THE EFFECTS OF FOUR TRAINING PROCEDURES ON THE MATCH-TO-SAMPLE PERFORMANCE OF SEVERELY AND PROFOUNDLY MENTALLY IMPAIRED STUDENTS

Dissertation for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
PATRICIA J. HECHT
1977

This is to certify that the

thesis entitled

THE EFFECTS OF FOUR TRAINING PROCEDURES ON THE MATCH-TO-SAMPLE PERFORMANCE OF SEVERELY AND PROFOUNDLY MENTALLY IMPAIRED STUDENTS

presented by

Patricia J. Hecht

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Special Education

Donald A. Zeke

Major professor

Date April 4, 1977

O-7639

579

ABSTRACT

THE EFFECTS OF FOUR TRAINING PROCEDURES ON THE MATCH-TO-SAMPLE PERFORMANCE OF SEVERELY AND PROFOUNDLY MENTALLY IMPAIRED STUDENTS

By

Patricia J. Hecht

One mode of instructional presentation which has demonstrated results with young normal children and moderately retarded individuals is vicarious learning, derived from Bandura's (1971) social learning theory. The effects of adjunctive verbal coding are equivocal, apparently as a function of the conceptual level of the subjects and the complexity of the tasks.

The purpose of this study was to compare the effects of four training procedures, all involving vicarious learning, on the match-to-sample performance of severely mentally impaired persons (SMI). Specifically, this investigation sought to determine whether correctional procedures or verbalization would facilitate the learning of these students. The basic paradigm for the presentation methods was drawn from studies by Forehand and Yoder (1973, 1974), who explored the effects of modeling and verbal cues on concept acquisition. The major extension

which occurred in the present study was the use of two correctional procedures.

Match-to-sample tasks from the Leiter International Performance Scale have been used by other researchers (Forehand and Yoder, 1973; Filler and Bricker, 1976) with educable retardates. In order to have this study relate to other research, three tasks from the Leiter Scale involving matching of identities were used.

Twenty-four students in educational programs for SMI were the subjects of this study. Subjects were screened on the match-to-sample tasks and randomly assigned to one of four treatment groups. All training procedures involved demonstrating the desired response for each trial. Treatments 1 and 4 (cued and guided, respectively) included a correctional phase if the student did not make the correct response. The cued condition utilized the visual cue of positioning the cube directly in front of the appropriate slot and pointing to the relevant response. The guided condition involved physically manipulating the student to make the correct response. In the verbal direction condition, the trainer verbalized the descriptive phrase "put the block here" while demonstrating the correct placement. In the verbal information condition, the trainer labeled the relevant attribute (e.g., "put the red with the red") while demonstrating the correct placement.

Each subject was trained on one task for a maximum of ten sessions (400 trials) or until achieving criterion of eight correct responses out of ten. The independent

variables were tasks and treatments. Number of trials to criterion was the dependent variable. The data were analyzed by ranks using the Hodges-Lehman two-way analysis of variance for blocked data.

The main hypothesis of this study was that correctional procedures would facilitate the performance of SMI students over the verbal conditions. It was further hypothesized that the picture task would be learned more easily than color or form. The results were inconclusive; however, by inspection of the actual number of trials to criterion, it appeared that the cued and guided conditions were somewhat more facilitative. Picture and color tasks appeared to be easier than form. Nine of the twenty-four subjects met criterion and these were relatively evenly distributed across treatment conditions, accounting for the non-significant results.

A number of problems were identified in conducting experimental research with SMI individuals. Discussion focused on the following issues: subjects, position preference, visual attending, age, residence, and mediation. The dearth of literature on this population may reflect the many obstacles in doing research with these individuals. Recommendations were made for questions to be answered by additional research. It was suggested that a more fruitful approach with this population might be through case study or longitudinal study in the naturalistic setting.

THE EFFECTS OF FOUR TRAINING PROCEDURES ON THE MATCH-TO-SAMPLE PERFORMANCE OF SEVERELY AND PROFOUNDLY MENTALLY IMPAIRED STUDENTS

By

Patricia J. Hecht

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Elementary and Special Education

1977

ACKNOWLEDGEMENTS

This research was carried out with the assistance of many people in many places. Without each of them it could not have been completed. The writer wishes to express sincere appreciation to the many individuals who made this study possible.

A special thank you is extended to the students who were the subjects of this study. Grateful appreciation is extended to the staff and administration of the Grand Rapids, Lansing, Lapeer Intermediate, Pontiac, and Wayne County programs for severely mentally impaired for allowing access to their centers. This study could not have been conducted without their cooperation and assistance in the identification of students.

Sincere appreciation is extended to all the members of my committee: to Dr. J. Edwin Keller and Dr. Eileen Earhart, who lent their ideas and support; to Dr. Don Hamachek, who encouraged me in the process of becoming; to Dr. Don Burke, Chairman, who not only guided the course through the doctoral program but also encouraged me to dream and then gave his moral support, advice, time, and direction to this project from its inception to conclusion.

Finally, deep and sincere appreciation is extended to my family and friends, who offered personal encouragement through the years of doctoral work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

PROBLEM AND REVIEW OF RELATED RESEARCH

With the implementation of Michigan's P. L. 198 mandating educational services to all school age handicapped persons, the responsibility for programming of severely and profoundly mentally impaired was shifted from mental health to education. The definition of who shall be educated has been expanded to include individuals who are severely handicapped. A Bureau of Education for the Handicapped (BEH) task force generated the following as a working definition in launching a national campaign:

> Those children who because of the intensity of their physical, mental, or emotional problems, or a combination of such problems need educational, social,psychological, and medical services which will make it possible for them to maximize their full potential for meaningful participation in society and for self-fulfillment (Thompson, 1976).

The Federal Government has established as a priority the provision of services to low incidence populations and the preparation of personnel. This current national interest and emphasis is exemplified by two events which occurred in the spring of 1975. The first was a national training meeting, Educating the 24-Hour Retarded Child, sponsored by the National Association for Retarded Citizens. The second was the founding of The American Association for

the Education of the Severely/Profoundly Handicapped with the goal of disseminating information and facilitating communication. BEH estimates the number of such severely handicapped youngsters at nearly 1.5 million, including over 460,000 severely to profoundly retarded (Thompson, 1976).

Teachers whose responsibility it is to train these students need to know whether a particular procedure or method facilitates learning. What is known about teaching educable or trainable mentally impaired may not be applicable to the education of severely mentally impaired (SMI) individuals. This study explored several methods of teaching a cognitive task to SMI students. Fundamentally, the question being asked was, "Do training procedures have a differential effect on student performance?" More specifically, we were interested in determining whether one of several methods is most facilitative in the case of SMI youngsters, a matter which has been virtually unstudied.

