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DEATON, Fran Kirksey, 1926-
A COMPARISON OF THE EFFECTS OF REINFORCING
ACCURACY AND ON-TASK RESPONSES IN A PROGRAMMED
REMEDIAL PROGRAM WITH FOURTH-GRADE READING
PROBLEM CHILDREN.

The University of North Carolina at Greensboro,
Ph.D., 1974
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ACCURACY AND ON-TASK RESPONSES IN A
PROGRAMMED REMEDIAL PROGRAM WITH
FOURTH-GRADE READING PROBLEM
CHILDREN

by

Fran Kirksey Deaton

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the Faculty of the Graduate School at
The University of North Carolina at Greensboro
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Doctor of Philosophy

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1974

Approved by

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APPROVAL PAGE

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ABSTRACT

DEATON, FRAN KIRKSEY. A Comparison of the Effects of Reinforcing Accuracy and On-task Responses in a Programmed Remedial Program with Fourth-Grade Problem Children. (1974) Directed by: Dr. Marilyn T. Erickson. Pp 155.

One-to-one assessment and individualized instruction have been the methods of choice in the identification and remediation of retarded readers. Educational systems, however, have not been able to meet the demand for individualized assessment or instruction. Therefore, other methods must be sought to meet the needs of more children. Behavioral research has revealed that reinforcement has been effective in increasing both accuracy and on-task behaviors. The present study was designed to compare the effects of reinforcing accuracy and on-task behaviors during programmed remedial instruction on the number and accuracy of completed frames and performance on the Slosson Oral Reading Test, the Wide Range Achievement Test, and the Spache Reading Diagnostic Scales as well as on teacher ratings of behavior in the classroom.

All fourth-grade students in two elementary schools were administered individual intelligence and reading achievement tests. Twenty percent of the children with the lowest reading achievement scores, but having an IQ score

of 79 or above, were selected to participate in the study. Twenty-seven poor readers were randomly assigned to two experimental groups and one control group.

The experimental groups were subdivided into groups of three children. Each subgroup left the classroom for approximately twenty minutes per day for the remedial instruction program. The three subgroups under the first experimental condition received points for free time contingent upon percentage of accurate responses. Accuracy was determined for each child, and points were combined for children within each subgroup to determine the free time for the next day. The three subgroups under the second experimental condition received points for free time contingent upon percentage of time on task. On-task time was determined for each child, and points were combined for children within each subgroup to determine the free time for the next day. Prior to the initiation of the experimental conditions, a baseline for accuracy and on-task behaviors was determined for each group. Point scales were then equated for each group. Children in the control group remained in their classrooms.

The remedial program lasted for ten weeks and included four preliminary sessions and 48 remedial sessions. Each child was then reexamined with the same reading achievement tests.

The results of the study indicated that the children in the Experimental groups responded differentially to the contingency for which they were reinforced. The Accuracy group

became more accurate and remained on task 97.5 percent of the time, whereas the On-task group increased its on-task time to 99.7 percent but decreased its accuracy to 88 percent during the last block of sessions. Implications for classroom procedures for reinforcement were discussed.

A multivariate analysis of variance of pre-test and post-test scores for 13 variables relevant to reading behavior was conducted to determine whether type of behavior reinforced during experimental conditions would differentially affect rate of reading achievement and also whether or not achievement rate for the Experimental groups was significantly better than that of the Control group. There was indication that the Accuracy and On-task groups performed better than the Control group. All groups improved from pre-test to post-test on six out of 13 variables. The Accuracy or On-task groups improved on 11 out of 13 variables. It may well be that for short periods of time when material is well developed and heavily redundant, whether being reinforced for accuracy or on-task behaviors is not crucial.

Conducting research in the natural environment is often correlated with limitations in the amount of experimental control. Although it was assumed that the control children would not be given extra reading remediation in the classroom, eight out of nine did, in fact, receive extra instruction in reading; in addition, five children in the Experimental groups received less classroom reading instruction than was expected.

Although programmed instruction offers well prepared instructional materials which can be used by groups of children at individual levels at the same time, the problem of cheating is prevalent and offers a challenge to those who teach problem readers with programmed materials.

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CHAPTER I

INTRODUCTION

Although psychologists have varied in the conception of their subject matter, objectives of their discipline, and their offerings to education (Bijou, 1970), they are scientifically oriented, and as scientists, they have observed naturalistic events, gathered and analyzed data, and attempted to find lawful relationships. The questions that psychologists have attempted to answer for educators have often been dictated by the times. With respect to the subject of reading, the first questions that were asked were concerned with "Can all children learn to read? At what age should we begin to teach children to read? What is wrong with the child who can't learn to read well? What is the best model for teaching reading?" More recently, the primary question has been, "How can we teach reading to all children?"

The development of any technology is a gradual process and is limited by what is known about relevant variables at the time. Fortunately, all scientists enable those who follow them to begin a little further along (Skinner, 1953). Staats and Staats (1963) have said that

". . . it may sometimes be possible to conduct carefully designed naturalistic studies based upon experimentally established principles (p.282)." Once principles are experimentally established, researchers may seek examples in naturalistic settings. The ultimate goal of the applied researcher is to manipulate stimuli in the natural setting to bring about desirable changes in behavior.

Contribution of Basic Psychological Studies to Reading

A large number of early as well as contemporary psychologists have gathered facts about the abilities and development of the child, and an extensive literature on the psychology of simple and complex learning and perception has been written. In addition, a variety of theories have been developed to explain many aspects of the child's behavior. Our understanding of intelligence, socialization, personality, development, and psychopathology has been developed primarily from psychoanalytic, cognitive, and learning theories and has been founded on the research results of studies utilizing experimental, correlational, clinical, and observational techniques.

The psychological processes considered important in the acquisition of reading have been of special interest to educational psychologists. The prevailing belief for these professionals has been that behavior is determined both by stimulus variables and by hypothetic internal variables

(Bijou, 1970). Because hypothetical internal variables have been central to their approach, educators have been prone to attribute school failure to such conditions as lack of motivation, perceptual disability, and clinically inferred brain damage (Bond & Tinker, 1967; Carter & McGinnis, 1970; Hallahan & Cruickshank, 1973; Lerner, 1971; Myklebust, 1971; Myklebust & Johnson, 1967; Rosewell & Natchez, 1964; Tansley, 1967; Tarnopol, 1969, 1971).

The techniques of assessing perceptual disabilities, language deficits, and visual motor skills of disabled readers have been subsumed under the psychoeducational approach. This approach has been used extensively by learning and reading specialists in an attempt to collect information that will help in planning a remedial reading program (Bateman, 1971; Chalfant & Flathouse, 1971; Frierson & Barbe, 1967; Frostig, 1967; Guthrie & Goldberg, 1972; Hellmuth, 1965; Kephart, 1967; Ketchum, 1967; Kirk & McCarthy, 1967; Lerner, 1971; Saunders, 1963; Valett, 1969; Wepman, 1967). Diagnosticians have developed and used tests in an attempt to ". . . know what receptive or perceptual, integrative or cognitive, expressive or response processes underlie complex behavioral products like reading, speaking, or writing and be prepared to assess them in as much depth as is required to find specific deficits and to plan strategies for reducing or circumventing these disabilities (Bateman & Schiefelbusch, 1969, p. 9)." This

type of testing is based on the assumption that there is an underlying process disability which has prevented adequate response to the usual methods of teaching reading. Although many tests have been developed, the Frostig Developmental Tests of Visual Perception (Frostig, 1964), the Visual-Motor Integration Test (VMI) (Berry & Buktenica, 1967), the Illinois Test of Psycholinguistic Abilities (ITPA) (McCarthy & Kirk, 1968), and the Slingerland Screening Tests for Identifying Children with Learning Disabilities (Slingerland, 1973), are the most popular assessment devices. All of these tests use objective criteria for scoring and have a standardized method for determining a significant deficiency.

The Frostig Test was designed to measure basic skills considered relevant to the reading and writing process, such as eye-hand coordination, figure-ground discrimination, form constancy, position in space, and spatial relationships (Frostig, 1967). The VMI tests visual-motor integration through copying of geometric forms. The ITPA was designed to assess various components of linguistic functioning on two levels - the representational level and the automatic level. Under the representative level are the auditory and visual receptive tests which sample the child's ability to understand what is said to him and his ability to relate concepts that are presented orally and visually. The expressive process examines the child's ability to express

himself verbally and nonverbally. The automatic level assesses linguistic constructs of grammar and syntax and his ability to identify objects after having been shown parts of them. The information obtained from the ITPA is difficult to interpret to a classroom teacher because she is not familiar with the terminology. Additional time is required to communicate the test findings in a form that the teacher can use to facilitate the selection of methods and materials for teaching the child.

The Slingerland Screening Test evaluates visual-motor coordination, visual memory, visual discrimination, and visual memory-motor coordination. It evaluates auditory-visual discrimination and auditory and memory-motor ability. There are also individual auditory tests to identify those children who are unable to recall or pronounce words correctly or who are unable to express organized thoughts in either spoken or written language. Since this test uses words or parts of words for stimuli, it is easier to explain findings to the teacher and to prescribe remediation directly from the findings.

Mental maturity, emotional maturity, mental content, and the individual's concept of himself are psychological factors which Carter and McGinnis (1970) feel should also be considered in the study of the disabled reader. Even if such an intensive evaluation were desirable, it is highly unlikely that many communities would have the services of

reading clinicians and specialists. The point of diminishing return needs to be considered when using the psycho-educational approach. An individual behavioral analysis done by the teacher or psychologist may prove a more effective procedure than process testing for the identification of the retarded reader.

In spite of the extensive research that has been carried on over the past ten years, there still remains inadequate knowledge of relationships between processes tested and behavioral disabilities such as reading, spelling, and writing. Moreover, systematic remedial procedures for these process disabilities are lacking, and the validity of process training in overcoming reading difficulties has been inadequate (Capobianco, 1971; Chalfant & Scheffelin, 1969; Hallahan & Cruickshank, 1973; Haring & Bateman, 1969; Haring & Phillips, 1972; Haring & Ridgway, 1971; Lovitt, 1971; Marx & Smith, 1972; Oakland, 1971).

Once a diagnosis has been made, a treatment program for the disabled reader is planned. The treatment of the disabled reader may consist of instruction, therapy, or both. It may be general, specific, or palliative. In all instances, remediation must be a direct response to a diagnostic study of the child. There are educators who believe that children with deficits in underlying processes should have specific remediation before going on to reading activities, e.g., auditory closure taught before phonics, i.e., teaching

to the weakness and improving it (Frostig, 1967; Frostig & Horne, 1964; Kirk & Kirk, 1971; Kirk & McCarthy, 1967; Tansley, 1967; Valett, 1969). The "teaching to the strength" proponents advocate diagnostic testing to find intact areas. Academic instruction can then be rechanneled to permit the child to learn more readily (Bateman & Schiefelbusch, 1969). Many learning specialists prefer to use both methods - giving one to one remediation for the weak areas and suggesting to classroom teachers that they teach the child by using his strongest modality (auditory, visual, kinesthetic).

Contribution of Experimental Psychology to the Technology of Education

A science of behavior has evolved from experimental psychology and the study of operant conditioning which is based on the psychological principles of learning. The principles of learning have wide application toward understanding human behavior and controlling problems in the educational setting (Staats & Staats, 1963). The experimental method involves the manipulation of relevant variables, is largely a matter of focusing on answerable questions, and includes adequate controls.

The contribution of behavioral psychology is complimentary rather than contradictory to more traditional aspects of psychology. Behavioral psychologists have become concerned

with educational goals and have attempted to provide teachers with techniques for achieving them. Behaviorism provides a language, a method of analyzing, and objective measurement for evaluating teaching. One of the goals of behaviorism is to enhance effectiveness through the analysis of antecedent and consequent stimuli. The behavioral analyst uses a research design which deals with changes in the individual child and can specify and describe environmental variables which are capable of modifying and controlling reading behaviors based upon observable accounts of the relationships between behavior and its determining conditions (Bijou, 1970; Bloom, 1973).

Functional analysis requires the use of assessment instruments and procedures which are highly specific and behaviorally oriented. The problem becomes one of determining the specific what rather than the why within large realms of behaviors or tasks that the child needs to learn in learning to read. Functional analysis can be used in analyzing complex behaviors observable in behavior disorders, socialization, or academic performance during skill acquisition. The general strategy is a two-step procedure consisting, first, of obtaining baseline data on the specific behavior to be changed and, second, of assessing the conditions that maintain the behavior. These conditions would include the antecedent events, i.e., instructional materials, the reading behaviors, the contingency system, and the consequences

within the learning environment. Functional analysis has been applied systematically and extensively in research programs in laboratory school settings and in the public school settings (Bradfield, 1971; Cobb & Hops, 1972; Haring & Hauck, 1969; Haring & Lovitt, 1973; Haring & Phillips, 1972; Hewett, 1968; Klein, Hapkiewicz & Roden, 1973; Kubany & Sloggett, 1971; O'Leary & O'Leary, 1972; Rogan & Lukins, 1969; Rosenberg, 1973; Tharp & Wetzel, 1969; Wetzel, 1971).

The aim of establishing baselines for relevant behaviors under the same conditions or stimulus arrangements is to evaluate the total range of variability for the child. However, the psychologist can use diagnostic tests as an aid in evaluating instructional materials and the child's reading responses. The behaviors observed can be exactly matched to those which the remediation is intended to modify. Diagnostic reading tests can provide information about the child's strengths and weaknesses as well as indicating an overall reading level. An analysis of specific errors might indicate, for example, poor word attack skills, lack of familiarity with phonetic elements such as vowels, final consonants, initial and final consonant blends, inadequate sight vocabulary, a slow reading rate, or difficulty with comprehension. Remediation may then be programmed to teach skills in one or more weak areas. Close observations of errors made on any general test of reading performance can give valuable information concerning particular skills that need to be taught (Cohn, 1971).

Behavioral psychologists have been specifically interested in observing behaviors that they have considered to correlate highly with school success or failure, such as on-task, orienting, out-of-seat, aggression, touching others, etc. Cobb (1970) found certain academic survival skills that correlated significantly with success in school. Attending and working were the most powerful positive correlates; while self-stimulation and looking around were the most negatively correlated.

In order for the behavior modification framework to be effective, Lovitt and others (1967, 1968) evolved the following basic decisions to be made:

1. Discover a consequence or reinforcement event that will accelerate a child's rate of performance on a specific task.
2. Change the program of instructional materials so that performance is facilitated.
3. When the child's performance is accurate, increase the reinforcer, and when the child makes an error decrease the reinforcer.
4. Eventually, have the child make his own instructional decisions such as corrections and establishment of reinforcement values (Lerner, 1971, p.246).

To effect a predictable change in behavior, a set of systematic procedures is necessary. These systematic procedures include direct observation, continuous measurement of behavior, and systematic manipulation of environmental events though to be effective for changing the behavior (Haring, 1973).

Contingency management consists of the application of behavior principles in the classroom using a systematic set

of procedures for utilizing reinforcing events in relation to specified behaviors. Three variables relevant to contingencies responsible for changing behavior are the occasion upon which behavior occurs, the behavior of concern, and the consequence of the behavior.

One of the two major variables important in maximizing conditions for learning is instructional material which is introduced in order to bring about specific responses and provides the cues to which the child must respond. The second major variable is the consequence for responding. Skinner (1953, 1961, 1965, 1972) and Haring (1973) have stressed the importance of sequencing academic materials which will permit the child to respond accurately.

Reading - A Target Behavior

Reading specialists acknowledge the fact that children have been taught to read with a variety of techniques which have been derived from a number of theories (Singer & Ruddell, 1970). Some of the variables which affect the rate of learning to read have been delineated and examined; however, the conceptualization of reading as a target behavior influenced by antecedent and consequent stimuli is a relatively new development (Bloom, 1973). Prior theoretical approaches emphasized hypothetical constructs and intraorganism events which were not amenable to experimental manipulation. With reading considered as a target behavior, environmental events that influence the acquisition of reading can be empirically tested.

Staats is thought of as the leading proponent of the behaviorist point of view in the field of reading (Williams, 1973). As early as 1962, Staats and his associates considered reading acquisition as discrimination training in which certain verbal responses are reinforced in the presence of certain visual stimuli. Staats, Staats, Schultz & Wolf (1962) demonstrated that a vocal response to a visually displayed written symbol was an S-R sequence that could be conditioned as any other operant through an extrinsic reinforcement process. Staats did not discuss reading as a language process until 1968 (Staats, 1968; Staats, Brewer, & Gross, 1970) when he described reading as a complex cognitive skill whose components must be developed on the basis of already learned basic skills, such as imitation, labeling of pictures, language, and orientation to a two-dimensional visual presentation. Essentially, the acquisition of reading was considered an instance of cumulative-hierarchical learning.

Staats (1968) presented a sequential analysis of the skills acquired in learning to read. Discrimination of letters is the first behavioral repertoire acquired in learning to read. For each different vocal response, the child must learn several different stimuli which control the response, i.e., upper and lower case, printed and written letters. The child then learns a repertoire of word families, i.e., at, sat, mat, bat, through discrimination

training. The child then learns to sound out words by proceeding from left to right and blending the sounds corresponding to the written words. After the child has learned to sound out words, whole words come to control vocal responses. Eventually, entire phrases and sentences may act as a single stimulus. Once the written word elicits a vocal (or subvocal) response, previously acquired language gives meaning to the word. Meaning responses include emotional responses, motor acts, and images.

The specific definition of reading determines the steps that are essential to develop that behavior. Complex behavior must be analyzed into simple observable behaviors, and the conditions under which the behavior will be expected to occur must be delineated. Finally, the criteria of acceptable performance must be described (Haring & Hayden, 1972; Mager, 1962).

In her review of theories and models for learning to read, Williams (1973) noted that most reading models of the beginning acquisition phase focus on decoding and its prerequisite abilities. Facility in reading comes through the utilization of redundancies in the written language such as word families and spelling patterns. The novice must rely heavily on visual information that is usually learned slowly. Each word is treated as a separate entity. Comprehension follows after the novice has taken advantage of the redundancies, spelling patterns, etc., and can concentrate on the content of what is read.

A poor reader is generally considered to be a child who has failed to acquire a repertoire of reading responses comparable to that of his peers. More specifically, the child who is considered to have a reading problem is reading below grade level. His poor reading performance may be reflected by low rates of total performance, high rates of error, a marked deficiency in word attack skills, or some combination of these factors.

Students who have had a reading problem in the early grades tend to fall further behind their peers as they move through the grades. These students carry an increasing burden of failure with them for as long as they remain in school. Children learn at a very early age to identify certain performances as failure, and they react to failure by withdrawing from the situation that provokes it. The accumulation of failure experience frequently leads to the reading disabled child's quitting school at the earliest opportunity.

The behavioral approach to reading remediation is an attempt not only to provide structured antecedent conditions for learning, but to induce or increase motivation, to build intrinsic motivation from extrinsic beginnings, and to enable motivation to become self-sustaining (Haring & Hayden, 1972). When learning activities are carried out with a high rate of correct responses and associated with satisfactory consequences, many children discover that reading becomes an increasingly satisfying experience.

Programmed Instruction

Skinner has said that learning occurs when behavior is reinforced (1953, 1961, 1965). Extensive changes in behavior can be brought about by arranging contingencies of reinforcement. The programming of knowledge and skills has made an important contribution to education (Brown & L'Abate, 1969; Gaudry & Spielberger, 1971; Glaser, 1965; Holden & Roberts, 1973; Skinner, 1961, 1965; Suchett-Kaye, 1972).

Programmed instruction is built upon the construction of carefully arranged sequences of contingencies leading to a terminal performance which has been specified in previously defined instructional objectives. In their direct contact with students, teachers could benefit by using the same principle of programmed sequences to shape social and academic behaviors. Programming in small sequences is time consuming, however, and also requires that teachers understand the process.

Many educational programs have already been developed that can help most students. These programs present materials that were designed by someone who knew what was to be taught and could prepare an appropriate set of contingencies. Programmed teaching materials differ from self-testing and scoring devices. Before using a self-testing device, the student must have already studied the subject and learned most of the material. Conventional programmed

texts arrange conditions under which students learn. In arranging contingencies of reinforcement of immediate feedback, programs do many things teachers do - they teach (Skinner, 1965).

Programmed instruction emphasizes the improvement of teaching on the principle that no enterprise can improve itself to the fullest without examining its basic processes (Skinner, 1965). Various forms of programmed instruction have many features in common (Brown & L'Abate, 1969):

1. They engage the attention of a single student and require his attendance to a small amount of information at one time.
2. They require the student to commit himself by making a response to each segment of information before him.
3. The program produces an immediate feedback of results for each response which the student makes.
4. The program permits each student to progress at his own pace (p.396).

Programmed instruction is most effective when the teacher knows the student and follows his progress daily (Brown & L'Abate, 1969; Griffith, 1972; Holden & Roberts, 1973; Skinner, 1961). Programmed instruction makes it possible for programmer and teacher to provide conditions which maximally expedite learning.

In maximizing the student's success, programmed instruction differs from the situation in which the student learns from mistakes. In the latter situation, at best, he may learn not to make the same mistake again. If a successful response does occur, little provision is made for

strengthening it. Programmed instruction is designed to teach with minimal error. If the student fails to learn, the program is considered inadequate for that particular student.

Holden and Roberts (1973) define a slow learner as any pupil who cannot keep up with the regular school class. Correlated symptoms include feelings of inferiority and incapability. These children attempt to avoid any test of performance and to hide their handicap. Whereas slow learners often react negatively or neutrally to conventional teaching, they have reacted very positively to various programmed reading books (Holden & Roberts, 1973; Webster, 1972) because these books have offered three assets not usually found in a regular classroom instruction, "(1) very small first steps with more repetition than the normal learner requires, (2) immediate positive reinforcement for every success and no negative consequences for mistakes, and (3) the encouragement which comes from success which compounds itself into greater success and self-confidence (Holden & Roberts, 1973, p.312)".

