, 1972) found that college students with crossed ocular-manual laterality were superior to lateralized students (both right handed and right eyed) in processing non-verbal information. More importantly, by comparing correlations of the percentage of correct recall for both hemispheres it was seen that, for the students with superior non-verbal processing, performance on word items correlated between hemispheres but performance on nonverbal stimuli did not correlate. For students with superior verbal skills, the opposite was true; performance by both hemispheres on nonverbal stimuli correlated significantly while the performance of the hemispheres did not correlate for verbal stimuli. Kershner interpreted these findings as indications that greater differentiation of the hemispheres for nonverbal stimuli in the crossed students resulted in superior ability with nonverbal material, while greater differentiation of the hemispheres for verbal stimuli in the lateralized students resulted in their verbal superiority.

In similar studies based not on hand-eye preference, but on reading skill, inferior verbal processing was again associated with non-lateralized hemisphere functioning. Several dichotic listening experiments (Sommers & Taylor, 1972;

Witelson & Robinovitch, 1972; Zurif & Carson, 1970) have reported incomplete or reverse dominance for language among poor readers. And a tachistoscopic projection study (Leavell & Beck, 1959) found that among retarded readers in their sample, unlike general findings, the right hemisphere was superior to the left in recalling objects presented.

In a later study, (1977) Kershner compared the performances of poor and successful readers matched for IQ, and gifted students accelerated in reading ability on a taschistoscope projection task. This time a dual projection method was used in which two words were projected simultaneously, one to each visual half field. Again, he found that there was less difference between the right visual half field and the left visual field performances for the poor readers than for both successful reading groups. All three groups of readers recognized more words correctly in the right visual field but the poor readers identified the least number and were more likely to alternate fields. Poor readers identified the highest number of words projected to the left visual field correctly with gifted readers identifying the least number projected to the right visual field. Comparison of hemisphere versus intelligence factors supported Kershner's position that cerebral laterality rather than general intelligence seemed to be the critical factor in this type of word identification task. Kershner interpreted these findings as support for the possibility that,

> the reading-impaired child may be employing a right-hemisphere localized coding strategy for reading...It can be hypothesized...that reading disability may be the result of a perceptual coding strategy (right hemisphere as opposed to left) that is inappropriate to the processing demands made by comprehending text and inefficient for the achievement of academic success via orthodox reading instruction...In summary the findings can be interpreted most clearly as due to a combination of hemispheric-processing differences and the type of coding strategy used by the children. (p.66)

If Kershner is correct and some poor readers are using a right hemisphere strategy to attempt to process written language, then possibly a right hemisphere skill such as visual-imagery could be beneficial as an organizational strategy.

Several other researchers support the likelihood that reading disabled students may be using a less efficient right brain strategy for reading tasks more efficiently processed by the left hemisphere.

Zurif and Carson's (1969) study supports Kershner's contention that some poor readers tend to use the right hemisphere for certain elements of reading processing that successful readers process with the left hemisphere. Using dichotic listening measures and a manual dexterity battery, Yurich and Carson found that poor readers were less efficient in assimilating auditory verbal imput (digits presented simultaneous to both ears). The successful readers showed a preference for information presented to the right ear (bordering on significance) while the poor readers showed no such asymmetry. In fact the poorer readers "exhibited a slight tendency to identify digits delivered to the left ear more accurately than those presented to the right." (p. 358)

Building on the theories of Money (1966) and Semmes (1968), Satz and Sparrow (1970) argue that the characteristics demonstrated among many poor readers, (left right confusion, finger agnosia, calculation difficulty, writing difficulty and depressed verbal intelligence), are the result of a maturational lag in the development of the brain and nervous system. This lag in functional development, they contend, is manifested in a delayed lateralization and differentiation of motor, somatosensory, and language functions associated with the left hemisphere.

In "Brain Theory and Minimal Brain Disfunction" (1973), Gazzaniga lends his support to the premise that reading disorders in children with average intelligence may be related to incomplete differentiation and laterality of the brain hemispheres. But Gazzaniga's perspective differs from the theorists cited above. He points out that in his research with commizerized monkeys when one hemisphere prepares to respond to a stimulus its readiness sends impulses to the other hemisphere which interferes with its processing ability. Gazzaniga argues for this reason and others, it is extremely important for there to be a central processing site (dominant hemisphere) to ensure efficient processing of incoming information. He suggests that the lack of a completely differentiated and lateralized hemisphere where one hemisphere is dominant for reading may underlie the observed reading problems of some poor readers.

Guyer and Friedman (1975) interpret the current studies concerning poor readers and hemisphere functioning more from the perspective of cognitive style or strategy. Their theories suggest a possible link between the lack of differention noted by the above authors and Kershner's proposal that poor readers may be using a right hemisphere strategy for reading. Guyer and Friedman note that the suggested "developmental lag" of many authors may be specific to certain systems of functioning.

> If indeed, cognitive systems are not synchronous in their development, continued use of the better developed system could be expected to result in a 'cognitive style' that would pervade most task operations and should be detectable as a deficit where task requirements and cognitive style are incompatible. (p. 658)

In an attempt to further delineate skills associated with hemisphere processing, Guver and Friedman matched a group of learning disabled boys with a control group of normal readers for age and receptive vocabulary, and

administered a series of academic and cognitive tests.[3] They found that three tests were successful in differentiating between the good and poor reading groups; The Rod and Frame Test, The Verbal Recognition Test, and the Verbal Closure Test. All three of these tasks were considered to be left hemisphere tasks by Guyer and Friedman and the successful readers were superior on all three tasks.

In examining the correlations between cognitive skills and academic achievement it was found that for successful readers the verbal tasks above correlated significantly with their performance on most of the academic measures from the California Achievement Test, the correlation of the verbal cognitive tasks to The Visual Closure Task however, which requires the subject to form a "gestalt" from visual bits of a picture, correlated significantly with achievement measures for the reading disabled group while not correlating with achievement measures among the successful readers.

Guyer and Friedman interpreted these results as suggesting that the reading disabled group was attempting to use a visual right hemisphere (or field dependent) processing strategy for acedemic tasks.

Whether because of genetic predisposition, developmental lag, lack of differentiation, or cognitive style, researchers cited above appear to be in agreement that poor readers may be using right hemisphere strategies for reading tasks more efficiently processed by the right hemisphere.

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[3]These tests included reading and math subtests from the California Achievement Test and the following cognitive tests: The Portable Rod and Frame Test, the Hand Awareness Test, Degree of Lateralization (hand, foot, eye), Visual Sequential Memory, Auditory Sequential Memory, Visual Recognition, Verbal Recognition, Visual Closure, Equivalence (a word meaning similarly measure).

Guyer and Friedman conclude their article by pointing to the already cited Seamon and Gazzanigas' (1973) study describing visual imagery as a right hemisphere skill, and to Paivio's voluminous research indicating that visual imagery can serve as an aid to verbal learning and memory. They call for research "to discover how visual materials and imagery instruction might serve to improve verbal abilities in learning-disabled children."

The experiments to be described in this disseration were an attempt to meet this felt need.

Reading, Reading Difficulties, and the Possible Role of Visual Imagery in Reading Comprehension

In order to appreciate how an imagery strategy might increase the reading comprehension skills of a student who is using a right hemisphere approach for a primarily left hemisphere task, one must have at least a familiarity with the reading process and what is required to master it. The final section of this review is an attempt to acquaint the reader with some of the complexities of the reading task, known reading difficulties, and how an imagery strategy might benefit the select population of poor readers of interest.

The Reading Process--Background Information

While reading is a tremendously complex task, with prerequisite and evolving skills interacting with each other for fluent reading, the learning process may be roughly divided into different components.

Elenor Gibson, in "Learning to Read" (1965), suggests that reading skill can be characterized as receiving communication, making discriminative responses to graphic symbols, decoding graphic symbols to speech, and getting meaning

from the printed page. Gibson suggests that the "receiving communication" ability for reading is relatively well mastered by the verbal four or five year old who approaches the reading task (although there is some dispute as to whether some readers have mastered the complexities of spoken language - see Belmont and Birch, 1966). She proposes that there are three phases of learning which the prospective student must master: "learning to differentiate graphic symbols, learning to decode letters into sounds, and using progressively higher-order units of structure." (p. 1067)

As the result of several research studies (Gibson, Gibson, Pick & Osser, 1962; Gibson, Osser, Schiff & Smith, 1963; A. D. Pick, 1965), Gibson concluded that the main learning task involved in letter discrimination is that of detecting the distinctive features which characterize the different letters. Decoding letters to sounds, she maintains, involves not only learning the individual sound to symbol correspondence, (indeed there is no single grapheme to morpheme correspondence in English), but learning the rules which generate larger and more complex units as reading skill develops. The smallest unit, Gibson contends, is the "spelling pattern" or the "cluster of graphemes...which have an invariant pronunciation according to the rules of English." (p. 1071) Larger units of structure are determined by the syntactic and semantic rules of spoken language. As these levels of structure increase the decoding process involves or evolves into the comprehension of written language.

Gibson's conceptualization of the continuum between decoding and comprehension skills is supported by repeated research findings which suggest that good readers can more easily decode meaningful rather than meaningless words and

sentences, as well as by instructional methods which urge students to use their understanding of the context of a passage to decode unfamiliar words.

Many educators consider letter discrimination and verbal language skills to be part of reading "readiness" and consider the reading task per se to consist primarily of decoding and comprehension tasks. The distinction between decoding and comprehension, while the above mentioned interaction must be remembered, may be important when considering types of reading difficulty.

Reading Difficulties

Isabelle Rapin, a neurologist investigating the involvement of different brain functions in the reading process, suggests the following four categories of reading difficulty based on children's observed reading patterns: These four categories can in turn be grouped into decoding and comprehension difficulties.

Decoding Difficulties

1. Specific Disorder of Phonemic Processing

> ...children who have major difficulty translating graphemes into phonemes. Some of these children possess some look-see vocabulary, i.e. whole word attack skills, even though they have little idea how to break down a word into syllables, what the order of phonemes in the word may be, what letter corresponds to what speech sound, etc. (p. 3)

2. Disorders Effecting Visual Perception.

> ...children having difficulties with spatial relations, directionality, and the processing of visual patterns. They confuse d and b, p and q, etc. They have preserved phonological skills. (p. 3)

Comprehension Difficulties.

3. Aggramatic Readers.

> These children who usually also have phonemic deficits, have difficulty with the small words of language i.e. functors such as articles and prepositions, while they do much better with nouns and slightly less well with adjectives and verbs. They appear to be able to process concrete words better than abstract ones. Inability to process functors

with the processing of sentences and therefore with the extraction of meaning from the text. (p. 3)

4. Semantic Dyslexia.

> These children are able to decode the phonology and syntax of language and have access to the words in their lexicon but have difficulty extracting a meaning from what they read. The difficulty here is usually at the level of the whole idea, or the paragraph, although in severe cases the child cannot process even single sentences for meaning. There is a question whether one can legitimately call this a reading disorder as opposed to a more general disorder affecting language processing or cognition. (p. 3)

There is some disagreement as to whether or not children with reading difficulties fall primarily within one of these categories. While most authorities admit to some mixing of the types of difficulties, others such as Satz and Sparrow (1970) suggest that a student may exhibit the different kinds of reading difficulties described in the four categories at different levels of development. Many poor readers, they argue, experience difficulty with either phonemic processing or spatial relations or both in early reading attempts and difficulty in deriving meaning from what they read as they mature.

This study is concerned with the ability of students to use imagery to increase reading comprehension skills. While as mentioned above, decoding and comprehension may represent two ends of a continuum, several researchers have become especially interested in students having difficulty primarily in comprehending what they read (Rapin's third and fourth category of reader). They have focused on structure or organization of information as the possible key to comprehension difficulties.

Syntactic and Semantic Organization

Written prose imposes an organizational framework on the information it contains. As mentioned earlier, paired-associates which are embedded in

sentences are remembered more readily than paired associates alone. This is generally thought to be the result of the organization the sentence imposes upon the word pairs through semantic and syntactic rules.

One example of what is meant by semantic and syntactic rules interacting to convey the meaning of a sentence, is the model of sentence processing utilizing "deep structure" and "transformational grammar" formulated by Noam Chomsky (1965). Chomsky proposed that there were two levels of syntatic structure to a sentence. The surface level of structure (roughly - the actual wording of the sentence) and the "deep structure", which more closely conveyed the actual meaning of the sentence. He illustrated this concept with examples such as, "The boy is hitting the girl," and, "The girl is being hit by the boy." While these sentences have very different surface structures any "competent" reader will note that the meaning of the sentences is the same. Chomsky argued this is because the two sentences have the same deep structure.

One theory of language processing is that the sequential nature of language requires a surface structure which can be held in short term memory just long enough to make the transformations to deep structure. This more complex deep structure can be gleaned for meaning under less time pressure in long term memory.

Katz and Fodor (1963) among others, suggested that syntactic rules for transformation were not enough to explain the ability to comprehend the message of a sentence. They argued that semantic rules or patterns also played a part. In order to comprehend the meaning of a sentence the reader (listener) needs a lexicon in which the meaning of individual words are stored along with

rules of how the meanings of these words might be effected by different contexts and syntax.

According to this oversimplified model one can see that in order to be skilled at comprehending the meaning of a spoken sentence the listener would need to be able to effectively process both syntactic and semantic rules of language. Language, and hence written prose, is thought to not only establish an organization between words (single thoughts - or images), but between sentences as well. Dooling (1972) suggested that the comprehension of a single sentence is dependent on comprehension of the general context from which the sentence was taken. Bransford, Barclay and Franks (1972), extended this premise by noting that in constructing a wholistic idea of what was being expressed in connecting sentences, subjects also made use of their knowledge of the world.

Slobin (1971) indicated the complexity of what is involved in comprehending sentences when he wrote,

> We cannot hope for a simple metrics of the difficulty involved in processing sentences on the basis of their syntax, because sentences are not used as purely syntactic entities. They are used as syntactic and semantic and pragmatic entities serving cognitive, affective, and social functions. (p. 37)

As complex as the comprehension of sentences is held to be by current linguists, it is still explained in terms of levels of structure or organization. This model is compatible with Rapin's observed categories of comprehension difficulties. "Aggramatic Readers" might be thought of as students having difficulty with syntactic components of language while "Semantic Dyslexics" appear to have difficulty with the semantic aspects of language processing. Added to the complexity of language processing when working with reading comprehension, is the actual breaking of the visual code.

Reading Comprehension

Wiener and Cromer (1967) proposed that poor readers could be categorized into two groups, "deficit" and "difference" readers. The deficit poor readers were readers who lacked the word identification skills, (probably having decoding difficulties), or the general vocabulary to comprehend a written passage. The difference readers were readers who could identify and knew the meaning of individual words but had difficulty comprehending passages never-the-less. Wiener and Cromer hypothesized that the difference readers were using an inefficient and "different" organizational strategy than successful readers.

Cromer (1968), conducted an experiment in which meaningful units of sentences were separated by physical spacing. It was found that "difference" readers were able to make dramatic improvements in comprehension ability while "deficit" readers were not aided by this reorganization.

In a follow-up study emphasizing that it was organizational skills and not solely word identification skills which lead to good reading comprehension, Oakan, Wiener, and Cromer (1970) matched poor and successful readers for age, sex, and general intelligence and compared their comprehension skills in a two-part study.

In the first part of the study, readers with poor word identification skills were given a passage to read and asked questions to establish a base line of comprehension. Next, they were taught to recognize all of the words which were to appear in a second passage of equal difficulty. They were able to both identify and give the meaning of all the words contained in this passage. When asked to read the story, there was no significant gain in comprehension for this second passage. After establishing their own base line, successful readers were

given a transcript of a poor reader's attempt at the second passage (simulating a poor identification condition for the good readers). Their comprehension level for this passage was relatively less than their baseline performance.

During the second part of the study, poor and successful readers listened to tapes of the passages being read by good and poor readers. The poor reading group was able to answer as many comprehension questions as the successful readers on the good rendition of the passage, but fewer after the poor reading of the story.

Oakan, Wiener and Cromer interpreted these findings as suggesting that good identification skills are a factor in comprehension (successful readers' comprehension decreased during the poor identification simulation), but are not sufficient for good comprehension. Poor readers' performance did not increase despite adequate identification skills. When the poor readers were provided with the organization cues of verbal inflection, pauses, etc. on the taped version of the passage their comprehension was comparable to that of the successful readers. Organization, according to these researchers is a necessary component of comprehension. Imposing an additional structure either with verbal cues or written signals appears to increase comprehension among "difference" readers.

Levin (1973), extended the model Wiener and Cromer proposed to include induced as well as imposed organization. Citing Matz and Rohwer's (1971) successful increase of comprehension through line drawings with children from lower socioeconomic backgrounds, Levin argued that these line drawings were providing additional structure for poor readers. While providing structure of a different nature, the additional organization facilitated comprehension just as in Wiener and Cromer's experiments.

Levin suggested that visual imagery could supply additional structure in reading passages by inducing subjects to create an organization. He added that visual imagery, like Cromer's regrouping of text, was dependent on readers having the ability to decode individual words. Visual imagery instructions, if they fostered additional structure, like the regrouped passages, would also differentiate between "difference" and "deficit" readers.

Levin (1973) conducted an experiment in which fourth graders were divided into three reader types: successful readers - reading on grade level or above, "difference" readers - reading below grade level but having vocabulary skills on the Iowa Test of Basic Skills less than one year below grade level, and "deficit" readers - reading below grade level and having vocabulary skills more than one year below grade level. These students were asked comprehension questions based on stories which they either (1) read, (2) read with instructions to make visual images for every sentence, or (3) saw a pictorial rendition (one picture for each sentence).

Levin predicted that the picture version of the story would be facilitative to both poor reader groups as it was in Matz and Rohwer. But this was not the case. The picture treatment was not significantly different from the reading treatment (though both poor reading groups did slightly better on the picture presentation). Levin suggested that the verbal explanation of the stories which accompanied Matz and Rohwer's pictures may have been essential for maximum comprehension of the passage content.

The instructions to make a visual image however was significant as a main effect ($t=2.52$, $df=40$, p .01), and significantly increased the comprehension of both good readers and "difference" poor readers. (Percent of comprehension

questions answered correctly increasing from 81 to 95% for the good readers and from 60 to 85% for the "difference" poor readers.) The "deficit" poor readers performed less well when given imagery instructions than when asked to simply read the passage (74% - 72%).

Levin concluded that his findings strongly supported the contention that visual imagery could facilitate comprehension and suggested that it added an organizational framework which was helpful only to readers who possessed other prerequisite skills needed for reading.

In "Comprehending What We Read: An Outsider Looks In" (1971-72), Levin suggests that the goal in remediating comprehension difficulties is "for poor readers to perform more like good readers." (p. 19) To accomplish this, Levin suggests one of two events must occur: (a) the reading materials must be changed in some way or (b) poor readers must learn to employ some of the successful reading "habits" of good readers .

The imposed struture of Matz and Rohwer's line drawings, or Wiener and Cromer's physical spacing, are examples of the first alternative. Levin argues that induced visual imagery is an example of the second alternative and presumes that good readers are already taking advantage of visual imagery as they read.

> If both good and poor readers can comprehend stories based on pictorial representation then it is reasonable to ask whether good readers are doing something pictorial-like when they are reading regular printed materials while poor readers are not. (p. 24)

The presumption that good readers, are doing something more "pictorial like" as they read than poor readers does not seem to be supported by Levin's own research. In his 1973 study both good and poor readers made gains in comprehension when asked to form images as compared to their performances

when simply asked to read the passages. If good readers already image in this fashion "habitually" why would their performance increase when this strategy was made explicit? Secondly, the Levin, Devine-Hawkins, Kerst and Guttman (1974) study suggests that students who learn well from pictures and not words can benefit from an imagery strategy. Levin suggests in that article that poor readers with this learning pattern may most benefit from using imagery while reading. If there are poor reading students with these skills it seems likely that their "difference" from successful readers (presumed to be skilled in both picture and word learning), would be in their difficulty with verbal learning, not in their similar ability to learn from pictures. Finally, as the preceding section illustrated, successful readers generally have superior verbal skills to poor readers (with a sub-population of poor readers possibly having superior visual-spatial skills to those more successful in reading). The key to what good readers are doing that poor readers are not appears more likely to be in the verbal processing of what they read rather than in something "pictorial-like" they may be doing.

Levin points to the Anderson and Hidde (1970), and the Anderson and Kulhavy (1972) studies, decribed earlier (p. 6), as evidence that good readers are using visual imagery to facilitate recall of what they read. But the fact that imagery seems to be related to retaining meaningful information does not in and of itself imply that this is a technique currently being used by good readers and not by poor readers with decoding skills.

A more probable hypothesis might be that both verbal and visual-spatial structures can aid a reader in discerning and recalling the information they read. Verbal processing skills may be most efficient in interpreting the information

given, as complex linguistic structures are already imposed on this material. Poor readers with the ability to decode single words may differ from successful readers primarily in their ability to process complicated verbal structures. An imagery strategy might be facilatative to both good and poor readers as it presents an additional organization to aid understanding and recall. The most dramatic improvements in comprehension might be expected in the poor reading population, because the imagery strategy may supply a structure which is not available to them through the more efficient verbal processing.

While it does appear that visual imagery may be a strategy which could benefit some poor readers, it may be that visual imagery does not represent a way of making poor readers "more like good readers". But rather, the use of visual imagery may represent an alternative organizational strategy which could augment the verbal organization generally used by successful readers but for some reason not being used effectively by poor reading students.

Allen Paivio's "dual coding" model of cognitive functioning presents a theory which would be compatible with this conceptualization of reading comprehension.

In, "Imagery - Current Cognitive Approaches", Paivio summarizes this aspect of his imagery theory:

> The major theoretical assumption here is that language is closely linked to two basic coding systems, or cognitive modes. One mode is related directly to speech itself; that is we can think in terms of words and their interrelations and these implicit verbal processes can mediate our language behavior. The other code is nonverbal and is presumably tied closely to the private experience we call imagery. (p. 15)

Paivio goes on to theorize that both cognitive modes can be used to determine meaning in language. On the word and the sentence level, Paivio argues tht the more concrete the referents are the more likely a visual image

will be evoked by the material, and this image will become and add to our understanding of the information. The content of a passage becomes very important to understanding what processes may be at work in comprehending the material.