Rationale

The education and training of persons who are severely mentally impaired has received increasing attention in the past few years. Programmatic focus has shifted from one of care to one of instruction (Roos, 1975). However, the research on the efficacy of special education offers little to inspire confidence that traditional practices have much to offer as a basis for programming for the SMI (Tawney, 1974). Stephens (1976) points out the need to define and

address educational issues for this population. Not only should attention be given to content or curricular areas, but also to methods of instructional presentation. For the most part, the technology has been the application of operant techniques and of the experimental analysis of behavior. None of the special teaching procedures developed for young children has been systematically tried out for mentally retarded individuals (Kessler, 1970). The SMI population is not homogeneous insofar as learning is concerned, but there is evidence that the early sensori-motor development approximates the sequence seen in normal children, albeit delayed (Woodward and Hunt, 1972; Inhelder, 1968).

The review of related literature will consider vicarious learning in young normal children as well as relevant research with retarded persons, primarily educable mentally impaired, which has explored methods of instructional pre-sentation. The present study was a spin-off of some of these studies, although not a replication in the sense of direct application with an SMI population. In essence, the cognitive level of tasks used with higher functioning individuals precludes a direct parallel from research done with those persons. The paucity of literature with this severely mentally impaired population will be evident to the reader.

Vicarious Learning

The importance of modeling, also referred to as vicarious learning, demonstration, and imitative learning, has been demonstrated in the acquisition of concepts in children, ranging from simple imitative responses to complex linguistic rule-governed behavior (Flanders, 1968; Zimmerman and Rosenthal, 1974; Cullinan, Kauffman, and LaFleur, 1975). The substantial body of experimental findings derives from social learning theory (Bandura, 1971). In the most comprehensive theoretical account of modeling, Bandura (1965, 1971) describes both vicarious effects and observational learning components. Our interest is in the former, which refers to the observer's performance as a function of observing a demonstration. Vicarious acquisition of affective, motor and problem solving behaviors does occur. Conceptual learning has been demonstrated through the vehicle of modeling.

Studies with normal children in the cognitive domain have primarily focused on comparisons of modeling with and without verbal cues as the basic paradigm. However, results have not been consistent with regard to the effects of verbalization on vicarious learning. Rosenthal, Moore, Dorfman, and Nelson (1971) found that verbal rule cues with modeling did not lead to better acquisition of a novel concept by three, four, and five year olds than did modeling alone. Of interest is the fact that all twelve trials were demonstrated prior to the observer's performance. In another study, Rosenthal, Alford, and Rasp (1972) found

that those second graders who were in a verbal labeling condition exceeded all other modeling groups; however, of note is the fact that those in a group which received a description of the model's actions were outperformed by those who observed a silent demonstration. It may be that the differences lie in the complexity of the tasks or in the conceptual level of the subjects.

In a series of investigations, Rosenthal and Zimmerman (1972) studied the acquisition of conservation through modeling by first graders and four year olds. In Experiment I conceptual rule verbalization by the model did not facilitate the subjects' judgments of equivalence, but did affect their explanations. Experiment III compared the effectiveness of modeling with a verbal instructions technique for Chicano children from Spanish speaking homes and demonstrated the superiority of modeling over instructions for these youngsters with limited facility in English.

Rattan (1974), in a study of acquisition, retention, and transfer of conservation by first graders, found that providing verbal rules in conjunction with either direct experience or demonstration was significantly better than verbal directions. One additional study of interest is that of Rosenthal and Zimmerman (1973), in which they investigated the relative effectiveness of modeling and guided practice. The guided practice procedure, which constrained the child to perform without error by being physically put through the movements, was less effective than simple observation of a model performing the task.

Mentally Retarded

Several studies (Forehand and Yoder, 1973, 1974; Yoder and Forehand, 1974) with educable mentally impaired (EMI) persons have explored the effects of vicarious learning (modeling) and verbal cues on concept acquisition. Utilizing match-to-sample tasks from the Leiter International Performance Scale, which involved categorizing based on an underlying conceptual rule (e.g., apple goes with pear, man goes with woman), their focus was on task completion time and number of errors. In all of their investigations the model demonstrated one trial and then the observer performed. In the first study (1973) three treatment groups were compared: demonstration with verbal concept, demonstration only, and exposure to materials without demonstration. Their findings indicated that modeling with verbalization of the concept produced fewer errors than did the model only and no model conditions. In a second study Yoder and Forehand (1974) investigated four treatments utilizing the same match-to-sample tasks. Two levels of verbalization were used in conjunction with demonstration: verbal directions and verbal rule or concept. They found that providing a verbal description with modeling did not improve performance over the model only condition; however, labeling the concept enhanced the learning of more difficult conceptual tasks. They suggested that task complexity is important in interpreting the effects of rule provision on imitative learning. Their interest in the third study (Forehand and Yoder, 1974) was

in whether observing the model was a critical variable. Might a student acquire the concept as readily by being exposed to the completed task with concurrent verbal labeling of the concept? Four treatment groups were studied: model only, verbal concept with demonstration, verbal concept without demonstration, and control. The findings again demonstrated that performance of both normals and retardates was facilitated by modeling. The combination of demonstration and verbal cues was more beneficial than modeling alone.

Litrownik, Franzini, and Turner (1976) conducted a study with trainable mentally retarded (TMR) students at a mental age level of 5.67 years. They found that TMRs could acquire a novel rule-governed concept vicariously by observing a model. Their results suggest that demonstration in which the observer performs following each trial (imitation) facilitated response matching, while massed modeling resulted in better transfer. Matching on imitative trials of an easy concept was not affected by providing a conceptual rule, a finding which is consistent with Yoder and Forehand.

Verbal Mediation

It has been shown that young normal children are unable to perform as well as older children on a variety of tasks which require verbal mediation (Landau and Hagan, 1974). However, when the materials were appropriate to the children's predominantly nonverbal representational

modes, younger children were able to remember just as much as were older ones (Corsini, 1969). In the case of retarded individuals, several investigators have posited attentional deficits (Zeaman and House, 1963), an excessively limited breadth of attention (Zeaman, 1973), attention to multiple, not necessarily salient, dimensions (Fisher and Zeaman, 1973), or mediation deficiency (Luria, 1961). The studies by Forehand and Yoder reviewed above appear to suggest that in the case of EMI subjects, vicarious learning is facilitated by labeling the verbal concept. Similarly, in teaching multiple classification skills to EMI students, Choe (1974) found that labeling and identifying attributes facilitated the performance of nine to thirteen year olds over both specific verbal instructions and a control condition. The role of verbal mediation with this population appears to be clear cut in the case of school age subjects.

Whether verbalization facilitates the learning of SMI students has not been extensively researched. Luria (1961) argues that the retarded individual does not acquire the second signal system (language) control over the first signal system (motor) that is normally acquired in development. In a similar vein, Milgram (1973) notes that if equivalence is assumed between language and thought, the verbal medium is likely to be relied on heavily in the education of retarded children. He points out that an individual may adequately solve problems in the absence of verbal product either expressively or receptively. Rosenthal and Kellogg (1973) hypothesized that vicarious

learning might have special efficacy for individuals with limited verbal skills. In a study with adult retardates, they compared silent demonstration with equivalent information provided verbally and found that modeling surpassed verbal instruction in fostering concept learning. On a two choice discrmination task with institutionalized retardates, Bricker and Bricker (1971) found that those children who were given training did not differ significantly on post-testing as a function of training under conditions of naming or no-naming of the relevant response. Both groups performed significantly better than the controls, possibly as a result of contingent reinforcement. The relationship between receptive language and verbal mediation is not clear in low functioning individuals.