The use of programmed instruction permits the experimenter to hold antecedent instructional conditions constant while investigating other variables contributing to rate of learning (Bloom, 1973; Smith, Brethower & Cabot, 1969). Although each child may be at a different place in the program, it can be reasonably assumed that he has acquired and retained very specific reading skills which he must

have to progress in the programmed series. For example, if a child has completed Book 1 and performed at a 90% correct criterion level on a test, he will have the same skills as any other child who has completed Book 1. Also, if a child enters the program at Book 4 and meets the 90% criterion, it is assumed that he also has the skills taught in Book 1.

Although programmed instruction has contributed much to education, it has not been the answer to all teaching problems. A unitary educational strategy has never been found to teach all children (Singer & Ruddell, 1970); the programmed format is no exception. Programmed instruction needs to be accompanied by other media, such as teacher instruction, tapes and films (Berthold & Sachs, 1974; Brown & L'Abate, 1969; Engleman, 1969; Lewis & Whitwell, 1971; Stout & Bussey, 1973) to be most effective. Engleman (1969) cautioned programmers to consider the fact that eliciting a response to a cue is not sufficient in itself. He calls this type of response a fixed response. Reinforcement for this response does not necessarily teach the rule or concept that covers all situations. For example, a child may be taught to make the sound /a/ when he sees the symbol a; however, until he can distinguish a from all other letters he has not learned the rule for identifying a. Likewise, if he learns to make the sound /a/ but does not

learn to blend the sounds of consonants with the sound of /a/, he has not learned the concept of word attack.

Finally, even the most enthusiastic supporter for the use of programmed instruction stresses the importance of interpersonal contact between teacher and child. Children with histories of learning problems, in particular, need social reinforcement in addition to good instruction (Dreikurs & Dinkmeyer, 1963; Connolly, 1971; Saunders, 1962; Staats & Staats, 1963; Suchett-Kaye, 1972).

The most important learning principle in programmed instruction is that a correct response is strengthened through the reinforcement of having matched the correct answer and being able to proceed with the program (Skinner, 1961, 1965; Staats & Staats, 1963). Staats and Staats (1963) questioned whether or not being correct and moving to the next frame as sufficient motivation for maintaining the studying behavior of the retarded reader. A child must have had a history of positive reinforcement when he has matched his behavior to that of an authority figure such as parent, teacher, or older child. If during the acquisition of language, motor skills, and reading, a child has had training in which he has been frequently reinforced in the presence of matching stimuli, producing a response that matches a standard becomes reinforcing. Therefore, the reinforcing strength of being correct would depend upon the past history of the child, and it would be expected that

the strength would vary widely among children. For the child who has been a slow or poor learner, the history of being reinforced for being correct is likely to have been weak (Staats & Staats, 1963).

The same analysis can be made concerning the reinforcement that is supposedly inherent in achievement. Achievement would be expected to be reinforcing only if the child has had a past history of having been reinforced extensively for achievement.

When programmed instruction is used with young children, slow learners, and retarded readers, the necessity of functionally analyzing the effects of past histories and assessing appropriate reinforcers becomes even more essential. The behavioral psychologist is in a position to functionally analyze important learning variables and to adjust them to optimize performance (Katz & Henchy, 1968; Lewis & Whitwell, 1971; Severson, 1973; Smith, Brethower & Cabot, 1969; Staats, Minke & Butts, 1970; Stout & Bussey, 1973; Sulzer, Hunt, Ashby, Kramsky & Knoiarski, 1971; Willis, Crowder, Morris, 1972).

Reinforcement - A Principle of Learning

According to operant conditioning principles, reinforcement is considered necessary for the acquisition and maintenance of behavior. Programmed instruction has demonstrated

that optimal instructional conditions can exist for each individual and can be programmed in such a way that students can proceed through learning tasks with a high rate of success. Skinner had hoped that the advent of programmed learning and teaching machines would solve the problem of motivating students toward learning (1961). As Staats and Staats pointed out in 1963, research was still needed to assess appropriate reinforcers for different age groups and different socioeconomic groups and to capitalize upon differences in individual histories that would affect the adequacy of reinforcers. Relevant antecedant conditions may be the student's personal learning history or the present instructional situation. A history of school failure implies that reinforcers have been on a sparse intermittent schedule.

Educators have historically been interested in developing instructional materials and educational programs that they have considered motivating in themselves. If the child failed, the problem was considered to be due to some deficiency within the child. Behavioral psychologists have demonstrated that environmental events determine much of the behaviors that are learned, and they have focused on the control of consequent variables to bring about desirable change. Only recently have educators and social scientists joined together to investigate systematic ways of facilitating behavior change through management of the consequences of behavior (Haring & Hayden, 1972).

Research in the 1960's revealed that the variability of reinforcer properties is indeed wide. Personal preferences, types of reinforcers, and schedules of contingencies all have their influence. Token reinforcement systems have been instituted in order to allow for individual choice in reinforcement and have proven to be applicable to a wide range of children (See O'Leary & Drabman, 1971 for a review).

Whereas continuous reinforcement is frequently effective in shaping beginning behaviors, intermittent reinforcement on a variable ratio schedule produces faster and more accurate working behavior. However, the experimental method of using each child as his own control to assess the effect of different schedules of reinforcement has revealed that children are different in their responses to schedules. If responsiveness is to be sustained, reinforcement rates and schedules may have to be adjusted during times when greater effort is required from the child.

Much of the research in the 1960's centered around the investigation of individual reinforcement contingencies and the modification of social behaviors. The effectiveness of the application of reinforcement techniques in the modification of disruptive social behaviors in the public classroom have been amply documented, e.g., (Clark, Evans & Hamerlynck, 1972; Erickson & Nelson, 1973; Fargo, Behrns & Nolen, 1970; Klein, et. al., 1973; O'Leary & O'Leary, 1972; MacDonald & Tanable, 1973).

Naturalistic observations in the classroom made by teachers who have participated in behavioral programs have revealed that academic progress has not necessarily followed once social behaviors have been controlled. Lipe and Jung (1971) have suggested that focusing on increasing what is considered to be appropriate behavior in the classroom is insufficient for producing academic achievement. Many times the social behaviors that have been controlled have been quite diverse and have fallen under the global category of task-oriented behaviors (Cobb, 1970). Global categories of task-oriented and non-task-oriented classroom behaviors have provided only low correlations with achievement (Cobb, 1970).

For the past four years, a major focus of CORBEH, the Center at Oregon for Research in the Behavioral Education of the Handicapped, has been the prevention and remediation of behaviors which are incompatible with successful academic functioning in educational settings (Hops & Cobb, 1972). Cobb (1970), Cobb and Hops (1971) and Walker, Fiegenbaum and Hops (1971) have pinpointed specific social behaviors they consider to be educational survival skills that act to increase the probability of successful academic functioning. Attending, working and volunteering or following teacher instructions are behaviors that have correlated highly with reading achievement and which seem to be necessary for successful academic functioning. "They were not academic

behaviors per se, but rather, the first components in a chain of correct academic responding (Hops & Cobb, 1972, p.6)." A second broad group of behaviors also identified with high achievement consists of response accuracy to curriculum materials. Hops and Cobb (1972) pointed out that minimal levels of survival skills are required before a high rate of correct responding can be performed.

The most recent research has centered on the investigation of the relationship between academic and social behaviors when reinforcement contingencies were placed directly on academic achievement. Ayllon, Layman and Burke (1972), Ayllon and Roberts (1974), Kirby and Shields (1972), and Winett and Roach (1973) have demonstrated that appropriate social behaviors increased when academic performance was the target behavior being positively reinforced.

Ayllon and Roberts (1974) found that whenever academic behavior was reinforced, concurrent disruptive behavior decreased. When the students were earning points for being accurate in reading workbook assignments, they reminded each other to be quiet or less disruptive so that they could work. Behavioral observations were made at the time when the students were being reinforced for academic performance, and Ayllon and Roberts concluded that a reciprocal relationship may exist between academic performance and disruptive behavior. Interestingly enough, they observed that the drastic reduction in disruption during reinforcement of accurate reading assignments did not generalize to other classroom

times even though the students were in the same classroom and had the same classmates and teacher. Ferritor, Buckholdt, Hamblin, and Smith (1972) also did not find generalization in either improved attention to studies or a decrease in classroom disruption to occur as a result of having been reinforced for performing arithmetic problems correctly; however, their observations were made at times other than during the arithmetic period. The issue is still not clear.

The discrepancy in experimental results from directly reinforcing social or academic behaviors is not unexpected because there are many variables that influence the acquisition and maintenance of learned social and academic behaviors. To be concerned with teaching children to "be still, be quiet, be docile (Winett & Winkler, 1972, p.499)" is concentrating on teaching children specific responses and does not guarantee that the child will take advantage of the time spent quietly in his seat to learn tasks put before him. Attempts to reinforce children for spending time and effort to perform academic tasks correctly will work only if the task is within the capability of the child, and generalization of academic and social behaviors to other situations will occur only when skills developed during periods of extrinsic reinforcement become intrinsically reinforcing and self-managed (Haring & Hayden, 1972).

Reading Remediation with Programmed Instruction

For the purpose of this paper, only research related to the remediation of reading through the use of programmed instruction or direct and daily measurement on specific reading skills along with an extrinsic reinforcement program will be reviewed.

Haring and Hauck (1960) investigated the use of tokens exchangeable for edibles and a variety of material items. Terminal reading goals were established as reading at grade level in basal readers and programmed books. The subjects were four elementary school boys who were severely disabled in reading but average or above average in intelligence. The reading environment was composed of a teacher station, four student stations and a reinforcement area. The teacher made verbal contact with each boy through a microphone to headsets worn by each boy. She gave instructions, provided directional prompting cues during oral reading, and manipulated switches to reinforce oral responses throughout the experiment. The students completed all written and oral work on the entire page before checking the answers and then manipulated a switch to tally correct and incorrect written responses at the student stations.

Various point values were placed on reinforcement items in line with actual retail value. Reinforcement schedules were designed to optimize the performance of each child. Arrangements of reinforcing events were designed

first to accelerate performance and then to maintain the high rate. Learning conditions were considered optimal when the child's performance rate accelerated and stabilized at the high rate or when the number of minutes avoiding reading greatly decreased. The continuous evaluation and making of on-going decisions for the development of terminal reading behavior required continuous measurement of written and oral responses during each change of reinforcement schedule. The authors concluded that the use of programmed materials which were designed to shape sequential skill development and close contingent adjustment of motivation variables proved to be the critical variables for efficient performance. The boys progressed in instructional reading levels from 1 1/2 years to 4 years during the five months of daily 65-minute reading periods.

Eaton and Lovitt (1972) asked teachers to take daily measures of the number of words read correctly and errors made during a five-minute period. Progress appeared to be sporadic until reinforcement contingencies of 30 words read correctly to 1 point earned toward one minute of free activity was instigated, after which correct reading rate increased, and error rate declined.

Smith, Brethower, and Cabot (1969) investigated the effects of reinforcement on correct responses made in a programmed reading series. Children were placed into experimental groups as they were referred to a clinic for

reading remediation. Correct graphic or oral responses were followed by no consequences, praise, work-break, money, and feedback on progress. Informative feedback in terms of points posted on a graph was fully as effective as monetary consequences in maintaining 95% correct responses. The children were free to work or not work as long as they did not talk during independent work and did not disturb others.

Willis, Crowder, and Morris (1972) accepted 43, second through eighth grade children who read two or more grade levels below their grade placement, into their reading program. The children were given a Slosson Intelligence Test and a Slosson Oral Reading Test for purposes of pairing students on the basis of I.Q. score and reading levels. Twenty-three eighth grade students were trained to be behavioral engineers (BE), and they carried out the remediation program. Sullivan programmed reading materials were used. Each BE worked with a pair of students. The BE gave a green plastic chip and praise for each sentence of five words or more read correctly. When the child made an error, the BE corrected the error, helped the child finish the sentence, and gave him or her a red chip. Then the other member of the pair was allowed to read, etc. At the end of the daily reading period, each pair of readers counted the green and red chips earned and recorded the number on a record sheet. Apparently receiving and counting the chips and recording the number was appropriate reinforcement for

this group of children, for they made a significant gain in reading skills compared to a control group and the regular remedial reading group in the school.

Since 1965, experimental education programs have been using systematic procedures, consisting of a highly structured environment, specific assignments to which observable responses could be made, continuous measurement of responses, and token reinforcement programs. All of these programs had positive results (Bijou, Birnbrauer, Kidder & Tague, 1966; Birnbrauer, Wolf, Kidder & Tague, 1972; Haring & Lovitt, 1973; Haring & Phillips, 1972; Hewett, 1968; McKenzie, Clark, Wolf, Kothera, Benson, 1968).

Group Reinforcement

Research concerning target behaviors has focused primarily on the investigation of the effects of individual contingency management. Research that has emphasized social behaviors has demonstrated the successful use of group contingencies (Axelrod, 1973; Barrish, Saunders & Wolf, 1969; Cobb, Ray & Patterson, 1971; Feldman, 1973; Packard, 1970; Patterson, Cobb & Ray, 1972; Schmidt & Ulrick, 1969). Studies employing group contingency techniques have considered peer pressure, positive or aversive, to be of primary significance. Feldman (1973) conducted an investigation comparing reinforcement and group pressure techniques in the classroom on the frequency of disruptive behaviors.

The experiment involved sixteen 7th- and 8th-grade students. Class A was comprised of four groups with one target child in each small group. The reinforcement of the members of each small group was solely contingent upon the performance of the target student. In Class B, the combined performance of the four target students determined the reinforcement consequences for the whole class. In Class C, the behavior of each target student determined his own reinforcement consequences. In Class D, the four target students served as a control group for the study and were monitored but not reinforced. Although all three reinforcement approaches were effective in lowering the frequency of talking-out behavior, large group pressure and shared responsibility (Class B) for reinforcement seemed to have the greatest potency in reducing disruptive behavior. Feldman (1973) was careful to point out that the feasibility of using shared responsibility toward group reinforcement was not completely substantiated. The effectiveness of working together and sharing of responsibility may be affected by such variables as age, socioeconomic background, I.Q., individual history, and personality characteristics. The differential responsitivity among individuals to group pressure and changes in social status of students occurring as a result of their effect on the group's reinforcement outcome should also be considered.

As Staats and Staats (1963) have pointed out, the retarded reader has probably had a history of very little reinforcement for academic success. Retarded readers have a history of losing in most academic competitions. Some children seem to thrive on competition for the very reason that the probability of their winning is high. Competition is not enjoyed by the proverbial loser. Placing retarded readers in a remedial program that has errorless learning as its goal plus having the reinforcement contingencies for success shared with a group may very well provide the necessary support for enhancing their feelings about themselves.

The studies that have been reviewed are but a few examples of the rapidly accumulating contingency management literature regarding the reinforcement of social or academic behaviors, the programmed teaching of reading, and the use of group reinforcement. However, the need for research on the effects of reinforcement contingency variables as they affect academic achievement is still present (Bloom, 1973; Birnbrauer, 1971; Hops & Cobb, 1972; Maehr, 1970; Nelson, 1973).

Criticism of Contingency Management Research

Birnbrauer (1971) in his review of contingency management research indicated that contingency managers have been criticized because they have neither asked the customary

questions nor adhered to the group-statistical model. Studies comparing contingency management procedures with programs derived from other theories are rare. Control groups have not been used; inferential statistics have not been applied to the data; single case studies predominate the literature; and only a small contribution is made in each paper. Adequate follow-up data is not presented (Birnbrauer, 1971; Kazdin, 1973). Subjects are not randomly selected, and the basis for selection may not be given; and negative results are not reported (Birnbrauer, 1971).

The Purpose of This Study

One-to-one assessment and individualized instruction have been the methods of choice in the remediation of retarded readers. Educational systems, however, have not been able to meet the demand for individualized assessment or instruction. Therefore, other methods are being sought which will meet the needs of more children. A survey of the literature indicated that no study has been conducted that compared academic achievement rate between children who have been reinforced for accuracy and those reinforced for on-task behavior while holding instructional materials constant.

The present study was designed to compare the effects of reinforcing accuracy and on-task behaviors during programmed remedial instruction on the number and accuracy

of completed frames and performance on the Slosson Oral Reading Test, the Wide Range Achievement Test, and the Spache Reading Diagnostic Scales as well as on teacher ratings of behaviors in the classroom.

CHAPTER II

METHOD

Subjects

The subjects for this study were 27 fourth-grade children from two elementary schools in a North Carolina county school system. All 165 fourth-grade students in these two schools were administered the Slosson Intelligence Test (SIT) (Slosson, 1963), the Slosson Oral Reading Test (SORT) (Slosson, 1963), and the Wide Range Achievement Test (WRAT) (Jastak & Jastak, 1965). SORT reading scores were ordered according to reading level within each school. Approximately twenty percent of the children having an IQ of 79 or above with the lowest reading achievement (SORT) scores were selected from each school; eighteen children were selected from School 1 and nine from School 2. Children already assigned to a resource room or learning disability program for reading remediation were not included.

Letters were sent to parents over the principal's signature notifying them that their child had been selected to go to a Reading Lab every day until the end of school. The parents were given the opportunity to ask questions and to refuse permission. No child was denied permission to participate.

Pre-test and Post-test Procedure

Immediately prior to the initiation of the remedial program, the 27 children were administered the SORT, WRAT, and Spache Diagnostic Reading Scales (SDPS)(Spache, 1963). These tests were re-administered at the end of the remediation period by an experienced psychologist who was not familiar with the study or the children. A classroom-teacher rating of attitudes and habits as well as the teachers' grades for reading were secured from the report card record after the last report card had been issued. The first eighteen weeks of school were used for the pre-test rating, and the last eighteen weeks were used as post-test ratings.

Assignment of Groups

Within each school, children were rank-ordered according to their reading level. The children were placed into two Experimental groups and one Control group using a stratified randomization procedure (Hays, 1963) which equated the groups for initial reading level. Children in the Experimental groups participated in the Reading Lab and were reinforced for either accuracy or on-task behavior. For remediation purposes, each Experimental group was subdivided into groups of three children. Within the Accuracy group, there were two groups of three at School 1 and one group of three children at School 2 - a total of nine children. The On-task group was structured in the same way. Within the

Control group, there were six children at School 1 and three at School 2. The Control children participated in the regular school program. Teachers were not informed that there was a Control group.

Remediation Procedure

All groups met with the same Experimenter (tutor) daily. Remediation was conducted in two-day units. Due to the schools' limit of 20 minutes for session length, Day 1 was used entirely for work in the Programmed Reading (3rd Edition) by C.D. Buchanan (Webster/McGraw Hill, 1973). During Day 2, children worked approximately six minutes in the Programmed Reading while waiting for their turn to read orally to the tutor. The last ten minutes of Day 2 was set aside for time in the Fun Room. Four 20-minute sessions were conducted at School 1 from 8:15 to 10:00 a.m. Two 20-minute sessions were conducted at School 2 from 10:30 to 11:30 a.m. Programmed instruction and oral reading in the Programmed Reading were given for a period of four preliminary sessions and 48 remediation sessions.

Preliminary sessions. Preliminary sessions were conducted for the first four days in order to acquaint the children with programmed instruction and reinforcement procedures. The children were given a Placement Test for the programmed reading in order to place them in a book at their level of proficiency. Appendix A contains specific preliminary session procedures. During the preliminary

sessions, the tutor kept a daily record of the number and accuracy of frames completed by each child as well as the amount of time on task. Two of the sessions were used to provide a baseline for accuracy and on-task behaviors for the Experimental groups. Point scales were equated for a reinforcement schedule for each group with the intention that the two groups would receive approximately the same amount of reinforcement. Appendix A contains the point scale used.

Every day of the program the children were told to read the material before writing their answers in their response booklet and before uncovering the answer in the book. They were instructed to look at each correct answer before going on to the next item. Appendix A contains the specific instructions. Remediation was conducted in two-day units.

Day 1. On Day 1, the children worked on individualized instruction for 15 minutes. During this time, they were earning points by being accurate or being on task, depending on which group they were in. Each child could earn up to ten points. Points were earned only in the Day 1 sessions. Each child in the Accuracy group was awarded points contingent upon his percent of accurate responses. At the end of 15 minutes, the workbook was stamped with the date. Children in the Accuracy group counted frames (answers) completed and correct answers. Each child then computed his percent accuracy on a small electronic calculator and

points were given by the tutor for percent accuracy. Percent accuracy and points earned were put in the book beside the stamped date. At a later time and before the next day, the tutor also counted frames completed and correct answers. If a change was made, the child was told before the next session. In order to receive the full amount of points earned for accuracy, each child had a criterion of number of answers he had to complete. As a child entered a new book, a record of the first three days of reading during Day 1 was kept. The number-of-responses criterion was the lowest amount completed in the three days. For every five responses below this criterion, a point was lost. For example, if a child had 100% accuracy, and his criterion was 40 responses, but he had only completed 30, he earned 8 points for the day, instead of 10. Each child contributed his points to the group, and the total number of points were averaged for time earned in the Fun Room for that group. For example, Child 1 earned 10 points for 100%. Child 2 earned 7 points for 96% accuracy, and Child 3 earned 5 points for 93% accuracy. Twenty-two points were earned with the group average being 7.3 points. For each point earned, a minute was earned in the Fun Room; thus, the group earned 7 minutes in the Fun Room.

Although points were earned for percentage of response accuracy, each child was also monitored for on-task behavior, and the time was recorded for each Day 1 period.

Each child in the On-task group was awarded points contingent upon the amount of time he had been on task during the 15-minute Day 1 session. Appendix A contains specific instructions to the On-task groups and a description of on-task behaviors. During the 15-minute period, the tutor monitored on-task behavior and ran a stop watch for each child. The stop watch ran as long as the child was working. If the child got up out of his seat, was disruptive in any way, was not working in his book, or talked about something other than what he was reading, the watch was stopped. At the end of the 15-minute period, the workbook was stamped with the date. Each child read the time he worked from the stop watch. The tutor looked on the point scale and told the child the number of points he had earned. Time on task and number of points earned were recorded in the book beside the date. Each child contributed his points to the group for time earned in the Fun Room by personally entering his points into a calculator. Each child participated in some way to the averaging process by helping to work the calculator. At a later time, the tutor made note of answers completed, number correct, and percent accuracy.