Shimron (1979) succinctly summarizes one possible application of Paivio's dual coding theory to reading passage comprehension.

> The two systems are interconnected and operate in conjunction. Their import, however, is different with regard to any particular task. The verbal system is specialized in representing and processing sequentially presented information. The imaginal system is specialized in representing simultaneous arrays of information. In memorizing concrete words, the two memory systems are at work. Concrete words are encoded in the verbal associative store and, also, in the imagery store. The redundancy of the trace results in better memory of concrete materials, which are stored twice, compared with abstract materials which are stored only once, in the verbal system. (p. 4)

Shimron notes that the semantic processing of a passage involves both propositional and nonpropositional processing. (The encoding of information which can be represented in words and numbers as well as nonpropositional information which can not be encoded easily in this fashion.) He suggests that the use of imagery can facilitate the processing of nonpropositional information such as spatial relations. It is this increased ability to internally integrate the relationships between elements in the text which will result in increased comprehension.

Shimron's speculations involved the benefit of an imagery strategy to any potential learner. The use of imagery by a student who is experiencing difficulty with some aspects of verbal processing may be more extensive. Students who are not effectively processing written information may be able to use an imagery strategy not only to augment the verbal organization already provided by the text, but be able to utilize the nonpropositional organization as a framework on which to hang weaker verbal structures.

If students with superior visual-perceptual skills to verbal skills are, in effect, using a "different" and less efficient right hemisphere processing strategy to approach the reading tasks, an organizational strategy relying heavily on visual-spatial skills may be able to signicantly increase their reading comprehension. Induced visual imagery may be just such a strategy.

B. SUMMARY AND JUSTIFICATION FOR RESEARCH

Researchers and educators are constantly looking for new techniques and teaching strategies to aid learners who are not succeeding with traditional teaching methods. The use of visual imagery has proven to be an effective facilitator of retention and comprehension of some verbal material and may be a helpful strategy for some students. Theorists suggest that imagery offers a means of organizing or structuring information.

While research utilizing an induced imagery strategy to increase reading comprehension has demonstrated statistically significant results, the actual gains made when using an imagery strategy have not been dramatic. The variance among subjects' performances when instructed to use visual imagery suggests that individuals may differ greatly in their ability to benefit from such a facilitator. Researchers have urged further studies to investigate individual differences in ability to use imagery as a facilitator of reading comprehension.

Studies utilizing imagery in paired-associates, reading, and listening tasks, as well as physiological research dealing with the lateralized functions of the brain, suggest that students with high visio-spatial skills may best be able to utilize an imagery strategy. Research concerning the cognitive functioning of students experiencing difficulty learning to read indicate that a large number of

these students have above average visual-spatial skills but below average verbal sequential skills.

Several researchers have argued that this group of poor readers may be using primarily right hemisphere strategies to attempt complex reading tasks more efficiently dealt with by the left hemisphere. While one approach to this problem would be to teach these students to attack reading with left hemisphere linguistic skills, an alternative approach might be to bolster right hemisphere skills with an imagery strategy to help impose structure or organization on what they read.

Levin's work with High Picture-Low Word learners suggests this group was able to utilize an imagery strategy to increase their comprehension or retention of what was read. If these findings can be generalized to poor readers with high visual-spatial skills but low verbal skills, an imagery strategy may prove to be a practical tool as a teaching and learning strategy for this group of poor readers.

C. RESEARCH DESIGN

The following research project was designed as a modification of the Levin, Devin-Hawkins, Kerst, and Guttman, 1974 experiments in an attempt to broaden their findings to include students currently labled learning disabled with above average to average visual-spatial skills but below average verbal skills as measured by the Wechsler Intelligence Scale for Children - Revised. As in the Levin et al. study, subjects were first administered a paired-associate task, and then asked to read passages with and without imagery instructions. (This series of experiments was described on pages 10 through 13 of the literature review.) Two major changes in the Levin et al. design were made however. The group

design used by Levin et al. was replaced by a single subject multiple baseline design, and the reading material which was projected sentence by sentence on a screen, was replaced by laminated pages of stories in paragraph form.

The substitution of the multiple-baseline design was made primarily for two reasons:

(1) Throughout the reasearch and critical reviews dealing with either Wechsler Intelligence Scale profiles on reading disabilities, it was pointed out that findings based on larger groups means were seldom if ever applicable to the individuals which made up that group. Huelsman in his review of the reasearch for a WISC-R profile depicting reading problems noted that not a single subject posessed the actual profile generated by averaging group performances. Several authors suggested that it was the over generalized grouping of students with disimilar characteristics as learning disabled that hindered progress in this field of research. Since the focus of this study was to consider individual differences in ability to utilize imagery and deals with a population which has suffered in the past from over generalization, a single subject was thought to be most appropriate.

(2) In addition, large group designs concerning the utility of visual imagery as a facilitator for reading comprehension have demonstrated only a small statistical increase in comprehension with an induced imagery strategy. The goal of this research is to investigate whether the use of an imagery strategy for this specific population will result in an improvement in reading comprehension which would be of practical importance to individual students rather than merely statisically significant. A single subject design incorperates this more stringent criteria of a demonstratable effect for individual subjects.

The replacement of projected single sentences by typed stories in paragraph form was an attempt to approximate more closely an actual classroom learning situation. While this change will necessarily result in less control over reading rate, context clues, etc., it was felt that the closer approximation to a naturally occuring reading task would result in more useful information for educators.

D. HYPOTHESES

Because the superior Performance to Verbal WISC-R scaled scores of these subjects are assumed to indicate a preference or superior ability for right hemisphere tasks, the following hypotheses were developed:

1. All twelve subjects will correctly associate significantly more picture pairs than word pairs in Levin's Paired-Associate Task. The majority of subjects performing similar to the High Picture-Low Word group identified by Levin.

When these subjects are presented with short narrative stories it is hypothesized that:

2. Subjects will significantly increase the number of correct responses to comprehension questions following reading passages upon the introduction of an imagery strategy.

3. Subjects will significantly increase the number of correct responses to comprehension questions following orally presented passages upon the introduction of an imagery strategy.

CHAPTER II

THE EXPERIMENTS

A. EXPERIMENT I

Method

Materials

The paired-associate task used for this experiment was the Form A. Paired-Associate task developed by Levin, Divine-Hawkins, Kerst and Guttman for their 1974 study concerning individual differences in learning from pictures and words. (Sample items are given in Appendix B.) The response booklet from the original study was sent to this researcher and individual slides of words and line drawings were reconstructed. The slides consisted of 8 word pairs and 8 picture pairs, one pair on each slide.

Three response booklets for each subject were duplicated from the original booklet developed for the Levin et al. study. The booklets contained 16 pages with one of the word or picture items of a pair at the top of each page and eight word or picture items listed below, one being the correct word or picture pair association.

Subjects

The same subjects were utilized for all three of the experiments described in the following pages. Subjects were drawn from the Metropolitan Nashville Public School System, and identified through the Special Education Department. Originally 25 boys between the ages of 9 and 11 who had been certified as "Learning Disabled" by school personnel, and who in addition had Performance

scores at least 10 points higher than Verbal scores on the Wechsler Intelligence Scale for Children - Revised, were identified as possible subjects.

Parental permission was obtained to conduct the experiments for 15 of these subjects. The Spache Diagnostic Reading Scales were administered to all 15 subjects. (A description of this test is given in Appendix B.) Two subjects were eliminated from the sample. These students had word recognition performances below a 1st grade level. They were considered "non-readers" and inappropriate for this study. A third subject was eliminated from the study because of bizzare behavior and the extreme difficulty in obtaining his compliance to the specific instructions during the reading comprehension experiment.

Information regarding individual demographics, WISC-R performances, reading, and listening comprehension measures, for the 13 subjects involved in these experiments is given in Appendix A.

Procedure

An attempt was made to replicate the procedures used in the Levin et al. 1974 study with the exception that subjects were tested individually in a room provided by their school, rather than in groups. Word and line picture pairs were presented on a screen for 5 seconds each, in the order decided upon in the Levin et al. study. (Originally slides were randomly assigned with the stipulation that no more than two consecutive pictures or word pairs would be presented and that both a word and picture pair appeared in the beginning and ending positions in the sequence.) After the last pair was projected on the screen, the subject, having been reminded to work as rapidly as possible, was given 1 1/2 minutes to complete the response booklet provided. Instructions to the subjects for this phase of the experiment were as follows:

You are going to see words and pictures on the screen in front of you. There will either be two words or two pictures on the screen at the same time. Try to remember what pictures and what words go together. When I tell you to begin, I want you to turn your booklet over and circle the word or the picture that you saw on the screen with the word or picture given at the top of your booklet.

The following example was presented to all subjects:

Look at the screen and you will see two pictures (a ball and a star). Now look at your booklet cover. There is a ball at the top of the page. Circle the picture which you saw with the ball on the screen.

The first trial began after the example was presented regardless of the accuracy of the subject's response (in actuality all subjects completed the example correctly). Two additional study-test cycles were provided.

Results and Discussion

It was hypothesized that these subjects would perform most like the High Picture-Low Word 4th grade group described by Levin et al. in their 1974 experiments with this paired-associate task. Superior visual-spatial skills to verbal skills were expected to correlate with a signficantly higher number of correct picture-pair associations than word-pair associations for all twelve subjects. The data from this experiment did not support these predictions.

The individual performances of the subjects on the Paired-Associate Task are listed in Table 1. Total performances and the difference between picture and word associations are listed in the far right columns of the table. While the expected superiority for picture recall was noted in all but three subjects, the differences between correct picture and word-pair associations was not very large - only half of the subjects performed better on the pictures pairs by a difference greater than three items.

TABLE 1

Number of Correct Word and Picture Associations
on the Levin Paired-Associate Task

Subject	Trial 1 W	Trial 1 P	Trial 2 W	Trial 2 P	Trial 3 W	Trial 3 P	Total W	Total P	P-W
1. SP	5	4	4	6	6	5	15	15	0
2. DN	2	2	2	4	2	5	6	11	5
3. BV	1	1	3	4	1	3	5	8	3
4. JA	3	6	2	8	3	8	8	22	14
5. AS	3	4	5	6	6	7	14	17	3
6. BE	3	6	3	8	8	8	14	22	8
7. KW	3	3	4	3	3	5	10	11	1
8. CF	3	8	4	8	4	8	12	24	12
9. LT	3	1	2	2	3	5	8	8	0
10. SS	2	3	7	6	8	7	17	16	-1
11. JS	4	6	3	5	0	8	7	19	12
12. LB	3	5	1	7	3	8	7	20	13

As shown in Table 2, the mean number of picture pairs correctly identified exceeded the mean number of word pairs by 10.45 for Levins' High Picture, Low Word Group. The mean number of correct picture pair associations exceeded the mean number of word pairs by only 5.83 for the experimental group taken as a whole.

Table 2 also illustrates that the mean performances for these subjects were significantly higher on both Picture and Word Tasks than the total mean performances of Levin's 40 subjects. As a group, these twelve subjects' performances are most similar to Levin's High-Picture High-Word subjects. This is of particular interest for the word pair performances in light of the fact that

the subjects in this experiment are known to have reading difficulties, while Levin's subjects were students in average fourth grade classes.

TABLE 2

Mean Number of Correct Word and Picture Associations
By Different Performance Groups

Group	Words	Pictures
Levin et al. Group		
Total	5.73	12.97
High Picture-High Word	10.25	16.25
High Picture-Low Word	3.44	13.89
Low Picture-Low Word	3.50	8.45
Experimental Group		
Total	10.25	16.08

High Picture performances were expected for this subject sample, as the group was selected on the assumption that this would be a strength. The significantly higher word pair performance as compared to Levin's 4th graders remains difficult to understand.

One possibility is that the higher performances on the Word pairs may be the result of the individual administration used in this experiment in contrast to Levin's group administration. The possible additional time and absence from distraction afforded by the individual administration might also effect the difference between the word and picture pairs if these factors were of more benefit when trying to recall or decode word pairs. (This is not unlikely, as one

would predict a more immediate recognition for the pictures than individual words.)

While the differences in Verbal and Performance scores in the WISC-R did not result in the significant differences between picture and word associates predicted for all 12 subjects, it is nevertheless possible that these two measures of verbal vs. spatial skills are related. In order to investigate the relationship between these tasks, subjects were ranked as to performance on Picture and Word pairs as well as to scores achieved on the WISC-R, and correlations between these rankings were calculated. The results are shown in Table 3.

TABLE 3

Spearman's Rank Correlations Between
WISC-R and Paired-Associate Task

WISC-R Scales		Paired-Associate Task	r
Full Scale IQ	x	Total PA Task	.81
Full Scale IQ	x	Picture PA	.71
Full Scale IQ	x	Word PA	.61
Performance IQ	x	Total PA	.72
Performance IQ	x	Picture PA	.76
Performance IQ	x	Word PA	.61
Verbal IQ	x	Total PA	.74
Verbal IQ	x	Picture PA	.63
Verbal IQ	x	Word PA	.54
Dif. PIQ-VIQ	x	Dif. Word-Pict. PA	.46

As one might expect, the highest correlation between the Paired-Associate task and the Wechsler is between total performance on both measures. The

Wechsler is designed as a predicter for learning tasks and correlates highly with students' performance on Levin's Paired-Associates task (r=.81).

The subject's rankings on the Performance scale of the WISC-R is the best predictor of their performance with the Picture paired-associates (r=.76). This is consistent with the underlying assumption of this study that visual-spatial skills relate to both tasks. Interestingly, however, the Performance scale rankings of these subjects correlate more highly with the word paired-associates (r=.76) than do the verbal-scale rankings (r=.54). While there are many possible reasons for this pattern of correlations, the higher Performance-Word Pair correlation is consistent with researchers' proposal that many students with reading difficulties continue to rely upon right hemisphere skills for reading tasks.

In predicting a significant difference between picture and word-pair associations for students with higher Performance Scale Scores to Verbal Scale Scores it was further expected that the degree of difference between WISC-R Scales would be reflected in a corresponding degree of descrepancy between picture and word pairs. While the correlation of the differences in these two measures shows some degree of relationship, (r=.46) this correlation is far less dramatic than anticipated.

The failure of the Verbal-Performance differences on the WISC-R to predict Picture-Word differences on the Levin Paired-Associate measure might best be explained through the relatively weak correlation between Verbal scores on the WISC-R and word-pair scores on the Levin instrument. In fact, the lowest correlations between the Weschsler and the paired-associate task are consistently with the word associate pairs. Full-Scale, Verbal Scale and Performance Scale rankings correlate least well with the subjects' performances with the word

pairs. One explanation for these relatively lower correlations may be found by examining the relationship of the subjects' basic decoding skills to their paired-associate performance.

As an approximation of decoding ablity, the subjects were ranked according to their performance on the word recognition test of the Spache Diagnostic Reading Scales. Table 4 shows the correlation between this ranking and that of their performance on the word-pair associates exceeds any WISC-R correlation for the word-pairs (r=.70). Almost half of the variance in word pair performance could be predicted by the student's basic word recognition or decoding skills. The correlation between picture performance and decoding skill is almost zero.

TABLE 4

Spearman's Rank Correlations Between Word Recognition Skills on Spache Versus Paired-Associate Task and WISC-R Scales

Spache		P A Task/WISC-R	r
Word Recognition	x	Word PA	.70
Word Recognition	x	Picture PA	-.07
Word Recognition	x	Verbal IQ	.29
Word Recognition	x	Performance IQ	.27

Levin's paired-associate task was designed as a measure to differentiate "learner types", separating students along a verbal/pictorial continuum. The original model for this measure was an instrument used in Levin, Rohwer and Cleary (1971). In the original instrument however, words which were utilized in the word-pairs were displayed on videotape with aural accompaniment.

In Levins' 1974 model the oral pronunciation of word pairs were dropped, presumably to more closely approximate the reading tasks which were to follow. It appears however that this modification may have substantially altered the task to the extent that a verbal/pictorial difference is no longer being assessed. Rather, actual word recognition skills become a major determiner of eventual picture-word differences.

It is possible that decoding skill plays a greater role in picture-word performance for the subjects in the present experiment than for the average fourth grade students utilized by Levin, Devine-Hawkins, Kerst and Guttman. The history of reading difficulty for these students make it more likely that individual words used in the word pairs might be unfamiliar to the students. General sensitivity to the reading task, lack of confidence in ability, etc., might also be more prevalent among these students with known learning difficulties than in the experimental group utilized by Levin et al. The superior performance of this group in the word-pair associates casts considerable doubt on this interpretation however.

There is a wide range of decoding ability among "average fourth grade students". While the majority of the students in the Levin et al. study may have been able to decode the stimulus words, the actual time required to decode the words, the amount of verbal rehearsal to confirm the correctness of that decoding, and the speed of recognition of those words as identical on repeated trials, might all be expected to relate to the decoding skill of the subject. It is unfortunate that the Levin study did not include some measure of the differential decoding skills of these subjects.

In any case, the predicted relationship between WISC-R performances and performance on the paired-associate task was not found in this experiment. The apparent relationship between decoding skill and success on the word-pair portion of Levin's measure suggest that this instrument may not be a measure of learner style or preference for these students but rather a measure of decoding skill.

B. EXPERIMENT II

Method

Materials

1. Stories. Ten stories of 25 sentences each were modified from various sources of children's literature. (See story references and modified stories in Apendix C.) An attempt was made to control the length of each sentence and the complexity of sentence structure without greatly altering the meaning of the passages. The number of words in the stories ranged from 226 to 239. The average sentence length was 9 words per sentence.

In addition to passage and sentence length, an attempt was made to control the "recognizability" of the words used in the students' probable reading experience. The words of each passage were rated in accordance to the grade level at which they are introduced in elementary reading programs (Harris & Jacabson, 1972). Individual words were also rated in accordance with Thorndike's word frequency list (Thorndike & Lorge, 1963). Where less common words or words introduced in later grades appeared in the original stories, more commonly used or earlier introduced words were substituted whenever possible.

The 25 sentences of each story were then reorganized into paragraphs and typed as a complete story on white 9 by 11 sheets. The ten pages were laminated for student use. While the different paragraph lengths may introduce some variability in story difficulty it was felt that the cohesion of the paragraphs might be an important element of the student's reading experience in natural circumstances.

2. Word List. A story word list was generated by compiling all words rated as first appearing in 3rd grade texts or beyond. This resulted in a 126 word checklist. The entire word list was presented to each of the six subjects to test word recognition skills for these particular words.

3. Story questions. Twenty-five questions (who, what, where, when and how) were constructed for each of the 10 reading passages. (For actual questions see Appendix C.) One question was created for each sentence in the story. An attempt was made to ellicit the main idea or an important fact from each sentence. Model answers were supplied for each question by lifting the specific wording from the sentences to which they referred. The correctness of student responses would be judged according to these model answers.

4. Imagery intervention practice material. A 6" by 6" looseleaf notebook was prepared for the imagery training intervention. Single words, sentences, and 5 sentence stories were typed on white paper and placed in a specified order in the notebook. (See actual material used in Apendix D.) The five sentence stories were adapted from SRA reading passages rated as being on approximately a third grade reading level. The single words and individual sentences were generated by the experimenter. An attempt was made to use words which

related to the students' every day experience as well as words which could be easily visualized.

5. Performance Charts. In an attempt to maintain motivation, a performance chart was constructed for each student from 12" x 24" posterboard. The charts had the student's first name printed in large letters on top, a row for each of the 10 stories and a column for each of the 25 questions, large gold stars were used to keep track of the number of correct responses for each story. Students received a penny for each correct response awarded at the end of each story session.

6. Tapes. In order to record the specific wording of students' responses to story questions and imagery practice sessions while maintaining a natural flow in conversation, a tape recorder was used throughout the experimental procedure. Individual tapes were logged and transcripts were generated for each individual experimental session.

Subjects

The subjects used for this experiment were drawn from the 9 and 10 year old boys described in Experiment 1. Originally it was intended that all 13 subjects (including the subject eventually discarded because of emotional factors) were to be utilized in this experiment. However because these subjects were in different schools spread across a large county, only 7 subjects could be scheduled at one time. The students were grouped into approximately similar reading levels on the basis of reading recognition scores obtained on the Spache Diagnostic Reading Scales. (See Appendix B.) Seven of the eight students reading above a 3.3 grade level were chosen for the "first session" of this

experiment. After viewing tentative results from this first session, conditions were altered for the remaining students to investigate listening rather than reading comprehension.

Procedures

Subjects were seen individually over 11 sessions. While testing rooms differed slightly from school to school, in each case the subject and experimenter were alone in the room seated at a small table with only the materials described above before them.

During the first session each subject was given the word list containing possibly unfamiliar words they would see later in the reading passages. Subjects were asked to read the entire list aloud and the experimenter recorded any errors made for later use.

For each of the remaining 10 sessions subjects were tested for their recall of a new story they read silently under either baseline or imagery intervention conditions.

1. Baseline Conditions. Following the multiple baseline design as described by Kazdin, all six subjects began with the baseline condition instructions. The stories were presented in the same order to all subjects. Subjects were randomly assigned to the different intervention schedules. As soon as subjects were seated and relaxed, the tape recorder was started and the following instructions were given for the first story session.

> I am going to let you read a story silently to yourself. Try and remember as much of the story as you can because when you have finished I am going to ask you questions about it. For every question that you get right you can earn a penny. (The Performance chart was then shown to the subject.)
>
> Before I give you the story there are a few words I'd like to see if you know.

The words which that individual subject had missed on the previously administered word list, which were contained in that day's story, were then reviewed. The subject was asked to pronounce the word. If he could decode the word he was praised and the word was set aside. If he was unable to read the word he was told the word by the examiner and it was placed in a separate pile. This procedure was repeated until the subject had either correctly identified all of the words or until he had attempted and been supplied with the correct response for each word three times. The subject was then given the story with the reminder to:

> Read this carefully. Take as much time as you want. Remember I am going to ask you questions about it. If you would like to use this card (a 5 x 8 note card) to help you keep your place that's fine. If you cannot read a word you may ask me and I will help you.