Match-to-Sample Tasks

In a study of teaching styles of mothers with their pre-school EMI children, Filler and Bricker (1976) utilized four-choice match-to-sample tasks from the Leiter Scale. The six items which they selected required matching of identities. Three were taken directly from the Leiter: color, picture, and form. Three were created from Leiter materials and involved matching according to number. In the study information-containing and information-devoid verbal directions accounted for 53 percent of the mothers' preresponse behavior. Limited choices in presentation was the only behavior which was significantly related to children's performance. Apparently, verbalization did not

relate directly to the performance of these young children. In a followup with the same subjects, Filler (1976) modified maternal teaching styles and demonstrated the importance of preresponse nonverbal manipulation of materials as compared to postresponse verbal feedback and control conditions. There was a marked improvement of pre-schoolers' performance when mothers systematically maximized the probability of a correct match by limiting choices.

It will be recalled from the earlier discussion about EMI students that the group of studies by Forehand and Yoder utilized items from the Leiter Scale. Their tasks involved understanding a concept as a basis for matching.

Summary Related to the Present Study

Studies with normal subjects have explored concept acquisition, retention, and transfer through vicarious learning and verbal cue. Although the conceptual level of these subjects was higher than the population of interest in the present study, the various methods of instructional presentation have applicability: silent demonstration, modeling with verbal rule labeling, and modeling with verbal description. Investigations with young normal subjects, as well as those with pre-school retardates, suggest that the ability to use verbal cues may relate to the functional level of the individual. Younger children appear to be less able to benefit from verbal cues. With older EMI students, the verbalizing of

a conceptual rule facilitated performance on a complex cognitive task.

Of importance in learning through observation is the observer's ability to attend to and remember what is modeled. The issue may not be simply one of verbal mediation. The role of imitative learning has been considered in language training for autistic children (see for example Lovass, 1967). In the training of cognitive skills for students whose developmental disability is primarily in the cognitive domain, persons who are SMI, the interrelationship of vicarious learning and verbal cues has not been studied.

In the present study, in an attempt to determine the effects of various training procedures all of which involved modeling, the three match-to-sample tasks were used with SMI students which were used previously with pre-school retardates (Filler and Bricker, 1976).

CHAPTER II

METHODOLOGY

Purpose

This study was undertaken as basic research to examine the relative effects of four instructional presentations on the match-to-sample performance of severely mentally impaired individuals. Specifically, it sought to determine whether there was a facilitative effect on number of trials to criterion under the conditions of cued response, verbal direction, verbal information, or guided response, all of which involved demonstration (vicarious learning).

Special Definitions

The following terms were used in the description of this study. Definitions are provided here to facilitate a common basis of understanding.

Severely mentally impaired - defined as developmental disability primarily in the cognitive domain such that the rate of development is approximately one-third or less than that of normal as identified by an Educational Planning and Placement Committee.

Match-to-sample performance - defined to be the number of trials to criterion on tasks (color match, picture match, form match) from the Leiter International Performance Scale.

Training session - a block of time, not to exceed ten minutes, during which forty successive trials were presented. The maximum number of training sessions was ten.

Trial - defined as the presentation of a single stimulus block to be matched, in both screening and training of subjects. The maximum number of training trials was 400.

Success criterion - eight correct responses out of ten successive trials.

Design

Overview

As an experimental study, this investigation involved screening subjects on the match-to-sample tasks and random assignment to one of four treatment conditions. Each subject was trained on one task for a maximum of ten training sessions or until reaching criterion.

The independent variables were tasks and treatments. Number of trials to criterion was the dependent variable. All cells contain two subjects. The data matrix is shown in Figure 1.

TASKS	TREATMENTS			
	1	2	3	4
Color				
Picture				
Form				

Figure 1

Variable Matrix of 3 X 4 Design

Research Questions

This study addressed the basic question of whether or not various training procedures have a differential effect on the performance of severely mentally impaired students. The main question asked was: What is the relationship between instructional presentation and match-to-sample performance when all methods involve vicarious learning (demonstration)? Will there be significant differences between the four treatments as reflected in number of trials to criterion on the matching identities task? Secondarily, the question was asked: Will any of the three match-to-sample tasks be learned more easily?

Population

The population for this study comprised severely mentally impaired students. Students were limited to those enrolled in educational programs for severely mentally

impaired who had been identified by an Educational Planning and Placement Committee. The delimitation of program placement was provided to circumvent the difficulties inherent in definitions utilizing intelligence scores with this population.

It was considered important to select students who were most likely to benefit from short daily training sessions and who were at a functional level consonant with a concept of matching. Students who met the following criteria were identified for further screening:

1. no evidence of severe vision or hearing loss.
2. no evidence of severe behavioral problems.
3. ability to cooperate in ten minute training sessions.
4. no evidence of gross neurological disease.
5. chronological age not less than seven years six months.

Procedure

Materials

Three items taken directly from the Leiter International Performance Scale (1969) comprised the match-to-sample tasks. These were three of the tasks used by Filler and Bricker (1976) with pre-school retardates. The tasks were: Year II - 1, colors (red, green, blue, and yellow); Year II - 3, pictures (elephant, chair, doll, and wagon); and Year III - 1, forms (cross, circle, square, and star). In order that there would be a task available at the appropriate level for each student when training

occurred, the three sets of materials varied in difficulty. In addition, all subjects were screened on the tasks prior to training.

In presenting the task, the four stimulus items were presented side by side on a single strip. This strip was mounted on a wooden frame with slots to accommodate four cubes which are matched to identical stimuli. The frame used in this study was modified from the original Leiter (see Appendix A for schematic representation). To minimize the motor component of placing the one-inch cubes, each slot was widened by one-fourth inch. To eliminate extraneous responses, the frame was shortened from eight slots to four.

Selection of Subjects

Potential subjects had been assessed on the Reasoning and Problem Solving Checklist (Hecht, 1975). Program supervisors in eight educational programs for SMI students identified those individuals whose assessments indicated the ability to match identical subjects (item 23) but not match forms (item 32). A concept of matching identities at the object level was regarded as the minimum functional level for the training tasks.

These students were then screened individually by the experimenter on the three training tasks in sixteen trials of each for a total of forty-eight trials. Approximately 125 individuals were screened. The criterion for exclusion from a task was originally set at 25 percent or better

(chance). The criterion was raised to 50 percent (eight correct) because the majority of students exhibited a position preference during screening and did not choose the four alternatives equally; their performance was better than chance as a function of the position preference. In the screening procedure each stimulus cube for each task was presented singly and the student asked to "put it where it goes." Each block was removed before presentation of the next. The four stimuli were presented in a pre-determined random order within each task. The order in which the tasks were presented was determined also by random order. Following screening, eight subjects were randomly assigned to each of the three match-to-sample tasks. Each of the subjects for each task was randomly assigned to one of the four treatments.