Day 2. On Day 2, each child read orally to the tutor for two minutes. While one child was reading, the other two children were given approximately six minutes to work in their programmed workbook. Material that was read was taken from the Programmed Reading (3rd Edition) at the level the child had just completed. A record was kept of number of

words read and errors made during the two-minute time period. After each child in the group had read, the children stamped their books with the date. At a later time, the tutor tallied the number of answers completed and percent accuracy. Appendix A contains the data sheet used for each Day 1 - Day 2 unit. The last ten minutes of the Day 2 session were set aside for whatever time in the Fun Room that had been earned by the group the previous day.

Absences. After an absence from school, the child returned to the Reading Lab regardless of whether a Day 1 or Day 2 session was in progress. There were no make-up sessions. It was not anticipated that children would be consistently absent more on Day 1 than Day 2. If a child missed time in the Fun Room on Day 2 to which he had contributed his points, he was not given a chance to make it up.

Materials and Equipment

Each child read from a programmed reading workbook at his own level. Levels that were used ranged from Book 1 to Book 16. The child wrote his answers in his own response book. Children were provided pencils without erasers.

Four stop watches were used. One watch was used to time the 15-minute reading period. Three stop watches were installed in a small plastic holder which permitted the tutor to start and stop watches with ease. A small portable electronic calculator was used by the children and the tutor to compute percentage of accurate responses and group-point average. An adjustable date stamp was used to record dates.

Fun Room supplies were varied in order to maximize motivation. The children were frequently asked what they would like to do in the Fun Room, and materials were provided to meet their interest. Basic supplies were tables and chairs, a black board, a rug, drawing materials, recreational and academic games, a typewriter, a cassette recorder, a radio, bean bags, high interest reading materials, and puzzles.

Experimental Design

The two Experimental groups and the Control group had been equated for reading levels. An analysis of variance revealed that there were also no significant differences among groups for IQ score and reading achievement rate prior to the experimental reading lab sessions.

A repeated measures multivariate analysis of variance was conducted comparing the two Experimental groups on the following variables:

1. Number of frames completed by each child in Day 1.
2. Percent accuracy of responses for each child in Day 1 using the arcsin transformation (Winer, 1971).
3. Number of points earned in the Accuracy group and On-task group during Day 1 for free time in Day 2.
4. Amount of on-task time for each child during Day 1.
5. Number of frames completed by each child in Day 2.

6. Percent accuracy of responses for each child in Day 2 using the arcsin transformation.
7. Number of words read for each 2-minute period for each child in Day 2.
8. Percent accuracy of words read for each 2-minute period using the arcsin transformation.

Using the scores derived from pre- and post-tests and the children's report cards, a multivariate analysis of variance was performed between the Accuracy group, On-task group, and Control group. Univariate analyses of variance were then run on the following thirteen variables:

1. SORT Reading achievement rate. A baseline reading achievement rate was determined for each child by taking the number of words read in the SORT and dividing by the number of weeks the child had been in school up to that test time. A post-test achievement rate was determined by taking the number of words read in the SORT and dividing by the number of weeks since the pre-test time.
2. Number of words read on the SORT.
3. Number of words spelled in the Wide Range Achievement Test.
4. Number of paragraphs read in Spache Diagnostic Reading Scales (SDRS) meeting the criterion of error.
5. Number of paragraphs read in Spache Diagnostic Reading Scales (SDRS) meeting criterion of 60% comprehension.
6. Number of correct consonant sounds pronounced in SDRS.
7. Number of correct vowel sounds pronounced in SDRS.
8. Number of correct consonant blends pronounced in SDRS.

9. Number of correct common syllables pronounced in SDRS.
10. Number of blends pronounced combining consonant blends and common syllables in SDRS.
11. Number of letter sounds recognized when presented orally from SDRS.
12. Teacher ratings of attitudes and habits as defined by the following behaviors:

- Listens to directions.
- Follows directions.
- Begins work on time.
- Takes pride in neat work.
- Does accurate work.
- Assumes responsibility for learning.
- Uses time wisely.
- Cooperates with teacher.
- Respects rights of others.
- Respects authority.
- Resourceful use of centers.
- Is polite, kind, courteous.
- Works well with others.
- Shares ideas.
- Shares materials.
- Does his share of work.

13. Teacher rating of reading defined by the following behaviors:

- Shows interest in reading.
- Understands what he reads.
- Knows basic vocabulary.
- Reads well orally.
- Gets new words for himself.
- Does related work independently.

Teacher ratings were given a numerical value as follows:

- 5 - Outstanding
- 4 - Satisfactory
- 3 - Improving
- 2 - Improvement necessary
- 1 - Unsatisfactory

The points were averaged over the first 18 weeks of school for the pre-test score and over the last 18 weeks for the post-test score.

When a univariate analysis of variance revealed that there was a significant difference among groups, a Newman-Keuls (Kirk, 1968) comparison of means was performed in order to determine where the differences occurred between groups. When a univariate analysis of variance revealed a significant difference from pre-test to post-test, a Sandler's A statistic (Runyon & Haber, 1972) for correlated samples was used to determine which groups improved significantly from pre-test to post-test.

In the comparison of Day 1 and Day 2 dependent variables when time given toward working in the programmed reading books were 15 minutes and six minutes, a Chi-square test was used for number of frames completed (Rao, 1952). A significance test for two binomials was used in order to determine if percent accuracy was significantly different within the Accuracy and On-task groups for Days 1 and 2 (Duncan, 1965).

CHAPTER III

RESULTS

Programmed Instruction with Contingency Management

Daily measures were taken of number of frames completed and percent accuracy of the frames completed for the two Experimental groups, Accuracy and On-task, under two conditions. The two conditions, direct supervision with reinforcement and no direct supervision or reinforcement, have been designated as Day 1 and Day 2, respectively. Day 1 and Day 2 were alternated throughout the program for a total of 48 sessions. Four sessions under each condition were averaged to yield the mean for each of six blocks of four sessions; thus, the data analyzed were the means for six blocks of sessions from Day 1 and six blocks of sessions from Day 2.

During Day 1, a measurement was also taken of time on task for each child and the number of points earned by each group. Points were earned by being accurate or by being on task depending on the Experimental group assignment. Table 1 and Figure 1 present the mean number of points earned by the Accuracy and On-task groups over six blocks of sessions for Day 1. All summaries of statistical tables may be found in Appendix B.

TABLE 1

Mean Number of Points Earned by the Accuracy and On-task Groups
over Six Blocks of Sessions for Day 1 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Mean Number of Points</u>	<u>Sessions</u>	<u>Mean Number of Points</u>
1	8.00	1	9.00
2	8.67	2	9.67
3	8.00	3	9.67
4	8.33	4	10.00
5	9.00	5	9.67
6	8.78	6	9.67

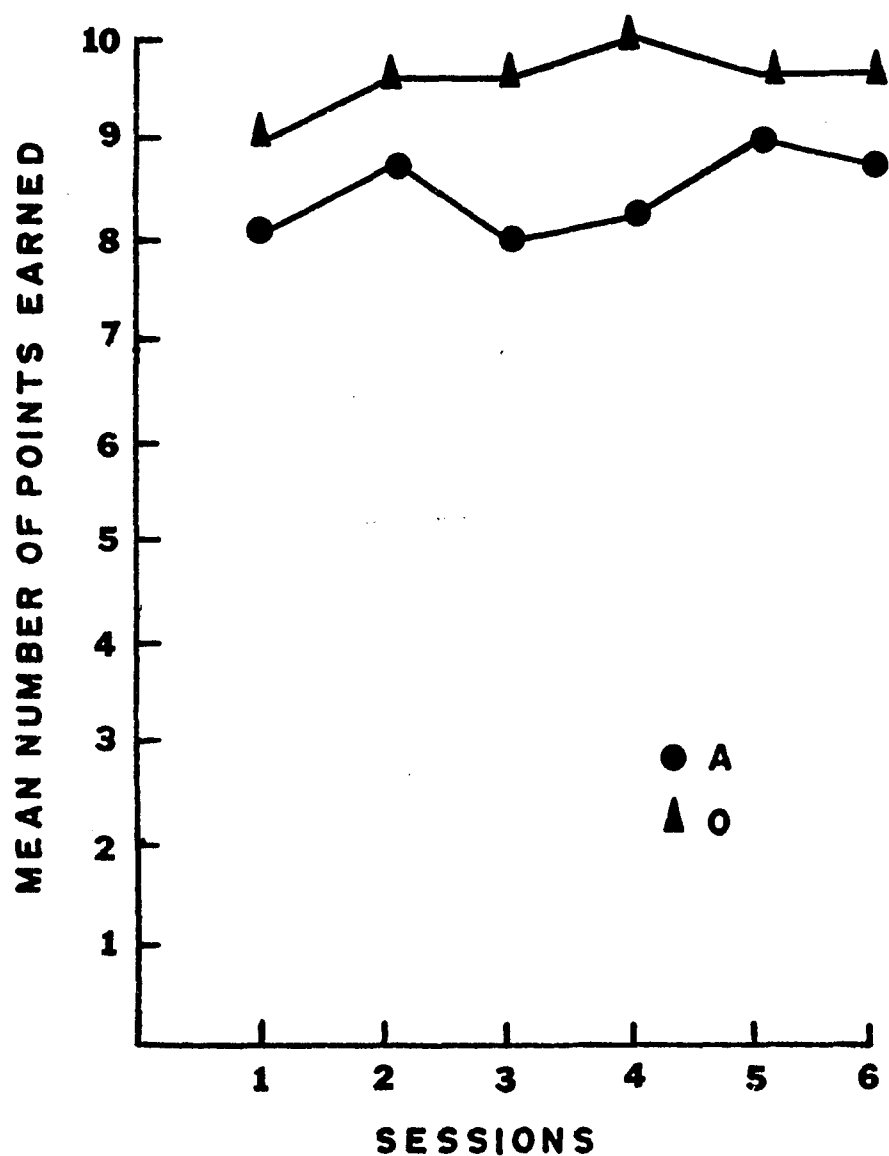


Figure 1. The Mean Number of Points Earned by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 1 Condition.

A repeated measures univariate analysis of variance revealed that the On-task group received a significantly greater number of points that were exchangeable for free time, one point representing one minute. The main effect of Type of Behavior Reinforced was highly significant ($F = 23.11$, $df = 1/16$, $p < .001$). Significant Sessions of Instruction effects were present ($F = 6.68$, $df = 5/80$, $p < .001$) as was the Type of Behavior Reinforced x Sessions of Instruction interaction effect ($F = 3.03$, $df = 5/80$, $p < .05$). The mean times earned for the Accuracy and On-task groups were 8.46 and 9.60 minutes; thus, the absolute difference was slightly more than a minute of free time per session.

A multivariate analysis of covariance was performed in order to statistically eliminate the variance contributed by differences due to number of points received. Points earned was the covariate for number of frames completed, percent accuracy of frames completed, and time on task. The main effect of Type of Behavior Reinforced was highly significant ($F = 40.11$, $df = 1/79$, $p < .001$). The Type of Behavior Reinforced x Sessions of Instruction interaction effect was also significant ($F = 2.47$, $df = 5/79$, $p < .05$), whereas there was only a trend toward Sessions of Instruction having significant effects over time ($F = 1.99$, $df = 5/80$, $p < .10$).

Table 2 and Figure 2 present the adjusted means for the number of frames completed by the Accuracy and On-task groups over six blocks of sessions for the Day 1 condition. Although the On-task group appeared to complete more frames than the Accuracy group for all sessions, a univariate analysis of covariance revealed no significant differences in number of frames completed for the Type of Behavior Reinforced, Sessions of Instruction, or the interaction effect.

Table 3 and Figure 3 present the adjusted means of the percent accuracy for frames completed by the Accuracy and On-task groups over six blocks of sessions for the Day 1 condition. The Accuracy group appears to have maintained a high level of accuracy throughout the sessions, whereas the percent accuracy of the On-task group performance gradually decreased. A univariate analysis indicated a significant difference due to the main effect of Type of Behavior Reinforced ($F = 7.62$, $df = 1/16$, $p < .05$). The effect of Sessions of Instruction was significant ($F = 2.38$, $df = 5/79$, $p < .05$) as was the Type of Behavior Reinforced x Sessions of Instruction interaction ($F = 4.50$, $df = 5/79$, $p < .01$).

Table 4 and Figure 4 present the adjusted mean of time (in seconds) on task for the Accuracy and On-task groups over six blocks of sessions for the Day 1 condition. Both groups appeared to remain on task; however, a univariate of analysis of covariance indicated that the On-task group remained on task significantly more than the Accuracy group.

TABLE 2

Adjusted Mean Number of Frames Completed by Accuracy and On-task Groups
over Six Blocks of Sessions for Day 1 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Adjusted Mean Number of Frames</u>	<u>Sessions</u>	<u>Adjusted Mean Number of Frames</u>
1	69.8	1	73.2
2	71.1	2	76.4
3	65.3	3	84.2
4	64.1	4	77.4
5	63.5	5	79.7
6	60.5	6	90.0

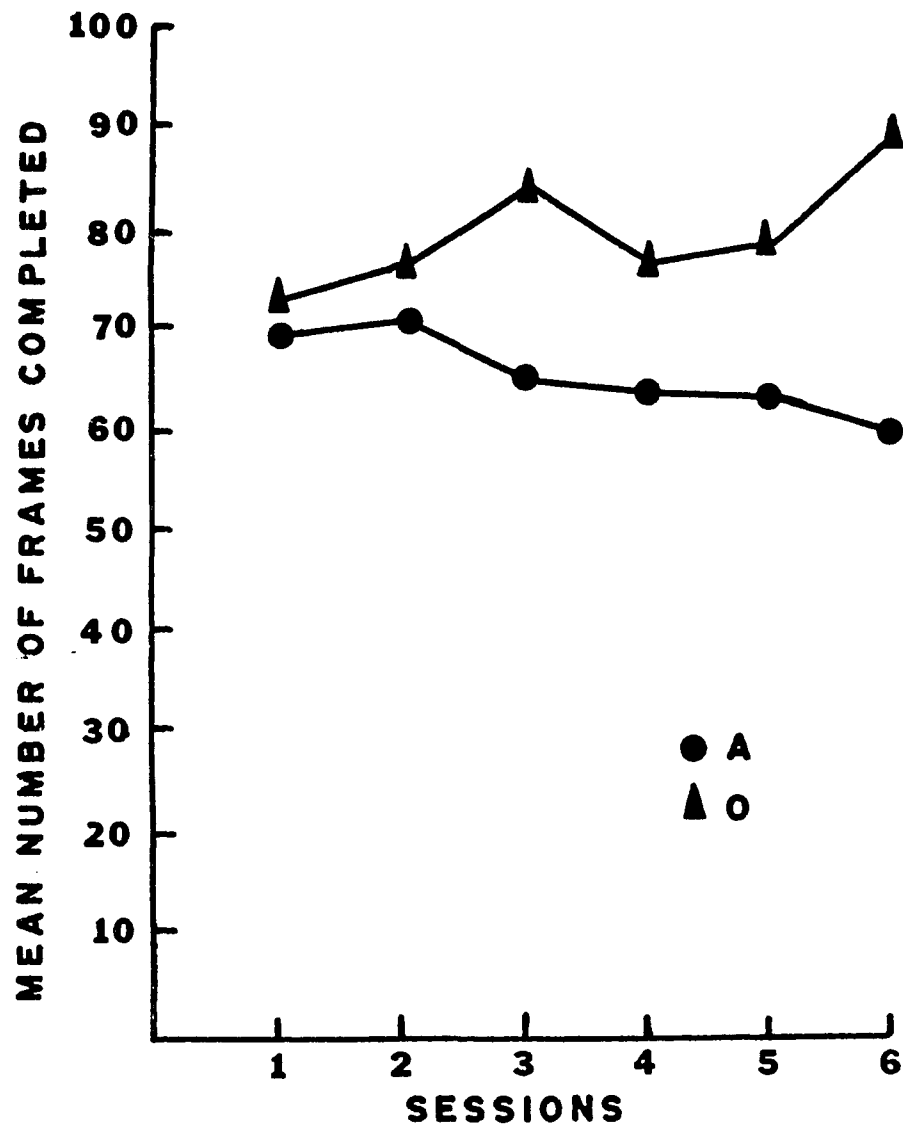


Figure 2. The Adjusted Mean Number of Frames Completed by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 1 Condition.

TABLE 3

Adjusted Mean Percent Accuracy of Frames Completed by Accuracy and
On-task Groups over Six Blocks of Sessions for Day 1 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Adjusted Mean Percent Accuracy</u>	<u>Sessions</u>	<u>Adjusted Mean Percent Accuracy</u>
1	.981	1	.960
2	.983	2	.945
3	.985	3	.936
4	.992	4	.926
5	.993	5	.916
6	.984	6	.888

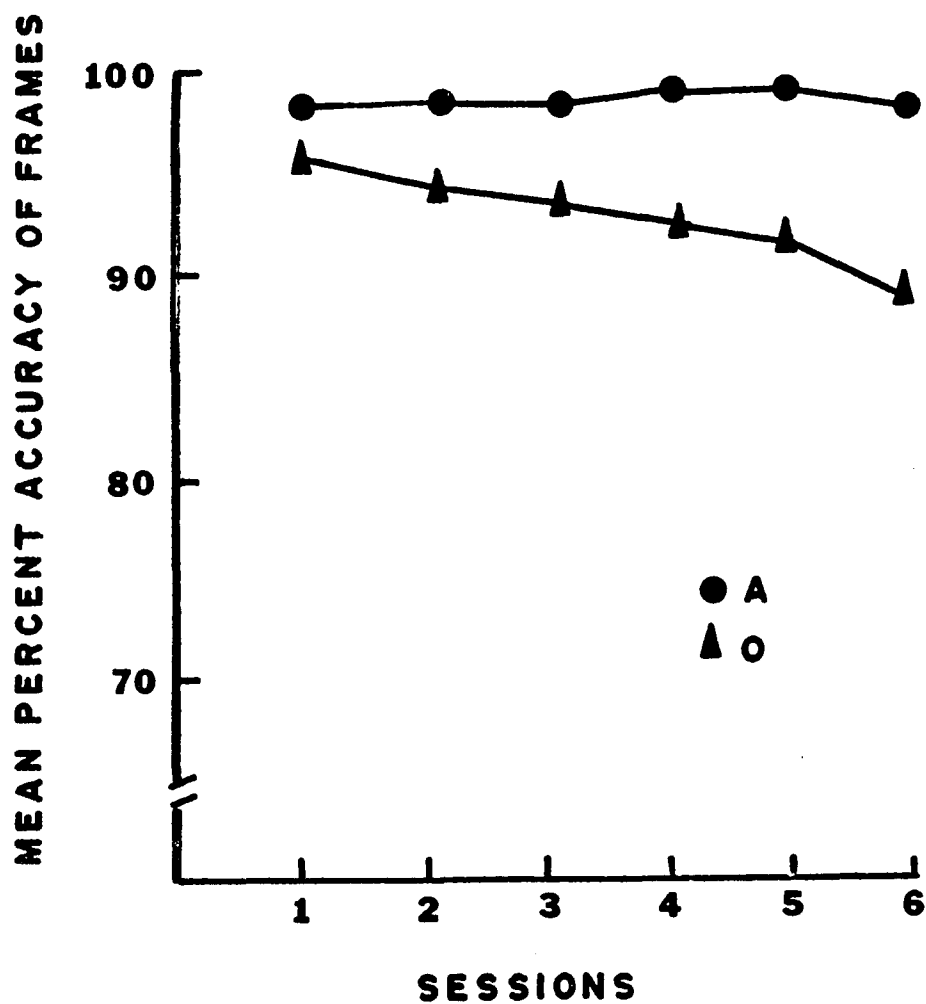


Figure 3. The Adjusted Mean Percent Accuracy of Frames Completed by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 1 Condition.

TABLE 4

Adjusted Mean Number of Seconds (Time) On Task by Accuracy and On-task
Groups over Six Blocks of Sessions for Day 1 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Adjusted Mean Number of Seconds</u>	<u>Sessions</u>	<u>Adjusted Mean Number of Seconds</u>
1	882	1	895
2	878	2	899
3	885	3	899
4	890	4	900
5	881	5	898
6	888	6	898

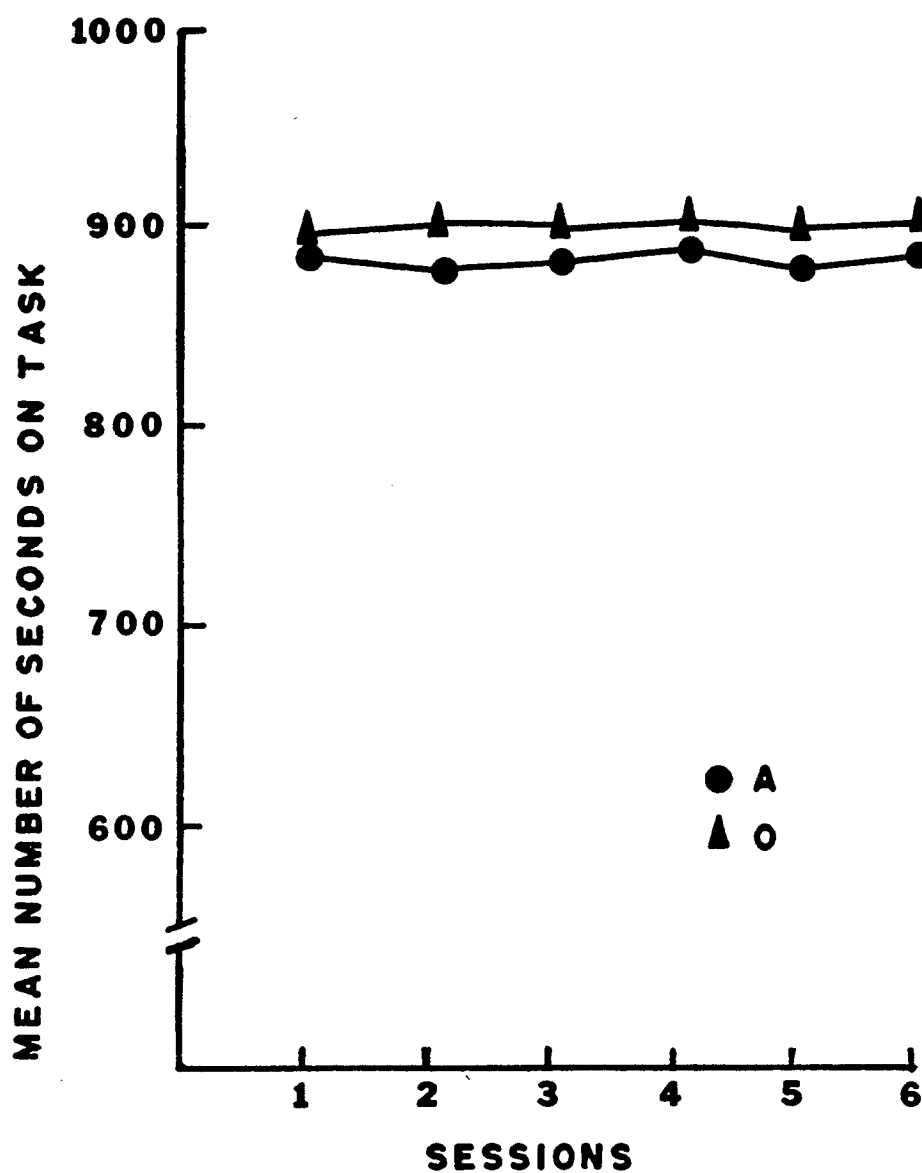


Figure 4. The Adjusted Mean Number of Seconds On-task for the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 1 Condition.