Directions during baseline after the first session were informally reviewed to insure that each student knew (1) he was to read carefully to himself, (2) he would be asked questions about the story, and (3) he would earn a penny for each correct response. Two subjects continued to read aloud despite several reminders to read silently. These performances were noted and the subjects were left to read as they were most comfortable. Immediately after the subject indicated he had finished the story the examiner began the first of the 25 questions, saying: "Good, now let's see how much of the story you can remember." The subject was discouraged from discussing any part of the story until all 25 questions had been answered. Questions were repeated when subjects requested and subjects were prompted to clarify any responses which appeared ambiguous to the examiner.

Subjects either watched the examiner place stars for each correct answer or placed the stars themselves on the performance chart. Responses had to

contain the exact wording or reasonable similies of the exact wording used in the model answers to be considered correct. Feedback as to the correctness of a response was given at the end of each question and stars were awarded or withheld. Incorrect sequences were corrected by supplying the model answers predetermined for each question. This was done both to keep the subject's interest in responding to all 25 questions and to prevent an incorrect response for an early question from influencing the subject to reorganize his version of the story in order to justify the erroneous information.

2. The Imagery Intervention. The subjects were randomly assigned to one of three schedules for baseline and imagery intervention conditions to conform to the multiple baseline design. The resulting multiple baseline schedule is shown in Figure 1. Two subjects began the imagery intervention on the 4th session, two subjects on the 6th session and the final two subjects began the imagery intervention on session 8.

Subjects	Baseline -			Imagery Intervention x						
1	-	-	-	x	x	x	x	x	x	x
2	-	-	-	x	x	x	x	x	x	x
3	-	-	-	-	-	x	x	x	x	x
4	-	-	-	-	-	x	x	x	x	x
5	-	-	-	-	-	-	-	x	x	x
6	-	-	-	-	-	-	-	x	x	x
	1	2	3	4	5	6	7	8	9	10

Reading Passage Number

Figure 1. Multiple baseline schedule used in Experiment II.

During the first imagery intervention session the following instructions were given immediately after the student was seated and relaxed. (For complete imagery materials, refer to Appendix D.)

> Today we are going to do something different. I want to talk with you about imagery. Do you know what that word means? Imagery is like a picture inside of you. Sometimes it is just one picture like a drawing or photograph. Sometimes it can be like a movie or as if you are watching real life. Do you ever imagine something or remember something or just think of something and it is almost as if you are really seeing it?
>
> (A yes response was given in all but one case.)
>
> That is what I mean by imagery. You were making images.

The experimenter then requested the subject to make an image for a printed word (dog). Frequent prompting, "Can you almost see it? Do you have a picture of it?, etc." was used until the subject indicated he "had" an image.

When the subject indicated he had a picture in his mind, or image of the word, he was asked to describe it to the experimenter. The experimenter praised whatever description was given and prompted the student to describe more of the image with questions such as "What is happening when you see it? What color is it?, etc." The examiner then modeled a prearranged image for the same word. Care was taken to emphasize visual aspects of the image, describing color, action, size, etc.

This procedure was repeated for first an additional word, then a single sentence, then for a five sentence story presented one sentence at a time, and finally for a short story presented as a paragraph to the subject. The five sentences were each separated by a sheet of blank paper. The students were instructed to be sure they had an image for the previous sentence before turning from this blank page to the next sentence. For both the 5-sentences and the short story imagery practice sessions, questions were asked about what happened

in the story before images were discussed in order to make the experience as similar to the target stories as possible. (See Appendix D. for specific directions.) After completing the small paragraph and answering questions about it. The subject was handed the next story from the 10 target stories and given the following directions:

> Now I'd like you to read one of the big stories. But this time I want you to read it just the way we've been practicing here. That is, I want you to make a picture in your mind for each sentence you read. Be sure you have a picture for each sentence before you read the next one. I will ask you questions about the story when you've finished.

Subjects reviewed words contained in the story which they had missed on the word list before reading the story. Questions were asked and stars awarded under the same procedures as in the baseline condition.

Throughout the imagery intervention sessions no attempt was made to conceal expectations that using imagery might increase the subjects ability to recall information in the story. In fact, the possibility was frequently mentioned to encourage the students. The assumption was made that the students were highly motivated before the intervention and were performing at their highest levels of ability. The knowledge of experimenter expectations only after imagery had been introduced could be considered part of the intervention itself.

3. The Scoring Procedure. The transcripts of each subject's responses were individually scored by the experimenter. All transcripts pertaining to a single story (eventually from both experiment II and III) were then compared to ensure that the scoring criteria had been consistently applied across subjects. Only after the second review were the subjects final scores interpreted according to the multiple baseline schedule.

As stated above, subjects were encouraged to clarify ambiguous responses and awarded stars when restated answers used either exact wordings or similies of the wording used in the model answers. A clear criteria for number of probes, when an incorrect answer would be probed, etc., was not established prior to beginning the experiment however. For consistency in scoring across subjects therefore, these prompted responses were not included with correct first responses and the resulting data will be reported separately.

Results and Discussion

The performance of the six subjects under both baseline and imagery intervention conditions is shown in Figure 2. Each data point represents the number of questions answered correctly on the first response for each story.

The six subjects were divided into two groups to simplify visual comparison of the baseline-treatment interaction of the multiple baseline design. (This division also represents a slight difference in reading level according to the subjects' previous performance on the Spache Reading Scales. This reading difference will be discussed below.) The jagged line through each three subject graph divides performances into baseline and intervention sessions. The staggered introduction of the imagery strategy allows for the comparision of one subjects' performance after the intervention to the continued baseline performances of subjects presented directly below.

The hypothesis that an imagery strategy would increase the ability of these subjects to answer comprehension questions was not supported by this data. Not only did the data fail to support an increase of the magnitude hoped for in order to justify an alternative teaching procedure, but for the majority of subjects, the

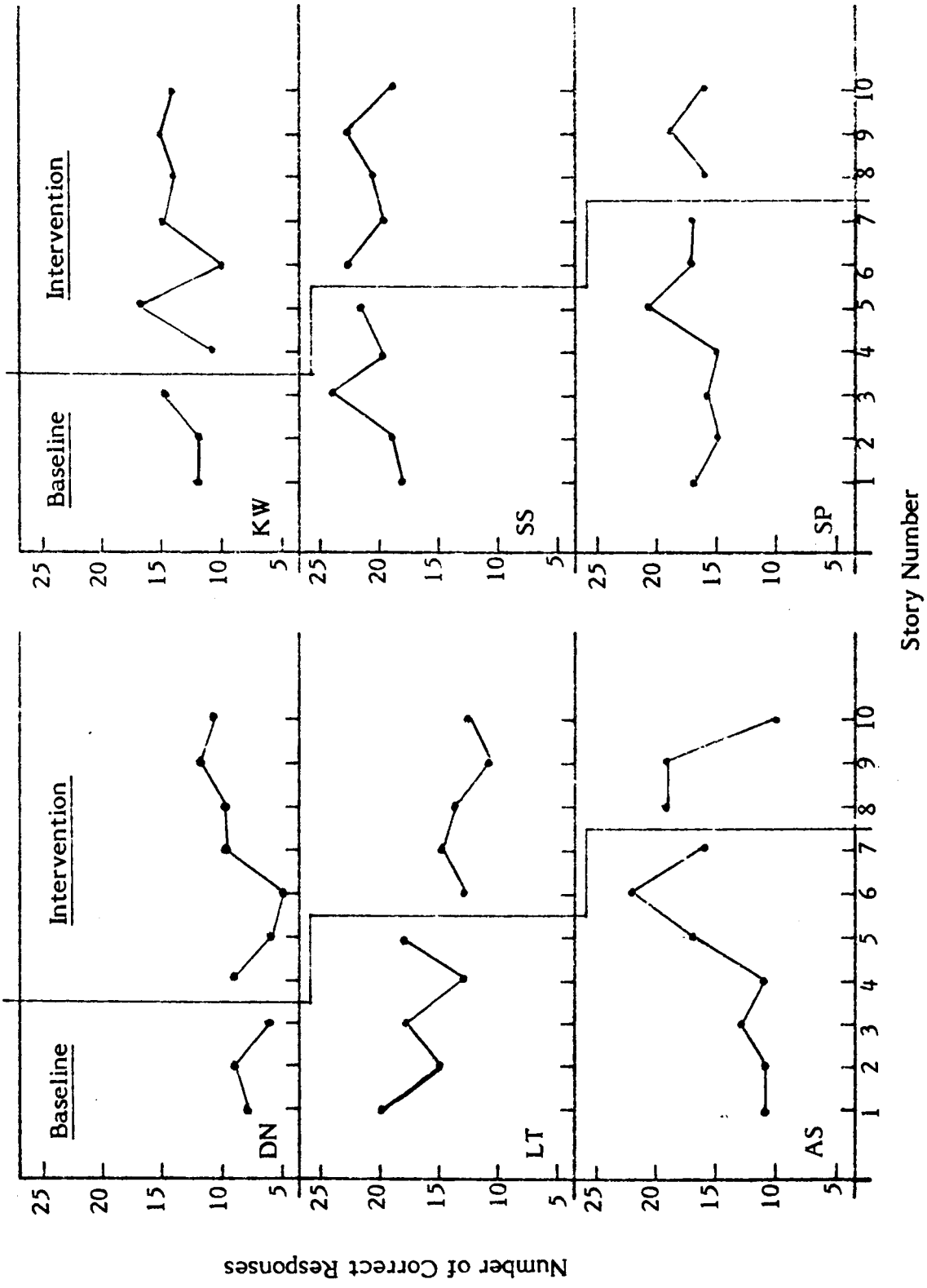

Figure 2. Number of correct first responses to reading comprehension questions before and after intervention.

data did not suggest an increase of any kind. In no case did the imagery intervention result in a sudden and sustained improvement in performance, and in one case (LT) the imagery intervention coincides with a decline in performance.

The initial data point under the imagery strategy represents an increase from the preceding story performance for only three subjects. For no subject is the initial performance with imagery superior to the subject's best baseline performance. Only two subjects (DN and KW) obtain a higher performance with the imagery training than they had achieved under baseline conditions.

Subject DN's performance does show a gradual increase across stories, but the initial drop in correct responses over the first three stories in which the imagery strategy is introduced suggests something other than the use of imagery may be responsible for this increase. In reviewing the tapes of DN's experimental sessions it was noted that he spontaneously began to read outloud at story 7. He persisted reading orally for the last 3 stories despite reminders to read silently. (He would read silently for a moment after a reminder and then gradually increase the volume of his oral reading.) It appears likely that this oral reading may have helped DN to either concentrate on or remember more of what he read.

While the baseline performance of subject SS resulted in such high scores that a ceiling effect might have disguised any positive influence of the imagery strategy, the lack of a positive effect in the performance of the remaining subjects with lower baseline scores makes this possibility seem unlikely.

Figure 3 is intended to demonstrate the type of results which would have supported a positive effect for imagery training on reading comprehension. The graph on the right illustrates the actual data obtained in this experiment. For

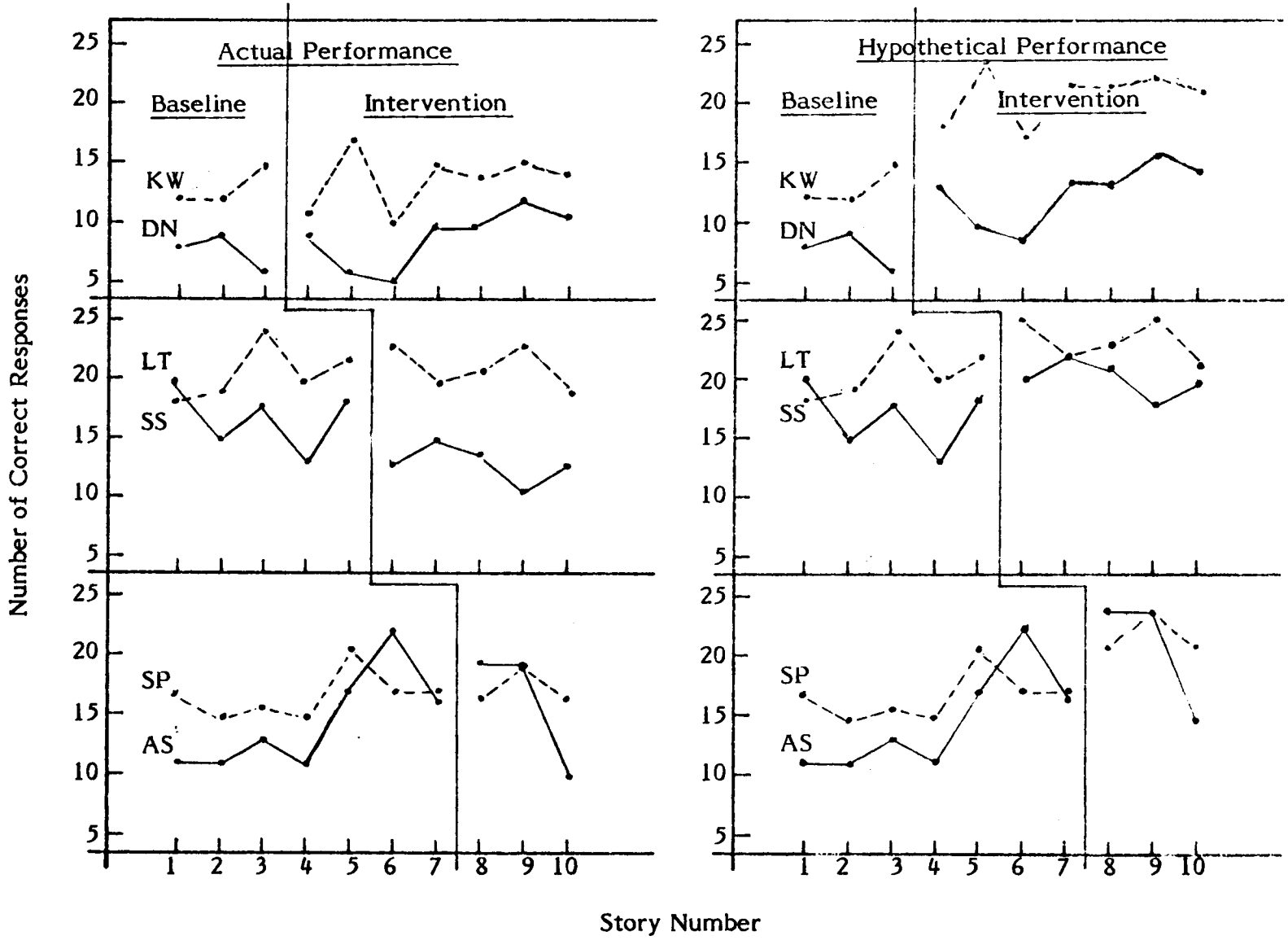

Figure 3. Reading comprehension performances and hypothetical data illustrating a significant behavioral change.

the individual subject, as well as for the group taken as a whole, if the baseline period were not clearly marked on the performance graph it would not be possible to estimate when the intervention, or even if an intervention took place.

On the graph to the left the subjects' individual performance increases noticeably when the intervention takes place while the performances of the subjects still under the baseline condition remain relatively unchanged.

All six subjects occasionally had difficulty in either understanding what information was being requested by the comprehension questions, or in expressing their answers specifically on a first response. Ambiguous responses were counted as incorrect for the purposes of the data previously presented. This allows for more precise application of the criteria set for a correct response. However, requests to repeat questions were honored and ambiguous responses were probed to see if the subject was able to correctly respond to the question with some clarification. Figure 4 shows the number of correct responses given for each story when these correct clarified responses are included. This data is seen as less reliable because incorrect responses were probed in regard to situational variables and not a pre-arranged criteria. It does serve however, as an informal correction for subjects' misunderstanding of specific comprehension questions or difficulty in expressing an answer, and may be a better indication of the actual amount of information remembered for each subject.

The effect of including these prompted responses appear only to be one of leveling the performances across different stories still further. This is the case for all except one subject.

When KW is given credit for corrected responses after probes by the experimenter, his performance does appear to increase with the imagery

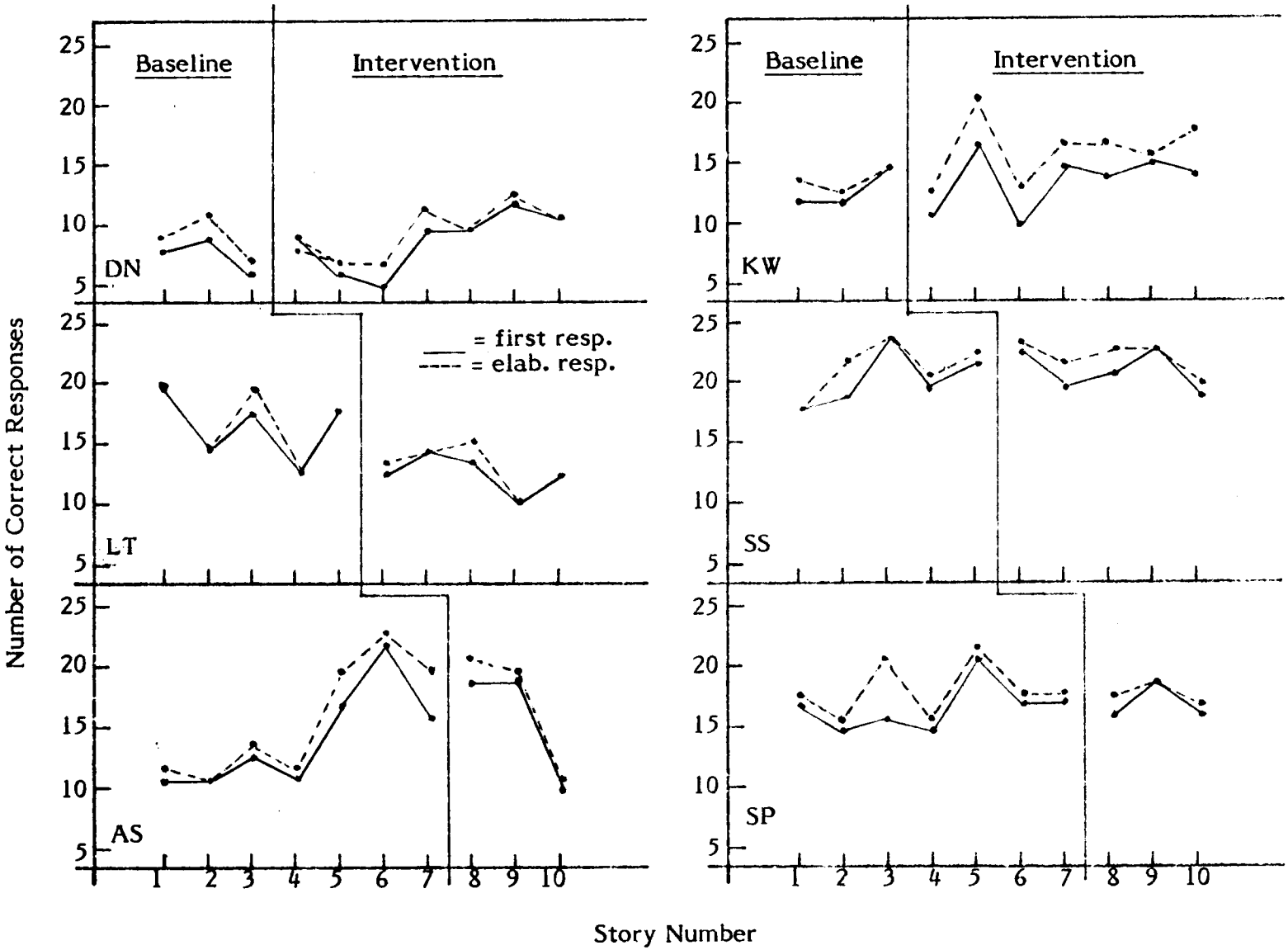

Figure 4. Number of correct first responses and elaborated responses to reading comprehension questions.

intervention. His average baseline performance (14.00) compared to his average with the imagery strategy (16.43) suggests an overall improvement which is not evident for the other subjects. In reviewing the tapes of KW's sessions however, it was noted that KW complained frequently and resisted using the imagery strategy during his first imagery session (story 4). His reading time increased from his average baseline time of approximately 3 minutes to approximately 4 minutes for that passage. In following passages, KW's reading time returned to between 2 1/2 and 3 minutes and he stated after several stories that he had not "made pictures" for much of the passage. Finally, after story 8, KW stated that he had not attempted to make pictures at all for that story. When asked if he found making pictures helpful or confusing, KW answered that the process seemed to confuse him "because he had to stop."

In light of the return to baseline reading time and the subjects' own statements, it seems fair to assume that any increase in performance must be attributed to something other than the consistent use of the imagery strategy as intended by the experimenter.

The Effect of Decoding Errors

Levin et al. (1973) suggested that readers experiencing significant decoding difficulties could not benefit from an imagery strategy. Therefore the role of decoding difficulties could be important in interpreting the lack of an imagery effect for these subjects.

As mentioned above, the six subjects were divided into two groups on the basis of their oral reading performance on the Spache Diagnostic reading scales. Subjects DN, LT and AS obtained oral reading scores below 3.8 and the KW, SS and SP group obtained scores above a 3.8 grade level. This difference in reading

ability did not appear to have a consistent effect on the subjects' performance. Table 5 shows average baseline performances estimated on the basis of the first three story performances. It indicates that one of the "poorer" readers (LT) averaged the second highest number of correct responses. However, the mean performance of the higher reading group (16.33) was 4 responses greater than the mean of the lower reading subjects (12.34).

Before reading each story, subjects had reviewed the words contained in that story which they had previously missed on the word recognition check list. This was done in an attempt to minimize decoding difficulties which might interfere with their reading of the story. However, reviewing difficult words does not ensure that they will be recognized in the following text.

TABLE 5

Average Number of Correct First Responses
Under The Baseline Condition

Subject	Spache Reading Level	Average # Correct
Lower Readers		$\bar{x}$ = 12.34
DN	2.8-3.8	7.67
LT	3.3-3.8	17.67
AS	3.3-3.8	11.67
Higher Readers		$\bar{x}$ = 16.33
SS	4.5-5.5	20.33
SP	3.8-4.5	16.00
KW	4.5-5.5	12.67

To further investigate the role the subjects' decoding difficulties might have had on their ability to answer comprehension questions, correlations were run between the number of words which a subject missed on the word recognition checklist and the number of correct responses given to comprehension questions for each story. A slight negative correlation was anticipated for all subjects, suggesting that subjects would answer fewer comprehension questions correctly for stories on which they had previously misread more words. Table 6 indicates the Pearson Product--Moment Correlation between words missed on the word recognition checklist and comprehension questions answered correctly for each of the ten stories.