Twenty-four severely mentally impaired students in four educational programs in Michigan were the subjects of this investigation. Table 1 shows the breakdown of these subjects by sex according to chronological age and place of residence. Chronological ages ranged from 8-3 years to 25-0 years. There were seventeen males and seven females. Sixteen of the subjects lived either at home or in foster care; eight were residents of an institution for mentally retarded.

The means, standard deviations, and ranges for ages in months are shown in Table 2. Six subjects are represented in each treatment. Subjects in Treatment 2 tended to be younger than those in other conditions. A Kruskal-

TABLE 1

DISTRIBUTION BY SEX, AGE, AND RESIDENCE

Sex	Chronological Age																		
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	N
Day																			
M	3	3	2								1			1					10
F	1								1	1						1	1		5
Institution																			
M				1					1	2	1				1	1			7
F						1												1	2

TABLE 2

MEANS, STANDARD DEVIATIONS, AND RANGES
FOR AGES IN MONTHS

TREATMENT	$\bar{X}$	SD	Range
1	193.0	87.8	104-300
2	143.1	37.1	100-213
3	186.3	62.5	99-278
4	219.7	53.1	125-290

Wallace (Siegal, 1956) computed on ages across treatments was not statistically significant ($H=2.97$, df 3, $p<.30$).

Treatments

In all conditions the experimenter was the trainer. The student was seated at a table with the trainer to the left and slightly forward. This position was selected both because it facilitated the student's observation of the match to sample in the appropriate left to right orientation and it permitted the trainer to tally the subject's visual attending to the stimuli during demonstration, albeit in an inexact way.

The common component in the four training procedures in this study was a demonstration of the relevant match. Two of the treatments involved correctional procedures, two did not. The four conditions utilized were:

Treatment 1. Demonstration with cued response. A treatment condition in which the trainer elicited the student's attention, modeled the required response by matching a single block, removed the block and gave the command, "You do it."

> If the student did not respond, the trainer allowed a time lapse of 5-10 seconds prior to beginning the next trial. If the student did not respond on two consecutive trials, the trainer requested an unrelated behavior known to be in the student's repertoire (e.g., "Look at me", "Hands on table", "Give me the ...") to elicit involvement before the next trial.
>
> If the student responded incorrectly, the trainer positioned the block directly in front of the appropriate slot and pointed to the relevant response, saying, "Here."

If the student responded correctly, the trainer gave verbal praise.

Treatment 2. Demonstration with concurrent verbal directions. A treatment condition in which the trainer elicited the student's attention, modeled the required response by matching a single block, gave the verbal command, "Put the block here", removed the block, and gave the command, "You do it."

If the student did not respond, the trainer allowed a time lapse of 5-10 seconds prior to beginning the next trial. If the student did not respond on two consecutive trials, the trainer requested an unrelated behavior known to be in the student's repertoire (e.g., "Look at me", "Hands on table", "Give me the ...") to elicit involvement before the next trial.

If the student responded incorrectly, the trainer gave a neutral comment, "OK", prior to beginning the next trial.

If the student responded correctly, the trainer gave verbal praise.

Treatment 3. Demonstration with concurrent verbal information. A treatment condition in which the trainer elicited the student's attention, modeled the required response by matching a single block, verbally labeled the relevant attribute (e.g., "Put the chair with the chair"), removed the block, and gave the command, "You do it."

If the student did not respond, the trainer allowed a time lapse of 5-10 seconds prior to beginning the next trial. If the student did not respond on two consecutive trials, the trainer requested an unrelated behavior known to be in the student's repertoire (e.g., "Look at me", "Hands on table", "Give me the ...") to elicit involvement before the next trial.

If the student responded incorrectly, the trainer gave a neutral comment, "OK", prior to beginning the next trial.

If the student responded correctly, the trainer gave verbal praise.

Treatment 4. Demonstration with guided response. A treatment condition in which the trainer elicited the student's attention, modeled the required response by matching a single block, removed the block, and gave the command, "You do it."

If the student did not respond, the trainer allowed a time lapse of 5-10 seconds prior to beginning the next trial. If the student did not respond on two consecutive trials, the trainer requested an unrelated behavior known to be in the student's repertoire (e.g., "Look at me", "Hands on table", "Give me the ...") to elicit involvement before the next trial.

If the student responded incorrectly, the trainer made physical contact and guided him in making the relevant response, saying, "Here."

If the student responded correctly, the trainer gave verbal praise.

Training

Each training session was comprised of forty trials. Subjects were trained to a criterion of eight correct responses out of ten trials, or a maximum of ten sessions, totaling 400 trials. Training sessions were scheduled twice daily for five consecutive days. The order in which the students were trained was randomized across sessions within each educational program. Due to missed sessions, five subjects had their ten sessions over four days rather

than five. In no case did a student have more than three training sessions in a single school day.

The stimulus cubes were presented in a predetermined random order within each training session. Blocks were presented singly on a standard referent point. Each block was removed before the demonstration and presentation of the next. A single trial was defined as the demonstration of the required response and the subsequent presentation of the block for the student to match. The stimulus strip was reversed following each training session to determine whether consistent choice was matching or a position reference.

Training of the first seven subjects was conducted as a pilot study. Treatment 1 for this pilot was a condition of demonstration only. It was felt during this initial training phase that students who exhibited a position preference would likely improve their performance only under a correctional procedure. At that time the one treatment condition which utilized a correctional procedure also involved physically touching the student, which might be reinforcing to some subjects. Consequently, Treatment 1 was rewritten to provide visual cueing as a correctional procedure equivalent to guidance without physical manipulation. In both of these conditions the initial presentation could be considered as demonstration only, since the correctional component was utilized only when the student did not respond correctly.

It was evident in the pilot that the screening procedure did not identify accurately those individuals whose visual attending to the task varied within a training session. It was decided to tally occasions during training sessions when the student was not visually attending to the materials during demonstration. No record was kept of inattention during the student's placement of the cube nor during the correctional phase of the cued and guided conditions (1 and 4, respectively).

Data Collection

The experimenter recorded correct responses and the positions of incorrect responses during both screening and training of each subject. The forms are shown in Appendix B.

Hypotheses

As was previously mentioned, the unit of analysis in this study was the number of trials to criterion on the matching task. Although the research does not clearly support any direction for a prediction, it was the writer's hunch that verbalization would not facilitate the performance of SMI individuals. Therefore, it was hypothesized that:

1. There will be a differential effect for training procedures on student performance.

In the case of normal young children, the attainment of the match-to-sample tasks is developmental with color

easiest and form hardest. Therefore, a further prediction was:

2. There will be a differential effect for tasks on student performance.

3. There will be no interaction between tasks and treatments.

Statistical Analysis

A Hodges-Lehman (1962) two-way analysis of variance for blocked data was used to test the hypotheses. The alpha level for significance was set at $p<.05$.

CHAPTER III

RESULTS AND DISCUSSION

The primary hypothesis of this study was that there would be a differential effect for treatments. Although the literature did not support firm predictions with an SMI population, it was the writer's hunch that students in the cued and guided conditions (Treatments 1 and 4, respectively) would achieve criterion in fewer trials than would students in the verbal directions and verbal information groups (Treatments 2 and 3). As was previously explained, training under all conditions was continued until the student met the criterion of eight correct responses out of ten trials, or a maximum of 400 trials.