There was a significant main effect for Type of Behavior Reinforced ($F = 10.27$, $df = 1/16$, $p < .01$). In addition, Sessions of Instruction was significant ($F = 3.39$, $df = 5/79$, $p < .01$) indicating a significant change in the amount of time on task over sessions. There appeared to be only a trend toward significance for the Type of Behavior Reinforced x Sessions of Instruction interaction ($F = 2.20$, $df = 5/79$, $p < .10$).

A repeated measures multivariate analysis of variance using the four dependent measures for Day 2 (number of frames completed, percent accuracy of frames completed, number of words read for 2 minutes, and accuracy of words read) revealed a significant difference between the Accuracy and On-task groups due to the main effect of Type of Behavior Reinforced during Day 1 (Approximate $F = 8.46$, $df = 1/80$, $p < .01$). There was a trend for a significant difference between groups due to Sessions of Instruction (Approximate $F = 2.24$, $df = 5/80$, $p < .10$), but there was no interaction effect.

Table 5 and Figure 5 present the mean number of frames completed by the Accuracy and On-task groups over six blocks of sessions for Day 2 condition. The number of frames appears to increase over time for both groups. A univariate analysis of variance for number of frames completed indicated that there was no significant difference in the number of frames completed by each experimental group. There was, however, a significant increase in number of frames

TABLE 5

Mean Number of Frames Completed by Accuracy and On-task Groups
over Six Blocks of Sessions for Day 2 Condition

Accuracy Group		On-task Groups	
<u>Sessions</u>	<u>Mean Number of Frames Completed</u>	<u>Sessions</u>	<u>Mean Number of Frames Completed</u>
1	50.0	1	44.3
2	54.0	2	45.7
3	56.6	3	49.4
4	53.3	4	56.0
5	65.0	5	58.7
6	58.4	6	67.9

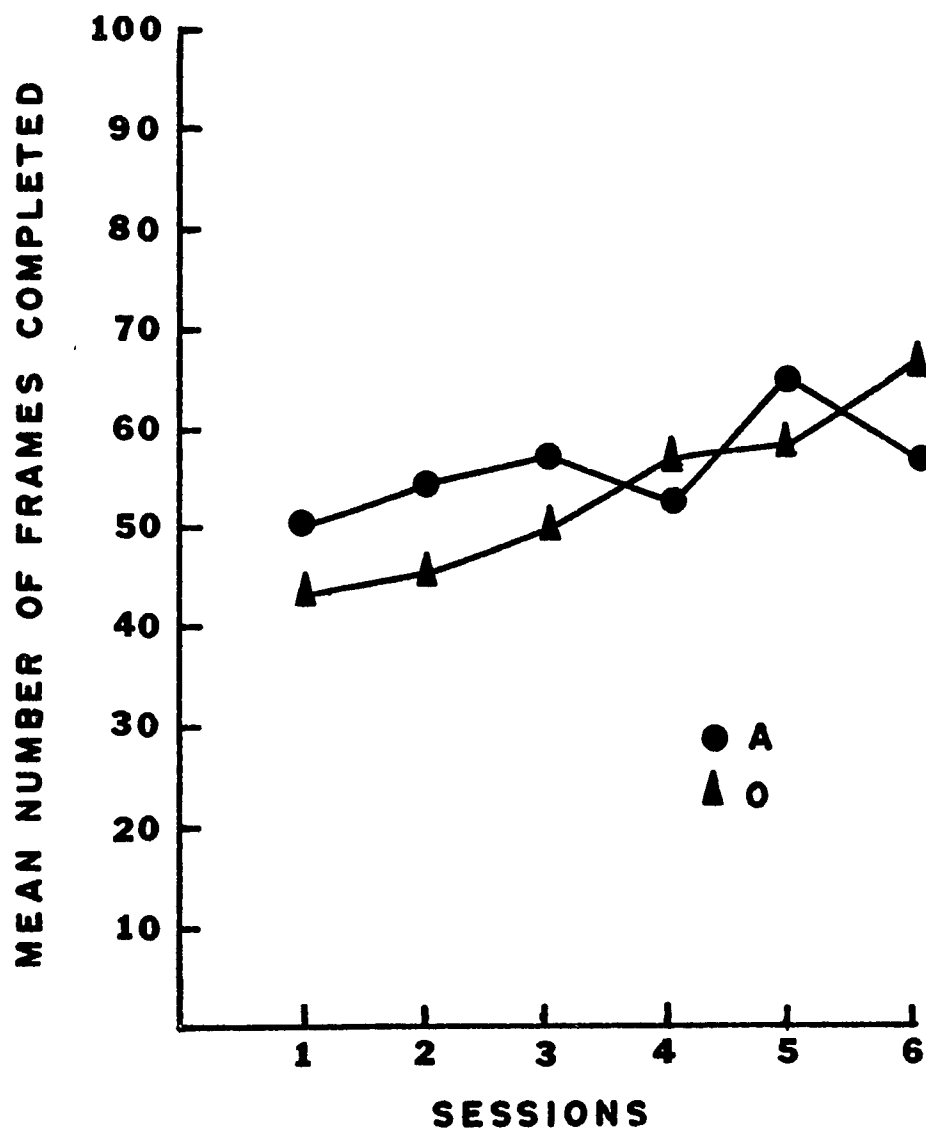


Figure 5. The Mean Number of Frames Completed by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 2 Condition.

completed by both groups due to the effect of Sessions of Instruction ($F = 4.44$, $df = 5/80$, $p < .01$) with no interaction effects.

Table 6 and Figure 6 present the mean percent accuracy of frames completed by the Accuracy and On-task groups over six blocks of sessions for Day 2 condition. The Accuracy group performed consistently more accurately than the On-task group due to the main effect of Type of Behavior Reinforced during Day 1 ($F = 5.15$, $df = 1/16$, $p < .05$) with no significant difference due to Sessions of Instruction interaction.

Table 7 and Figure 7 present the mean number of words read by the Accuracy and On-task groups for two minutes over six blocks of sessions for Day 2 condition. The On-task group appears to have consistently read more words than the Accuracy group. A repeated measures univariate analysis of variance indicated there was no significant difference between number of words read by the two Experimental groups due to the main effect of Type of Behavior Reinforced during Day 1. There was a trend for both groups to read more words due to the Sessions of Instruction effect ($F = 2.08$, $df = 1/80$, $p < .10$). The Type of Behavior Reinforced x Sessions of Instruction interaction was not significant.

Table 8 and Figure 8 present the mean percent accuracy of words read by the Accuracy and On-task groups over six

TABLE 6

Mean Percent Accuracy of Frames Completed by Accuracy and On-task Groups
over Six Blocks of Sessions for Day 2 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Mean Percent Accuracy</u>	<u>Sessions</u>	<u>Mean Percent Accuracy</u>
1	.988	1	.976
2	.990	2	.986
3	.992	3	.969
4	.984	4	.960
5	.989	5	.980
6	.993	6	.962

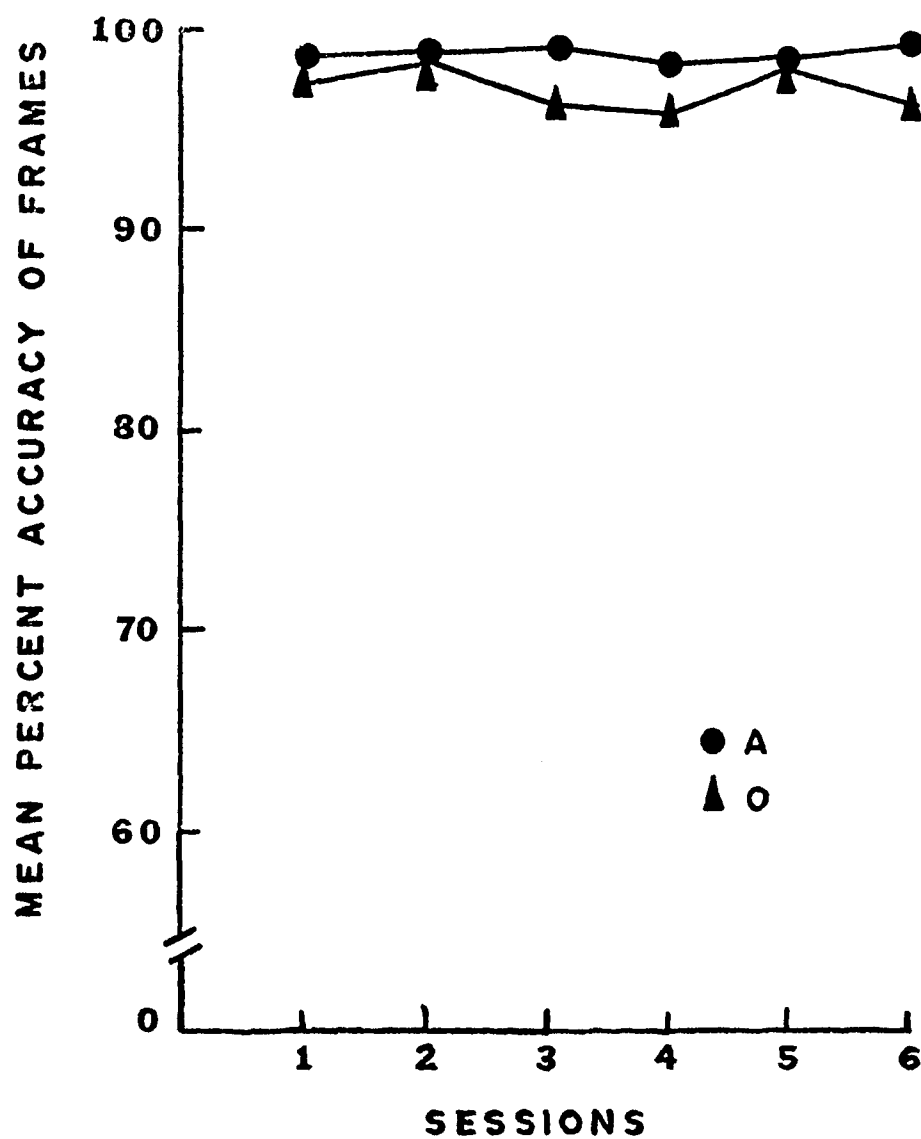


Figure 6. The Mean Percent Accuracy of Frames Completed by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 2 Condition.

TABLE 7

Mean Number of Words Read Orally in Two Minutes by Accuracy and
On-task Groups over Six Blocks of Sessions for Day 2 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Mean Number of Words</u>	<u>Sessions</u>	<u>Mean Number of Words</u>
1	92.4	1	100.8
2	98.0	2	101.7
3	96.9	3	102.7
4	97.8	4	108.2
5	106.8	5	107.0
6	108.7	6	113.8

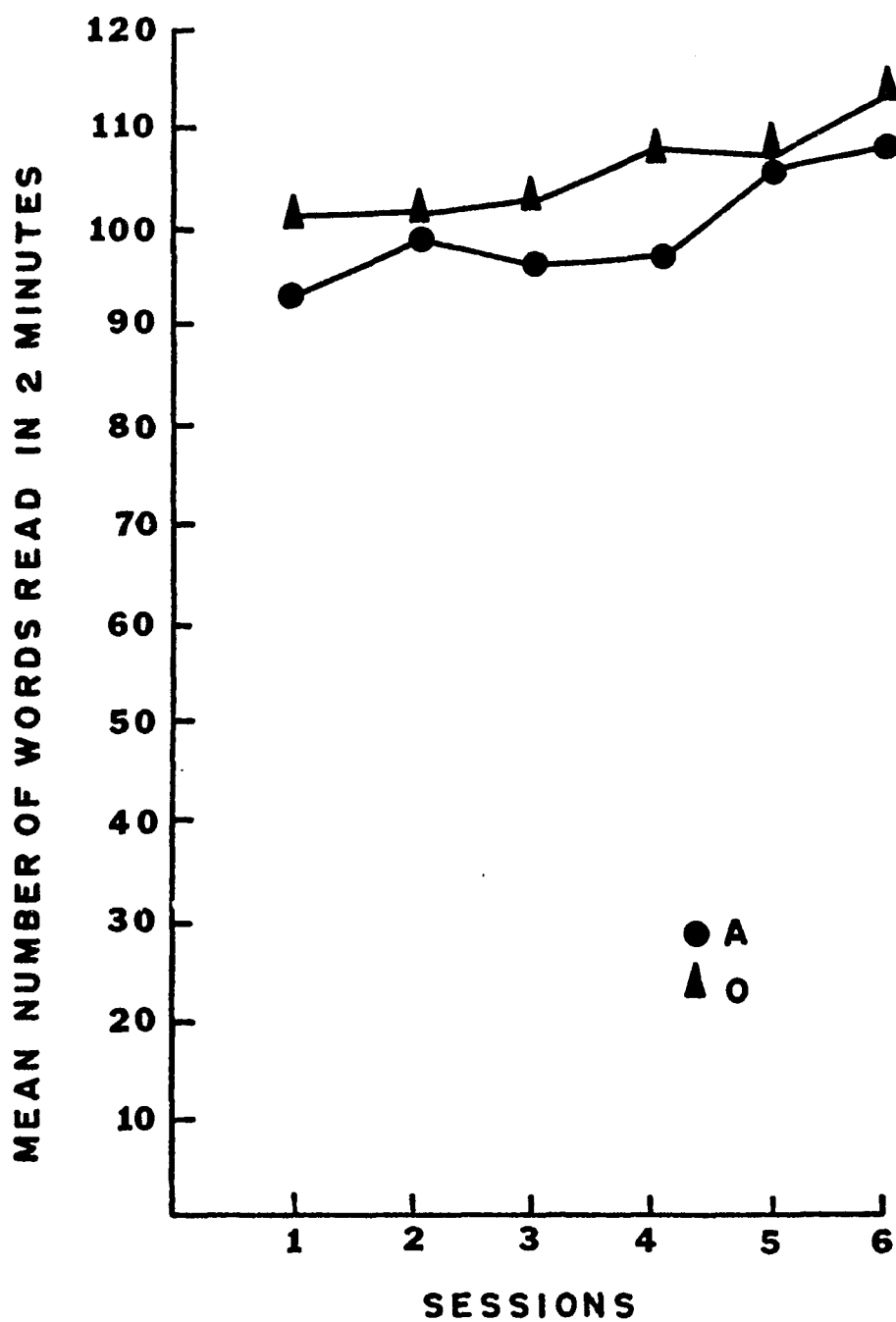


Figure 7. The Mean Number of Words Read in Two Minutes by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 2 Condition.

TABLE 8

Mean Percent Accuracy of Words Read in Two Minutes by Accuracy and On-task
Groups over Six Blocks of Sessions for Day 2 Condition

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Mean Percent Accuracy of Words</u>	<u>Sessions</u>	<u>Mean Percent Accuracy Of Words</u>
1	.960	1	.967
2	.969	2	.973
3	.976	3	.980
4	.974	4	.984
5	.981	5	.926
6	.985	6	.986

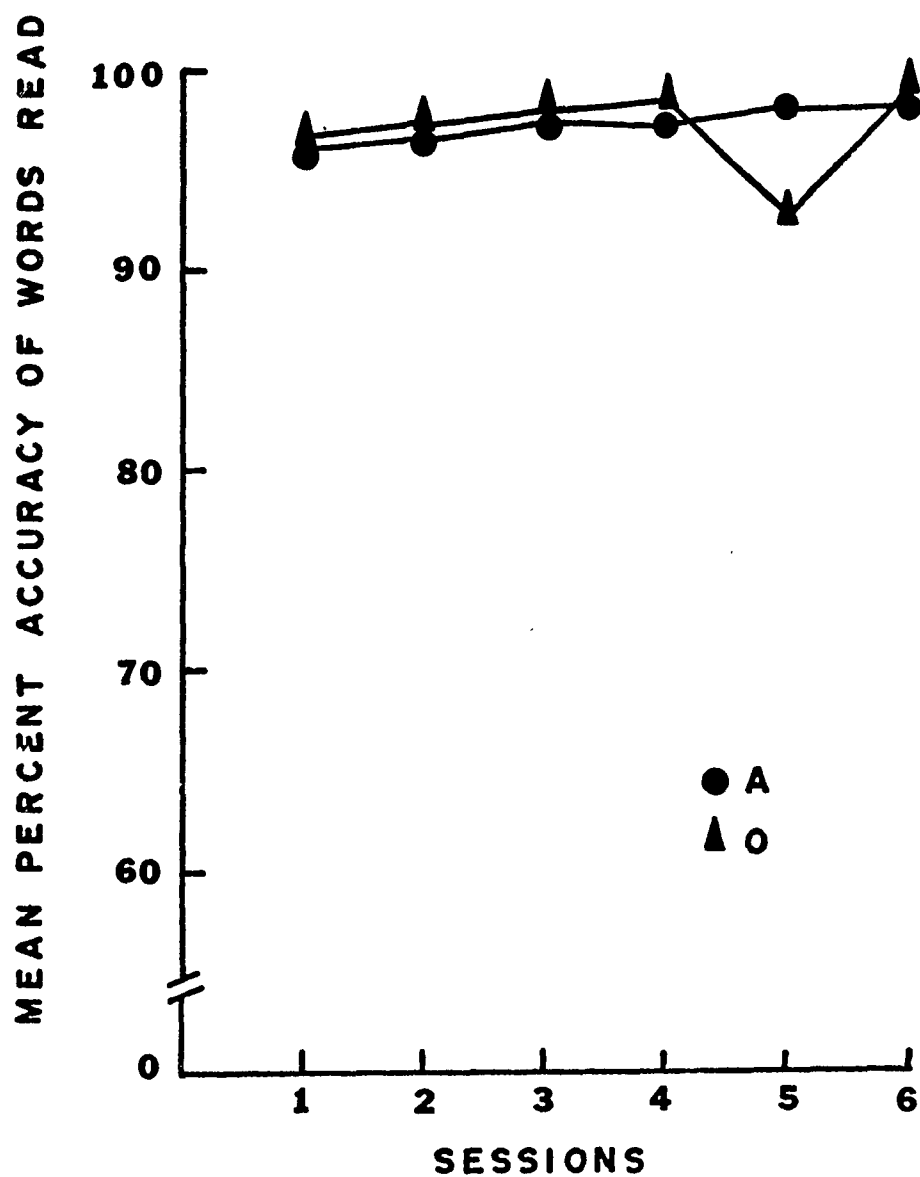


Figure 8. The Mean Percent Accuracy of Words Read in Two Minutes by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 2 Condition.

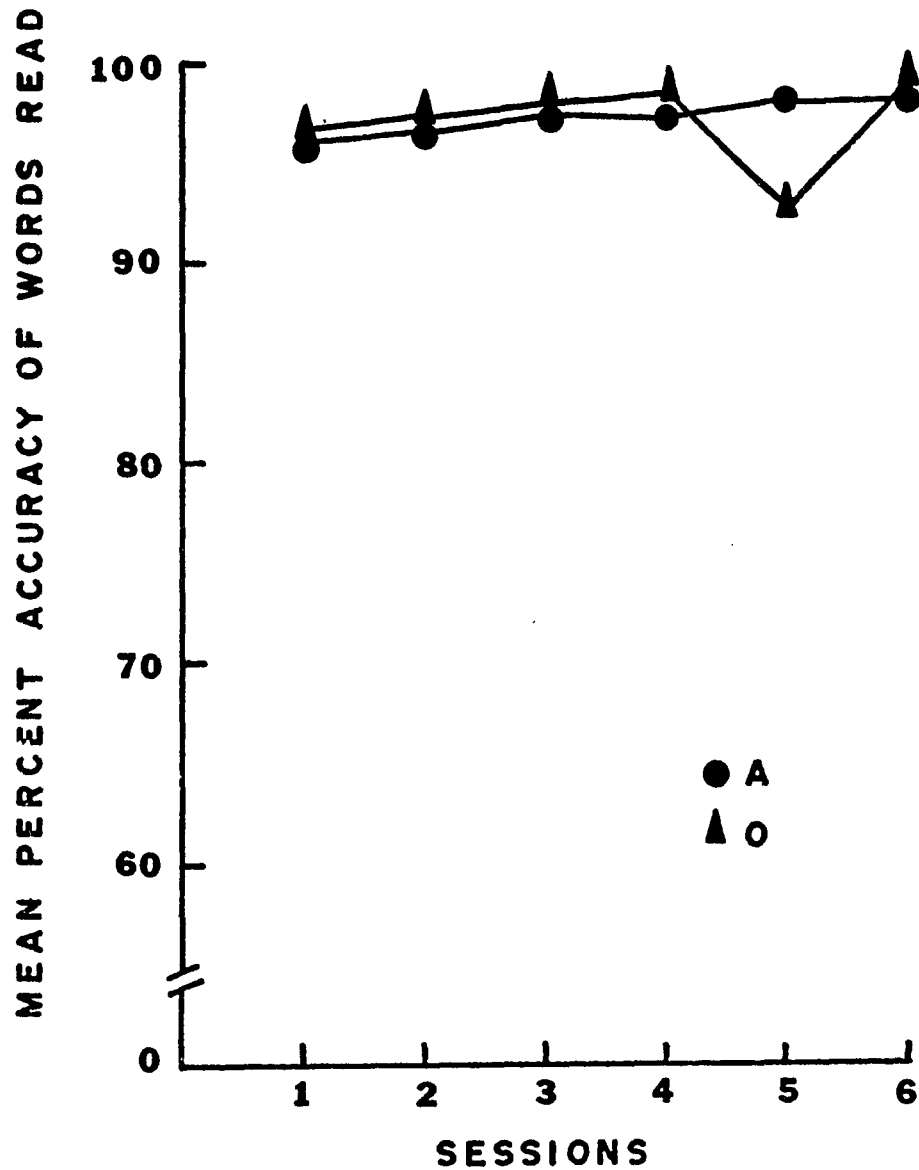


Figure 8. The Mean Percent Accuracy of Words Read in Two Minutes by the Accuracy and On-task Groups over Six Blocks of Sessions for the Day 2 Condition.

blocks of sessions for the Day 2 condition. A repeated measures univariate analysis of variance confirmed the impression from looking at the table and figure that there was no significant difference in accuracy of words read between groups, nor did the groups change in the percent accuracy due to the Sessions of Instruction effect.