TABLE 6

Pearson Product-Moment Correlations Between Decoding Errors and Correct Responses to Reading Comprehension Questions

Subject	r
Reading Levels Between 2.8 - 3.8	
DN	-.40
LT	-.59
AS	.52
Reading Levels Between 3.8 - 5.5	
SS	.23
SP	.20
KW	.02

The correlation figures indicate that the expected negative relationship between words missed on the word list and comprehension questions answered correctly was demonstrated for only two of the six subjects. No relationship between missed words and story comprehension was indicated for subject KW, (r=.02) a slight positive relationship between words missed and questions answered correctly was suggested for subjects SS (r=.23) and SP (r=.20), and 27% of the variance in the number of correct comprehension answers might be accounted for by word recognition performance of subject AS (r=.52).

Correlations between the number of misread words on the pretest and the number of correct responses to comprehension questions for each story suggest that for subjects DN and LT decoding errors may have had a significant negative effect on their ability to answer comprehension questions (DN r=.40, LT r=.59). In addition, the average number of words misread in the stories used with the imagery strategy was greater than in the baseline stories for both subjects (DN-Baseline 6.66, Imagery 9.00 / LT-Baseline 7.6, Imagery 10.00). Conceivably, word difficulty could have masked the positive effect of imagery training for these two subjects[4].

For the remaining four subjects however, no correlation or a positive correlation between word difficulty and performance was indicated. One possible explanation for this seemingly contradictory finding is that the review procedure provided for the words missed somehow "oriented" some of the subjects toward

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[4]The largest negative correlation was for subject LT. This subject also has the highest number of errors on the word check list. It is interesting to note that subject LT was the only student whose performance significantly decreased with the introduction of the imagery strategy. This is consistent with Levin's 1973 findings that students with considerable decoding difficulties actually appeared to do worse when imagery instructions were given before reading a passage.

their reading task. Thus constituting a "treatment" which varied according to the number of words initially missed on the check list.

Interpreted in this manner, a regression correlation might be more appropriate for estimating the effect practicing words contained in the story had on eventual passage comprehension. The regression coefficient for each subject would be as follows: DN -.40, LT -.52, AS .68, SS .30, SP .26, KW .02.

Subject AS' performance may have been significantly influenced by this procedure. 46% of the variance in his performance across stories may be accounted for by the number of words practiced before reading the passages. The regression coefficients of subjects SS and SP also suggest a slight influence from this procedure (9% and 6% of variance) while the coefficent for subjects DN and LT remain negative.

A possible explanation for the differential effect of decoding difficulties and word rehearsal procedures may be obtained by reviewing the tapes of the actual experimental sessions. While subject AS initially misread as many words as subjects DN and LT, he appeared to regard the review of words before reading each story as a game. He also spontaneously offered the meaning of many of the review words and frequently was able to recognize the words before the pronunciation was supplied by the examiner. These review sessions appeared to be a very positive orientation toward the passage to follow.

Subject LT however, frequently apologized for not being able to decode a review word and appeared to be frustrated and embarrassed by the task. The experimenter often reminded LT that he was "not expected to know these words" but the atmosphere for these review sessions continued to be "tense".

Subject DN appeared not to benefit from the review of words as much as the remaining subjects. The procedure involved repeating the words missed until they were correctly identified or had been misread three times. Subject DN had a greater number of words which he was still unable to recognize on the third presentation and requested noticeably more assistance while reading than the other subjects.

In summary then, the relationship between word recognition difficulties and ability to correctly answer comprehension questions varied across subjects. For two subjects, LT and DN, word recognition or decoding difficulties may have influenced their ability to comprehend the passages. For the remaining four subjects, however, an insignificant or positive relationship between words misread and correct responses to comprehension questions suggest that the decoding difficulties were not a hindering factor. In addition, there was no significant difference between the average number of words missed on baseline or imagery stories for any of these subjects. It is unlikely therefore that decoding difficulties explain the lack of positive results for these subjects.

There are, of course, many possible reasons for the absence of positive results in this experiment. However, the actual comments and reactions of the six subjects to the reading task using the imagery strategy strongly suggests this lack of positive results relates directly to the ineffectiveness of the strategy rather than to the confounding of extraneous variables. The subjects generally did not like using the imagery strategy and did not feel it was helpful. (For a detailed description of actual student reactions to the imagery task see Appendix A.)

Reviewing the tapes and transcripts of the experimental sessions revealed that all six of the subjects made negative comments about reading the target stories using the imagery technique. While all six of the students had cooperated enthusiastically throughout the baseline stories and had established a good rapport with the experimenter, the subjects had strong negative reactions to being asked to use the imagery technique while reading the target stories.

Originally it was intended that the remaining six subjects of Experiment 1 would duplicate the experiment described here. But because of the failure of the imagery strategy to increase reading comprehension for any of the first six subjects, and because of their unamimous dislike of the use of induced imagery with reading, the target stories were recorded on tape and presented as a listening comprehension task to the remaining subjects. It was hoped that a comparsion of the results obtained with a listening comprehension tasks might help to explain the results obtained here. An increase in correct responses to the comprehension questions using the same subject selection methods, procedues, and materials would strongly suggest that the negative findings reported above were a direct result of the ineffectiveness of induced imagery with reading, rather than the possible effects of extraneous confounding variables.

C. EXPERIMENT III

Method

Materials

The target stories described in Experiment II were read onto a tape recorder by the experimenter. These recordings were played, one per session in the same manner as the written passages were used in Experiment II.

The same story questions and imagery practice material described in Experiment II were used for this experiment. Individual tapes and performance charts were again utilized.

Subjects

The remaining 6 subjects from Experiment I were utilized in this experiment. As a result of grouping students for similar reading levels for the purposes of experiment II these subjects, with the exception of subject BE, differed from the subjects used in Experiment II in that they were reading below a 3.3 grade level. (See individual subject information in Appendix A.)

Procedures

The same procedures outlined for Experiment II were followed in this experiment with the exception that the reading passages were recorded on tape by the experimenter and played for the subjects. The answering of listening rather than reading comprehension questions was the target behaviour of interest. Subjects were again seen individually. They were not required to read the word checklist of Experiment II as reading errors would not be of interest in this experiment.

The schedule for baseline and imagery intervention differed from that in Experiment II because of interruptions at the school settings. A fire drill on one occasion and a late class on another made it more feasible to continue the shorter baseline condition for that session than to begin the more lengthy imagery training. The resulting schedule is shown on Figure 5. This alteration in schedule was not seen as a significant difficulty in comparing results between

the two experiments, and in fact allowed for a statistical procedure not permissible under the intended intervention schedule.

Subject										
1	-	-	-	x	x	x	x	x	x	x
2	-	-	-	x	x	x	x	x	x	x
3	-	-	-	-	x	x	x	x	x	x
4	-	-	-	-	-	x	x	x	x	x
5	-	-	-	-	-	-	x	x	x	x
6	-	-	-	-	-	-	-	x	x	x
	1	2	3	4	5	6	7	8	9	10

Story Number

Figure 5. Multiple Baseline Schedule Used In Experiment III

The instructions given during baseline were the same as those given in Experiment II with the exception that students were told they were going to "listen" to rather than "read" a story. The reference to and review of difficult words was omitted. After introducing the performance chart, students were merely instructed to: "Listen carefully to the story. Remember I am going to ask you questions about it when you are finished."

During the imagery intervention training sessions, subjects listened and read along while the experimenter read the stimulus words, sentences, and passages. The following instructions were given to the subjects before listening to the target stories after the first imagery session and reviewed upon all following sessions.

> Now I'd like you to listen to one of the big stories. But this time I want you to listen the way we have just practiced. I want you to try and make pictures in your mind to go along with everything you hear. So make pictures just in the way we've been doing. I am going to ask

you questions about the story as always. Let's listen. Remember to try and make pictures for everything you hear.

The scoring procedure for the subjects' responses to comprehension questions was identical to that used in Experiment II.

Results and Discussion

The results of this experiment are shown in Figure 6. Each data point again represents the number of correct answers given on the first response to the 25 comprehension questions for each story.

As in Experiment II a clear and dramatic effect across subjects was not demonstrated. However, these results do suggest positive effects for at least two (JS and BV) and possibly three (CF) subjects. For subjects JS, BV, and CF, performances increased when the imagery training intervention was introduced while the performances of subjects still under the baseline condition remained relatively stable. The performances of subjects JS and BV remain at a higher level after imagery intervention while CF's performance is less consistent.

Unlike the performances with imagery for reading comprehension, where only half of the subjects showed an increase for the first story using imagery and only one subject's highest performance was in the imagery condition, in this experiment five of the six subjects showed an increase from the previous story when the imagery strategy was first introduced, and four of the six subjects' best performances were under the imagery strategy condition.

The problem of unstable baseline presents more of a difficulty in this experiment. Of the three subjects for which the imagery treatment may have had an effect, only the baseline performance of JS is relatively stable. The

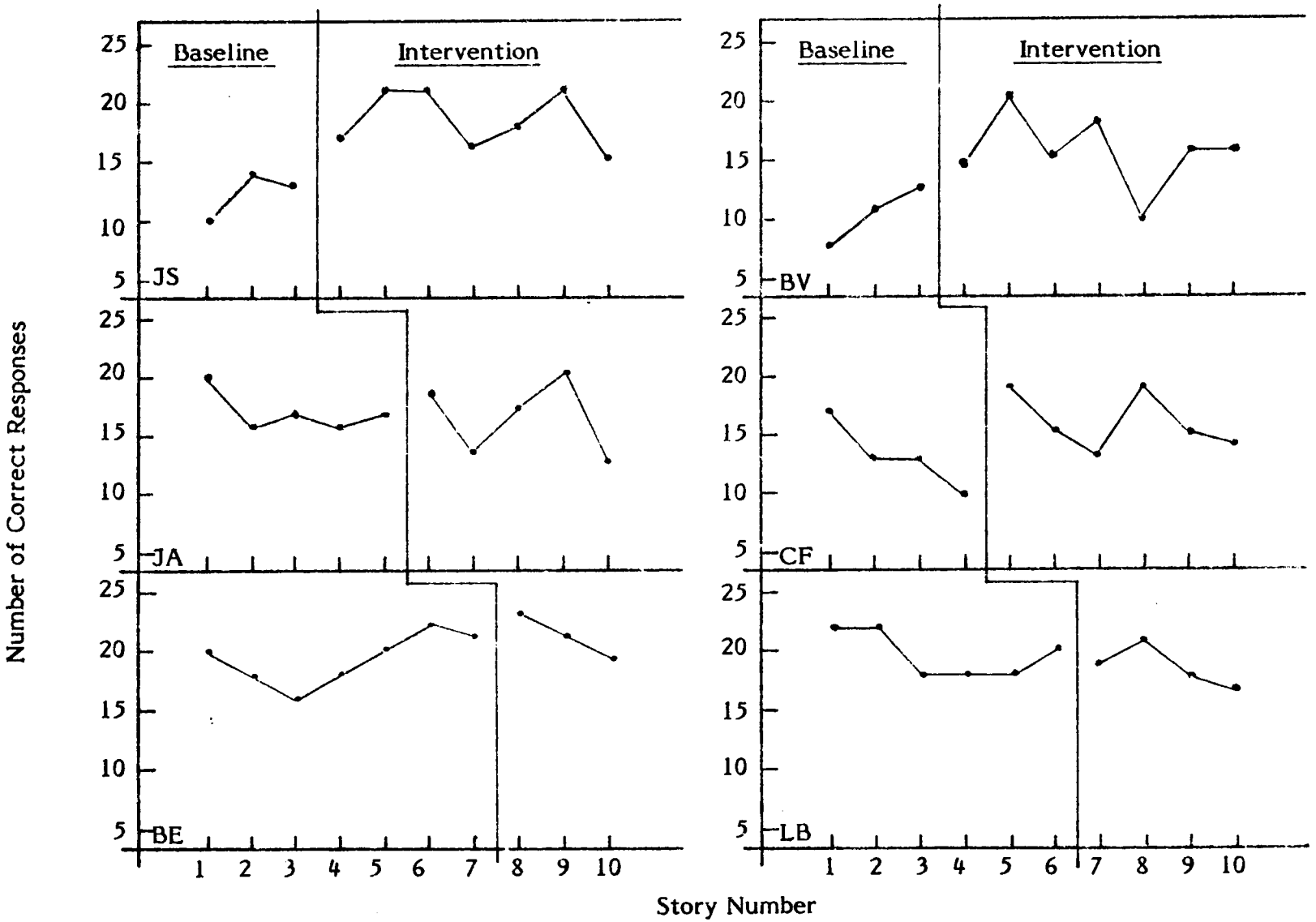

Figure 6. Number of correct first responses to listening comprehension questions before and after intervention.

baseline for CF is sloped in the opposite direction of the hoped for treatment effect, and therefore, presents less of a difficulty in interpretation than the increasing baseline performance of subject BV. While the average level of performance is notably higher under the treatment condition for BV the rate of increase, or slope of the data, does not change considerably with the introduction of the imagery strategy. The unstable baseline increasing in the direction of the anticipated effect makes attributing the continued increase to the imagery strategy tenuous.

While many researchers who utilize single subject designs in their studies argue against the use of statistical analysis for these models, a growing number of scientists advocate the use of statistics when the evaluation of an intervention is not conclusive through visual inspection. In Single Case Experimental Designs, Kazdin indicates the use of statistical analysis might be most helpful when a stable baseline has not been established before intervention, when the effects of an intervention may be subtle rather than dramatic, and when extraneous contingencies cannot be eliminated.

While the reading comprehension data of Experiment II did not merit statistical analyses, the data from this experiment is suggestive of an effect but not conclusive from inspection alone. Statistical analysis does appear appropriate in this case.

Because of the limited number of stories, recently developed time series analysis techniques do not appear appropriate for this data. (Herson and Barlow recommend a minimum of 40 data points for this type of analysis.) The statistic which appears most appropriate, is the Rn statistic developed by S. H. Revusky for use with multiple baseline designs.

As mentioned earlier, the point of intervention varied for the subjects in this experiment from the three point schedule used in Experiment II because of situational factors. This happenstance makes it possible to apply Revusky's Rn statistic for multiple baseline designs in analyzing the data. This statistical treatment requires a minimum of four distinct points of intervention and the altered schedule in this experiment provides 5 distinct intervention points.

Revusky's statistical treatment is applied here with two limitations. One being that this is purely a post hoc use of a statistic and the second (being a result of the first) is that two imagery interventions were begun simultaneously and cannot be taken into account by the model.

The top of Table 7 lists the raw data in the form suggested by Revusky. The number of correct first responses are listed for each subject on stories 1 through 8. Beginning with story four, responses under the imagery intervention (b) are distinguished from responses under continuing baseline conditions (a).

Revusky recommends a transformation of raw scores when absolute levels for subjects differ significantly during baseline[5]. Transformed data, and resulting ranks are shown in Table 7 below the original raw scores.

The intention of Revusky's treatment is to compare the change in performance at the point of intervention to the performance of subject still under the

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[5]High or low absolute levels may mask changes in performance. A dramatic increase for one subject for example may result in a raw score which is still not as high as the performance of a subject whose initial baseline performance is higher than the subject undergoing behavior change.

As baseline performances were of differing levels, the transformation recommended by Revusky was applied to the data.

$$\frac{Bi-\bar{A}i}{\bar{A}i}$$

Where Bi is the raw score of a performance being compared and $\bar{A}i$ is the average of all preceding performances.

TABLE 7

Revusky's RN Statistic Applied to Listening Comprehension Results

Subject	Story Number 1	2	3	4	5	6	7	8
				Number of Correct Responses				
1. JS	10	12	12	15b				
2. BV	8	11	13	15b				
3. CF	17	13	13	10a	19b			
4. JA	20	16	17	16a	17a	19b		
5. LB	22	22	18	18a	18a	20a	19b	
6. BE	20	18	16	18a	20a	22a	21a	23b
				Transformed Data				
1. JS				.32b				
2. BB				.41b				
3. CF				-.30a	.43b			
4. JA				-.09a	-.01a	.11b		
5. LB				-.13a	-.10a	.02a	-.03b	
6. BE				-.02a	-.04a	.20a	.11a	.19b
	Ranks =			1	1	2	2	1

Note: Critical Value = 6 R = 7

baseline condition. The performances are ranked with the smallest number being assigned to the greatest increase in performance. The assumption is made that because the subject for whom the intervention is begun at a given point is randomly assigned, "any combination of ranks at the point of intervention is equally probable if the intervention has no effect." A positive effect however, will be reflected by consistently low ranks (in this case) for the subjects beginning the imagery strategy.

According to the significance table provided by Revuski the sum total of the ranks for five subjects must be equal to or less than 6 to be significant at the .05 level of confidence. If only one of the two subjects whose intervention began at story four is used to compare with the remaining four subjects, this critical score is exceeded by one rank. The use of an imagery strategy to increase listening comprehension was not significant across all subjects. However, it is interesting to note that the increase in both subjects JS and BV's performance was dramatic (the only positive changes for story four). If the increase of both subjects had been as dramatic at differing intervention points which could have been used in the statistical comparison, the resulting rank of 8 would meet the critical score for a six subject comparison at the 05 level.

This type of manipulation of a post hoc use of a statistical method is purely speculative, of course, and is offered only as an indication of the tendency toward significance which may not be apparent through observation alone.

While imagery training was not significant as an effect across subjects, there was a noticeable increase in performance for subjects JS and BV. What characteristics differentiate these two students from the remaining four for which there was no dramatic increase?

The most obvious differentiation between subjects BV and JS and the remaining subjects is the level of their baseline performance. Table 8 shows the average baseline and imagery intervention performances for each subject. A comparision suggests that both BV and JS initially were performing considerably below subjects JA, LB, and BE and that after imagery training their performances approached the level maintained by these 3 subjects[6].

TABLE 8

Mean Number of Correct Responses to Listening Comprehension Questions Before and After Intervention

Subject	Baseline	Intervention
JS	11.67	16.14
BV	10.33	16.00
CF	13.25	15.67
JA	17.20	17.00
LB	19.67	18.50
BE	19.29	21.00

The possible connection between the lower baseline performance of subjects JS and BV and their relatively greater increase in comprehension with imagery might be explained in several different ways. One possibility is that the initial listening comprehension skills of these two subjects was somehow qualitatively different from and inferior to those of subjects JA, LB and BE. The

[6]It is also interesting to note that the third subject who appears to have made a possible increase in performance after the imagery intervention (CF) began at an intermediate level of performance and increased to an average slightly below JS and BV.

imagery strategy may have been able to augment the skills of these two subjects in the hoped for fashion but not have been able to significantly enhance the more developed skills of the remaining subjects.

The performance of subjects JS and BV on the previously administered measures suggests they may have initially had more deficits in skills related to listening comprehension than the other subjects in experiment three. Subject JS had the lowest listening comprehension performance (below 3.8) of all 12 subjects on the Spache Scales. Subject BV obtained a listening comprehension score on the Spache which was comparable to the remaining subjects but had the lowest Verbal Scale score on the WISC-R of any of the subjects utilized in either series of experiments.

A second possible reason the subjects with lower baseline performances increased the number of correct responses with the imagery strategy, while subjects with higher baseline performances did not, could be a ceiling effect. The relatively high baseline performances for some subjects in this experiment may be the result of the material used. When originally constructing the 10 target stories, they had to be worded carefully to compensate for the subject's low word recognition skills. Complex sentence structure was changed whenever possible in an attempt to insure similiar levels of difficulty across stories. When these stories were put on tape, the task became well within the capabilities of several of the subjects.

Subjects with these initially high baseline performances had to correctly answer a very high percentage of the questions in order to demonstrate a significant increase. When relatively few errors determine whether or not an increase is demonstrated, relative difficulty of specific questions become

important. Specific questions may have been more difficult for all six subjects. Subjects who had already achieved a higher baseline performance would, therefore, need to answer a greater percentage of these very difficult questions in order to demonstrate the same increase as subjects with initially lower scores.

A review of individual responses to the various comprehension questions indicated that seven of the ten target stories had two questions which were missed by at least five of the subjects. (Story one had only one "difficult" question while stories four and ten had 7 and 5 such questions respectively.)

The fact that at least five of the six subjects missed at least two of the same items for the majority of the stories suggests that these items were more difficult than the questions for which there was a more random spread of errors. This would reduce the total number of similiar questions possible to 23 and make it very unlikely that subjects LB and BE with baseline performances averaging near 20 correct responses could demonstrate a significant increase.

A third possible explanation for the importance of baseline performance may be found in the type of errors these 6 subjects made. In examining the subjects' responses it was seen that subjects JS and BV differed from the remaining subject in the number of errors they made concerning the factual information in the story. The most complete explanation for the relationship between baseline performance and an imagery effect may be provided by considering the type of errors the subjects made.

As in Experiment II, ambiguous responses or responses indicating a misunderstanding of the question asked, were probed by the experimenter. Figure 7 shows the number of correct responses given to the comprehension questions when these (clarified) responses were credited.