Twenty-four subjects were trained under four conditions. One would have expected that the majority would reach criterion or that a clear trend would be evident. As will soon be observed by the reader, the training sessions resulted in fewer than half of the subjects achieving criterion and these were distributed relatively evenly across treatment conditions. In all, nine of the twenty-four subjects met criterion; five did so within the first training session, or fewer than forty trials. The remaining four students required from 140 to 305 trials. The mean number of trials to criterion was 108.7 with a

standard deviation of 110.6 and a range of 10 to 305 for those who achieved criterion.

Table 3 shows the number of trials by treatment and task for those subjects who met criterion. As can be seen, at least two subjects learned under each treatment and three subjects learned each of the tasks.

TABLE 3

TRIALS TO CRITERION BY TREATMENT AND TASK

	TREATMENTS							
TASKS	Cued 1		V Direct 2		V Info 3		Guided 4	
Color	X	X	X	150	X	X	36	18
Picture	29	10	X	X	X	10	X	X
Form	X	X	269	305	151	X	X	X

X designates subjects who did not meet criterion.

By inspection of the actual number of trials, it appears that the cued (Treatment 1) and guided (Treatment 4) conditions were somewhat more facilitative and that the picture and color tasks were easier than form.

Hypotheses Tests

The Hodges-Lehman is a non-parametric two-way analysis of variance for blocked data which tests the effects in both directions and the interaction, providing a single

computed value. If significance were found, simultaneous confidence intervals would be used to locate the source of differences among the distributions by pair-comparisons in the mean ranks. Since so few subjects achieved criterion, the chances of finding support for the hypotheses were decreased.

Hypothesis 1

There will be a *Treatment* main effect favoring either the cued or guided treatment over the verbal direction or verbal information treatment.

The difference in the mean ranks between the four groups was not statistically significant (HL=.030, df 3).

Hypothesis 2

There will be a *Task* main effect with picture and form learned more easily than color.

The statistic of .030 was not significant for the difference in mean ranks between the three tasks. Thus the data did not support the hypothesis.

Hypothesis 3

There will not be a *Treatment* by *Task* interaction.

The data supported the hypothesis; however, the failure to find main effects weakens the support of this hypothesis.

Findings

Means, standard deviations, and ranges for the three tasks are displayed in Table 4. These block means were

TABLE 4

MEANS, STANDARD DEVIATIONS, AND RANGES FOR TRIALS TO CRITERION BY TASKS

TASK	$\bar{X}$	SD	Range
Color	275.5	165.8	18-400
Picture	256.1	185.8	10-400
Form	340.6	86.6	151-400

used to align the data prior to assigning ranks for computation of the Hodges-Lehman test. Eight subjects are represented in each block. Three subjects achieved criterion in each block, so the mean includes five students at the arbitrary ceiling of 400 trials.

In Table 5 the ranks of those who met criterion are displayed. Subjects who did not meet criterion in 400

TABLE 5

RANKS OF THOSE WHO MET CRITERION

TASKS	TREATMENTS 1	2	3	4
Color	---[a]	---	---	5
	---	6	---	3
Picture	4	---	---	---
	1.5	---	1.5	---
Form	---	8	7	---
	---	9	---	---
$\bar{X}$	12.25	12.33	12.75	12.67

[a]Those who did not meet criterion have a tied rank of 17.

trials had a tied rank of 17. Because the absolute value of number of trials required to achieve eight correct responses out of ten trials had the arbitrary ceiling, the data were analyzed by ranks.

It will be recalled that inattention was defined as the failure of a subject to visually attend to the materials during the demonstration of correct placement in each trial. The tally of occurrences of inattention apparently was too inexact to record the behavior it was intended to measure. Totals ranged from zero to 122 out of a maximum of 400, if the subject were inattentive for every trial. Passive inattention, such as glassy-eyed staring, was not recordable on this measure. In addition, it was the observation of the writer that there were other points during the entire sequence of a trial in which visual attending was crucial for successful task completion. Not only was it important that the subject observe the demonstration, but also that he look at the materials to make his choice and place the cube. Some of the subjects were particularly prone to maintain eye contact with the trainer rather than to attend to the materials during this choice phase. For students in the cued and guided conditions, inattention during the correctional phase would, in effect, negate the treatment condition. Therefore, these data were not meaningful and were not included.

Fewer than half of the subjects achieved criterion and these were relatively evenly distributed across treatments, accounting for the non-significant results. In an

effort to better understand why the findings were inconclusive and to identify trends, the data were scrutinized for commonalities among subjects.

In Table 6 it can be observed that the majority of subjects who did not meet criterion did not improve their performance across the ten training sessions. Only Subject 15 showed such a trend. In fact, many declined in their percentage of correct responses from the first to the tenth session, although only one subject did not perform better than screening at any time. These data are more fully presented in Appendix C.

Since there was a lot of variation in a subject's performance both within and across training sessions, the highest percentage in a given session was selected as the best effort and is displayed in Table 6. The procedure of utilizing the highest percentage of correct responses was consistent with the identification of those who achieved criterion. What is evident is the lack of consistency in performance across sessions. For many subjects, marked variation occurred within training sessions as well. In effect, achieving criterion was not necessarily synonymous with mastery of the task. If the performance of the 15 subjects who did not meet criterion is indicative, then the arbitrary nature of the criterion is apparent.

There may be a point where maximum benefit occurs. Fourteen of the twenty-four subjects doubled the percentage of correct responses during the first training session over the percentage attained in screening. Another four subjects

TABLE 6

HIGHEST PERCENTAGE ACHIEVED PER SESSION

	Session										
	Pre*	1	2	3	4	5	6	7	8	9	10
Subject											
Day Center											
1	30	60	50	60	60	30	20	30	30	40	40
2	25	70	40	30	30	40	40	40	40	30	30
3	25	80	--	--	--	--	--	--	--	--	--
5	20	20	40	10	20	40	40	30	20	20	20
6	30	30	20	10	10	10	30	30	20	0	10
7	15	50	50	60	50	60	40	40	70	40	40
9	25	60	40	40	30	30	30	40	30	30	30
10	25	70	50	50	30	20	30	30	20	20	30
12	20	40	40	10	20	40	10	20	80	--	--
13	25	30	40	40	50	40	50	60	50	40	40
14	25	40	50	30	30	30	30	30	40	20	40
15	20	30	30	30	30	20	30	30	40	60	60
17	25	50	50	50	80	--	--	--	--	--	--
19	30	80	--	--	--	--	--	--	--	--	--
21	25	40	50	20	30	30	30	40	40	40	50
23	25	40	50	20	30	30	30	40	40	40	50
Institution											
4	25	90	--	--	--	--	--	--	--	--	--
8	25	40	30	60	80	--	--	--	--	--	--
11	30	60	70	70	60	70	70	90	--	--	--
16	25	90	--	--	--	--	--	--	--	--	--
18	25	40	30	50	40	40	40	40	40	30	30
20	25	90	--	--	--	--	--	--	--	--	--
22	20	30	40	40	30	10	20	20	30	30	20
24	20	30	10	30	30	40	50	40	20	20	40

*Percentage correct on the training task during screening.

did so in the second training session. For thirteen of these eighteen subjects, the highest percentage achieved across trials occurred in the first or second training session. There did not appear to be any pattern relating to treatment or to task.