Comparison of Day 1 Performance with Day 2

The time allocated for working on programmed reading instruction was different for Day 1 and Day 2. Fifteen minutes were allocated to reading in a programmed workbook during Day 1 and approximately six minutes in Day 2. On Day 2 two children worked in their books while the third child read orally. After all the children had read or after nine minutes total time, the free-time period began.

Table 9 and Figure 9 present the mean number of frames completed per minute by the Accuracy and On-task groups over six blocks of sessions for the Day 1 and Day 2 conditions. A Chi-square test was performed for each Experimental group to determine whether the children performed differently on Day 1 and Day 2 in terms of the number of frames completed. Chi-square for the Accuracy group was highly significant ($\chi^2 = 4265.81$, $df = 1$, $p < .001$). The Accuracy group completed a greater number of frames in six minutes than would be expected from examining the Day 1 data. Chi-square for the On-task group also indicated that this group also completed more frames in Day 2 than was expected ($\chi^2 = 2206.68$, $df = 1$, $p < .001$).

TABLE 9

Mean Number of Frames Completed Per Minute by the Accuracy and
On-task Groups over Six Blocks of Sessions for Days 1 and 2

Accuracy Group		On-task Group	
<u>Day 1</u>		<u>Day 1</u>	
<u>Sessions</u>	<u>Adjusted Mean Number of Frames Per Minute</u>	<u>Sessions</u>	<u>Adjusted Mean Number of Frames Per Minute</u>
1	4.6	1	4.9
2	4.7	2	5.1
3	4.3	3	5.6
4	4.3	4	5.2
5	4.3	5	5.3
6	4.0	6	6.0

TABLE 9
(Continued)

Mean Number of Frames Completed Per Minute by the Accuracy and
On-task Groups over Six Blocks of Sessions for Days 1 and 2

Accuracy Group		On-task Group	
<u>Day 2</u>		<u>Day 2</u>	
<u>Sessions</u>	Mean Number of Frames Per Minute	<u>Sessions</u>	Mean Number of Frames Per Minute
1	8.3	1	7.4
2	9.0	2	7.6
3	9.4	3	8.2
4	8.9	4	9.3
5	10.8	5	9.8
6	9.7	6	11.3

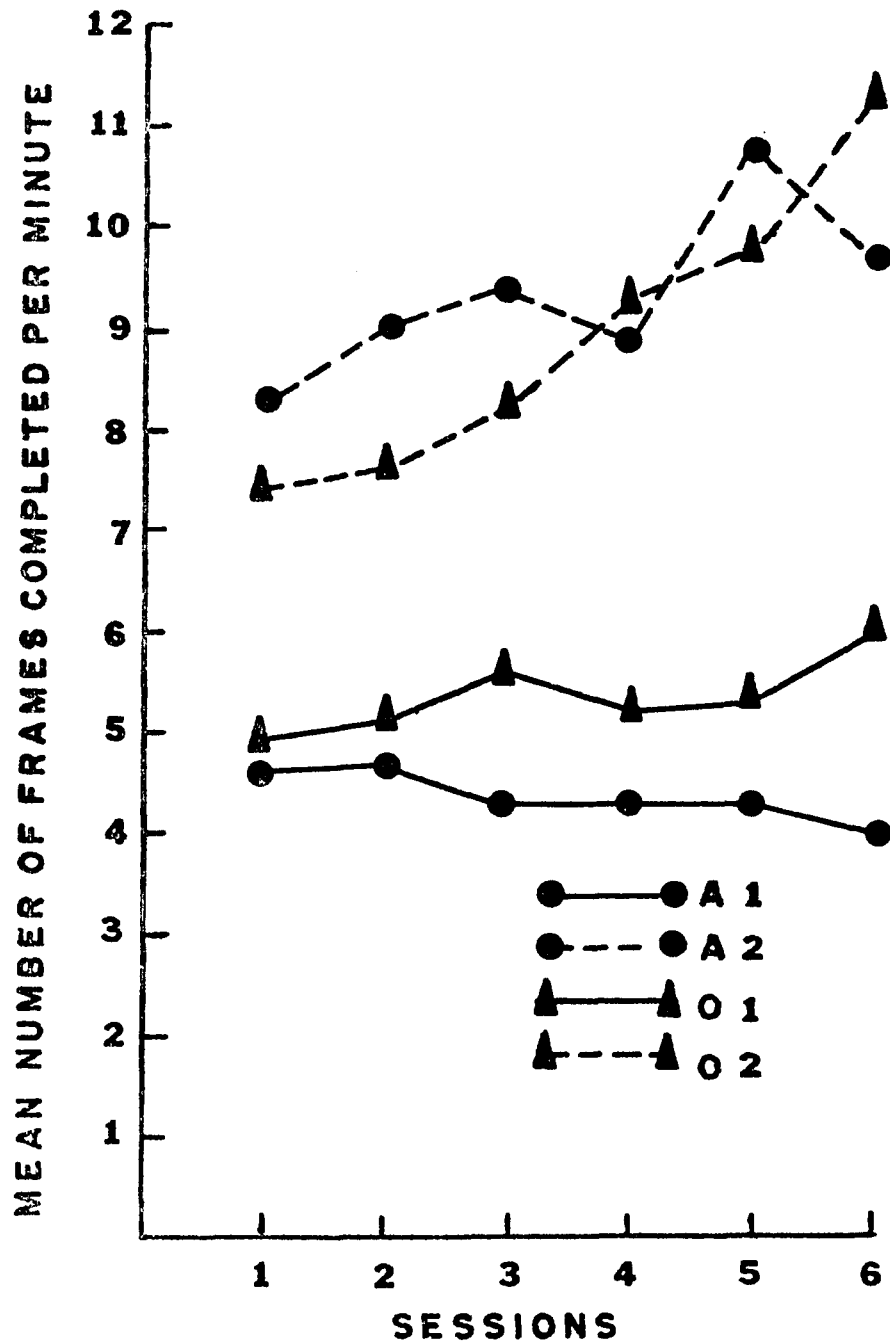


Figure 9. The Mean Number of Frames Completed per minute by the Accuracy and On-task Groups over Six Blocks of Sessions for both Day 1 and Day 2 Conditions.

Table 10 and Figure 10 present the mean percent accuracy of frames completed by the Accuracy and On-task groups over six blocks of sessions for Day 1 and 2. A significance test for two binomials was used in order to determine whether percent accuracy was also different for Days 1 and 2 for each group. The Accuracy group was more accurate on Day 2 than on Day 1 ($Z = -3.05$, $p < .001$) as was the On-task group ($Z = -10.72$, $p < .001$).

Pre-test Post-test Analyses

Table 11 and Figures 11 through 23 present the mean scores and ratings for the pre-test and post-test levels on the SORT, WRAT, SDRS, and teacher-ratings. The Experimental groups appeared to perform at a higher level than the Control group, but all groups improved from pre-test to post-test. A multivariate analysis of variance over eleven standardized score variables and two teacher-ratings indicated a significant difference among Groups ($F = 194.30$, $df = 2/24$, $p < .001$) and between Testing ($F = 29.46$, $df = 1/24$, $p < .001$) but no Group x Testing interaction.

A series of univariate analyses was subsequently performed for each of the thirteen variables in order to determine which variables discriminated among the groups and between the pre-test and post-test measures.

Table 12 summarizes the statistical findings for the thirteen variables relevant to reading behavior at pre-test post-test levels for the Accuracy, On-task and Control groups.

TABLE 10

Mean Percent Accuracy of Frames Completed by the Accuracy and
On-task Groups over Six Blocks of Sessions for Days 1 and 2

Accuracy Group		On-task Group	
<u>Sessions</u>	<u>Day 1</u> Adjusted Mean Percent Accuracy	<u>Sessions</u>	<u>Day 1</u> Adjusted Mean Percent Accuracy
1	.929	1	.934
2	.981	2	.960
3	.983	3	.945
4	.992	4	.936
5	.993	5	.929
6	.984	6	.916

TABLE 10
(Continued)

Mean Percent Accuracy of Frames Completed by the Accuracy and
On-task Groups over Six Blocks of Sessions for Days 1 and 2

Accuracy Group		On-task Group	
<u>Day 2</u>		<u>Day 2</u>	
<u>Sessions</u>	<u>Mean Percent Accuracy</u>	<u>Sessions</u>	<u>Mean Percent Accuracy</u>
1	.988	1	.976
2	.990	2	.986
3	.992	3	.969
4	.984	4	.960
5	.989	5	.980
6	.993	6	.962

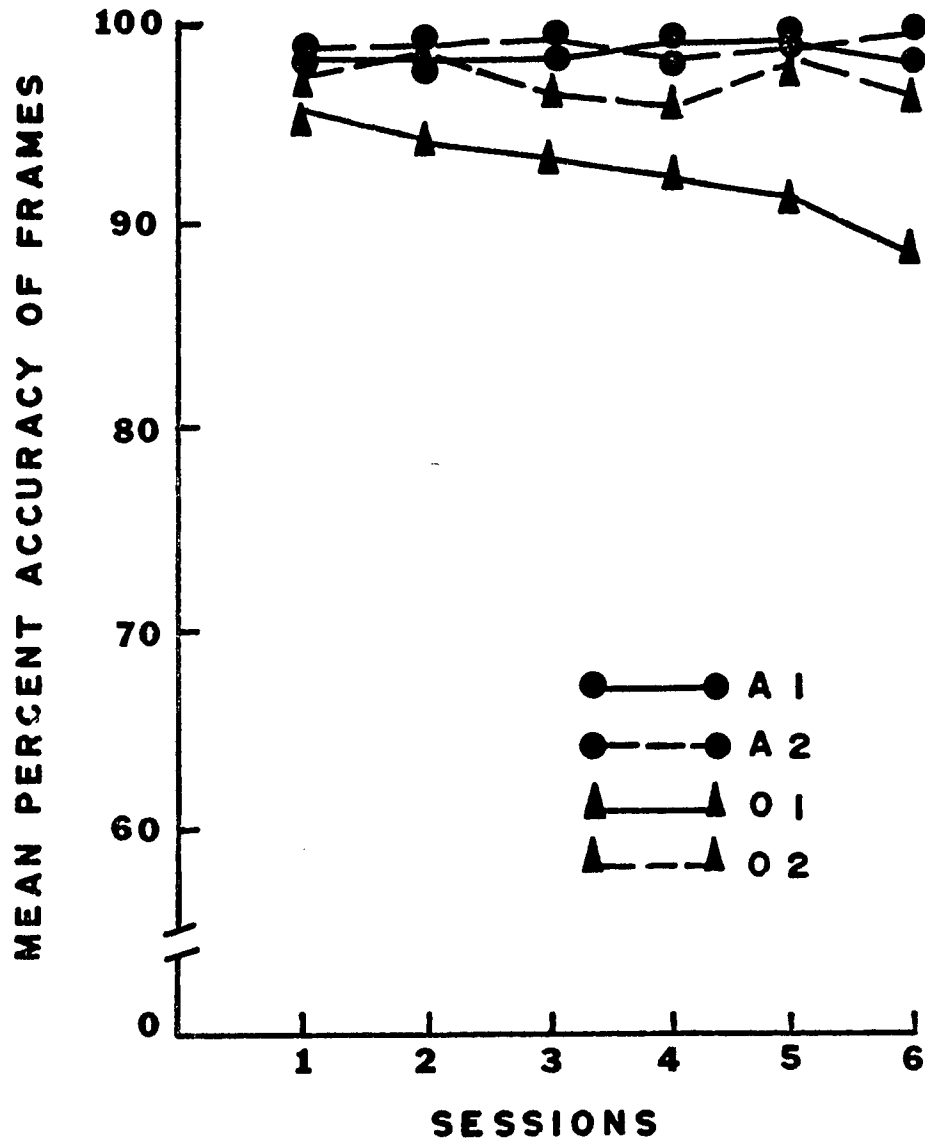


Figure 10. The Mean Percent Accuracy of Frames Completed by the Accuracy and On-task Groups over Six Blocks of Sessions for both Day 1 and Day 2 Conditions.

TABLE 11

Mean Scores and Ratings of Thirteen Reading Variables
(Relevant to Reading Behavior) at Pre-test
and Post-test Levels for the Accuracy,
On-task and Control Groups

Reading Achievement Rate on SORT

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	.4327	.4507	.3820
Post-test	1.0881	.6108	.9750

Number of Words Read on SORT

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	55.8	59.8	54.2
Post-test	71.3	69.3	68.2

Number of Words Spelled on WRAT

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	14.0	13.6	12.2
Post-test	14.4	14.3	13.7

Number of Paragraphs Read using Error Criterion

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	10.1	10.2	9.6
Post-test	11.7	12.2	10.3

Number of Paragraphs Read using Comprehension Criterion

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	11.9	11.9	11.1
Post-test	13.9	13.3	11.2

TABLE 11
(Continued)

Number of Correct Consonants

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	17.7	16.2	16.3
Post-test	19.8	19.3	19.6

Number of Correct Vowel Sounds

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	7.2	8.3	8.0
Post-test	13.3	13.4	5.9

Number of Correct Common Syllables

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	15.9	17.4	16.1
Post-test	26.2	27.8	25.4

Number of Blends combining Consonant Blends and Common Syllables

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	2.0	3.7	1.8
Post-test	6.2	6.4	5.9

Number of Letter Sounds

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	20.3	20.9	22.0
Post-test	22.7	23.7	22.1

Teacher Rating of Reading Skills

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	38.4	34.8	36.2
Post-test	41.1	39.2	38.1

TABLE 11
(Continued)

Teacher Rating of Attitudes and Habits

	<u>Accuracy</u>	<u>On-task</u>	<u>Control</u>
Pre-test	122.0	124.7	124.2
Post-test	125.4	125.3	119.0

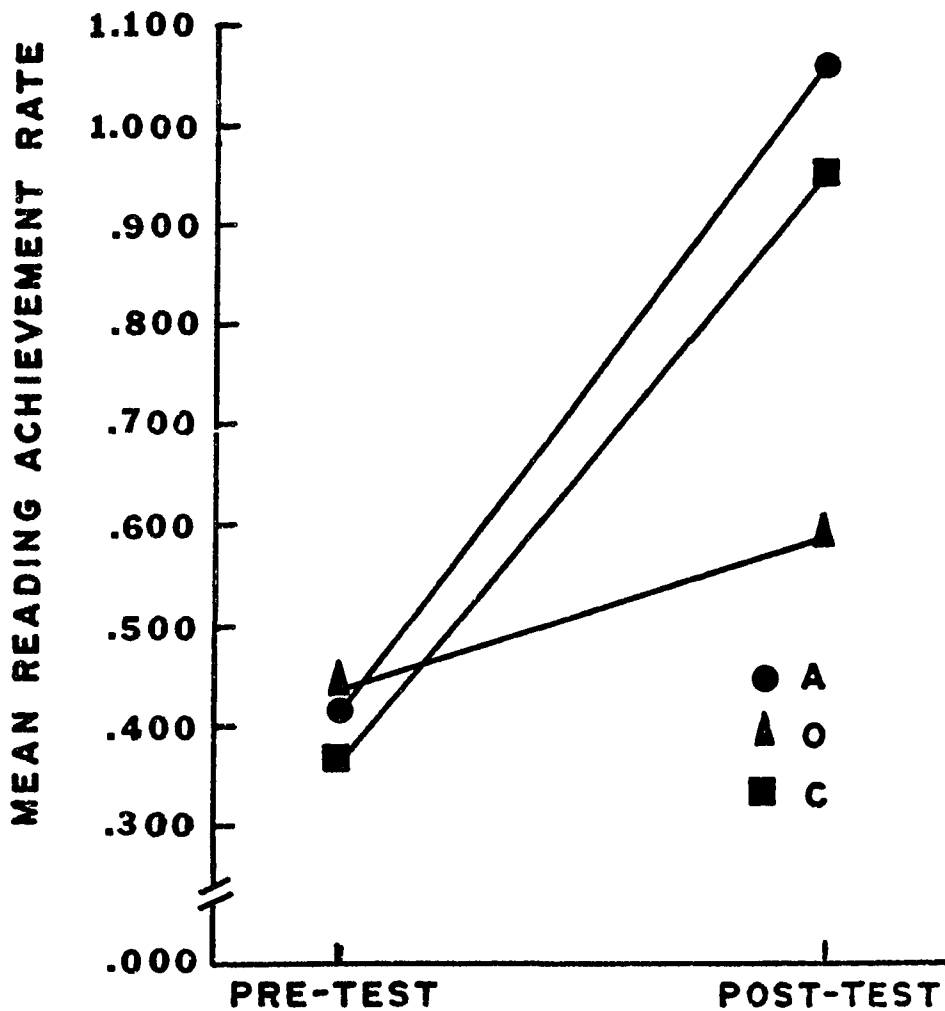


Figure 11. The Mean Reading Achievement Rate at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.¹

¹The pre-test score was derived by dividing the number of words read on SORT by number of weeks enrolled in school. Post-test score was derived by dividing number of words read on SORT by number of weeks since pre-test.

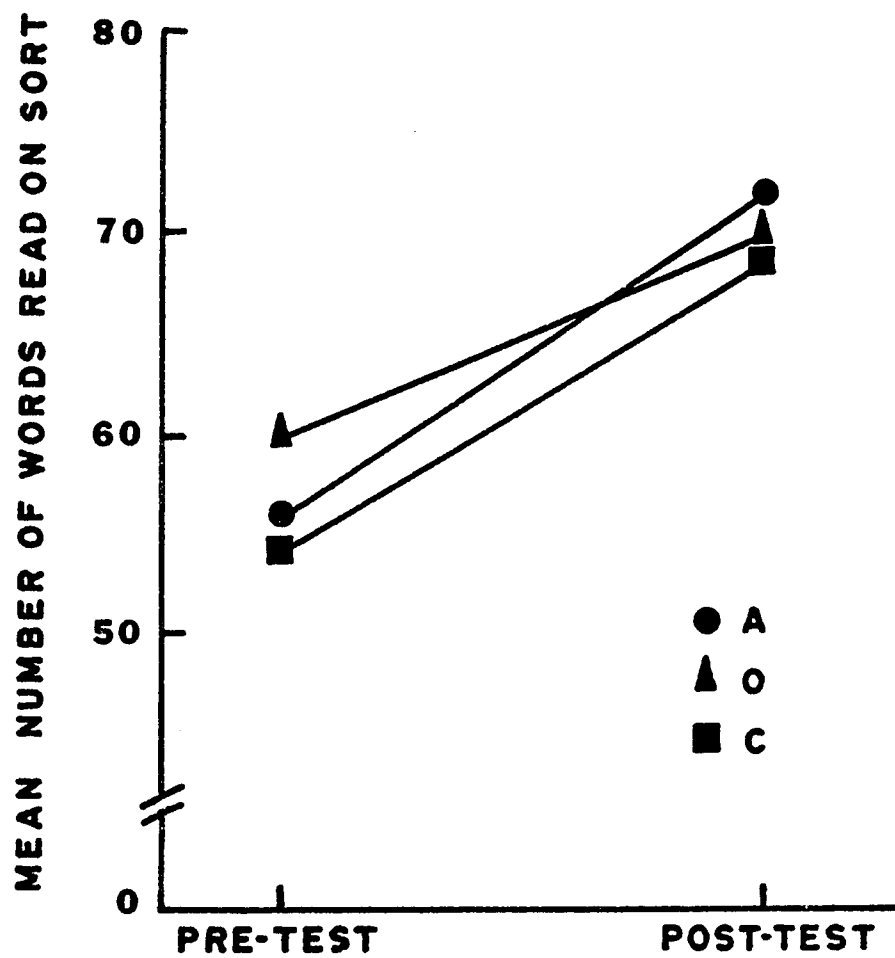


Figure 12. The Mean Number of Words Read Correctly on the SORT at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