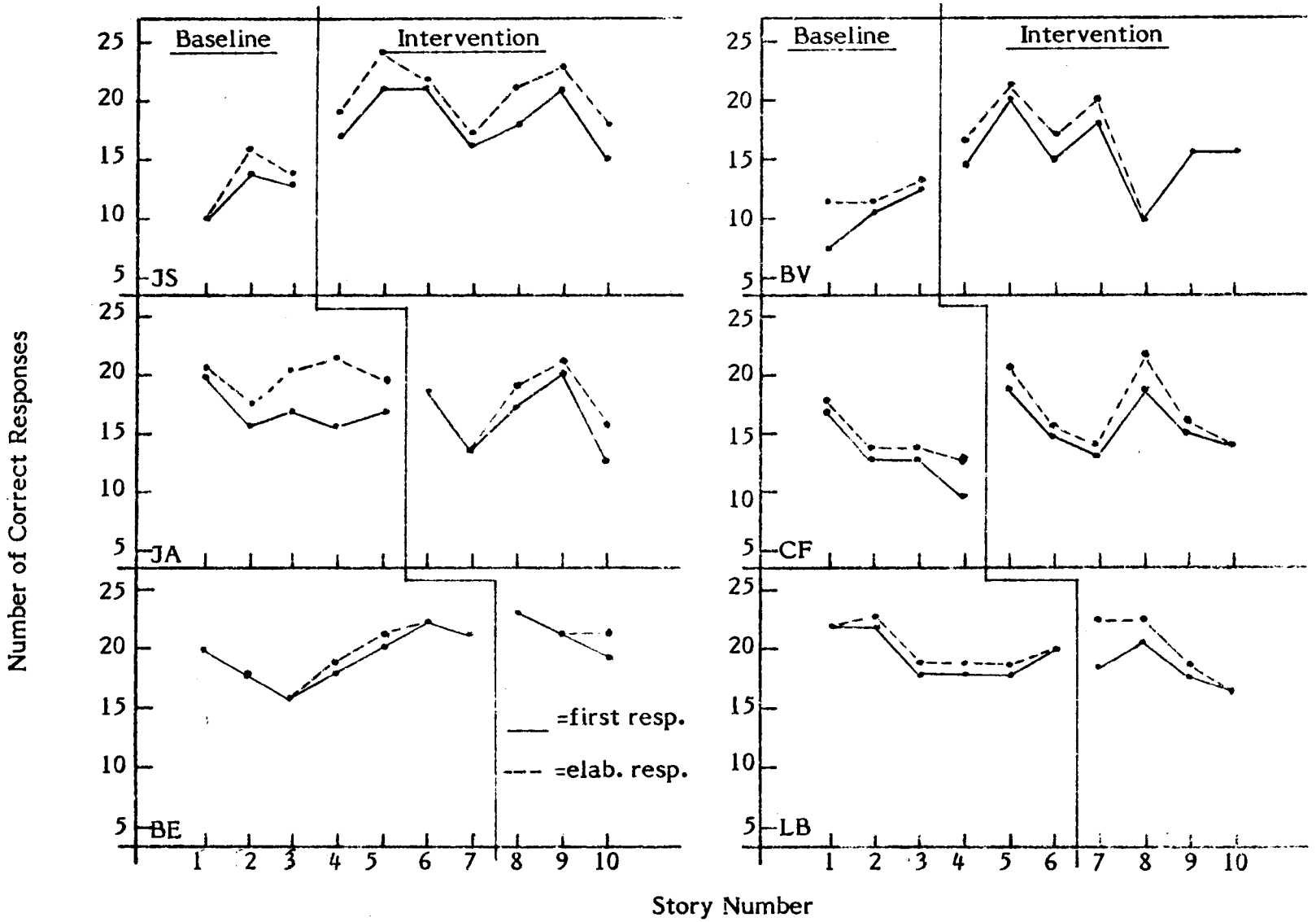

Figure 7. Number of correct first responses and elaborated responses to listening comprehension questions.

The baseline performance of subject BV is more stable when prompted responses are considered while increase in performance is just as dramatic. Subject LB, the only subject not to increase in performance with the introduction of the imagery strategy does show the expected increase when corrected responses are included.

The inclusion of elaborated responses indicates that many of JA's errors were responses which were too vague or too general rather than errors of fact. When these responses are credited JA is the only subject who appears to have done less well on some stories with the imagery strategy than without it.

The difference between the answers which were correct on first response and those which were correct when subjects were able to clarify their answers points out the importance of the kind of errors subjects were making.

For an answer to be considered correct, the response had to contain the exact words or direct similies of the exact words of the model answers by the experimenter. (These model answers were constructed directly from the stimulus sentences.)

Generally the errors the subjects made can be broken into four types:

(1) Responses giving a clearly wrong piece of information, (eg. "How much air did the boys have left when they reached the top?" Response 3 minutes worth model answer "4 minutes of air").

(2) Answers which are too general to be credited. eg. "What were the boys doing on the day their story began?" Response looking around model answer "taking a walk").

(3) Answers which are correct in fact but ignore the sequence of events. (eg "Who came next to talk about the spacemen?" Response army men model answer "a reporter" but next to arrive were army men.)

(4) Answers which indicate a lack of understanding for the question asked. (eg. "What did the men do after the cable was tied down?" subject asks "Which men?")

The subjects' errors for all ten stories were divided into these categories. Table 9 indicates the mean number of each error type for each student under both baseline and intervention conditions.

The baseline means suggest that subjects BV and JS differ most from subjects JA, LB and BE in the number of errors made concerning the actual facts in the story (the largest category of errors for all subjects). In comparing baseline and intervention means, it is this category of factual information which increases greatly for subjects JS and BV. Errors related to sequence difficulties, wording of the response or misunderstanding of the question do not appear to change significantly with the imagery intervention.

TABLE 9

Mean Number of Error Types Under Baseline and Intervention Conditions

Subjects	Type Error							
	1		2		3		4	
	B	I	B	I	B	I	B	I
JS	10	5.00	1.67	1.714	1.00	1.714	1.00	(.14)
BV	12.33	6.14	.33	.571	1.33	1.714	.33	(0)
CF	9.25	6.00	2.00	1.33	1.50	1.66	.25	1.33
JA	3.20	6.20	2.00	1.20	2.40	.60	.20	(0)
LB	3.00	3.00	.80	1.75	1.50	.75	.16	(.50)
BE	4.143	2.00	.714	1.33	.86	.33	.00	(.33)

Figure 8 illustrates the errors of fact made by each of the six subjects for the 10 target stories. The graphs show the fairly dramatic drop in errors related to factual information by subjects JS and BV with the initiation of the imagery strategy as compared with the fairly consistent responses of the remaining subjects still under the baseline condition. This graph also indicates how few factual errors subjects JA, BE and LB were making initially and again raises the strong possibility of a ceiling effect.

It is not possible to conclude from the data here whether the imagery strategy would have benefited at least five of the six subjects if there had been a greater number of items. But the fact that the subjects who were in the most need of support in listening comprehension were the ones who did in fact improve with the imagery strategy, is encouraging for educators looking for strategies to improve these skills.

The Comparison of Imagey Effects for Listening and Reading Comprehension

The main reason for conducting this experiment with listening rather than reading comprehension was to contrast the results with those of Experiment II. While, as mentioned above, the imagery strategy did not result in a significant effect across subjects, the possibility of an imagery strategy being successful was far more promising for the listening task.

Tables 10 and 11 compare individual and group performances on both the reading and listening comprehension tasks. The percentages listed were generated by adapting Revusky's conversion of raw data for comparing different performance levels. The average of a subjects performance on the first three baseline stories ($\bar{A}i$) was subtracted from each of the following seven performances. Each figure was then divided by this average ($\bar{A}i$). The result was a

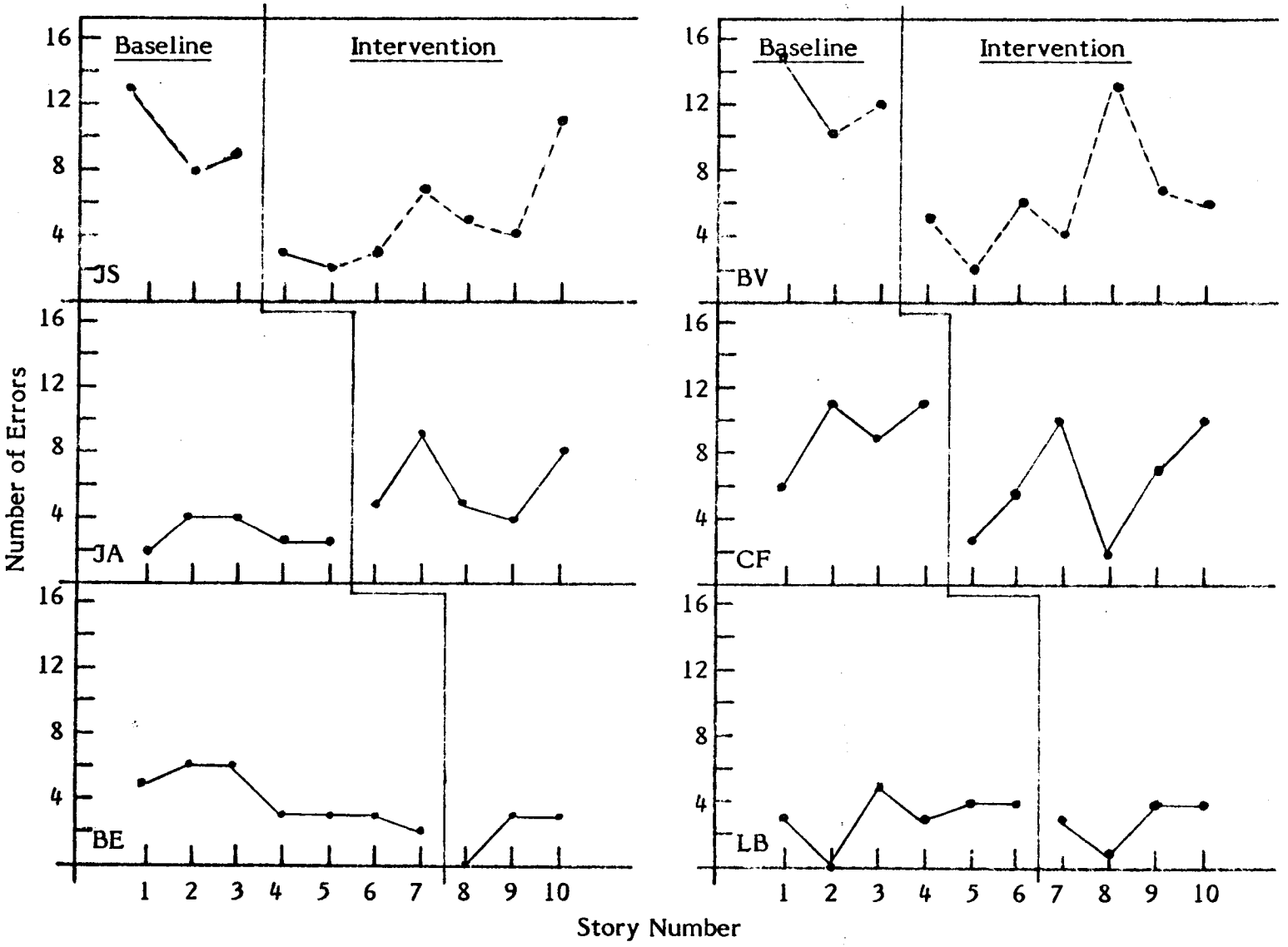

Figure 8. Number of factual errors on listening comprehension questions.

TABLE 10

Percentages of Relative Increase in Performance
Compared to First Three Stories

Subject	Story Number						
	4	5	6	7	8	9	10
			Reading Comprehension				
DN	.17	-.22	-.35	.30	.30	.56	.43
KW	-.15	.31	-.23	.15	.08	.15	.08
LT	-.26	.02	-.26	-.15	-.21	-.38	-.26
SS	-.02	.08	.13	-.02	.03	.13	-.07
AS	-.06	.46	.89	.37	.63	.63	-.14
SP	-.06	.31	.06	.06	.00	.19	.00
			Listening Comprehension				
JS	.32	.59	.77	.32	.32	.68	.06
BV	.41	.97	.50	.78	-.06	.59	.59
CF	-.30	.33	.05	-.09	.33	.05	-.02
JA	-.09	-.04	.08	-.21	.02	.19	-.26
LB	-.13	-.13	-.02	-.08	.02	-.13	-.27
BE	.00	.11	.22	.17	.28	.17	.06

Note: Jagged line seperates imagery and intervention conditions.

percentage which represents the amount of increase or decrease in performance from the average of the first three baseline stories for that subject.

TABLE 11

Percentage Means of Relative Increase in Performance For Different Treatment Conditions

Conditions	Story Numbers						
	4	5	6	7	8	9	10
Total Group	-.01	.23	.15	.13	.15	.24	.02
Total Reading	-.06	.16	.04	.12	.14	.21	.01
Reading Without Imagery	-.10	.22	.48	.22	-	-	-
Reading With Imagery	.01	.05	-.18	.07	.14	.21	.01
Total Listening	.04	.31	.27	.15	.15	.26	.03
Listening Without Imagery	-.07	-.02	.10	.17	-	-	-
Listening With Imagery	.37	.63	.35	.18	.15	.26	.03

The individual performances listed in Table 10 are again divided by a jagged line to differentiate between baseline and intervention conditions. On both the reading comprehension and listening comprehension portion of the table, performances above the jagged line are intervention performances while figures below the line represent baseline performances.

A comparison of individual performances illustrates that in the reading comprehension experiment there does not appear to be a pattern or contrast between baseline and intervention conditions; some intervention sessions

represent a decrease in a subjects performance while subjects under the baseline condition for the same story show increases in performances.

The performances for the subjects in the listening comprehension experiment however, do suggest a contrast between baseline and intervention sessions. On story 4, subjects under the intervention condition improve their performance while performance for subjects under baseline conditions all decrease. Similarly in story five and six, the percentages indicating the most improvement are consistently in the imagery condition.

Table 11 averages the relative performances across subjects in the various treatment conditions. The average performances for all twelve subjects suggest that story 4 and 10 may have been the most difficult for the group as a whole. A comparison of reading performances with and without imagery again illustrate that for these subjects no consistent pattern between conditions was demonstrated. A comparison of listening comprehension performance with and without imagery however, does suggest consistently greater increases in performances for the imagery condition. In addition, the listening comprehension condition is the only condition which maintains a positive increase for all seven stories. A comparison of reading with imagery and listening with imagery demonstrates in tabular form what may be difficult to see on the individual graphs. The relative increases for reading with imagery are consistently almost zero. Only for stories eight and nine is there a slight increase in performance. The relative increases for listening with imagery are positive for six of the seven stories.

Perhaps the greatest contrast between the two experiments however, was the subjects' reactions to using the imagery strategy as a facilitation for the target stories.

In reviewing the tapes of the listening comprehension sessions, it was confirmed that the negative reactions which were so predominative during the reading tasks were non-existent in this experiment.

There were no refusals or behavior changes indicating that the students in any way objected to using the imagery strategy while listening to the target stories.

Only one subject, CF, had difficulty creating images for the material. This subject was the only student of the twelve to say he did not understand the concept of imagery. Unlike the subjects in Experiment II, who were able to understand and perform well on the imagery training material but unable to apply this strategy to the reading task, subject CF initially reported he was unable to "make pictures" for even the single words used in the training material.

With the exception of subject CF, the subjects in this experiment were enthusiastic about both the imagery training and its use with the taped stories. Actual comments about the use of imagery with the tapes were all positive. Subjects BV, JA, and LB all indicated that they found making images easy and helpful when they tried to remember events contained in the stories. Subject BE indicated that some events were difficult to picture. (Such as the hanging of the southern soldier. BE was unsure whether there "was a horse running out or one of those doors dropping".) But he indicated the pictures were helpful where he could make them. Subject JS commented that in listening to the tapes "you have to make them (the pictures) really fast". But frequently he indicated that he had made pictures for the stories and found them helpful in responding to the comprehension questions.

The subjective reaction of the students to using the imagery strategy for the listening task was in sharp contrast to the previous attitude of the students in Experiment II. While the actual objective data of number of questions correct with the imagery strategy for listening comprehension was encouraging, it was the more subjective responses of the students which most strongly suggest a real difference between the listening and reading comprehension tasks.

CHAPTER III

GENERAL DISCUSSION

A. CONCLUSIONS

The original purpose of this investigation was to explore the effectiveness of induced visual imagery as a facilitator for reading comprehension among a specific population of poor readers. The desired result was an instructional tool of sufficient strength to be of practical rather than statistical significance.

It was hoped that these students would perform on a paired-associate task in a similar manner to Levin's High Picture-Low Word learners because Levin had demonstrated that reading comprehension might be facilited for students with this learning pattern. The subjects' performance in experiment 1 was not similar to Levin's group however. Presumed cognitive abilities based on WISC-R performances appeared to be related to picture associations but not closely related to word associations. Actual word recognitions or decoding skills appeared to be more effective than cognitive characteristics in prediciting subjects' successes in associating word pairs. Individual subjects' performance on Levin's paired-associate task was not predictive of later reading or listening comprehension success with imagery.

The results of Experiments II and III do not support the use of induced visual imagery as a reading comprehension facilitator for the population chosen. The number of correct responses to reading comprehension questions did not significantly increase with the use of the imagery strategy. The lack of a significant increase for any of the subjects involved in this experiment, plus the

unanimous dislike of the students for the use of imagery in this manner, suggests that there may be little utility for such a teaching technique for students with similar reading and cognitive characteristics.

Results were not as negative when the identical imagery strategy was introduced into a listening comprehension task. The two subjects whose original performance indicated the most need for a facilitative strategy did increase their number of correct responses with the imagery intervention. While the effect of using the induced imagery strategy was not significant across all subjects, the initially high baseline performances of half the subjects utilized suggests that a ceiling effect may have prevented more positive findings.

In addition, the subjects responded positively to the use of induced imagery while listening to the narrative materials. Indeed, several students became noticebly more animated when encouraged to "make pictures in their minds" to go along with the tapes they were listening to.

The use of induced imagery to increase listening comprehension may prove to be a useful learning and teaching strategy to help students understand and recall orally presented information. Although the results of this study can not be cited as overwhelming support for the effectiveness of such a strategy, they do suggest that additional research is warranted.

B. THE INEFFECTIVENESS OF IMAGERY AS A FACILITATOR FOR READING COMPREHENSION

While the failure of the imagery strategy to facilitate reading comprehension was discouraging in a search for useful applied techniques, it suggests some interesting theoretical possibilities. Four possible explainations for the lack of a positive effect will be discussed below.

The use of the multiple baseline design demands a strong impact by the independent variable in order to demonstrate a positive effect. This design was used intentionally as the desired goal was a teaching/learning strategy of practical rather than statistical significance. It may be however, that the use of imagery as a strategy is such a subtle internal process that it is not powerful enough to overcome the changing effects of the other internal variables which confounded this experiment across subjects and across reading material. The interaction between the content of the different stories, the imagery process, and individual subjects may have confounded the results of this experiment to the point that possible benefits from using induced imagery are not apparent. Efforts to insure a similar level of difficulty for each story were extensive. (See Procedures and Appendix C.) Attempts to control for the possible confounding variables of the subjects' varying decoding abilities and understanding of the comprehension questions were described previously. These varaiblies do not appear to sufficiently explain the absence of improvement using the imagery strategy. But variables beyond the control of the experimenter may have confounded these findings.

One variable known to effect a subject's ability to comprehend or remember information is the familiarity of that subject with the material to be remembered. Great care was taken to make sure students were equally familiar with the individual words contained in the reading passages, but it was not possible to control how familiar each student might be with each story line. While the actual plot of each story was fantastic enough to ensure no subject would have direct experience with the events, (an attack by a grizzly bear, a visit by a man from outer space, survival at sea, etc.) , each story was set in an

environment with which the boys might differ in familiarity (camping, swimming, snow, travel, etc.). Throughout the reading sessions it was apparent that some stories were more exciting to the subjects than others and that the students differed as to which stories they preferred. If students by chance read baseline stories with which they more readily identified because of past experiences and less familiar stories under the imagery condition the positive effects of the imagery strategy would be lessened.

Another factor which varied uncontrollably between students was the way in which they reacted to the success or failure on previous stories or questions within a story. Some of the students for example were obviously discouraged by missing several questions in a row while others were challenged to try even harder to give a correct response.

A third internal variable was a student's alertness, concentration or fatigue during the session. While all students were coaxed to give their best performance, the sequential nature of this design made it vulnerable to colds, late night television, or other factors which influenced the student's ability to perform on that particular day. Similarly, events which took place at home or school during the ten story sessions could have influenced the student's performances in such a way as to mask the positive effects of the imagery strategy. For example, one subject's father was in the hospital during the last part of the experiment and on one occasion another student "escaped" a class punishment to participate in his session.

The larger subject populations of more traditional experimental designs can help to counterbalance these types of internal and situational variables. But

they become more of a hazard with a complicated task such as answering comprehension questions when using so few subjects.

Despite these methodological difficulties however, one is still confronted with the fact that when the first response to comprehension questions is considered the target behavior, no subject demonstrated the predicted increase in accuracy with the initiation of the imagery strategy to a significant degree. If these factors were strong enough to disguise the benefit of an imagery strategy on these tightly controlled stories it is difficult to imagine a classroom situation in which the practical benefit of such a strategy could be demonstrated. It was the dramatic rejection of the use of the imagery strategy by the subjects in the reading comprehension study which cast the most doubt on this interpretation of the results.

A second possible reason for the students' lack of benefit from the imagery strategy is that their reading difficulties were not of the nature Levin and others described when they spoke of readers who might benefit from an organizational strategy.

Levin predicted that induced imagery might prove a successful facilitator for a group of poor readers who could decode words correctly, and understand their individual meanings, but who had difficulty understanding the meaning of sentences and passages, presumably because of difficulty interpreting the structure imposed on them by the rules of language. Rapin would probably categorize these readers as semantic dyslexics (page 34 of the literature review).

The reading ability of the subjects utilized in this experiment did not conform to those of Levin's "difference" readers however. While WISC-R profiles and anecdotal information in the students' psychological reports indicate

the strong likelihood that these learners were either superior in or preferred the more picture-like right hemisphere processing, their reading difficulties did not appear to be the strictly organizational deficits Levin described for his hypothetical population.

The subjects selected here on the basis of WISC-R profiles and previously identified reading difficulties, tended to have significant decoding difficulties. On the Spache Diagnostic Reading Scales, these subjects were able to answer comprehension questions successfully when words they misread were supplied for them. The authors of this reading measure had suggested a maximum number of word recognition errors and a minimum number of correct comprehension questions which were permissable for each graded passage. When misread words were corrected by the examiner, all twelve of the subjects were able to meet the criteria of the minimum number of comprehension questions but exceeded the maximum number of oral reading errors for their most difficult passages. For the majority of subjects, it was noted that on the easier passages many of their reading errors involved the small "functors" in the sentence (of, on, or, to, the). The students were able to recognize these functors in isolation, when their attention was directed solely to these words, but frequently misread or stumbled over the words when reading passages. This pattern of reading difficulty more closely resembles Rabin's "Aggramatic readers" rather than the "Semantic Dyslexics".