The distribution of the subjects' ages by treatment is shown in Table 7. Essentially the distribution was

TABLE 7

DISTRIBUTION OF AGES BY TREATMENT

Treatment	Chronological Age																	
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	2	1*												1		1		1*
2	1*	1	1	1*		1*				1								
3	1	1							1*	1*	1					1		
4			1*						1*	1	1				1		1	

*Those who achieved criterion.

bimodal with ten subjects younger than twelve years and thirteen subjects older than sixteen years. Those achieving criterion were dispersed across the age range (8-4 to 25). Age did not appear to be a relevant variable.

A much higher percentage of institutional residents met criterion than did subjects from day training settings,

as can be seen in Table 8. Subjects were not stratified by residence prior to assignment to treatment groups.

TABLE 8

PERCENTAGE OF THOSE WHO MET CRITERION BY RESIDENCE

RESIDENCE	TREATMENTS 1	2	3	4	%
Day Training	1/5	1/4	1/4	1/3	.25
Institution	1/1	2/2	1/2	1/3	.62

Of interest is the fact that three of the five institutional residents who met criterion did so within the first forty trials. Overall the individuals in the institution tended to have considerably less educational experience relative to their ages.

Discussion

There is no obvious conclusion to be drawn from these data, since so few students achieved criterion and those who did were rather equally distributed across treatments. These data do not permit conclusions in either direction, pro or con, with regard to the effects of the four training procedures. We are not in the position of saying that any treatment facilitated learning, nor can we conclude that it does not make a difference what method of instructional presentation is used with an SMI population. For those students who did achieve criterion, it appeared by simple

inspection of the number of trials that cued and guided conditions took fewer trials and that color and picture were easier than form.

While we do not have data to fully answer the questions which this study sought to answer, there are a number of issues which warrant discussion. If this study is any indication, experimental research with SMI subjects is fraught with problems. Clearly those students who are being programmed as SMI are not homogeneous with regard to learning. Numerous factors impinge on a placement decision such as behavioral problems, attending difficulties, lack of other appropriate program, etc. In an attempt to understand the findings, several possibilities were considered. We began by looking for commonalities among those who achieved criterion. The discussion which follows will touch on these topics: subjects, position preference, visual attending, age, residence, and mediation.

Subjects

One of the initial difficulties experienced in this study was finding subjects within the specified parameters and at an appropriate functional skill level (i.e., had a concept of matching identical objects, but could not yet match forms at a representational level). It will be recalled that the three match-to-sample tasks from the Leiter Scale were at the Year II and Year III levels. With normal children attainment of these tasks would be expected

to occur over the developmental span of about twelve months. In the case of this population of SMI individuals, who by definition have developmental disabilities primarily in the cognitive domain, this developmental span should logically be longer; however, the segment appeared to be much narrower for these subjects. Essentially, we encountered an all or none phenomenon. Those students who could consistently match at the object level could perform the three matching tasks utilized in this research and were screened out. By and large, the subjects who were screened in did not perform above chance on any of the tasks. It would appear, based on this sample, that the developmental sequence for matching may not hold for SMI individuals. In the planning stages, consideration was given to adding tasks such as matching of number quantities (using those described by Filler and Bricker, 1976). In field testing of these materials with students in an SMI setting, it was obvious that the matching of number quantities was a giant leap cognitively from the identical matching of color, picture, or form. Matching of number quantities required counting and was not simply a direct matching, although it could conceivably be achieved by configuration. The net effect of tapping a narrow segment of the population seemed to be a bimodal distribution of subjects: younger individuals who might be at a readiness stage for a concept of matching identities and older individuals who for some reason have not attained the concept. Those in the middle were screened out because they were able to do the three

match-to-sample tasks. Possibly the older subjects were an artifact of amount of educational experience or the fairly recent shift in programmatic focus for these students. This characteristic was not unique to the subjects used in this study; the observation held for those students who were screened out as well as for those who met the criterion for inclusion in all of the centers. It is not clear why finding subjects was so difficult.

Position Preference

The reader will recall that during the screening of subjects and the pilot study, a position preference was exhibited by the majority of students who were potential subjects. A student was considered to have a position preference if he failed to choose all four locations with equal frequency, 25 percent of the time. The choice of any one position 40 percent or more of the time or a combination of the two positions 65 percent of the time during any single training session (forty trials) was defined as a position preference in the present study. All subjects demonstrated a position preference on the tasks during screening. The preferred position was not the same location across training sessions for most students, but a position preference held within a single training session. With the exception of a brief notation in Bricker and Bricker (1971) that position preferences are a frequent problem with low functioning individuals, there was no

indication in the literature to suggest a problem of the magnitude encountered here.

Based on the experience in the pilot study and the dearth of literature on this stereotypic responding, the decision was made to proceed with the study, even though it was unlikely that the questions could be fully answered. It seemed reasonable to assume that a position preference would not be altered without some type of intervention or correctional procedure; consequently, Treatment 1 was modified from a demonstration only condition to a visual cueing roughly analogous to the physical guidance in Treatment 4, but without touching the student. Interestingly, many of the subjects could match three or even four identical objects, a task with which they were familiar; so it would not appear that a position preference is something that students have been taught. Rather, when confronted with the unfamiliar materials utilized in this study, they failed to make any discriminations. What appeared to be occurring was an inflexibility in approaching a new task. It makes one wonder about the students who were screened out because they could do the tasks. Even given that instruction in the school setting has the potential for a more task analytic approach than was possible within the confines of this study, one wonders how students who could do match-to-sample tasks learned to do so, especially in view of the fact that most of the subjects did not show improved performance over time.

Might there have been some selective factor that related to developmental phase, educational experience, rigidity in thinking, learning style, or some other variable? Obviously, some gaps exist in our ability to assess where these students are in terms of readiness for acquiring a new skill or concept. There are more bits of information that are not known than are known about SMI individuals. The major checkpoints from normal development give a framework, but the steps in between have not all been charted. Perhaps a position preference is a developmental phase that a student goes through which is prerequisite to being able to respond to a four-choice array in a manner similar to that of an infant holding objects in both hands before being able to transfer hand to hand. Might those who were screened out differ from the subjects in their style of learning or their approach to problem solving? Zigler (1973) identified two contrasting learning styles, one characterized by reliance on concrete situational cues (outer-directedness) and the other characterized by active attempts to deal with abstract relations among elements (inner-directedness). He postulated that the high incidence of failure experienced by retarded individuals generates a sensitivity to external cues. Rosenberg (1968, p. 22) defines learning style as "an individual's characteristic pattern of behavior when confronted with a problem." Of the four styles he identified, the "rigid-inhibited" approach in which the individual is closed to both external and internal sources of information may have

applicability to this group of subjects. He sees this learner as not developed beyond the concrete level of managing information in a problem solving situation. Perhaps for the subjects who did not meet criterion, the representational level of pictured materials was too complex. Other factors which might have impinged are such things as amount of educational experience, flexibility in accepting changes in routines, or adaptability in working with an unfamiliar adult. It will be recalled that potential subjects in eight educational programs were screened for possible inclusion. It was the writer's impression that students in two of these programs were less perturbed by the process and seemed to relate more easily. These two centers are in close proximity to teacher training programs which use them extensively for field placement, practicum, and student teachers. One possibility is that students in these centers tend to take such changes in stride. The opposite extreme was evident with institutional residents, many of whom exhibited resistant behavior such as balking at leaving their classrooms or refusing to cooperate in the screening.