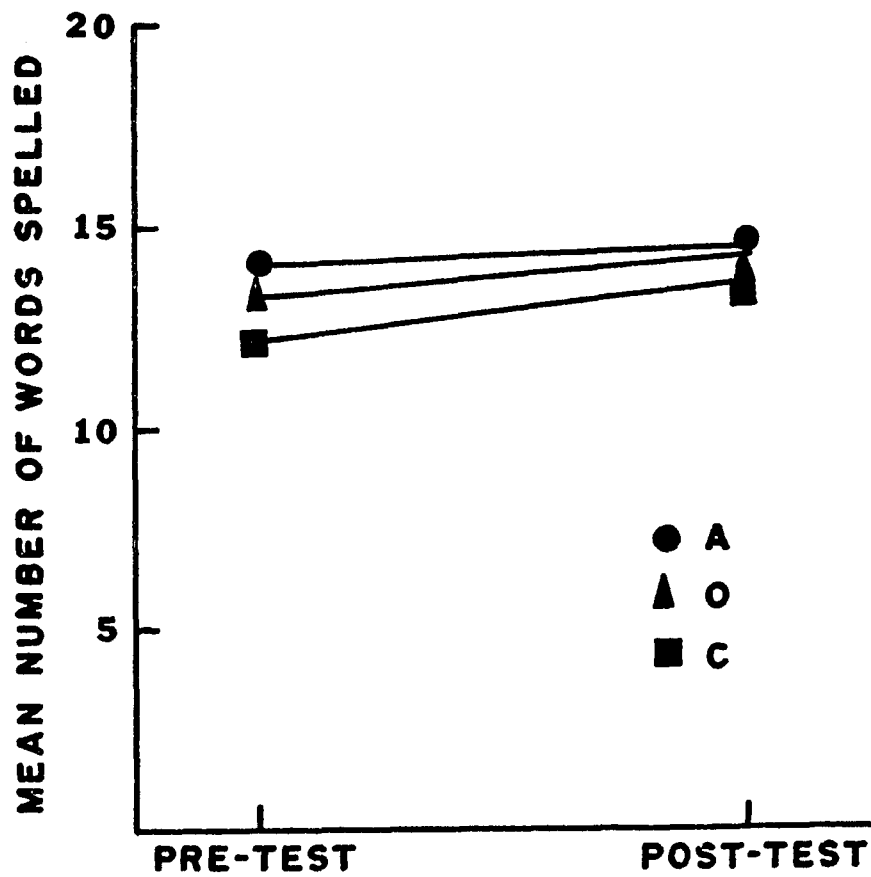


Figure 13. The Mean Number of Words Spelled on the WRAT at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

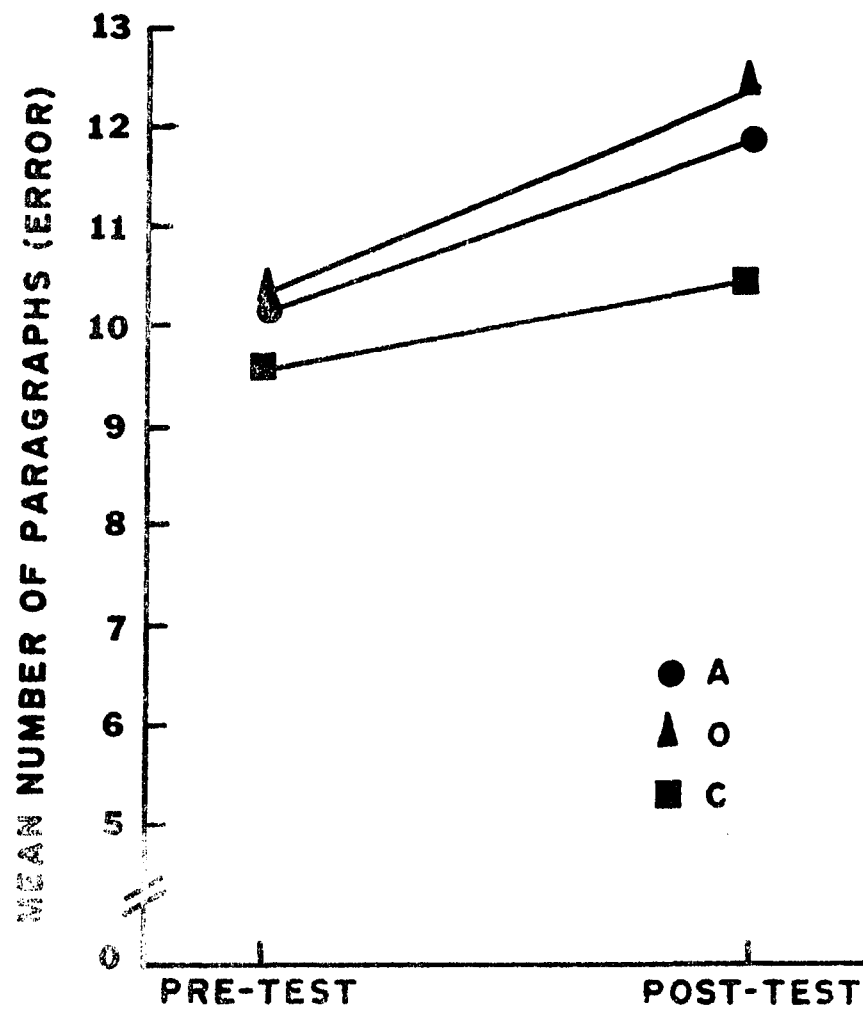


Figure 14. The Mean Number of Paragraphs Read Using the Error Criterion at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

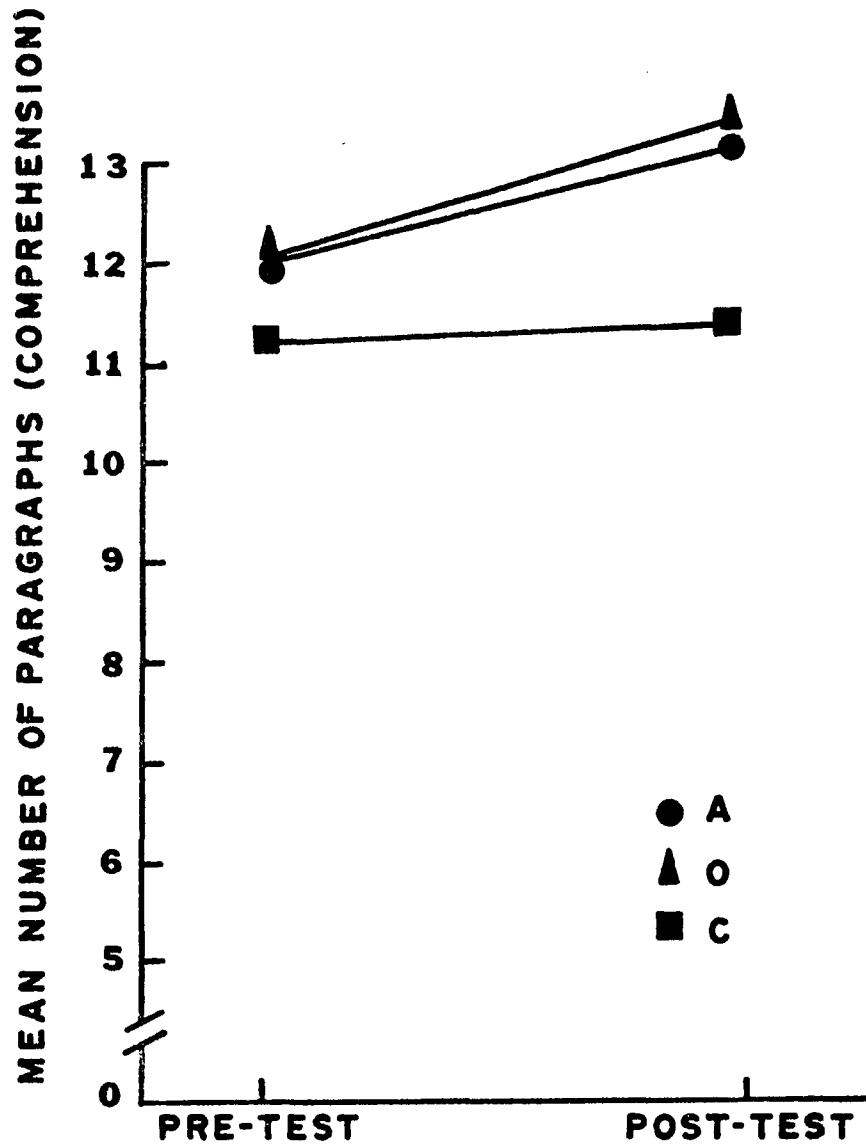


Figure 15. The Mean Number of Paragraphs Read Using the Comprehension Criterion at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

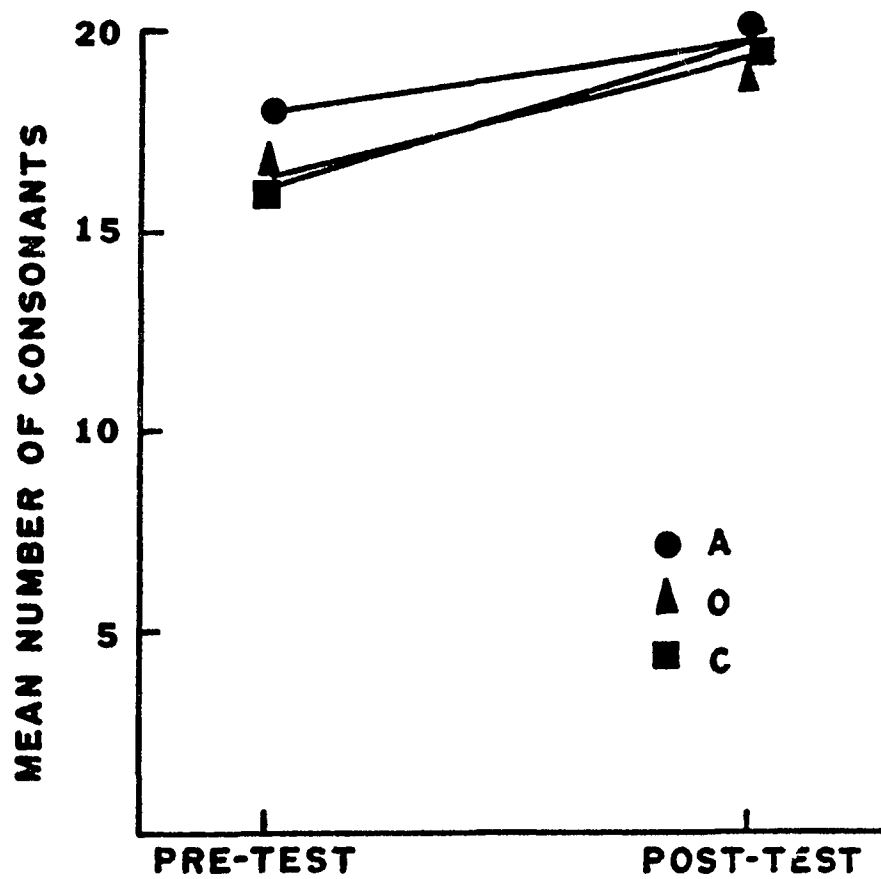


Figure 16. The Mean Number of Consonants Pronounced Correctly at Pre-test Levels for the Accuracy, On-task, and Control Groups.

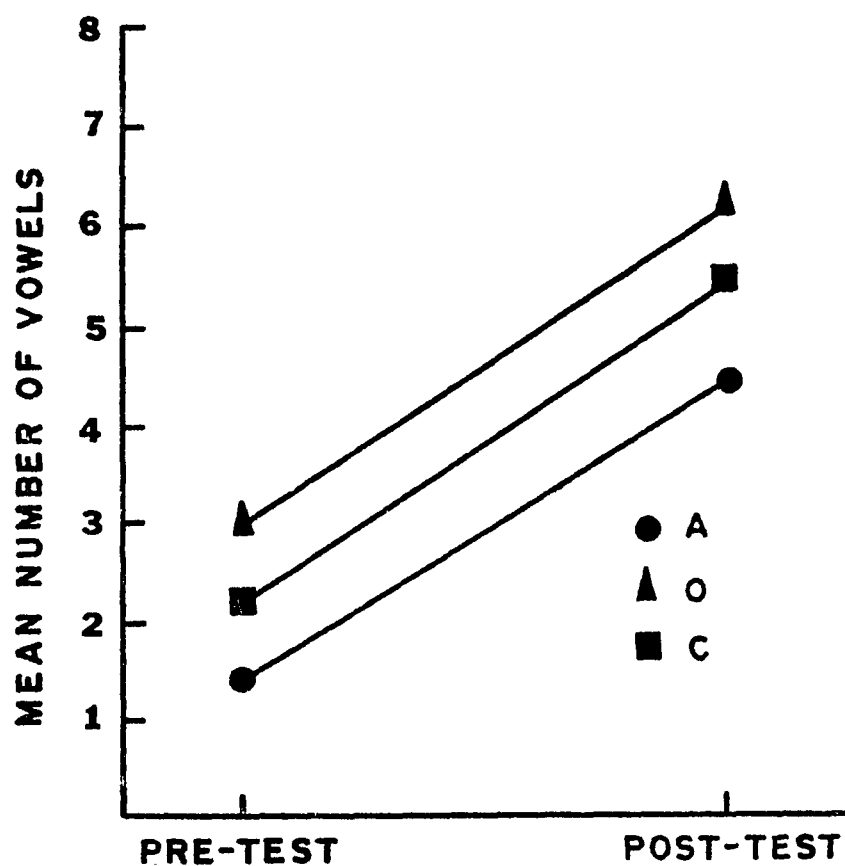


Figure 17. The Mean Number of Vowels Correctly Used at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

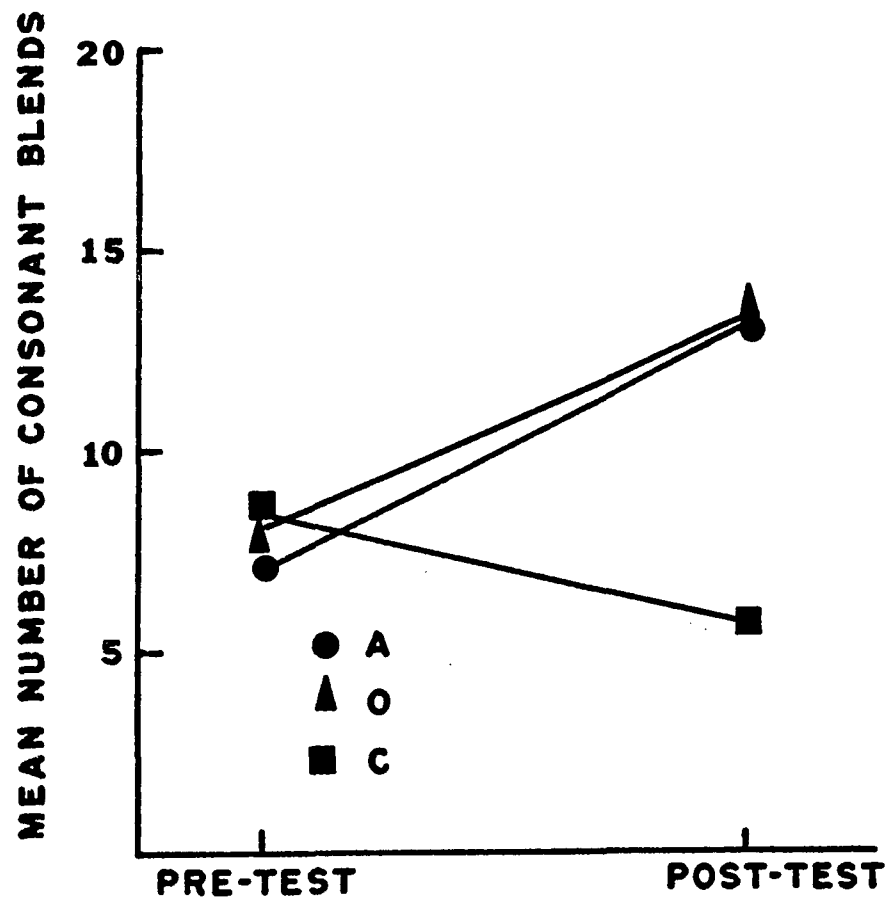


Figure 18. The Mean Number of Consonant Blends Correctly Pronounced at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

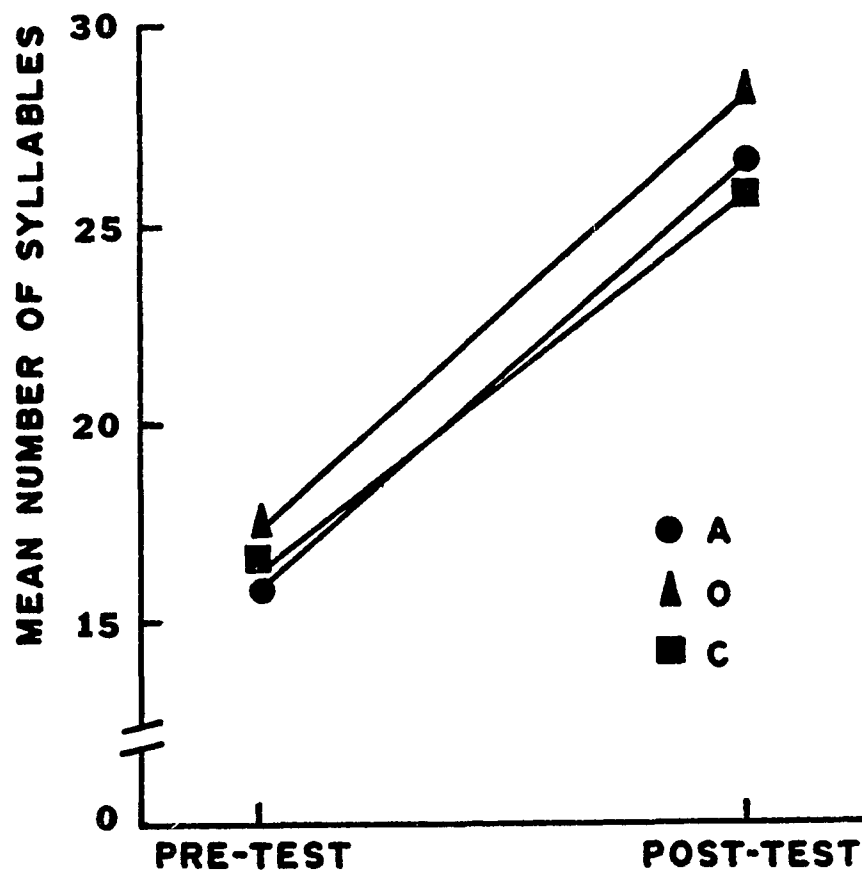


Figure 19. The Mean Number of Common Syllables Correctly Pronounced at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

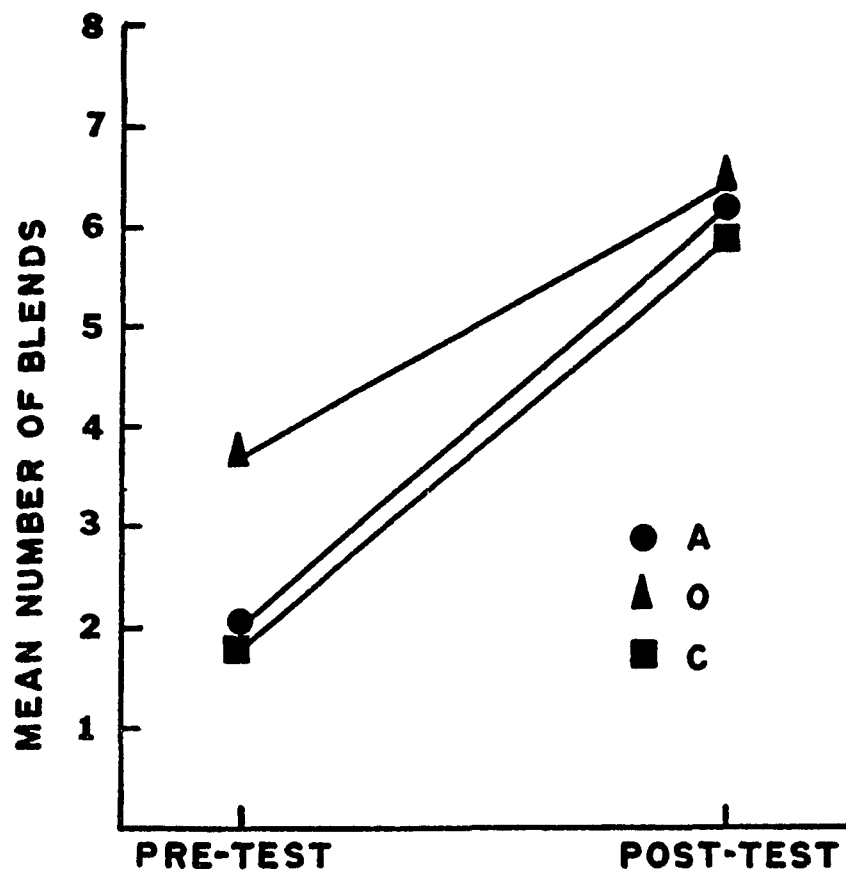


Figure 20. The Mean Number of Blends Pronounced Combining Consonant Blends and Common Syllables at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

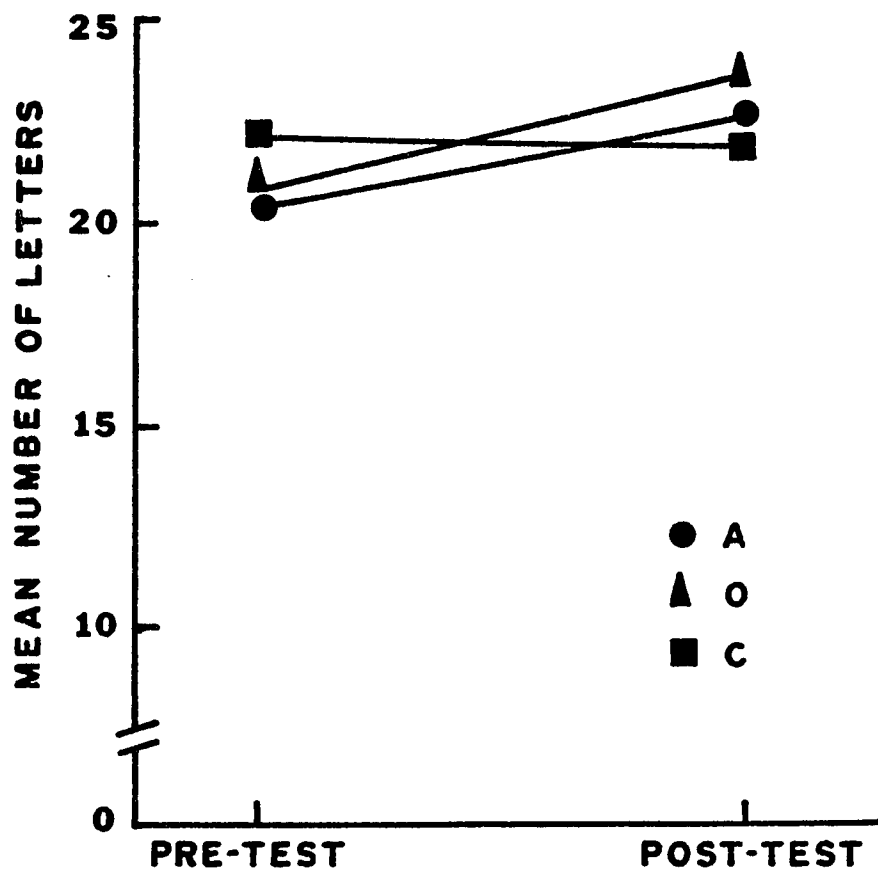


Figure 21. The Mean Number of Letters Recognized When Presented Orally at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