The frequent misreading of functors may be related to a lack of an underlying understanding of the syntactical rules of language. We know that decoding skills are not completely separate from the meaning the reader attributes to the passage (page 33 Lit. review). It is possible that these

Aggramatic readers may be less likely to correctly anticipate the required functor in a sentence because of a less well established knowledge or confidence in exactly which functors will be required to make sense out of that cluster of words. These small functors do not carry a great amount of visual cues, and the context of a sentence (or its syntactic and semantic rules) may be important in consistently correctly decoding these words. The misreading of the functors in a sentence will surely hinder the reader's ability to comprehend the structure of the passage the author intended.

This type of reader might be expected to look very much like the semantic dyslexic (who can correctly identify isolated words and words in context) unless the examiner were to have them actually read passages aloud. Both might be able to identify long lists of isolated nouns and adjectives and to give the correct meaning of isolated words.

If the subjects used in this experiment are thought of as poor readers primarily because of decoding or misreading difficulties which are problematic in advanced nouns and adjectives, but also in small functors in the sentences they read, their performance during the three experiments becomes more easily explained.

In Experiment I, correlations between WISC-R performances and the subjects' performance in both the Spache Reading Scales and Levin's PA test indicated that for these subjects, actual word recognition or decoding skills were more predictive of successful word-pair associations than general verbal skills. Clearly, the more words the students recognized the better able they were to make useful associations. But associating the nouns was not significantly more difficult for them than associating picture pairs. This may be because their

difficulties are not in generating this type of global verbal association but rather in the interplay of syntactical rules, decoding words, and using the functors of the language when reading in context. In fact, the subjects might well translate words into images of the objects they represent and associate them in the same manner they make associations between the picture pairs (the higher correlation of performance scores to word-pairs is consistent with this possibility).[7]

In Experiment II, the reading comprehension experiment, the subjects' tendency to misread the functors in a sentence would deprive them of critical information needed to construct useful images. While every effort was made to assure that readers would be familiar with the more difficult nouns and adjectives contained in the target stories, there was no way to ensure the correct recognition of important functors (i.e.: to, the, on, in, but, or) which carry much of the structural information which organizes the material according to language rules.[8] If subjects misread the vital information which makes the relationship between elements in the sentence explicit, they could not form appropiate representations of these relationships in terms of visual images.

When the stories are presented on tape however, as in Experiment III, these students are able to utilize, to varying degrees, the important information

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[7]The higher correlation between word-pairs and performance tasks on the WISC-R, when compared to the word-pair verble task correlation suggests that this population may be using right hemisphere skills for either or both decoding and associating word pairs.

[8]The small correlations for most subjects between the number of words missed on the word list and the number of correct responses to comprehensive questions is consistent with the possibility that it was the reading of words in context (including functors and familiar sight words) which presented difficulty for the student.

carried in the phrasing and correct use of these "functors". Supplied with the necessary information to generate accurate imagery, these students may be able to utilize the strategy to recall more of the story detail.

Decoding difficulties of the kind described above could explain the lack of success of the imagery strategy for reading comprehension but possible success for listening comprehension. However, the strong negative reaction of the students to the imagery strategy with the reading task suggests that something more may have been happening. The contrast between the students' affective reactions to the reading versus the listening task was the most dramatic result of the study.

A third possible explaination for the ineffectiveness of the imagery strategy which would account for the subjects' affective reactions might be that reading for this group was so difficult as to require most of their energy and concentration. In addition, one might expect that reading for these students might be an anxiety producing activity because of their history of reading difficulties. Any task combined with reading, not just specifically creating images, may have been too much for these students and have resulted in frustration.

The listening comprehension task on the other hand may be a less demanding and anxiety producing task for these subjects. The addition of another activity while listening to a tape may have been more within these subjects' capability.

Finally, an intriguing possibility is that there was a conflict between the imagery and the reading tasks which was a result of the specific nature of these two processes.

Subject comments that the imagery strategy, when used in conjunction with the reading passages, was more confusing than helpful, and KW's comment that he did not like to make images, "because you have to stop" (reading), suggest that the imagery process may be somehow in conflict with the reading process for these subjects.

Levin and Devine-Hawkins (1974) suggested just such a conflict between the reading process and a visual imagery strategy in follow-up article to the research which was the model for this study. They argued that while visual imaging may be an effective comprehension strategy it may not be effective for reading comprehension because the act of reading is itself a visual process. They suggested that these two visual processes may in effect share a processing system "represented by visual perception."

In an attempt to demonstrate this possible conflict, Levin and Devine - Hawkins compared the effectiveness of an imagery strategy to increase comprehension for a similar reading and listening task. While task performance data did not conclusively support their hypothesis, subjective rating by the students indicated they were more likely to actually use an imagery strategy, despite original instructions, for the listening task.

Levin and Devine-Hawkins interpreted this finding as being consistent with their theory that the use of visual imagery is more compatible in terms of processing ease or frequency when used in a listening rather than reading task.

As in the Levin and Devine-Hawkins experiment, it is the subjective reports of the students in this study which present the most interesting data and suggest most strongly that imagery generation may not be an effective comprehension strategy for written prose.

Levin, presumably, was referring to children, or all readers, in general when he suggested that visual imagery may be, in effect, too interwoven with the visual process involved in reading to be an effective reading comprehension strategy. This statement may be even more applicable to this population of students. As mentioned in the review of the literature, studies investigating the laterized functioning of the brain suggest that some poor readers may persist in the use of a right hemisphere strategy (visuo-spatial) for reading while more successful readers tend to move toward left hemisphere processing once basic letter discrimination is mastered. It is possible that these students who were selected on the basis of superior visual-spatial to verbal skills, are just such readers.

Originally this experimenter presumed that precisely because of right hemisphere skill or preference, these students might be able to better utilize a visual imagery strategy to increase reading comprehension than many of their peers. If Levin's theory of incompatability is correct however, these students may actually be using more of the common visually related processing system while reading than the average student their age and in effect be the least likely group to benefit from an imagery strategy.

The dramatic rejection of the imagery strategy for reading comprehension after the ready acceptance of both tasks when rehearsed independently is strong indirect support for the existence of a processing conflict.

C. IMPLICATIONS FOR FURTHER RESEARCH

As stated earlier, there was little in these experiments to suggest that further research with induced imagery as a facilitator of reading comprehension

would be fruitful for students with similar profiles to these subjects. However, the reading abilities of these students were not as anticipated. It is possible that students with poor comprehension skills who are not experiencing any decoding problems may benefit from an induced imagery strategy.[9]

Subjects for this experiment were chosen first on the basis of specific WISC-R profile. Students who did have the comprehension difficulties Levin describes in the absence of decoding problems might be identified through reading tests which utilize reading in context or through direct observation. The cognitive profiles of these students might then be estimated by the administration of Wechsler Intelligence Scales or other cognitive ability measures. Positive effects with an induced imagery strategy for reading comprehension among students with high visual-spatial skills would suggest that it was decoding problems which prevented the subjects of this study from benefiting from such a strategy and lessen the argument for a reading-imagery processing conflict.

Similarly, the ability of successful readers with high and low visio-spatial skills to utilize an imagery strategy to further increase reading comprehension might provide interesting clues to the "visual" nature of the imagery process.[10]

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[9]From a limited experience as an assessment specialist, it appears to the researcher that Rabin's "semantic dyslexics" are far less frequently identified in school populations than poor readers with some degree of decoding difficulties. This may be because these students are rare. It is also possible however that this minority is a result of the rather primitive reading measures commonly used by assessment specialists to verify reading difficulty. In many cases, word lists are the primary basis for establishing reading level. Students who can read and define individual words but not comprehend their use in sentences would not be identified by these measures.

[10]Successful readers would presumably be using left hemisphere skills appropriately for the reading task. The use of an imagery strategy might then augment verbal processing in the fashion originally predicted for the subjects in this study.

The most fruitful avenue for further research however, appears to be with the use of induced imagery and listening comprehension. Without the limitations of limited decoding ability concerns, material of sufficient length and complexity could be generated to avoid the possible ceiling effect of this experiment. Students with noted deficits in listening comprehension, or students of varying visual-spatial abilities, could be asked to use an induced imagery strategy in experimental models similar to this one or in larger group designs.

The positive attitude of these subjects toward the use of induced imagery for listening tasks, and the encouraging results with the students who were most in need of a facilitative strategy suggests that induced visual imagery may be a useful tool in applied settings.

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APPENDIXES

APPENDIX A

SUBJECT INFORMATION

Students Participating in Reading Experiment

DN
Age: 9 years, 6 months
Race: Caucasian

Wechsler Performance		Spache Reading Scales	
Verbal	74	Word Recognition	3.8
Performance	87	*Oral Reading	2.8
Full Scale	79	Silent Reading	3.3-3.8
		Listening Comp.	4.5

*On the oral reading section of the test, DN was able to answer 6 of 8 comprehension questions for a passage rated as 3.8. But he made too many reading errors on a passage raited 3.3 to be given credit for these more advanced passages. In oral reading DN would frequently read "and" for "on", "in" for "it", "for" for "from" and "was" for "saw".

LT
Age: 11 years
Race: Black

Wechsler Performance		Spache Reading Scales	
Verbal	86	Word Recognition	3.8
Performance	96	*Oral Reading	3.3
Full Scale	90	Silent Reading	3.8
		Listening Comp.	4.5

*On the oral Reading section LT was able to answer a sufficient number of comprehension questions to receive credit for a passage raited 3.8. However, LT made too many reading errors to receive credit. LT read "to" for "the", "was" for "saw" and left out suffixes (such as "er") in several words.

AS
Age: 9 years, 3 months
Race: Black

Wechsler Performance		Spache Reading Scales	
Verbal	86	Word Recognition	4.5
Performance	104	*Oral Reading	3.3
Full Scale	96	Silent Reading	3.3
		Listening Comp.	4.5

*On the oral reading section, AS did not make many errors on "functors" but stumbled over adjectives and nouns. Like many of the other subjects in this experiment, he was able to answer the comprehension questions for a 3.8 raited passage but made too many reading errors to receive credit for this grade level equivalency.

KW
Age: 9 years, 9 months
Race: Caucasian

Wechsler Performance	
Verbal	82
Performance	101
Full Scale	90

Spache Reading Scales	
Word Recognition	4.5
*Oral Reading	4.5
Silent Reading	4.5
Listening Comp.	5.5

*KW's reading errors were at the maximum for credit at this level but comprehension was very good.

SS
Age: 10
Race: Caucasian

Wechsler Performance	
Verbal	90
Performance	102
Full Scale	95

Spache Reading Scales	
Word Recognition	4.5
*Oral Reading	4.5
Silent Reading	4.5
Listening Comp.	6.5

*Subject SS did not appear to have difficulty reading the "functors" in these passages but omitted articles, possessives, and ignored periods in several sentences.

SP
Age: 10 years, 9 months
Race: Caucasian

Wechsler Performance	
Verbal	79
Performance	96
Full Scale	86

Spache Reading Scales	
Word Recognition	4.5
*Oral Reading	3.8
Silent Reading	4.5
Listening Comp.	6.5

*SP seemed distracted by the errors he made while reading orally. He had to use his finger to keep his place as he read. Frequently SP substituted words in sentences which made sense but were not at all similar in meaning or appearance to the actual word in the text.

Students Participating in Listening Comprehension Experiment

JS
Age: 10 years, 3 months
Race: Black

Wechsler Performance	
Verbal	88
Performance	98
Full Scale	92

Spache Reading Scales	
Word Recognition	2.3
*Oral Reading	2.3
Silent Reading	1.8
Listening Comp.	3.8

*JS had 100% correct reponses to comprehension questions on a passage rated 2.8 but exceeded maximum decoding errors. However during silent reading JS was only able to answer 3 comprehension questions of 8 on a 2.3 passage.

BV
Age: 10 years, 6 months
Race: Caucasian

Wechsler Performance	
Verbal	73
Performance	91
Full Scale	80

Spache Reading Scales	
Word Recognition	2.3
*Oral Reading	1.8
Silent Reading	1.8
Listening Comp.	4.5

*Subject BV, like subject JS had good comprehension on a reading passage rated 2.3 but exceeded maximum decoding errors. On a silent reading passage however (where errors were not corrected by the examiner) comprehension was poor.

CF
Age: 9 years, 8 months
Race: Caucasian

Wechsler Performance	
Verbal	97
Performance	118
Full Scale	107

Spache Reading Scales	
Word Recognition	2.3
*Oral Reading	3.3
Silent Reading	3.3
Listening Comp.	4.5

*CF appeared to be able to use context cues to help him decode words in passages in that more errors were made in isolation.

JA
Age: 9 years, 6 months
Race: Caucasian

Wechsler Performance	
Verbal	84

Spache Reading Scales	
Word Recognition	2.3

Performance	108	*Oral Reading	2.8
Full Scale	94	Silent Reading	2.3
		Listening Comp.	4.5

*JA was able to answer the comprehension questions for a reading passage graded as 3.3 but again, made too many reading errors to be certified in this level. The examiner noted that JA seemed to disregard proverbs and commas as he read, frequently combining sentence parts in nonsensical ways.

LB
Age: 11 years, 2 months
Race: Black

Wechsler Performance		Spache Reading Scales	
Verbal	82	Word Recognition	3.3
Performance	96	*Oral Reading	2.8
Full Scale	88	Silent Reading	2.8
		Listening Comp.	4.5

*When misread words were corrected by the examiner, LB was able to answer all comprehension questions for a passage rated as 3.3 correctly. The reading errors made on this passage however, exceeded the limit set for that passage.

BE
Age: 9 years, 7 months
Race: Caucasian

Wechsler Performance		Spache Reading Scales	
Verbal	101	Word Recognition	6.5
Performance	128	*Oral Reading	6.5
Full Scale	114	Silent Reading	4.5
		Listening Comp.	7.5

*Subject BE was not considered to be a poor reader on the basis of these test scores despite the fact that he was continuing to be served in reading support by the public school system. His high performance on the listening comprehension section of this test may explain why his performance on the baseline target stories was so high that it was difficult to demonstrate improvement with imagery.

The following paragraphs contain behavioral descriptions and excerpts from student transcripts concerning the students' reactions to using the imagery strategy while reading.

Subject AS had participated smoothly throughout the seven baseline sessions and appeared to enjoy his first imagery training session. When asked to then read the target story in the same fashion however, he responded, "Do I have to? (whining) How come I can't do it like I used to?" and added, "Shoot, I don't know how I can remember." When asked, after reading the story, if the pictures were helpful or confusing, AS responded, "Confusing". This was despite previous comments by the experimenter indicating that the imagery would hopefully be helpful in remembering the story. AS's resistance grew with succeeding stories. On story nine, before beginning the story he complained, "I want to read it like I used to." When asked why he said, "Because that ain't no fun. Ain't no fun." After story ten the subject indicated he had "made those pictures" but refused to talk with the examiner at all beyond that comment. He appeared very disappointed with his performance and angry with the experimenter.

Subject SP was able to generate images to the single words used in the training session but was annoyed with the 5 sentence passages. He groaned, "Oh! Uh!" to the instruction to read the target story in the same fashion and blurted, "I'm not going to tell you anything about it."

Before the imagery training on session nine SP demanded, "No. No. No. I don't want to make no pictures and I'm not going to do it!" When the experimenter explained how important this was to "the experiment part" of their work together, he agreed to go on and was able to generate imaginative descriptions for the training stimulus tasks. When asked if he was able to make

many images for the target story he said "no". When asked if he remembered the pictures he had made when answering story questions SP responded, "I made different ones--hah, hah!"

Subject KW's negative response to the imagery task was mentioned earlier. On several occasions he indicated strongly that he did "not want to do this" and later that he had not attempted to make images as instructed.

Subject SS did not become noticeably angry as the three subjects mentioned above, but did resist the imagery strategy for the target stories. He indicated some resistance to his first story using the imagery strategy asking "Do we have to stop to make a picture?" and "Do we have to read it all at once?"

During his third session using imagery, SS got out of his seat and walked to the door after the imagery training when he was handed the target story to read. He called back, "I'm leaving." (rather than read the story). After completing the story, the experimenter prompted, "Tell me about some of the pictures you made." SS responded, "I hate them."

Subjects LT and DN did not resist using the imagery strategy when reading target stories but both subjects indicated some difficulty with the task. LT was the only subject to indicate he "could not" make a picture in his mind for several of the sentences in the training material. He began the imagery training with story six. After stories 8, 9, and 10 he was still answering that he was not able to make pictures for most of the target story. After story 8, when asked if making the pictures made it easier or harder to answer the questions LT responded, "Hard. I get the pictures....some of them mixed up."

Subject DN was the only student to eventually say he felt the imagery strategy was helpful in remembering the target story. This student was initially

very quiet and had to be coaxed to respond to any questions beyond the text related structure. In reviewing the tapes his responses were frequently inaudible, but the experimenter's reactions appeared to indicate he did not find the imagery strategy helpful for the first three stories (stories 4-6). After story five the experimenter asked, "Do you think the pictures made it easier, or was it kinda confusing?" DN responded "Kinda confusing."

After story eight, DN indicated the pictures "helped me remember." However, this subject appeared to be very anxious to please the examiner and may have answered positively in an attempt to please. It may be relevant as well, that this subject enjoyed the imagery training sessions very much. He began to share more and more description with the experimenter for the stimulus material presented. His affect changed noticeably when the imagery training was introduced. Previously appearing "timid", or a little frightened, DN left the first imagery session with a broad smile. He greeted the experimenter with far greater enthusiasm from that point on. Before the third imagery session, DN's classroom teacher commented that "Whatever you are doing is working wonders." DN was participating much more frequently in class both in reading group and general classroom activities.

It seemed to the experimenter that DN was responding to the sharing aspect of "trading" visual images with the experimenter. He may have been deriving some of the benefits therapists have noted when advocating the use of imagery in counseling situations.

APPENDIX B

DESCRIPTION AND EXAMPLES OF SPACHE READING DIAGNOSTIC SCALES AND LEVIN'S PAIRED-ASSOCIATE TASK

Spache Diagnostic Reading Scales

The Diagnostic Reading Scales (Spache, 1963) are a series of individually administered tests designed to provide standardized evaluations of oral and silent reading skills and of listening comprehension. The tests consist of lists of individual words, and reading passages of increasing difficulty accompanied by related comprehension questions.

Students are first administered the individual word lists to establish a word recognition level. This level is taken as a starting point for the oral reading passages. When either too many oral reading errors have been made or too few comprehension questions have been answered correctly, a reading passage of equal difficulty is administered to be read silently. When the student fails to meet the minimum standards for a graded passage read silently, the examiner proceeds to read increasingly difficult passages to the student until that student fails to answer a required number of questions.

Spache reports a test-retest reliablity for these scales of .84 for the oral reading passages and .88 for the silent reading stories. Internal consistency for the word list was reported as ranging between .87 and .96.

In a critical review of different assessment measures, Salvia and Jesseldyke suggest that the relabilty data for these scales should be used with caution because insufficient information concerning the sex, age, grade level, etc.. is given for Spaches reliabilty sample. They maintain that the validity of

this test is also not supported by sufficiently stringent statistical information. Salvia and Jesseldyke conclude that the main value of these scores are in the interpretation of the kinds of errors the child makes in oral reading.

Because the purpose of administering this measure was to gain insight into the kind of reading difficulty these students displayed as well as to establish a rough indication of reading level for the purposes of constructing appropriate reading material the experimenter felt justified in using the popular Diagnostic Reading Scales.

Levin, Divine-Hawkins, Kerst, and Guttman Paired-Associate Task

The picture pairs and word pairs were mounted on slides, one pair to a slide, and projected onto a screen at the front of the room (see Procedures Experiment I). Figure 9 below shows a sample of a picture pair used in this task. On the following page Figure 10 gives a sample of a page from the students' response booklet.

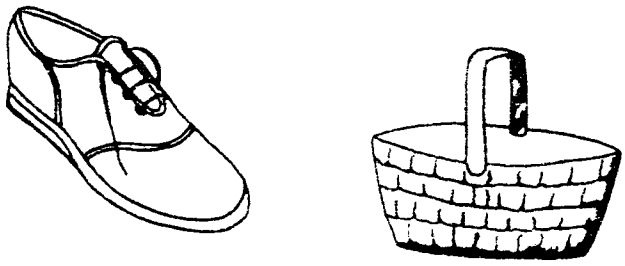

Figure 9. A picture pair from the Levin Paired-Associate Task.

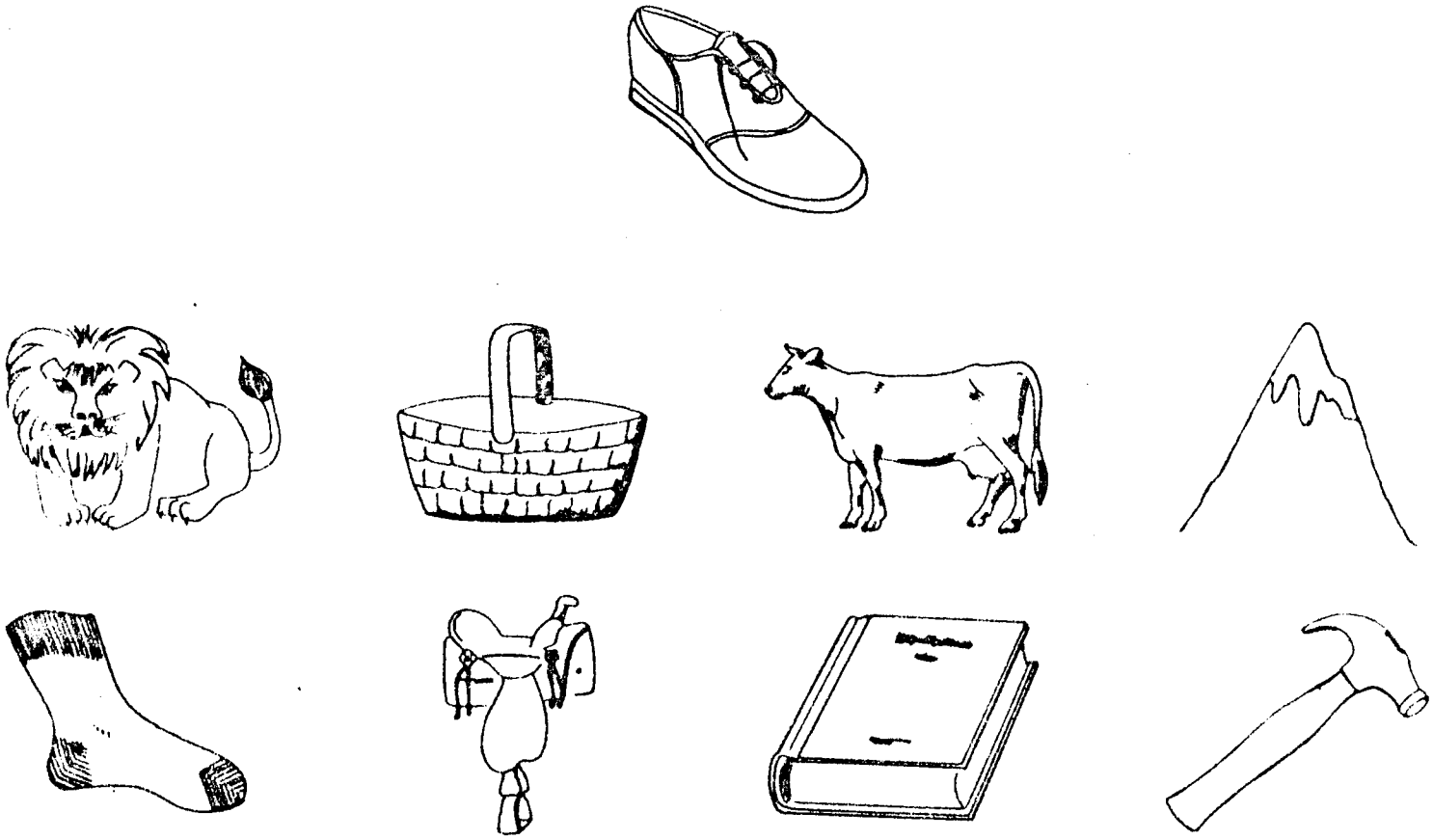

Figure 10. A sample page from the student response booklet for the Levin Paired-Associate Task.