Visual Attending

Fundamental to any type of learning is attending. Klausmeier (1974, p. 29) defines attending as "orienting one's sensory organs so that external stimuli may be received." His model postulates that attending along with discriminating and remembering are involved in motor as

well as perceptual experiencing. For an individual to be able to discriminate between several stimuli, he must attend to the features of an object or picture which differentiate it from others. The distinctive features to which one attends vary as a function of age. In the case of low functioning individuals, the literature suggests that inattention may be a factor. In visual discrimination learning, Zeaman and House (1963) postulated that the retarded subject does not focus on the relevant dimensions of a stimulus display. Further, Routh (1973) cites Drotar's work, which found that retardates may be deficient in their ability to disengage or withdraw their attention from irrelevant stimuli. We do not have data to bring to bear on this issue. Those students who obviously did not focus their attention on the materials during screening were excluded from the study, since the design did not include the shaping of visual attending. As presented in the findings section, the inattention measure which was kept on the subjects did not differentiate in any meaningful way. The experience of those who instruct SMI individuals is that visual inattention is a significant impedence in the learning process. This issue needs to be studied systematically.

Age

Age did not appear to be a relevant variable for those subjects who met criterion. Of interest is the fact that the age distribution was bimodal (see Tables 1 and 7) and

those of ages twelve to sixteen were minimally represented in this study. One possible explanation would be that as students receive appropriate programming at younger ages, it is conceivable that the potential for skill acquisition is increased. Perhaps age, as such, is not so much the factor as is experience, specific training, or some other variable.

Residence

In Table 8 the higher percentage of institutional residents who achieved criterion was displayed. These individuals had been in a structured educational setting for one year prior to the time the study was conducted. Previously, programming was done on the ward in the institution and focused primarily on self-care skills. That these students were screened in may have related to a lack of experience in test taking. Once the task was demonstrated during training, then the student understood what was expected. In effect, two of these subjects achieved criterion under demonstration only, since ten trials were all that were necessary. In the case of day training, for the most part these students have been in structured programs for a longer period of time, even though the focus has shifted in the past few years. Another way of looking at this phenomenon is to consider that under Zigler's (1973) hypothesis the critical variable in retardate learning is failure experiences; one would expect the

non-institutionalized to have the greatest sensitivity to external cues.

Mediation

Operationally both attending and short term memory require similar behaviors on the part of the learner. In a further attempt to understand these results, in terms of possible strategies which could be used for successful performance, the ways in which a student might complete the tasks were considered. It will be recalled that in all of the instructional conditions each trial was demonstrated for the subjects. Three possible ways that a student might complete the task were identified. First, he could scan the choices and make the appropriate visual discrimination. Second, it is possible that he could form an image of the spatial array as a whole and remember the location of the placement which was demonstrated. Third, he could represent the object internally, either verbally or non-verbally, and recognize its match.

The viewpoint of verbal mediation theorists suggests that labeling responses are necessary; therefore, the young child and the retarded individual are limited to non-mediated stimulus control. It is not clear to what extent a student's language development may have been related to successful task completion in this study. No assessment was made of the language development of the subjects, since it was not deemed necessary for task performance; however, it may have been a facilitative

factor. As an after the fact observation, five of the subjects who met criterion had some appropriate speech. Of particular interest is the fact that three of the five were in the verbal direction condition. As was shown in Table 3, those subjects achieved criterion in 150 to 305 trials. The issue of language development may be particularly relevant as it relates to verbal mediation and memory strategies.

In the case of preverbal children, the mediation may not be verbal but perceptual. Piaget has demonstrated that cognitive activity occurs during the sensorimotor period prior to the advent of speech. A strong case against the equivalence of thinking and verbalization has been advanced by Furth (1966) using the example of the deaf. Probably the developmentally earliest means by which information is represented is through imagery. It seems clear that images are not verbal, but do have functional characteristics. In a study with children ages three and one-half to seven, Corsini (1969) found that memory of younger children does not differ from that of older children when the response is nonverbal and nonverbal cues are used in retention. He postulated that successful performance of a direction following task was probably achieved through forming a more or less external representation of the spatial array through the use of sensorymotor cues. This interpretation would seem to lend support to the second possible strategy, remembering the location of placement. The conditions used in this experiment do

not provide the basis for resolving this issue; however, future studies might pursue the mediation aspect.

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

Because of the expanded definition of who is to be educated, including the severely handicapped, and the changing emphasis in programming for the severely mentally retarded from care to education, issues of the "what" of curriculum and the "how" of instruction need to be addressed. The major responsibility for educating these individuals rests with classroom teachers, many of whom have been trained to work with higher functioning retardates.

One mode of instructional presentation which has demonstrated results with young normal children and moderately retarded individuals is vicarious learning, derived from Bandura's (1971) social learning theory. The effects of adjunctive verbal coding are equivocal, apparently as a function of the conceptual level of the subjects and the complexity of the tasks.

The purpose of this study was to compare the effects of four training procedures, all involving vicarious learning, on the match-to-sample performance of severely mentally impaired persons. Specifically, this investigation sought to determine whether correctional procedures or verbalization would facilitate the learning of these

students. The basic paradigm for the presentation methods was drawn from studies by Forehand and Yoder (1973, 1974), who explored the effects of modeling and verbal cues on concept acquisition. Research has clearly demonstrated that modeling is superior to verbal description for subjects who lack verbal facility (Rosenthal and Zimmerman, 1972; Rosenthal and Kellogg, 1973). Yoder and Forehand (1974) utilized two levels of verbalization concurrently with modeling: verbal description and verbal concept or rule. The major extension which occurred in the present research was the use of two correctional procedures.

Match-to-sample tasks from the Leiter International Performance Scale have been used by other researchers (Forehand and Yoder, 1973; Filler and Bricker, 1976) with educable retardates. In order to have this study relate to other research, three tasks from the Leiter Scale involving matching of identities were used.

This investigation was designed as an experimental study. Twenty-four students who were in educational programs for SMI were the subjects of this study. Subjects were screened on the three match-to-sample tasks and randomly assigned to one of four treatment groups. All training procedures involved demonstrating the desired response for each trial. Treatments 1 and 4 (cued and guided, respectively) included a correctional phase if the student did not make a correct response. The cued condition utilized the visual cue of positioning the cube directly in front of the appropriate slot and pointing to

the relevant response. The guided condition involved physically manipulating the student to make the correct response. In the verbal direction condition, the trainer verbalized the descriptive phrase, "Put the block here", concurrent with demonstrating the correct placement. In the verbal information condition, the trainer labeled the relevant attribute (e.g., "Put the red with the red") concurrent with demonstrating the correct placement.