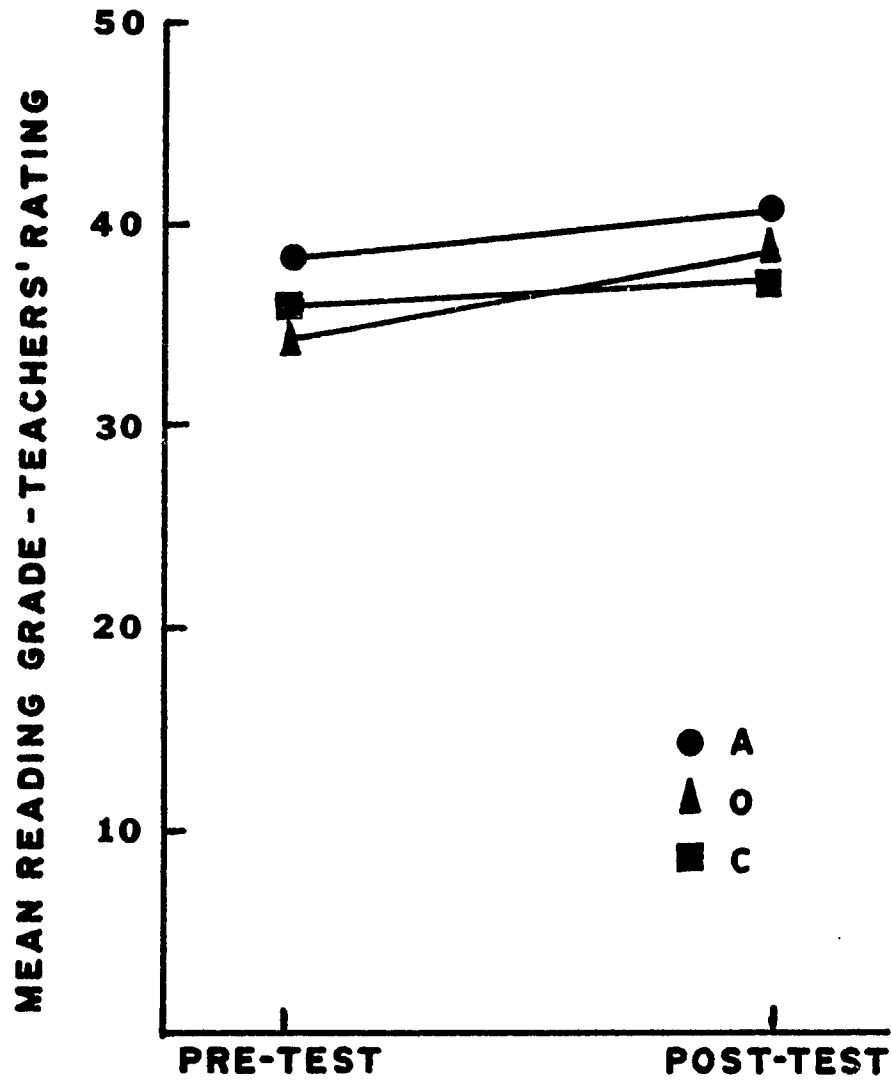


Figure 22. The Mean Teacher Rating of Reading Grade at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

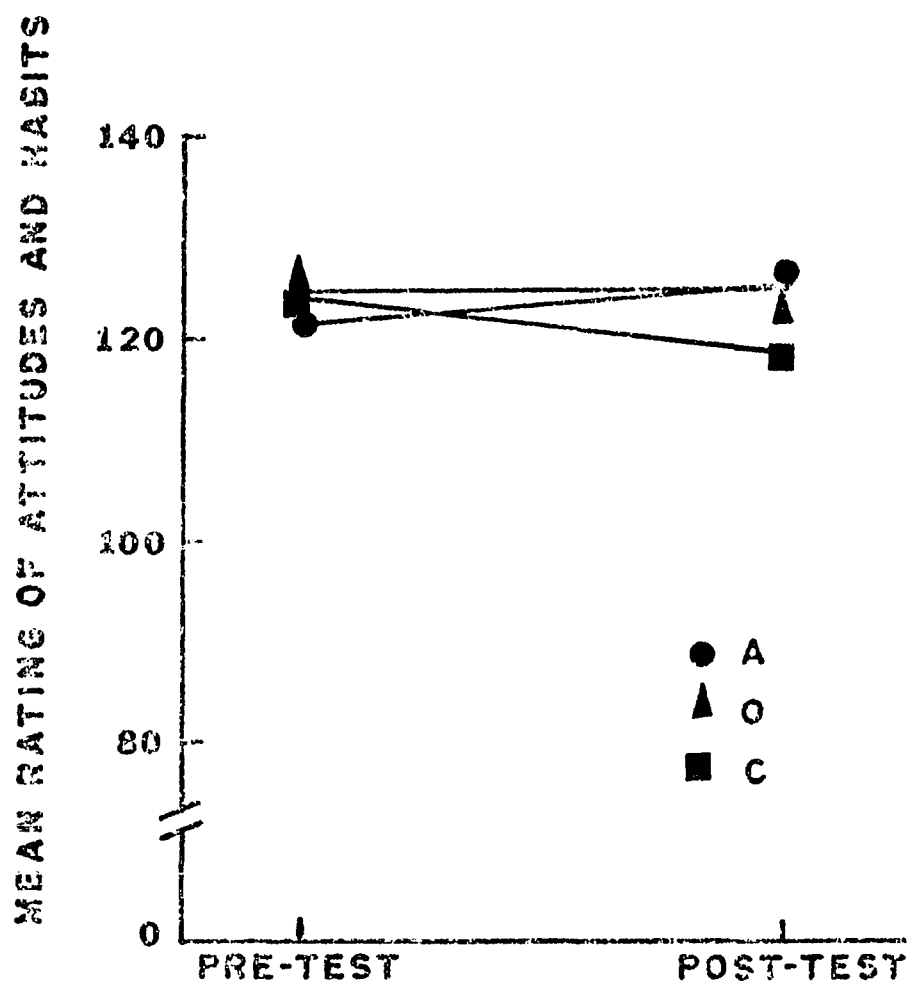


Figure 23. The Mean Teacher Rating of Attitudes and Habits at Pre-test and Post-test Levels for the Accuracy, On-task, and Control Groups.

TABLE 12

Summary Table of Statistical Findings for Thirteen Reading Variables
(Relevant to Reading Behavior) at Pre-test and Post-test Levels
for the Accuracy, On-task and Control Groups

Source	F-Ratio Variables		
	<u>Reading Achievement</u>	<u>Words Read on SORT</u>	<u>Words Spelled on WRAT</u>
Between Subjects			
Groups	1.83	.09	.27
Subjects within Groups			
Within Subjects			
Testing	28.00***	79.78***	4.34*
	A=**	A=**	A=n.s.
	O=**	O=*	O=n.s.
	C=**	C=**	C=n.s.
Groups x Testing	3.12	1.52	.48
Testing x Subjects Within Groups			

*p<.05

**p<.01

***p<.001

n.s.p>.05

TABLE 12
(Continued)

Summary Table of Statistical Findings for Thirteen Reading Variables
(Relevant to Reading Behavior) at Pre-test and Post-test Levels
for the Accuracy, On-task and Control Groups

Source	F-Ratio Variables		
	<u>Paragraphs (Error)</u>	<u>Paragraphs (Comprehension)</u>	<u>Consonants</u>
Between Subjects			
Groups	.349	.57	.37
Subjects within Groups			
Within Subjects			
Testing	18.33	6.43*	15.53***
	A=**	A=*	A=*
	O=*	O=n.s.	O=*
	C=n.s.	C=n.s.	C=*
Groups x Testing	1.12	1.27	.27
Testing x Subjects Within Groups			

*p<.05

**p<.01

***p<.001

n.s.p>.05

TABLE 12
(Continued)
Summary Table of Statistical Findings for Thirteen Reading Variables
(Relevant to Reading Behavior) at Pre-test and Post-test Levels
for the Accuracy, On-task and Control Groups

Source	F-Ratio Variables			
	<u>Vowels</u>	<u>Consonant Blends</u>	<u>Syllables</u>	<u>Consonant Blends & Common Syllables</u>
Between Subjects				
Groups	1.28	4.43 A=C** O=C** A=O	.36	.3
Subjects within Groups				
Within Subjects				
Testing	38.45*** A=** O=** C=**	12.18** A=* O=* C=*	168.75*** A=** O=** C=**	92.60*** A=** O=** C=*
Group x Testing	.02	8.86**	.19	1.46
Testing x Subjects Within Groups				

*p<.05
**p<.01

***p<.001
n.s.p>.05

TABLE 12
(Continued)

Summary Table of Statistical Findings for Thirteen Reading Variables
(Relevant to Reading Behavior) at Pre-test and Post-test Levels
for the Accuracy, On-task and Control Groups

Source	F-Ratio Variables		
	<u>Letters</u>	<u>Teacher Rating Reading</u>	<u>Teacher Rating Attitudes & Habits</u>
Between Subjects			
Groups	.44	1.07	.21
Subjects within Groups			
Within Subjects			
Testing	11.27**	7.28	.04
	A=**	A=n.s.	A=n.s.
	O=**	O=*	O=n.s.
	C=n.s.	C=n.s.	C=n.s.
Groups x Testing	2.53	.46	2.03
Testing x Subjects Within Groups			
<p>*p<.05 ***p<.001</p> <p>**p<.01 n.s.p>.05</p>			

A univariate analysis on SORT Reading Achievement Rate indicated no significant difference among Groups. There was a significant difference between Testings ($F = 28.40$, $df = 1/24$, $p < .001$), and there was a trend toward a significant difference for the Group x Testing interaction ($F = 3.12$, $df = 2/24$, $p < .10$). A Sandler's A for correlated samples used to determine a significant difference within each group from pre-test to post-test revealed that the Accuracy, On-task, and Control groups improved ($df = 8$, $p < .01$).

A univariate analysis on Number of Words Read on the SORT indicated neither a significant difference among Groups nor a Group x Testing interaction. There was a significant difference between Testings ($F = 79.79$, $df = 1/24$, $p < .001$). A Sandler's A indicated a significant difference between pre-test and post-test within each group with the Accuracy and Control groups at $p < .01$ ($df = 8$) and the On-task group at $p < .05$ ($df = 8$).

A univariate analysis for Number of Words Spelled on the WRAT revealed that there was no significant difference among Groups or a Group x Testing interaction; however, there was a significant difference for Testing ($F = 4.34$, $df = 1/24$, $p < .05$). A Sandler's A to determine the significance within each group, however, did not reveal a significant difference for any group.

For the Number of Paragraphs Correctly Read using Error as a criterion, there was no significant difference among Groups nor a Group x Testing interaction. There was a significant difference between pre-test and post-test ($F = 18.41$, $df = 1/24$, $p < .001$). A Sandler's A for within

group significance indicated that the Accuracy group improved ($\underline{df} = 8$, $\underline{p} < .01$) as did the On-task group ($\underline{df} = 8$, $\underline{p} < .05$), but that the Control group did not improve.

For Number of Paragraphs Correctly Read using Comprehension as a Criterion, there was no significant difference among Groups nor a Group x Testing interaction. There was a significant difference between Testing ($\underline{F} = 6.43$, $\underline{df} = 1/24$, $\underline{p} < .05$). A Sandler's A revealed that the Accuracy group was the only group to improve ($\underline{df} = 8$, $\underline{p} < .05$) from pre-test to post-test.

A univariate analysis for Number of Consonants Correctly Pronounced indicated neither a significant difference among Groups nor a Group x Testing interaction. There was a significant difference for Testing ($\underline{F} = 15.53$, $\underline{df} = 1/24$, $\underline{p} < .001$). A Sandler's A for within group significance indicated that the Accuracy, On-task, and Control groups improved equally well from pre-test to post-test ($\underline{df} = 8$, $\underline{p} < .05$).

A univariate analysis for Number of Vowels Correctly Pronounced revealed neither a significant difference among Groups nor a Group x Testing interaction. There was a significant difference for Testing ($\underline{F} = 38.45$, $\underline{df} = 1/24$, $\underline{p} < .001$). A Sandler's A indicated that the Accuracy, On-task and Control groups improved between pre-test and post-test ($\underline{df} = 8$, $\underline{p} < .01$).

For Number of Consonant Blends Correctly Pronounced, a univariate analysis of variance revealed a significant difference among Groups ($\underline{F} = 4.43$, $\underline{df} = 2/24$, $\underline{p} < .05$). A Newman-

Kuels comparison of means revealed that the Accuracy and On-task groups pronounced more consonant blends than the Control group ($p < .01$) with there being no difference between the Experimental groups. There was a significant difference for Testing ($F = 12.18$, $df = 1/24$, $p < .01$) and also for Group x Testing interaction ($F = 8.86$, $df = 2/24$, $p < .01$). A Sandler's A for within group performance from pre-test to post-test indicated that the Accuracy and On-task groups improved ($df = 8$, $p < .05$ and $p < .01$) but the Control group did not.

A univariate analysis for Number of Syllables Correctly Pronounced showed neither a significant difference among Groups nor a Group x Testing interaction. There was a large significant difference for Testing ($F = 168.75$, $df = 1/24$, $p < .001$). A Sandler's A for improvement within each group indicated that the Accuracy, On-task, and Control groups improved equally well from pre-test to post-test ($df = 8$, $p < .01$).

For Number of Blends Correctly Pronounced using nonsense words comprised of consonant blends and common syllables, a univariate analysis did not indicate a significant difference among Groups nor a Group x Testing interaction. Testing was highly significant ($F = 92.60$, $df = 1/24$, $p < .001$). A Sandler's A indicated that all three groups improved from pre-test to post-test ($df = 8$, $p < .01$).

A univariate analysis on Number of Letter Sounds Recognized when presented orally indicated neither a significant difference among Groups nor a Group x Testing interaction. However, there was a significant difference for Testing ($F = 11.27$, $df = 1/24$, $p < .01$). Sandler's A found the Accuracy and On-task groups to have improved ($df = 8$, $p < .01$), but the Control group had not improved from pre-test to post-test.

Two measures of global performance were based on teacher ratings taken from report cards. A univariate analysis of Teachers' Ratings for Reading indicated there was no difference among Groups nor was there Group x Testing interaction. Testing was significant ($F = 7.28$, $df = 1/24$, $p < .05$). A Sandler's A indicated that the On-task group was the only group to have improved from pre-test to post-test ($df = 8$, $p < .05$). A univariate analysis for the Teachers' Ratings of Attitudes and Habits revealed no significant differences for Groups, Testing, or Group x Testing interaction.

CHAPTER IV

DISCUSSION

The results of the present study indicated that the children in the Experimental groups responded differentially to the contingency for which they were reinforced. The Accuracy group became more accurate, and the On-task group increased its on-task behavior. The sanction that required the Accuracy group to perform at a certain minimum kept the number of frames they completed at a reasonable level. It was anticipated that once the children became fully aware of the accuracy contingency they might complete relatively few frames but be extremely accurate. Although the interaction was not significant, the Accuracy group was beginning to complete fewer frames than the On-task group as they progressed to higher level books. Since each book level required progressively more reading per frame, the Accuracy group correspondingly decreased their number of recorded answers, whereas the On-task group worked even more rapidly. Had the Accuracy group not had a minimum performance criterion to earn the maximum number of points, they might have presented greater decreases in on-task behavior. Although the Accuracy group was on task significantly less often than

the On-task group, the children in the Accuracy group were on task an average of 97.5% of the time, appeared to be more relaxed, looked away from their books occasionally, checked on each other's progress, and responded when another child declared he had made a mistake or completed a perfect page. Since the Accuracy group completed as many frames as the On-task group yet were more accurate, it appears that teachers would do well to continue to reinforce accuracy with the provision that a criterion in quantity also be met.

Some of the children in the On-task group learned to appear to be on task by keeping their eyes on the material. Behaviors observed to illustrate this fact were looking at a page with pencil in hand, but not writing, over long periods of time or working very rapidly using perseverative or random responses, i.e., picking one vowel to fill in all blanks on a page. It was frustrating for the tutor to observe the children who took advantage of the on-task contingency by not attempting to be accurate other than by cheating and to follow through with reinforcement of on-task behavior only as specified. As with the Accuracy group, some requirement for accurate academic performance would have kept the reinforcement for on-task behavior a more acceptable procedure for teachers. Whereas the children in the Accuracy group were more accurate and remained on task on the average of 97.5% of the time, the On-task group exhibited on-task behavior at a high level, but its accuracy had decreased in performance to 88% at the

end of the last block of sessions. If this trend had continued over a longer period of time, it would have been indicative to add an accuracy criterion to the contingency, i.e., at least 90% accuracy with programmed instruction in order to earn all points earned by being on task.

However, if a child has exhibited disruptive behavior with little or no academic survival skills, i.e., attending, working, and following directions, it might do well first to reinforce on-task behaviors which are relatively easy to emit to allow the child to receive reinforcement and feel successful. A criterion for accurate productivity might then be added.

The fact that it was easier to appear to be on task than to be accurate was reflected by the fact that the On-task group received significantly more points for reinforcement even though the point scales had originally been designed such that both groups would receive an equal amount of reinforcement. Nevertheless, when the variance due to the number of points was statistically eliminated, the types of behaviors that were being reinforced and the sessions of instruction still affected accuracy and on-task behaviors.

The enthusiastic cooperation emitted by both Experimental groups is attributed to the fact that they were earning points for free time rather than grades. Grades fall in the class of social reinforcement which may or may not be an effective

reinforcer. Retarded readers with their concomitant lack of reinforcement in the classroom might be more apt to respond to other types of reinforcement, i.e., consumables and special privileges.

Letting the children work in their workbooks without direct supervision afforded an opportunity to observe how they might perform in the usual classroom environment where indirect supervision is present the majority of the time. The performance of number of frames completed and percent accuracy was compared within the Accuracy and On-task groups from Day 1 to Day 2. In order to make this comparison, it was necessary to assume that the children performed at the same pace for the six minutes on Day 2 as they did for 15 minutes on Day 1 and that an expected performance for six minutes could be determined by using 15-minute data. A better procedure might have been to compare performance of the first six minutes in the 15-minute period of time in Day 1 with the six-minute period of time in Day 2; however, these data were not available. By using the less stringent comparison procedure, it was determined that the Accuracy and On-task groups completed proportionately more frames and were more accurate than was expected from observing work periods under direct supervision.

At least two factors might have contributed to the change in performance pace and accuracy. First, the children obviously enjoyed finishing units within a book and progressing from one book to another. Second, during Day 2 sessions, at

least two-thirds of the children were observed at various times copying the answers in order to work faster and more accurately. The Accuracy group particularly reflected the pressure they had received under direct supervision.

As has been true in much of the learning research literature, individual differences were very pronounced, and the curve for average performance did not accurately reflect the curves of individual child behavior. From informally observing the children closely over the fifty-two sessions, it was interesting to see how some children were immediately affected by the contingencies and began to respond appropriately. Responding contingently appeared to be easier for the On-task group. However, within the on-task sub-groups, there were children who performed at a particular pace throughout the program, and their performance did not appear to change whether they were supervised or not. Within one sub-group, two children imitated the behavior of the third by filling in the blanks without concern for appropriateness or accuracy during the Day 1 condition. This group varied between doing the same thing on Day 2 to being accurate by cheating.

Within the Accuracy group, some children seemed not to be able to increase their accuracy. They were the ones who preferred to check their answers at the end of the page rather than after each answer, even though it was explained that more errors were made this way. These children also did not respond to the group pressure put upon them to be more

accurate either by trying to cheat or by changing their method of getting feedback, i.e., checking their answer after each response. The children, who most often verbalized their concern over accuracy, tended to become even more accurate on unsupervised days and were observed to cheat more.

One of the purposes of this study was to determine whether the type of behaviors reinforced would differentially affect rate of reading achievement. A multivariate analysis of variance for the 13 variables which included 11 standardized tests for reading skills and two teacher-ratings indicated that the Accuracy and On-task groups performed better than the Control group. Post hoc analyses did not show significant differences between the two Experimental groups, however. Apparently the sessions of programmed instruction accounted for progress observed from pre-test to post-test and not the type of behavior that was reinforced. Even though the On-task group was not as accurate, the redundancy of the material apparently enabled them to learn nevertheless. The fact that the children in the On-task group did as well on the oral reading when they were receiving close tutor attention was also indicative that they were learning the reading vocabulary. Thus, it may well be that for short periods of time, when the material presented is well developed and heavily redundant, whether being reinforced for accuracy or on-task behaviors is not crucial.

Both of the Experimental groups improved on nine of the eleven standardized test variables. In addition, the Accuracy group was the only group to improve from pre-test to post-test in the correct reading of paragraphs with comprehension as the criterion; however, according to teacher ratings, they did not improve on reading skills, in general. The On-task group was the only group the teachers rated as improved in reading. Since the Reading Lab was conducted for only 10.4 weeks or approximately 11 hours of instruction, it was surprising that standardized tests were able to reflect improvement.

The Control group improved from pre-test to post-test on six out of eleven standardized test variables and did not improve on either of the two teacher ratings. Neither the Experimental groups nor the Control group improved on the number of words spelled on the WRAT nor on their ratings for attitudes and habits in the classroom.