APPENDIX C

STORY AND QUESTION INFORMATION

The target stories were adapted from various sources of children's literature. While sentence structures were simplified when necessary and edited to conform to a standard sentence length, the actual story line was never altered. References to the original stories are listed below. Six of the ten stories were adapted from a book of short stories, Amazing Adventures in a series of readings for children, The Pal Paperback series. This group of stories was rated by the publishers as being between a 2.5 and 3.5 grade level.

1. Car Crash: "Crash at Red Rock River" by Valeria Winkler Griffith. Scholastic Magazines Inc. 1965.

2. Spaceman: "Only a Story" by Anthony Carmendolla. Scholastic Book Services, Action Unit, Scholastic Magazines Inc. 1970.

3. Dogsled Race: "Dogsleds Race Against Death", Amazing Adventures. Mary Verdick (Ed.), In Pal Paperback. Middletown, Connecticut: Xerox Corporation 1974.

4. Diving Danger: "Diving Into Danger", Amazing Adventures.

5. Grizzly: "Battle With A Grizzly", Amazing Adventures.

6. Shipwrecked: "Shipwrecked Boys Survive 15 Months on Lonely Island", Amazing Adventures.

7. Dog Lost: Readers Digest Skill Builders Series.

8. War Story: "A War Story" from Tennessee: A Guide to the State. Hastings House Publishers, 1949.

9. Nightmare: "Nightmare Ends After Endless Days at Sea", Amazing Adventures.

10. Airship: "One Slip Would Mean Death", Amazing Adventures.

An attempt was made to rate the reading difficulty of these controlled passages by having third grade students complete a clozure task using each story. Two separate forms were used for each story. One form omitted every 4th word from the text and the second form omitted every fifth word of the story. Students were asked to supply the missing words of the story in order to make the story make sense. The ease in which a reader can supply the correct missing words, or similies for that word, gives an estimation of the predictability of the words in the story. This predictability is frequently used as a measure of the reading difficulty for a passage. A ratio was then devised for each story such that the number of correct word choices plus the number of words with the correct meaning were divided by the number of items to be filled in for both versions of the story. The resulting ratios suggested that 3 of the stories (stories numbers 3, 4 and 9) may have been more difficult to comprehend despite efforts to minimize story differences. However the clozure task is only one measure of difficulty and it is possible that when the missing words were supplied (as with the actual reading task for the experimental subjects) these stories would not have been more difficult to comprehend.

TABLE 12

Word Selection Percentage by Third Grade Students on Clozure Exercise

Story	Correct Word Form 1*	Correct Word Form 2*	Correct Meaning Form 1	Correct Meaning Form 2	Correct Word or Meaning Form 1	Correct Word or Meaning Form 2	Ave. Forms 1 & 2
1	.4304(690)	.4710(690)	.0768	.0696	.5072	.5406	.5239
2	.4000(705)	.5200(658)	.0922	.0773	.4922	.5973	.5448
3	.2333(660)	.3654(572)	.0939	.0979	.3273	.4633	.3953
4	.3305(675)	.3262(506)	.0468	.0567	.3773	.3830	.3802
5	.4357(645)	.3425(473)	.1922	.1121	.6279	.4545	.5412
6	.5476(630)	.4143(210)	.0444	.1571	.5921	.5714	.5818
7	.4884(690)	.4600(658)	.0971	.1400	.5855	.6000	.5928
8	.5304(690)	.3874(506)	.0870	.1047	.6173	.4921	.5547
9	.3833(675)	.2922(616)	.0924	.0714	.4758	.3636	.4197
10	.4514(720)	.3681(720)	.1278	.1833	.5792	.5510	.5651

*Numbers in parentheses are total possible selections for that Form (Number of subjects x number of missing words).

STORY WORD LIST

_____ alive	_____ adventure	_____ general	_____ Civil
_____ wrapped	_____ wouldn't	_____ army	_____ dirt
_____ brush	_____ bit	_____ wrecked	_____ spacemen
_____ united	_____ underground	_____ below	_____ change
_____ cabin	_____ collie	_____ treasure	_____ dogsled
_____ tight	_____ thin	_____ crack	_____ somehow
_____ decided	_____ driver	_____ south	_____ coconuts
_____ states	_____ sky	_____ drawing	_____ daughter
_____ excitement	_____ expected	_____ helpless	_____ spent
_____ reporter	_____ radio	_____ everywhere	_____ coast
_____ finally	_____ farther	_____ already	_____ sailing
_____ questioned	_____ pound	_____ west	_____ calm
_____ grab	_____ growl	_____ broke	_____ slept
_____ promised	_____ lips	_____ terrible	_____ China
_____ hours	_____ heart	_____ cracked	_____ signal
_____ north	_____ against	_____ soldier	_____ Chinese
_____ island	_____ writing	_____ drums	_____ hospital
_____ month	_____ body	_____ Alaska	_____ locked
_____ lifted	_____ traveled	_____ sick	_____ medicine
_____ airship	_____ circle	_____ blood	_____ problem
_____ war	_____ shoulder	_____ died	_____ expect
_____ biting	_____ drifted	_____ blinding	_____ half-way
_____ unforgettable	_____ raft	_____ slipped	_____ curled
_____ captain	_____ escape	_____ crowd	_____ dives
_____ tighter	_____ pilot	_____ disappeared	_____ spaceship
_____ dangerous	_____ grizzly	_____ bodies	_____ grabbed
_____ screamed	_____ anchored	_____ scratched	_____ nine
_____ edge	_____ whole	_____ cable	_____ scout
_____ racer	_____ building	_____ drove	_____ dead
_____ fresh	_____ tank	_____ snapped	_____ diving
_____ pack	_____ current	_____ camping	_____ seawater

CAR CRASH (Titles did not appear on copies given to students)

Pete and Sam were riding with Jack in his new car. Suddenly they saw many cars stopped or pulled off the road. Pete wanted to stop and see what was going on.

The three boys ran to the edge of the river bank. A crowd stood looking at the water below. Sam saw a car turned over in the water.

A policeman was pushing through the water and waving back at the crowd. The policeman tried to open the car door but couldn't. One door was against a rock and the other was locked. Sam ran down the bank to help. The water was dangerous because it was moving very fast.

Now the policeman was trying to move the car. Sam pushed too but the car was too heavy. The driver inside did not move and his eyes were closed. Sam saw a boy and little girl in back.

Then Sam moved slowly back to the bank. He yelled at Pete and Jack to come and help. Jack started down the bank and Pete followed. Then others followed Sam and his friends into the water.

The whole thing was over in 5 minutes. They pulled the driver and the children from the car. The driver was alright and so were the children.

The driver thanked the policeman for saving them. But the policeman said Sam had saved the family. Because Sam got everyone moving in the right direction.

SPACEMAN

One day Al told his father he had seen a spaceship. It was just a story. Al liked to read about people from space.

But Al's father believed him and told other people. They asked Al to tell them about the spaceship too. Al didn't want to hurt his father. So he told them a story about the ship and its spacemen.

A reporter came and put Al's picture in the paper. Men from the army came to talk to Al. Then they showed Al drawings of spaceships and spacemen. Al wanted to tell them it was only a story. But Al's father liked having people come to their house. So Al told his story again and again.

Weeks later Al went back to just reading about spaceships again. People finally left him alone again and he was happy. Then one night a man stopped him on the street. He said that he knew all about Al. Al stood very still and wondered what the man wanted. The man said he knew Al's story was not true. Al shook his head sadly and promised never to tell the story.

The man held out his hand and Al took it. The man had eight fingers on his hand! In the next second the man just disappeared. Al knew then he had really met a man from space. And he also knew he would never tell anyone about it.

DOGSLED RACE

A town in Alaska was in trouble. All at once many people were getting sick. Five people were dead already and 100 others were sick.

Jack Lion was a great dogsled racer. His young daughter was very sick. Lion knew that only medicine would save his daughter. But the closest place with that medicine was 650 miles away.

An airplane carrying medicine tried to get to the town. But the pilots couldn't see in the blinding snow. Now it was up to the men with the dogsleds.

They used radios to line up sled drivers along the way. Each driver would take the medicine to the next driver. But the dogsled trip usually took three weeks. Three weeks would be too late for Lion's daughter. So Lion decided to go for the medicine himself.

Lion pushed his way through the blinding snow day and night. The wind cut his hands and face. In just two days Lion met the driver with the medicine. He took the medicine and started back without stopping.

Lion knew he should stay off the thin ice on the lake, but he decided to take a chance to save time. Lion was about halfway over the thin ice. Suddenly a big crack opened in front of him. But Lion's dogs jumped over the crack just in time.

Lion made it home in time to save his daughter and many others.

DIVING DANGER

Last week Bob and Stu decided to go diving. They were looking for underground rooms filled with water. Sometimes there were old bones of dead animals in these rooms. The boys wanted some of these bones to take to school.

On most dives Bob and Stu took two air tanks. But on this day each boy had only one tank of air. They didn't expect to stay down too long. Bob let out a thin rope as they swam. The rope would help them find their way back.

They swam for a long time without finding any bones. Suddenly the floor dropped down out of sight. The boys swam over the edge and down to the bottom. Their lights picked up a treasure of bones. They took what they wanted and turned to head back. When the boys turned around, their feet scratched up the dirt floor. Suddenly they couldn't see a thing!

Bob looked down at his hand and his heart almost stopped. The rope had somehow slipped out of his hand. The two frightened boys looked everywhere for a way out. Now they were getting low on air.

Finally their lights showed a small current. Slowly they swam up with the current and then stopped. Their air was almost gone. Then Bob and Stu both saw the rope at the same time.

The boys reached the top with only 4 minutes of air left.

GRIZZLY

Mike and Scott had an unforgettable adventure one summer. The two friends were camping in the woods of Alaska.

One day they decided to take a walk. Suddenly the boys heard a low growl. A big grizzly came out of the brush.

Scott ran, but he tripped and fell. He curled himself into a ball to protect his face. The angry grizzly begain biting Scott. He started yelling and waving his arms up and down. He wanted the bear to look at him and leave Scott alone. The bear left Scott and suddenly started toward Mike. He caught Mike and bit him on the head and shoulder. Then the bear went back to Scott.

In the excitement, Mike did not know he was hurt. He grabbed Scott's walking stick and hit the bear with it. Finally the big grizzly ran off into the trees.

Scott found that he could not move his arms or legs, so Mike carried him almost a mile to some water. There he took off his shirt and wrapped Scott's cuts.

Then Mike walked two miles to a road. A passing car took him to the nearest town. From there he telephoned for help. Soon an airplane came to take both boys to a hospital.

SHIPWRECKED

Six boys from an island set off on a fishing trip. They expected to be gone a day or two at most.

After sailing and fishing for a while they anchored their boat. They decided to go to sleep. While they slept the boat's anchor broke away. The boat drifted off into the dark night.

The boat wrecked far from home. The frightened boys swam for their lives to an island. The island was about a mile from their wrecked boat.

Months passed without a word from the boys. Finally everyone back home thought the boys were dead.

But the boys learned how to live on the island. There was no fresh water and little food. So the boys drank milk from coconuts. They ate birds they caught with their hands. They used parts of the wrecked boat to build a cabin. Two boys kept watch at all times. In the evenings the six boys sat around the fire. They sang songs they made up about their adventures on the island.

The boys built small fires to try to signal passing ships. But no one on the ships ever saw the small fires.

Finally a ship called the Just David came into sight. This time the boys set fire to the trees. The captain sent a boat to see what was going on. The boys went home after 15 months on the island.

DOG LOST

Mr. Woods had to get home to start his new job. But he could not find his dog Rex. Mr. Woods drove his car slowly through town. Now and then he stopped to call Rex. But the Collie did not come. So Mr. Woods drove sadly away without his dog.

Rex was out in the country. A pack of dogs had chased him out of town. He was afraid to go back to Mr. Woods in town. Finally Rex started home by himself.

Somehow he knew he should go west. But the Collie was young and soon he lost his way. For almost 1,000 miles the dog ran in great circles. But he did get 200 miles nearer to home.

As the days went by he got more tired and hungry. His only food was the rabbits and birds he could catch. Then winter came and it was hard to find any food. Ice cut his paws until they left blood in the snow. When Rex could go no farther he would stop with a kind family. Sometimes they would tie him up to make him stay with them. But he always got away and ran on.

Once dog catchers tried to put him in a dog pound. He had to jump into a cold river to escape.

In six months Rex traveled over 3,000 miles. Finally Mr. Woods saw Rex coming into his own back yard.

WAR STORY

Many young men had to fight in the Civil War. One of these young men was 19 year old Sam Davis.

Sam was a good scout for the South. But one day some soldiers from the North caught him. They took him to the General to be questioned. General Dodge wanted names of men who helped the south. At first Sam said he wouldn't talk. The General told him he would hang if he didn't tell. But Sam said he would hang before telling the names of his friends.

That night General Dodge couldn't sleep at all. He wanted Sam to talk and save himself from hanging. Sam spent the night writing a letter home to his family. In the letter Sam said he was not afraid to die.

General Dodge sent a man to see Sam the next day. He asked Sam if he would change his mind and talk. Sam thought for a while but then said no. General Dodge had to hang Sam. They sent his body back to his home in Nashville, Tennessee.

Two years later the war ended. Americans started building and working together again. The people in Tennessee wanted others to know about Sam Davis. They wanted to build something to help people remember him. They asked for money to help build. Soon money came from all over the country.

General Dodge sent the most money of all.

NIGHTMARE

It was a beautiful June night. The sea off the coast of China was calm. Suddenly the Chinese fishing boat caught fire.

Quickly the burning boat began to go under. 9 men jumped off the boat to escape the fire. They found pieces of wood and two oil drums in the sea. They made a tiny raft and climbed on top.

The helpless men tried every way to stay alive. But each day someone on the raft died. Finally only Lee Young and his brother Lee Nong were still alive.

The brothers' biggest problem was food. They tried to catch birds and small fish. They also tried to catch rain in their hands and mouths. But they had to drink some sea water to stay alive. The sea water made them feel sick.

Sometimes the brothers caught sight of a ship far away. They shouted and waved their arms up and down. But the ship would always leave without spotting them. Finally the brothers gave up hope of ever being found. Their lips cracked and their bodies burned in the sun.

But one day someone spotted the tiny raft in the sea. The raft was 800 miles from where the fishing boat went down. The passing ship took both men to a hospital. The brothers cried when they saw land. The terrible trip was over after 69 days at sea.

AIRSHIP

A big crowd waited on the ground one May in 1932. A United States airship slowed to a stop above them. The ship started down slowly for a landing.

First they let down a cable from the ship. 90 men stood ready on the ground. They wanted to grab the cable and pull the ship down. But suddenly the wind blew and lifted the ship up.

The airship came down again but the men missed the cable. On the third try the men finally caught the cable. They tied the huge cable down tight. Quickly they grabbed the many ropes on the ship's side. They began to pull the airship down.

But the wind blew again and pulled the ship up. The cable stretched tighter and tighter until it snapped!

Most of the men on the ground let go of the ropes. But John still hung on to his rope. The crowd screamed when the ship pulled John up into the sky.

John held on but the rope cut his hands. When he looked down he saw a piece of wood tied to the rope. Slowly he climbed down the thin rope. When he reached the wood he stood on it.

John hung in the sky for two hours. He was afraid that no one knew he was hanging there. But three men in the ship were pulling the rope up. Finally a man helped John climb into the airship.

CARCRASH

1. What were the boys doing at the beginning of the story?
   -Riding in a new car, riding in a car

2. What was the first thing the boys saw?
   -Cars pulled off the road or stopped

3. What did one of the boys want to do then?
   -Stop to look, stop the car

4. What did the boys do after stopping the car?
   -Ran to riverbed, got out to look

5. What was the crowd there doing at first?
   -Just looking, watching

6. What did Sam see when he looked?
   -A car in the water, policemen

7. Who was already in the water trying to help when the boys came?
   -A policeman

8. What did the policeman try to do first?
   -Open the car doors

9. Why couldn't he open the doors?
   -One locked, one against rock

10. Who was the first person to try and help the policeman?
    -Sam

11. What was the water in the river like?
    -Very fast, dangerous

12. What was the second thing the policeman tried to do?
    -Move the car

13. Why couldn't Sam and the policeman move the car?
    -It was too heavy

14. What was the driver doing inside the car?
    -Nothing, not moving, keeping eyes closed

15. What did Sam see in the back of the car?
    -A little girl and boy

16. Where did Sam go then?
    -Back to bank, back to friends, crowd

17. What did Sam do when he reached the bank?
-Yelled at friends, crowd to come help

18. What did boys do when Sam yelled at them?
-Came down the bank, started to help

19. What did the crowd do when Pete and Jack started to follow Sam?
-They followed too

20. How long did it take to help the people in the car?
-Five minutes

21. What did they do to help?
-Pulled them out of the car

22. How were the people inside the car?
-Alright

23. Who did the driver thank first?
-Policeman

24. Who did the policeman say saved the people in the car?
-Sam

25. Why did he say Sam was the one who saved them?
-Because he got everyone moving in the right direction

SPACEMEN

1. What did Al tell his father one day?
   -That he saw a spaceship

2. Had he really seen a spaceship?
   -No

3. What did Al like to do that made him think about spacemen?
   -Read stories about people from space

4. What did Al's father do after Al told him the story?
   -Told other people

5. What did the people Al's father told want Al to do?
   -Tell them about the spaceship

6. How did Al feel about his father?
   -Didn't want to hurt him

7. What did Al do when the people his father told asked him to tell about the spaceship?
   -Told them a story about spacemen

8. Who came next to talk about the spacemen?
   -A reporter

9. Who came after the reporter?
   -Army men

10. What did the Army men show Al?
    -Drawings

11. What did Al want to tell them?
    -It was just a story, it wasn't true

12. But how did Al's father feel?
    -He liked people coming to the house

13. What did Al do to keep his father happy?
    -Told the story again and again

14. What did Al go back to weeks later?
    -Just reading about spacemen

15. How did he feel about people leaving him alone?
    -Happy

16. What happened one night?

-Man stopped him on the street

17. What did the man say about Al?
-Said he knew all about him
(if: "story not true", say "what did the man say before that?")

18. What did Al do at first when the man stopped him?
-Stood very still, nothing

19. What did the man say about Al's story about spacemen?
-It was not true

20. What did Al promise?
-Never to tell the story again

21. What did the man do after Al promised?
-Held out his hand

22. What was strange about the man's hand?
-Had eight fingers, too many fingers

23. What happened to the man after they shook hands?
-He disappeared

24. What did Al know about the man?
-He was a spaceman

25. What did Al decide to do about telling people what happened?
-Never to tell anyone

DOG SLED RACE

1. Where was the town? In what state?
   -Alaska

2. What was the problem in the town?
   -Many people getting sick

3. How many people had died already?
   -5

4. What was Jack Lion very good at?
   -Racing dog sleds

5. Who did Lion love that was very sick?
   -His daughter

6. What was the one thing that could save Lion's daughter?
   -Medicine

7. How far away was the closest town with medicine?
   -650 miles

8. What had already tried to bring medicine to the town?
   -An airplane

9. Why didn't that work?
   -Men couldn't see through snow

10. What men were going to try to bring in medicine after the airplane failed?
    -Dogsledding, men with dog sleds

11. What did the men do with radios?
    -Line up sled drivers

12. Where would each driver take the medicine?
    -To the next driver

13. How long did the dogsled trip usually take?
    -3 weeks

14. What was wrong with the trip being 3 weeks long?
    -Would be too far to help Lion's daughter

15. What did Lion decide to do about the medicine?
    -Go for it himself

16. What did Lion have to push through day and night on the trip?
    -Snow

17. What did the wind do to him?
    -Cut his hands and face
    (If: "hurt him", ask "how")

18. What happened in two days of travel?
    -Lion met driver with medicine

19. What did Lion do when he met the other driver?
    -Took medicine and started back

20. What did Lion know he should do?
    -Stay off thin ice

21. Why did he decide to take a chance?
    -To save time

22. How far was Lion across the ice when something happened?
    -Halfway

23. What happened when Lion was halfway over?
    -A crack opened in front of him

24. What happened when the crack opened in front of Lion?
    -Dogs jumped over it

25. What did Lion make it home in time to do?
    -Save his daughter

DIVING DANGER

1. When did Bob and Stu go diving?
   -Last week

2. What were they looking for?
   -Underground rooms, rooms filled with water
   (If: "bones", say "Where were they going to look?"