It was anticipated that the children in the Control group would remain in the classroom without special remediation. Although the teachers had not been informed that there was a Control group, they were aware that there were children in their rooms who were in need of help as much as the children who had been selected to attend the Reading Lab. An interview with each teacher after the closing of school indicated that the teachers did provide special instruction for eight of the nine Control children. Two children were placed in a resource

room for remediation of reading. Two children were put in an extra reading period within the classroom. Two children were changed to a reading series using high motivational materials (Open Highways), and two were given phonics workbooks to use.

One teacher who had five Experimental children attending the Reading Lab at three different times during the morning said she couldn't make arrangements to give them their regular reading period, and she decided that the Reading Lab would have to be enough. Prior to placing the children in the Reading Lab, it had been heavily emphasized that the Lab was to be made available in addition to the regular reading period and was not to be used as a substitute.

Conducting research in natural environments is often correlated with limitations in the amount of experimenter control. For this study, it might have been preferable to have a written contract with the classroom teachers to the effect that they would not change their procedures for reading instruction during the ten weeks of the Reading Lab with the understanding that remediation for other children in the classroom would be given at a later time.

How much the use of reinforcement procedures contributed to the enhancement of the child's self-esteem remains unclear. It was not considered advisable to attempt to conduct another group in the same school taking children from the same classroom and omitting reinforcement of time in the Fun Room. Teachers verbalized that children attending the Reading Lab

looked forward to attending and seemed to enjoy the reading program as well as the Fun Room. The teachers, however, did not rate these children as improving in attitudes and habits any more than the Control children.

Several possibilities for future research are evident. The developers of the Buchanan Programmed Reading (3rd Edition) have teacher guides that heavily stress teacher interaction with the students in the form of direct teacher instruction, blackboard drills, and other related activities for each unit of the books. Berthold and Sachs (1974) found that children performed at a significantly higher level with teacher instruction or teacher instruction and programmed computer instruction than by computer instruction alone. Placing children in homogeneous groupings according to reading level could permit teachers to supplement programmed instruction meaningfully. Extrinsic reinforcement versus no reinforcement conditions would clarify whether or not reinforcement abets performance using programmed instruction. Non-contingent reinforcement and contingent reinforcement conditions might also be examined for their effectiveness in motivating retarded readers.

Cheating behavior was a problem when using programmed instruction with retarded readers, and the need for techniques to control cheating remains high. In a series of programmed-reading projects involving several thousand children, Griffith (1971, 1972) reported that 41 to 84 percent of the teachers indicated that shortcutting or cheating was a problem.

Cheating is a difficult behavior to manage. It is often considered the height of cleverness to get away with cheating in games. Unless the peers somehow lose out because of the cheating behavior by another peer, the payoff includes peer attention and approval as well as coming closer to winning. The unpardonable crime is being caught in the act. Traditionally, authority figures have considered cheating to be a symptom of a more basic underlying personality problem. Although cheating in school is usually handled by some form of punishment, getting at the basic problem would involve the manipulation of grading systems, parent and/or teacher pressure for maximum accuracy in performance, and feelings of self-worth.

A behavioral approach to the problem of cheating might prove to be more productive. Cheating is an operant behavior, and it follows that the probability of an increase or decrease in cheating can be determined by how it is reinforced. If those who cheated were caught more often, cheating might decrease. Cheating behavior may continue, however, because the probability of receiving punishment for poor school performance is considerably greater than the probability of being caught and punished for cheating. The probability of being reinforced for good grades is greater than being reinforced for non-cheating-good grades or bad.

Investigating the parameters of teacher behavior such as the frequency of monitoring, instructions, reinforcement

for non-cheating, and the contingencies for cheating may elucidate the variables that abet or deter cheating behavior.

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APPENDIX A

PRELIMINARY PROCEDURE

1. Give children a Placement Test for the Programmed Reading.
2. Tell children they will be working in workbooks at their own level and at their own speed.
3. Demonstrate how to use the programmed text.
4. Have them check their answer right after they have made it.
 - a. If it is wrong, put a line through it and write in the correct answer.
 - b. DO NOT ERASE.
5. Discuss rules.
 - a. You must work quietly by yourself.
 - b. You must not disturb others.
6. Demonstrate how the watch will be set at the beginning of each period. When I call Stop! they are to stop working in their books.
 - a. If they have a question, they are to hold up their hand and let me come to them.
 - b. When I tell them to stop, they will stamp the date right after the last answer.
7. They will be told that they will have the privilege of earning points.

Group A will be told that they will earn points for accurate work. We will practice counting answers attempted and answers correct. I will demonstrate how I will give points by using tokens. Then I will demonstrate how they will share their points with the groups for minutes earned in the Fun Room.

Group B will be told that they will earn points for working. We will role play on-task behavior, and I will demonstrate how I will run the stop watch. I will teach them how to read the stop watch and how to find out how many points each has earned toward minutes in the Fun Room.

8. I will record each child's performance - number of answers attempted, number of correct answers, percent correct, and time on task.
9. During Day 2, I will listen to each child read for 2 minutes and record number of words read and number missed.
10. I will give the children a chance to play in the Fun Room for 10 minutes and will observe them to see what their interests are.
11. At the end of the preliminary sessions, a baseline for accuracy and on-task behaviors will be determined for each group. Point scales will be equated for a reinforcement schedule for each group with the goal that groups will receive approximately the same amount of reinforcement.

DAILY PROCEDURES

ACCURACY GROUP

Day 1

1. Have workbooks in place and plenty of pencils without erasers available.
2. Have children in their seats ready to work.
3. Give instructions:

Today you will be earning points for free time tomorrow by doing correct work.

Please be sure to read in your book before you write your answer. Write your answer down before you look at the book answer. Be sure to check to see if your answer is correct each time.

If you make a mistake, cross it out and write the correct answer. Reread the material to see why you have made the mistake. Most of the time you can find clues on the page to help you.

Remember, you must work quietly so that you do not disturb others.

You will work for 15 minutes today. I will tell you when to start and stop.

Go!

After 15 minutes -

Everyone stop! Please stamp your book right where you wrote your last answer. Count the number of answers you have done. Then count your mistakes and let me know what you have.

4. Each child will compute his percent accuracy on a portable calculator while I supervise him. I will tell him how many points he has earned.

5. Each child will enter his points in the calculator, and group will average the points to determine amount of free time earned.
6. At a later time, I will check reliability of answer and error count and record frames completed, correct answers, percent accuracy, time on-task, points earned individually, and points earned as a group.

Day 2

1. Have workbooks in place and plenty of pencils without erasers available.
2. Have two children in their seats ready to work.
3. Have oral reading materials ready for each child.
4. Have data sheet for oral reading ready.
5. Give instructions -

Today each of you will read to me for two minutes. I want you to work carefully and quietly in your books while I am listening to the reading. Keep working until I call you.

You will have ____ minutes free time today, and we will start when everyone has finished reading to me.

Go!

After everyone has read, or if a child is absent, after nine minutes -

Everyone Stop! Please stamp your books under your last answer.

I will set the timer for the number of minutes you have earned. When the bell rings, you will have to leave.

6. While the child is reading, I will record words missed. At a later time, I will count the number of words read and record.
7. At a later time, I will count answers attempted and errors made by each child in his workbook and will record.

ON-TASK GROUP

Day 1

1. Have workbooks in place and plenty of pencils without erasers available.
2. Have children in their seats ready to work.
3. Give instructions -

Today you will be earning points for free time tomorrow by working. Remember that I have a stop watch going for each of you, and it will run as long as you are working in your book. If you need to ask a question about what you are reading, you may do so.

Please be sure to read in your book before you write your answer. Write your answer down before you look at the book answer. Be sure to check to see if your answer is correct each time.

If you make a mistake, cross it out and write the correct answer. Reread the material to see why you have made the mistake.

Remember, you must work quietly so that you do not disturb others.

You will work for 15 minutes today. I will tell you when to start and stop.

Go!

After 15 minutes -

Everyone stop! Please stamp your book right where you wrote your last answer. Read the time on your stop watch, and I will tell you how many points you have earned.

4. I will also read the watch and write the time down beside the date in the book.
5. Each child will enter his points in the calculator, and the group will average the points to determine the amount of free time earned.

6. At a later time, I will make an answer and error count and record frames completed, correct answers, percent accuracy, time on-task, points earned individually, and points earned as a group.

Day 2

Same as for Accuracy Group.

Dear Parent:

Your child, _____ has been selected to participate in a Reading Lab for the rest of the school year beginning February 18. This program will be given in addition to the classroom reading period and will require twenty minutes time out of class every morning.

If you have any questions concerning the program or do not wish your child to participate, please feel free to call me at the school or leave a message for Mrs. Fran Deaton to call you.

Mrs. Deaton is connected with the University of North Carolina at Greensboro and is employed as an intern by the Title VI program in the Guilford County School system to provide special services. She will be teaching the program and will send progress reports home frequently.

Sincerely,

Principal

REINFORCEMENT SCHEDULE

Prior to the initiation of the experimental conditions, a baseline for accuracy and on-task behaviors was determined for each group. Point scales were then equated for each group which are as follows:

Accuracy Scale	On-task Scale
100.00 -- 99.25 = 10	15' 0" -- 14' 58" = 10
99.25 -- 97.75 = 9	14' 58" -- 14' 53" = 9
97.75 -- 96.25 = 8	14' 53" -- 14' 49" = 8
96.25 -- 94.75 = 7	14' 49" -- 14' 44" = 7
94.75 -- 93.25 = 6	14' 44" -- 14' 40" = 6
93.25 -- 91.75 = 5	14' 40" -- 14' 35" = 5
91.75 -- 90.25 = 4	14' 35" -- 14' 31" = 4
90.25 -- 88.75 = 3	14' 31" -- 14' 26" = 3
88.75 -- 87.25 = 2	14' 26" -- 14' 22" = 2
87.25 -- 85.75 = 1	14' 22" -- 14' 17" = 1
85.75 -- = 0	14' 17" -- = 0

Day 1

Day 2

130

Lynn Doyle

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APPENDIX B

TABLE B1

ANOVA Summary for Accuracy and On-Task Groups for
Number of Points Earned Over Six Blocks
of Sessions for the Day 1 Condition

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	35.59	35.59	23.11***
Subjects within Groups	16	24.59	1.54	
Within Subjects				
Sessions of Instruction	5	8.74	1.75	6.68***
Types of Behavior Reinforced x Sessions of Instruction	5	3.96	.79	3.03*
Sessions x Subjects within Groups	80	20.96	.26	

tp < .10
*p < .05
**p < .01
***p < .001

TABLE B2

Multiple Analysis of Covariance Summary for Accuracy and On-Task Groups
 for Number of Frames Completed, Percent Accuracy of Frames Completed,
 and Time on Task Over Six Blocks of Sessions for Day 1
 Condition Using Points Earned as the Covariate

Source	df	Approximate F
Between Subjects		
Types of Behavior Reinforced	1	40.11***
Subjects within Groups	16	
Within Subjects		
Sessions of Instruction	5	1.99 ^t
Types of Behavior Reinforced x Sessions of Instruction	5	2.47*
Sessions x Subjects within Groups	79	
Covariate - Points Earned	1	1.92 ^t

^tp<.10
 *p<.05
 **p<.01
 ***p<.001

TABLE B3

Analysis of Covariance Summary for Accuracy and On-task Groups
 for Number of Frames Completed Over Six Blocks
 of Sessions for Day 1 Condition Using
 Points Earned as the Covariate

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	2078.88	2078.88	.61
Subjects within Groups	16	54347.61	3396.73	
Within Subjects				
Sessions of Instruction	5	322.64	64.53	.25
Types of Behavior Reinforced x Sessions of Instruction	5	2042.49	408.50	1.56
Sessions x Subjects within Groups	79	20612.39	260.92	
Covariate - Points Earned	1	2.56	2.56	.01

TABLE B4

Analysis of Covariance Summary for Accuracy and On-task Groups
for Percent Accuracy of Frames Completed Over Six Blocks
of Sessions for Day Condition Using Points
Earned as the Covariate

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	8844.76	8844.76	7.62*
Subjects within Groups	16	18571.59	1160.72	
Within Subjects				
Sessions of Instruction	5	1598.27	319.65	2.38*
Types of Behavior Reinforced x Sessions of Instruction	5	3018.95	603.79	4.50**
Sessions x Subjects within Groups	79	10600.46	134.18	
Covariate - Points Earned	1	596.46	596.46	4.45**

tp<.10
*p<.05
**p<.01
***p<.001

TABLE B5

Analysis of Covariance Summary for Accuracy and On-task Groups
for Time On Task Over Six Blocks of Sessions for Day 1
Condition Using Points Earned as the Covariate

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	1971.10	1971.10	10.27**
Subjects within Groups	16	3076.35	192.27	
Within Subjects				
Sessions of Instruction	5	648.10	129.62	3.39**
Types of Behavior Reinforced x Sessions of Instruction	5	419.96	83.99	2.20 ^t
Sessions x Subjects within Groups	79	3016.05	38.18	
Covariate - Points Earned	1	18.89	18.89	.49

^tp<.10

*p<.05

**p<.01

***p<.001

TABLE B6

Multiple Analysis of Covariance Summary for Accuracy and On-task Groups
 for Number of Frames Completed, Percent Accuracy of Frames
 Completed, Words Read Orally, and Percent Accuracy of
 Words Read Over Six Blocks of Sessions
 for Day 2 Condition

Source	df	Approximate F
Between Subjects		
Types of Behavior Reinforced	1	8.46*
Subjects within Groups	16	6.74
Within Subjects		
Sessions of Instruction	5	2.24t
Types of Behavior Reinforced x Sessions of Instruction	5	1.21
Sessions x Subjects within Groups	80	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B7
ANOVA Summary for Accuracy and On-task Groups
for Number of Frames Completed Over Six
Blocks of Sessions for Day 2 Condition

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	176.33	176.33	.10
Subjects within Groups	16	28609.91	1788.12	
Within Subjects				
Sessions of Instruction	5	3699.66	739.93	4.44**
Types of Behavior Reinforced x Sessions of Instruction	5	1122.11	224.42	1.35
Sessions x Subjects within Groups	80	13331.26	166.64	

tp<.10
*p<.05
**p<.01
***p<.001

TABLE B8

ANOVA Summary for Accuracy and On-task Groups for
Percent Accuracy of Frames Completed Over Six
Blocks of Sessions for Day 2 Condition

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	4078.31	4078.31	5.15*
Subjects within Groups	16	12660.55	791.28	
Within Subjects				
Sessions of Instruction	5	1168.95	233.79	1.36
Types of Behavior Reinforced x Sessions of Instruction	5	1062.87	212.57	1.24
Sessions x Subjects within Groups	80	13722.06	171.53	

tp<.10
*p<.05
**p<.01
***p<.001

TABLE B9

ANOVA Summary for Accuracy and On-task Groups for Number
of Words Read Orally for Two Minutes Over Six
Blocks of Sessions for Day 2 Condition

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	844.48	844.48	.28
Subjects within Groups	16	47688.75	2980.54	
Within Subjects				
Sessions of Instruction	5	2589.89	517.97	2.08 ^t
Types of Behavior Reinforced x Sessions of Instruction	5	287.40	57.48	.23
Sessions x Subjects within Groups	80	19895.25	248.69	

^tp<.10

*p<.05

**p<.01

***p<.001

TABLE B10

ANOVA Summary for Accuracy and On-task Groups for Percent
Accuracy of Words Read Orally for Two Minutes Over Six
Blocks of Sessions for Day 2 Condition

Source	df	SS	MS	F
Between Subjects				
Types of Behavior Reinforced	1	716.29	716.29	.08
Subjects within Groups	16		8678.88	
Within Subjects				
Sessions of Instruction	5	35539.46	7107.89	1.01
Types of Behavior Reinforced x Sessions of Instruction	5	36168.45	7233.69	1.03
Sessions x Subjects within Groups	80	560267.26	7003.34	

TABLE B11

Multivariate Analysis of Variance Summary for Accuracy, On-task and
Control Groups for Thirteen Reading and Teacher-rating Variables

Source	df	Approximate F
Between Subjects		
Groups	2	194.30***
Subjects within Groups	24	7.29
Within Subjects		
Testing	1	29.46***
Groups x Testing	2	1.11
Testing x Subjects within Groups	24	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B12

ANOVA Summary for Accuracy, On-task and Control Groups for
Reading Achievement Rate on SORT

Source	df	SS	MS	F
Between Subjects				
Groups	2	4875.80	2437.90	1.83
Subjects within Groups	24	31907.10	1329.46	
Within Subjects				
Testing	1	29758.05	29758.05	28.40***
Groups x Testing	2	6546.84	3273.42	3.12
Testing x Subjects within Groups	24	25145.86	1047.74	

tp<.10
 *p<.05
 **p<.01
 ***p<.001

TABLE E13

ANOVA Summary for Accuracy, In-task and Control Groups
for Number of Words Read on SOPT

Source	df	SS	MS	F
Between Subjects				
Groups	2	105.33	52.67	.09
Subjects within Groups	24	13851.35	577.16	
Within Subjects				
Testing	1	2294.50	2294.50	79.78***
Groups x Testing	2	87.26	43.63	1.52
Testing x Subjects within Groups	24	690.13	28.76	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B14

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Words Spelled on the WRAT

Source	df	SS	MS	F
Between Subjects				
Groups	2	16.26	8.13	.27
Subjects within Groups	24	719.0	29.96	
Within Subjects				
Testing	1	10.67	10.67	4.34*
Groups x Testing	2	2.33	1.17	.48
Testing x Subjects within Groups	24	59.00	2.46	

tp<.10
 *p<.05
 **p<.01
 ***p<.001

TABLE B15

ANOVA Summary for Accuracy, On-task and Control Groups for Number
of Paragraphs Read Using Error Criterion

Source	df	SS	MS	F
Between Subjects				
Groups	2	15.81	7.91	.349
Subjects within Groups	24	543.33	22.64	
Within Subjects				
Testing	1	28.17	28.17	18.33***
Groups x Testing	2	3.44	1.72	1.12
Testing x Subjects within Groups	24	36.88	1.54	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B16

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Paragraphs Read Using Comprehension Criterion

Source	df	SS	MS	F
Between Subjects				
Groups	2	23.26	11.63	.57
Subjects within Groups	24	487.78	20.32	
Within Subjects				
Testing	1	11.57	11.57	6.43*
Groups x Testing	2	4.59	2.30	1.27
Testing x Subjects within Groups	24	43.33	1.81	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B17

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Consonants Pronounced Correctly

Source	df	SS	MS	F
Between Subjects				
Groups	2	8.78	4.39	.37
Subjects within Groups	24	285.22	11.88	
Within Subjects				
Testing	1	109.80	109.80	15.53***
Groups x Testing	2	3.81	1.91	.27
Testing x Subjects within Groups	24	169.89	7.07	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B18

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Vowels Pronounced Correctly

Source	df	SS	MS	F
Between Subjects				
Groups	2	25.04	12.52	1.28
Subjects within Groups	24	234.22	9.76	
Within Subjects				
Testing	1	133.80	133.80	38.45***
Groups x Testing	2	.15	.07	.02
Testing x Subjects within Groups	24	83.55	3.48	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B19

ANOVA Summary for Accuracy, On-Task and Control Groups for
Number of Consonant Blends Pronounced Correctly

Source	df	SS	MS	F
Between Subjects				
Groups	2	162.26	81.13	4.43*
Subjects within Groups	24	439.33	18.31	
Within Subjects				
Testing	1	124.52	124.52	12.18**
Groups x Testing	2	181.15	90.57	8.86**
Testing x Subjects within Groups	24	10.22		

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B20

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Common Syllables Pronounced Correctly

Source	df	SS	MS	F
Between Subjects				
Groups	2	35.15	17.57	.36
Subjects within Groups	24	1143.33	47.63	
Within Subjects				
Testing	1	1350.00	1350.00	168.75***
Groups x Testing	2	3.0	1.49	.19
Testing x Subjects within groups	24	191.99	8.00	

tp<.10
 *p<.05
 **p<.01
 ***p<.001

TABLE B21

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Blends Pronounced Combining Consonant
Blends and Common Syllables

Source	df	SS	MS	F
Between Subjects				
Groups	2	14.78	7.39	.3
Subjects within Groups	24	244.22	10.18	
Within Subjects				
Testing	1	185.19	185.19	92.60***
Groups x Testing	2	5.81	2.91	1.46
Testing x Subjects within Groups	24	47.99	2.00	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B22

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Letters Recognized When Presented Orally

Source	df	SS	MS	F
Between Subjects				
Groups	2	5.78	2.89	.44
Subjects within Groups	24	158.56	6.61	
Within Subjects				
Testing	1	40.91	40.91	11.27**
Groups x Testing	2	18.37	9.19	2.53
Testing x Subjects within Groups	24	87.22	3.63	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B22

ANOVA Summary for Accuracy, On-task and Control Groups for
Number of Letters Recognized When Presented Orally

Source	df	SS	MS	F
Between Subjects				
Groups	2	5.78	2.89	.44
Subjects within Groups	24	158.56	6.61	
Within Subjects				
Testing	1	40.91	40.91	11.27**
Groups x Testing	2	18.37	9.19	2.53
Testing x Subjects within Groups	24	87.22	3.63	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B23

ANOVA Summary for Accuracy, On-task and Control Groups for
Teacher Ratings of Reading Skills

Source	df	SS	MS	F
Between Subjects				
Groups	2	87.37	43.69	1.07
Subjects within Groups	24	976.11	40.67	
Within Subjects				
Testing	1	121.50	121.50	7.28*
Groups x Testing	2	15.44	7.72	.46
Testing x Subjects within Groups	24	400.55	16.69	

tp<.10

*p<.05

**p<.01

***p<.001

TABLE B24

ANOVA Summary for Accuracy, On-task and Control Groups for
Teacher Ratings of Attitudes and Habits

Source	df	SS	MS	F
Between Subjects				
Groups	2	105.44	52.72	.21
Subjects within Groups	24	6165.86	256.91	
Within Subjects				
Testing	1	1.85	1.85	.04
Groups x Testing	2	176.26	88.13	2.03
Testing x Subjects within Groups	24	1043.82	43.49	