3. What did they hope to find in these rooms?
   -Old bones

4. Why did they want the bones?
   -To take to school

5. How many air tanks did Bob and Stu usually wear?
   -2

6. How many did they wear on this day?
   -1

7. Why did they only wear one?
   -Didn't expect to be down long

8. What did Bob do while the boys swam?
   -Let out a rope

9. What was the rope for?
   -To help find way back

10. How many bones did the boys find when they first started the dive?
    -None

11. What suddenly happened to the floor?
    -Dropped out of sight

12. What did the boys do then?
    -Swam over the edge to the bottom

13. What did their lights pick up on the bottom?
    -Bones

14. What did the boys do after they saw the bones?
    -Took what they wanted, started back

15. What happened when they turned to leave?
    -Their feet scratched up dirt
    (If: "They couldn't see", ask "Why?"

16. What happened when their feet scratched the dirt?
    -They couldn't see

17. What happened when Bob looked down at his hand?
    -His heart almost stopped

18. Why did Bob's heart almost stop? What was wrong?
    -Rope slipped out of hand

19. What did the two do next?
    -Look for a way out

20. What was happening to their air now?
    -Running out, getting low

21. What did their lights finally show?
    -Small current

22. What did the boys do after they saw the current?
    -Swam up with current, swam then stopped

23. What was almost gone?
    -Their air

24. What did Bob and Stu see at the same time?
    -Rope

25. How much air did the boys have left when they reached the top?
    -4 minutes

GRIZZLY

1. At what time of the year did Mike and Scott have their adventure?
   -One Summer

2. Why were the boys in the woods? What were they doing?
   -Camping

3. What were the boys doing on the day their story began?
   -Taking a walk

4. What did the boys hear as they were walking?
   -A low growl

5. What was it that came out of the brush?
   -A bear, a grizzly

6. What did Scott do when he saw the bear?
   -Ran, or tripped, or ran and fell

7. What did Scott do to protect himself from the bear?
   -Curled into a ball, covered his face

8. What did the bear begin to do to Scott?
   -Knock about, hit, or bite Scott

9. Where had Mike gone when he first saw the bear?
   -Behind a tree

10. What did Mike see from behind the tree?
    -Bear biting Scott

11. What did Mike do when he saw the bear biting Scott?
    -Wave his arms, yell
    (If: "hit with stick", say "What did he do first?")

12. Why did he wave his arms and yell?
    -To get bear to look at him

13. What did the bear do when Mike yelled and waved?
    -Left Scott and started for Mike

14. What did the bear do to Mike?
    -Hit him on the shoulder or head
    (If: just "hit him", ask "Where?"

15. What did the bear do after he hit Mike on the head or shoulder?
    -Went back to Scott

16. What didn't Mike know because of the excitement?
-He was hurt

17. What did Mike use to help get the bear away from Scott?
-A walking stick, Scott's stick

18. What did the grizzly finally do?
-Ran into the trees

19. What did Scott realize when the bear left?
-He could not move his arms or legs

20. After the bear left what did Mike do first to help Scott?
-Carried him to some water

21. What did Mike do with his shirt?
-Wrapped up Mike's cuts

22. What did Mike do after wrapping up Mike's cuts?
-Walked to a road

23. How did Mike get to town?
-A passing car

24. How did Mike get help for Scott?
-Used telephone

25. Where did the airplane take Mike and Scott?
-To a hospital

SHIPWRECKED

1. How many boys set off on the trip?
   -6

2. How long did they think they would be gone?
   -A few days, one or two days

3. What did the boys do before anchoring their boat?
   -Sailing, fishing

4. What did the boys do after anchoring their boat?
   -Went to sleep

5. What happened while the boys were sleeping?
   -Anchor broke away
   (if: "ship wrecked", say "yes, but what happened before that?)

6. What did the boat do when the anchor broke away?
   -Drifted into the night
   (if: "wrecked" say "yes, but what happened before that?")

7. What happened to the boat after it drifted away?
   -It wrecked

8. What did the boys do when the ship wrecked?
   -Swam to an island
   (if: "swam" where did they swim to?)

9. How far did the boys have to swim?
   -A mile

10. What did the people back home hear from the boys?
    -Nothing, not a word

11. What did the people back home finally think about the boys?
    -That they were dead

12. What did the boys learn how to do on the Island?
    -Live, survive, find food and water

13. What was the problem with food and water for the boys?
    -Little food, no fresh water

14. What did the boys drink?
    -Coconut milk

15. What did the boys eat?
    -Birds

16. What did the boys use to build a cabin?
-Parts of the wrecked ship

17. What did two boys do at all times?
-Kept watch

18. What did the boys do in the evening?
-Sat around fire, or sang songs

19. What did they sing about?
-Their adventures on the island

20. What did the boys usually do to try to signal passing ships?
-Build small fires,
(If: "fires to trees", say but what before that?)

21. What usually happened to the passing ships?
-Left, didn't see fires

22. What was the name of the ship that finally saved the boys?
-Just David

23. What did the boys do differently to signal the Just David?
-Set fire to trees

24. What did the captain of the Just David do?
-Sent boats to see what was going on

25. How long were the boys on the island?
-15 months

DOG LOST

1. Why did Mr. Woods have to get home?
   -To start a new job

2. What couldn't he find?
   -His dog, Rex

3. What did Mr. Woods do in his car to try to find Rex?
   -Drove slowly through town

4. What did he do now and then while driving through town?
   -Called Rex

5. What happened when he called Rex?
   -Rex didn't come, Nothing

6. What did Mr. Woods finally do?
   -Drove home without Rex

7. Where was Rex when Mr. Woods was looking for him?
   -Out in the country

8. Why was he out in the country?
   -Dogs chased him

9. How did he feel about going back to town?
   -Afraid

10. What did Rex finally do?
    -Started home by himself

11. What did he somehow know to do right?
    -Go west

12. But what soon happened to Rex?
    -Got lost

13. What did Rex do for almost 1,000 miles?
    -Ran in circles

14. How much closer to home did Rex get while running in circles?
    -200 miles closer

15. How did Rex feel as days went by?
    -Hungry, tired

16. What did Rex eat?
    -Birds, rabbits

17. What happened to his food when winter came?
-Hard to find

18. What did the ice do to Rex?
-Cut his paws, made him bleed

19. What would Rex do when he could go no farther?
-Stop with a family

20. What would they sometimes do?
-Tie him up

21. What did Rex always do when families tied him up?
-Get away and run

22. Who tried to catch him once?
-Dog catchers

23. What did Rex have to do to get away from the dog catchers?
-Jump into a river

24. How many months did it take Rex to travel 3,000 miles?
-6

25. What did Mr. Woods finally see Rex doing?
-Coming into the back yard

WAR STORY

1. What kind of men does this story talk about fighting in the Civil War?
   -Young

2. How old was Sam Davis?
   -19 years

3. What job did Sam do for the South?
   -Scout, spy

4. What happened to Sam one day?
   -Caught by North, caught by soldiers

5. Who did they take Sam to see?
   -The general

6. What did the general want Sam to do?
   -Tell names of men who helped the South

7. At first what did Sam say?
   -Said wouldn't talk

8. What did the general say he would do to Sam?
   -Hang him

9. What did Sam say when the general told him he could hang?
   -He would hang before telling, still wouldn't talk

10. What happened to the general that night?
    -Couldn't sleep

11. What did he wish would happen?
    -Sam would save himself, Sam would talk

12. What did Sam do that night?
    -Write a letter home

13. What did he say in his letter?
    -That he was not afraid to die

14. What did the general do first the next day?
    -Send a man to talk with Sam
    (If: "hung Sam", ask "What did he do first?")

15. What did the man say to Sam?
    -Asked him to change his mind

16. What did Sam do?

-Thought for a while, said no

17. What did the general have to do?
-Hang Sam

18. What did they do with Sam's body?
-Sent it home, sent it to Nashville, Tennessee

19. When did the war end?
-Two years later

20. What did Americans start to do again?
-Build and work

21. What did the people in Tennessee want others to do?
-Remember Sam Davis

22. How were they going to help people remember?
-Build something

23. What did they ask for to help them build?
-Money

24. Where did the money come from?
-All over the country

25. Who sent the most money of all?
-General Dodge, the general

NIGHTMARE

1. When does the story begin?
   -One night, June

2. Near what country was the boat sailing?
   -China

3. What was the first thing that happened to the fishing boat?
   -Caught fire,
   (If: "sank", ask "What happened first?")

4. What happened to the boat after it caught fire?
   -It sank, went under water

5. How many men jumped overboard to escape?
   -Nine

6. What did the men find in the sea?
   -Oil drums, pieces of wood

7. What did they make from the wood and oil drums?
   -A raft

8. In the beginning, what were all the men trying in every way to do?
   -Stay alive

9. In the beginning what happened each day on the raft?
   -Someone died

10. Finally how many men were left?
    -Two

11. What was the brothers' biggest problem?
    -Food

12. What did the men try to do for food?
    -Catch birds and/or fish

13. What did the men try to do to get fresh water?
    -Catch rain in hands and/or mouth

14. What did the brothers finally have to drink to stay alive?
    -Seawater

15. What happened when the men drank the seawater?
    -Got sick

16. What did the brothers sometimes see in the distance?

-A ship

17. What did the men do when they saw a ship?
-Wave or shout

18. What would the ships always do?
-Not see, leave (without seeing them)

19. What did the men begin to think about being found?
-They gave up hope, that they wouldn't be found

20. What happened to the brothers' lips and bodies?
-Burnt, cracked

21. Finally what happened one day?
-Someone spotted raft

22. How far was the raft from where the fishing boat went down?
-800 miles

23. Where did the ship take the brothers?
-To a hospital

24. What did the brothers do when they saw land?
-Cried

25. How long were the brothers at sea?
-69 days

AIRSHIP

1. In what month did this story take place?
   -May

2. What was the crowd on the ground looking at?
   -An airship

3. What was the airship trying to do?
   -Land

4. What was the first thing the airship did when it got low enough to try to land?
   -Let down a cable

5. How many men were waiting to help the airship?
   -90

6. What were the men waiting to do?
   -Grab the cable, pull the ship down

7. What happened the first time the men tried to grab the cable?
   -Wind blew the ship up

8. What happened the second time the ship came down?
   -Men missed the cable

9. What happened on the third try?
   -Men caught cable

10. What did the men do with the cable?
    -Tied it down

11. What did the men do after the cable was tied down?
    -Grabbed ropes on ships side
    (If: "Pulled down ship", ask "What did they have to do first?")

12. What did the men begin to do after they grabbed the ropes on the ships side?
    -Pulled the ship down

13. What happened as the men were pulling the ship down?
    -Wind blew the ship up

14. What happened to the cable holding the ship?
    -Stretched, snapped, broke

15. What did most of the men on the ground do?
    -Let go of the ropes

16. What did John do with his rope?

-Held on

17. What did the crowd do when they saw John going up?
-Screamed

18. What did the rope do to John's hands?
-Cut them
(If: "hurt them", ask "How?")

19. What did John see when he looked down?
-A piece of wood

20. What did John do next?
-Climb down to wood
(If: "Stood on wood", ask "What did he have to do first?")

21. What did John do when he reached the wood?
-Stood on it, held on

22. How long did John hang in the sky?
-2 hours

23. What was John afraid of?
-That no one knew he was there

24. How many men were pulling John up?
-Three

25. What did the men finally do for John?
-Helped him into the airship

APPENDIX D

IMAGERY INTERVENTION MATERIAL

The following material was presented to the students during the imagery interventions. The words, sentences and stories were assembled in a 6½ by 6½ loose leaf note book and presented in the same order to all subjects. The individual stimulus words and single sentences were generated by the experimenter. The five sentence stories were adapated from the stories presented in the Green Level of the Reading Laboratory series published by Science Research Associates Inc., in 1969. The material is presented here in the sequence in which it was introduced to the subjects. The actual directions and context of the experimenters presentation is included for the first session. The same general format was followed for all the sessions.

Session I Imagery Intervention

Directions:

> Today before we (read/listen to) a atory I want to talk with you about imagery. Do you know what imagery is? Imagery is like a picture inside of you that goes along with what you (read/hear). Sometimes it is just one picture, like a drawing or a photograph. Sometimes it can be like a movie or as if you are watching real life. Have you ever (read/listened to) something or pretented something and it was just as if you could really see it?
>
> I am going to show you some words. Try to make a picture in your mind about what you have read.

Dog

> Try to make a picture in your mind of a dog. If you have a dog or know a dog that you see a lot, try to make a picture of that dog. Do have a dog? Do you see one dog a lot? Try to see him in your mind. Can you see him? Tell me about it. What color is the dog? How big is the dog? Does the dog have a tail? What does it look like? Does the dog have ears? What do they look like?

The subject was praised for making an image regardless of its quality and encouraged to relax and enjoy the exercise if they were at all concerned about responses. The experimenter then said: "Let me tell you what I see when I think about the word dog." The statements below were not read verbatim but served as prompts to the experimenter to ensure that the model images shared would be essentially the same for all subjects.

My image of dog. My dog at home. Is a white dog with big brown spots. Long brown ears. Comes up to about my knee. He is looking up at me and wagging his tail. Now he is jumping up and putting his two front paws on my stomach. He is happy to see me.

Directions: "Lets try another one."

Mother

> Try to make a picture in your mind of your mother. Can you see her? Tell me about your picture? Do you see her face or all of her? Is

she smiling? What is she wearing? A dress? Pants? What does her hair look like? Long? Short? What color?

Again the subject was praised and the following image was shared.

My image of mother. I see just my mother's face smiling at me. She has blue eyes and she looks like she has just told me a joke. She has grey hair with dark streaks in it. And she has little wrinkles around her eyes and mouth.

Directions: "Now I am going to (show/read you) a sentence. Try to get a picture in your mind for what you (read/hear)."

The cat climbed on the dog's back and they swam across the river.

Tell me about your picture. What does the cat look like? Color? How big? What's he doing? What does the dog look like? Color? How big? What is he doing? What does the river look like? Color? How big? Water moving fast or slow?

The subject was praised for his description of his image. No model images were shared beyond the single words. After praising the subject the following directions were given:

Now I am going to let you (read/listen to) five sentences. They go together to make a story. As you (read/listen to) each sentence try to make a picture in your mind about what is happening. Try to make a picture for each sentence you read/listen to). Sometimes it takes a little time to make a picture of what you are (reading/hearing). So when you have (read/heard) the sentence turn the page. Then wait until you have a picture of what that sentence said. When you have a picture, turn the next page and you will see the next sentence in the story. Keep doing this until I tell you to stop. Then I will ask you some questions about what happened in the story and we can talk about what kind of pictures you were able to make to go along with what you (read/heard).

A sick monkey at the zoo would not eat.

Dr. Green held out a banana but the monkey would not eat it.

Then Dr. Green rubbed the banana all over the monkey's hand.

Slowly the monkey licked his hand clean.

Dr. Green put the banana on the monkey's hand until he ate by himself.

Questions for the 5 sentence story.

1. What was wrong with the monkey?

2. What did the doctor try and get the monkey to eat?

3. How did the doctor finally get the monkey to eat the banana?

Directions: "Were you able to make pictures for those sentences? Tell me about them." (The subject was then given the following directions. The only difference in the stimulus material is that it was presented as an entire story rather that in sentences separated by blank spaces.)

> Now I am going to let you read another little story. I want you to so the same thing you just did when you read it. Try try to make a picture in your mind for each picture you read. Sometimes it takes a little time to make a picture for the sentences you read. So after you read a sentence, be sure you have a picture in mind before you read the next serntence. You may want to close your eyes or look up for a moment to finish making your picture for that sentence. Remember, be sure you have a picture in your mind for the sentence before you go on to the next one. After you have read the little story I will ask you some questions about the story and then we can talk about the pictures you were able to make.

All day and all through the night a fire burned in the woods. Men came from all around to fight the fire. One man heard something that sounded like a baby crying. He looked up and saw a baby bear up a tree. Quickly the man went up the tree to get the bear down.

Questions for the short story.

1. What was happening all day and through the night in the woods?

2. What did one man hear? Sound like a baby crying? What did it sound like?

3. What did the man do when he saw the baby bear?

> Directions: Were you able to make pictures for that story? Tell me about them. Now I want you to (read/listen to) one of the big stories. But this time I want you to (read/listen to) it in the way we've just

practiced. Try to get a picture in your mind for each sentence you (read/listen to). When you've finished I will ask you questions about the story and we'll use your chart to keep track of your answers.

(The subject was then given a target story and all procedures were identical to baseline sessions.)

Session II Imagery Intervention

Words:

Cat

(Prompts same as for dog Session I).

Model Image:

My old roommate's small cat. Tan fur with little white lines through it. I see her curled up in a ball on the couch asleep.

Daddy

(Prompts same as for Mother Session I).

Model Image:

Dark hair with white lines running through it. Dark leathery skin. Sitting in big green chair smoking a pipe.

Sentence:

The blue lights on top of the police car went around and around.

Prompts for Sentence:

Is it day or night in your image?

Can you see the police car?

Is the car moving or standing still?

Five Sentence Story:

John wanted to play baseball way out in the country. But there were not enough boys to play ball. Then John heard about a horse who played baseball. The horse caught the ball in his teeth. And soon John found a way for the horse to use a bat.

Questions for the five sentence story:

What was it John wanted to do?

What was the problem?

Who did John get to play baseball?

What did John teach the horse to do?

Prompts for Five Sentence Story:

What did John look like?

What did the horse look like?

How did you see the horse using the bat?

Short Story:

One winter day a bear met a fox. The fox had a line of fish hanging down his back. The bear asked, "How did you catch those fish?" The fox told him to cut a hole in the ice and put his tail in the water. When the bear tried this his tail got stuck in the ice.

Questions for Short Story:

Who did the bear meet one day?

What did the fox have?

How did the fox tell the bear to catch fish?

What happened when the bear tried it?

Prompts for Short Story Images:

What did the bear look like?

How did the fox look with the fish on his back.

How did you picture the bear when he put his tail in the water?

SESSION III Imagery Intervention

Words:

House

Do you see the front or the back of the house?

Is this the house you live in now?

What is it made of?

What color is it?

What else is in your picture of the house?

Model Image:

My house - A big red brick house on a busy street. There are no bushes in front--just grass. There is a hole next to the front door that the dog dug.

Teacher

(Prompts same as Mother Session I)

Sentence:

The sun was so bright on the water you could hardly see.

Prompts for Sentence:

Where was the water?

What kind of water? (pool? lake? river?)

What were you doing in the picture?

Five Sentence Story:

Lucky was an unhappy racehorse who ran very slow. His owner thought Lucky might run faster if he had a friend. He bought Lucky a cat, but Lucky still ran slow. He bought Lucky a dog, but Lucky didn't like him. Then he bought Lucky an old goat and Lucky started running fast.

Questions for Sentence:

How did Lucky run when he was unhappy?

What did his owner think would help Lucky?

Who did Lucky finally get as a friend?

Short Story:

Lucky was a racehorse with a goat for a friend. One day Lucky was in a big race. He started slow but soon he was passing the other horses. Then he saw the goat eating grass by the track. Lucky lost the race because he stopped to eat with his friend.

Questions for Short Story:

Who did Lucky have for a friend?

What was Lucky doing one day?

What did Lucky see while he was in the race?

What finally happened in the race?

Model images were not provided after Session III. The experimenter used prompts for images to words, sentences, and stories in the same manner as illustrated above. Questions were asked about information in five sentence stories and short stories. These prompts and questions were not included here. The actual stimulus words and sentences are provided below.

Session IV Imagery Intervention

Words:

Car

Brother or Sister

Sentence:

Would you like to swing on a star?

Five Sentence Story:

One summer day three boys went to the beach for a picnic. After they swam for a while they decided to eat. They looked around the beach for a good spot to eat. Suddenly one of the boys saw a hole under a tree. The boys dug in the hole until they found a chest.

Short Story.

Once all birds had bright feathers but one. This one bird had feathers that were dark brown. He was very sad until a bear told him what to do. The bear told him to peck at the red lines in a rock. Then the bird used the rock dust to paint his feathers red.

Session V Imagery Intervention

Words:

Bedroom

Friend

Sentence:

Suddenly the little log cabin caught fire.

Five Sentence Story:

A long time ago a rooster was king of all the animals. He told them that he had fire in his red comb. He said he would burn them if they didn't do what he said. But one day a kitten touched his comb while he was sleeping. The kitten found out that the comb was cold and all the animals were free.

Short Story:

A new town was being built by a stream. Everyone was glad to see beavers in the water. They thought it would be fun to watch the beaver family live. Then the beavers started eating the new fences the people built. Now the people in town wish the beavers would go away.

Session VI Imagery Intervention

Words:

Backyard

Neighbor

Sentence: (No sentence was given for this session)

Five Sentence Story:

Once a frightened king watched a spider in a cabin. The king was hiding because he was losing a war. He watched the spider swing on a long thread all day. The spider finally swung all the way to the wall. The king decided to keep fighting like that spider.

Short Story:

Bill was a great cowboy in the rodeo. He could throw a steer to the ground very fast. One day a big crowd came to see Bill's show. The people were so noisy that the frightened steer jumped over the fence. Bill jumped after him and threw him down before anyone was hurt.

Session VII Imagery Intervention

Words:

Breakfast

Grandmother

Sentences and stories were not given for this seventh imagery session. It was thought that students were sufficiently familiar with the imagery process to go directly from the "warm up words" to the target story.

VITA

Karen Michelle Raquet was born in St. Louis, Missouri on December 24, 1950. She attended Elementry School in Beverly Hills, Michigan and graduated from Wylie E. Groves High School in June of 1969. She received a Bachelor of Arts Degree from Michigan State University in the Winter of 1973.

The author entered the Doctoral program in the Department of Psycholgy at The University of Tennessee in the fall of 1975. After two years academic work in Experimental Psycholgy she changed her area of emphasis to School Psycholgy and completed the compentancy based program in the spring of 1979. She was married in the summer of 1979 to Thomas Glenn Coop of Bell Buckle, Tennessee and moved to Nashville, Tennessee. There she began the research for this dissertation and the following year was employed as a School Psychologist by the Sumner County Board of Education.

K. Michelle Coop is a member of Phi Beta Kappa, The National Association of School Psychology, and the Tennessee Association of Psychology in Schools. After graduation, she will continue to be employed with the Sumner County Board of Education.