Each subject was trained on one match-to-sample task for a maximum of ten sessions (400 trials) or until achieving criterion of eight correct responses out of ten trials. The ten minute training sessions were administered twice a day on five consecutive days. The independent variables were tasks and treatments. Number of trials to criterion was the dependent variable. The data were analyzed by ranks using the Hodges-Lehman two-way analysis of variance for blocked data.

It was the main hypothesis of this study that the correctional procedures would facilitate the performance of SMI students over the verbal conditions. It was further hypothesized that the picture task would be learned more easily than color or form. The results were inconclusive; however, by inspection of the actual number of trials to criterion, it appeared that the cued and guided conditions were somewhat more facilitative. Picture and color tasks appeared to be easier than form. Nine of the twenty-four subjects met criterion, and these were relatively evenly distributed across treatment conditions, accounting for

the non-significant results. These data do not permit conclusions in either direction with regard to the effects of the four instructional methods.

Recommendations

Modification of the Present Study

One possible approach to overcoming some of the problems encountered, specifically the relatively few students who met criterion and the stereotypic responding of position preference, might be to use a training sequence under all conditions which would move the subject through various phases. The idea would be to systematically maximize the probability of a correct match in some way such as by limiting the placement choices available in a manner similar to that used by Filler (1976) as one modification of maternal teaching style. A format of easy-to-hard training sequences like that used by Irwin (1976) in training a discrimination task may be applicable.

Consideration could be given to match-to-sample tasks which might tap a broader range of subjects. It was not clear with subjects who did not meet criterion whether the representational level of the tasks was a relevant factor. A possible approach would be to use concrete objects such as toys, miniatures, or geometric blocks for identical matching at a more concrete level.

In view of the number of problems encountered in this experimental study and the variables which are difficult to control with an SMI population, perhaps a more fruitful

method of study would be a case study approach or longitudinal study in the naturalistic setting.

Additional Research

A number of issues were raised in conducting this study which have implications for future research. Additional research is necessary to explore the following questions and topics presented in the discussion. They are listed here in the order in which the background and issues were discussed.

1. Does verbalization by the instructor facilitate the learning of SMI individuals? Might a silent demonstration be as effective as modeling with concurrent verbal cues? Does verbalization serve to elicit a student's attention for learning?

2. Are there meaningful ways by which SMI students might be grouped which would create more homogeneity in terms of learning?

3. Does the developmental sequence for SMI students approximate that for "normal" children on matching tasks?

4. How did those students who can perform match-to-sample tasks learn to do so?

5. Are there ways to approach a position preference which might encourage an SMI student to use his past experience in approaching new problem-solving situations? To what extent is a position preference related to inability to generalize or transfer prior learning? To what extent is a position preference a developmental phase on the part

of the learner? Might a position preference be a reflection of learning style for some SMI individuals? To what extent does a position preference relate to the representational level of the materials or the functional level of the subjects?

6. Might visual attending be a critical variable in imitative learning? To what extent might auditory processing as an adjunct to visual processing facilitate attending? What is the relationship between attending and various methods of instruction?

7. What is the relationship between a student's language development and methods of instructional presentation?

8. If mediation can be either imagery or verbal, what are the implications for teaching these students?

It would appear that what is known about the learning of trainable and educable retardates does not apply directly to the severely and profoundly mentally retarded. Only further research efforts will allow a clearer delineation of whether various methods of instruction facilitate or impede task performance with this population.

REFERENCES

REFERENCES

Bandura, A. *Social Learning Theory.* N.J.: General Learning Press, 1971.

Bandura, A. Vicarious processes. In L. Berkowitz (Ed.) *Advances in Experimental Social Psychology,* Vol. 2. N.Y.: Academic Press, 1965, pp. 1-55.

Bricker, W. and Bricker, D. Receptive vocabulary as a factor in the discrimination performance of low functioning children. *American J. of Mental Deficiency,* 1971, 75, 599-605.

Choe, K. Effect of instruction on multiple classification skills of young mentally retarded children. Unpublished doctoral dissertation, Columbia University, 1974.

Corsini, D. Developmental changes in the effect of nonverbal cues on retention. *Developmental Psychology,* 1969, 1, 425-435.

Cullinan, D., Kauffman, J., and LaFleur, N. Modeling: Research with implications for special education. *J. of Special Education,* 1975, 9, 209-221.

Filler, J. Modifying maternal teaching style: Effects of task arrangement on the match-to-sample performance of retarded preschool-age children. *American J. of Mental Deficiency,* 1976, 80, 602-612.

Filler, J. and Bricker, W. Teaching styles of mothers and the match-to-sample performance of their retarded preschool-age children. *American J. of Mental Deficiency,* 1976, 80, 504-511.

Fisher, M. and Zeaman, D. An attention-retention theory of retardate discrimination learning. In N. Ellis (Ed.) *International Review of Research in Mental Retardation,* Vol. 6. N.Y.: Academic Press, 1973.

Flanders, J. P. A review of research on imitative behavior. *Psychological Bulletin,* 1968, 69, 316-337.

Forehand, R. and Yoder, P. Acquisition and transfer of conceptual learning by normals and retardates: The effects of modeling, verbal cues, and reinforcement. *Behaviour Research and Therapy*, 1974, 12, 199-204.

Forehand, R. and Yoder, P. The effects of modeling and verbal cues on learning of retardates. *J. of Clinical Psychology*, 1973, 29, 184-186.

Furth, H. *Thinking Without Language*. N.Y.: Free Press, 1966.

Hecht, P. J. Developmental checklist and training guide: Reasoning and problem solving. Unpublished manuscript, Michigan State University, 1975.

Hodges, J. L., Jr., and Lehman, E. Rank methods for combination of independent experiments in analysis of variance. *The Annals of Mathematical Statistics*, 1962, 33, 482-497.

Inhelder, B. *The Diagnosis of Reasoning in the Mentally Retarded*. N.Y.: John Day Co., 1968.

Irwin, L. K. General utility of easy-to-hard discrimination training procedures with the severely retarded. *Education and Training of the Mentally Retarded*, 1976, 11, 247-250.

Kessler, J. W. Contributions of the mentally retarded toward a theory of cognitive development. In J. Hellmuth (Ed.) *Cognitive Studies*, Vol. 1. N.Y.: Brunner-Mazel, 1970, 111-209.

Klausmeier, H., Ghalata, E., and Frayer, D. *Conceptual Learning and Development: A Cognitive View*. N.Y.: Academic Press, 1974.

Landau, B. and Hagen, J. The effect of verbal cues on concept acquisition and retention in normal and educable mentally retarded children. *Child Development*, 1974, 45, 643-650.

Leiter, R. G. *Examiner's Manual for the Leiter International Performance Scale*. Chicago: Stoelting Co., 1969.

Litrownik, A., Franzini, L., and Turner, G. Acquisition of concepts by TMR children as a function of type of modeling, rule generalization, and observer gender. *American J. of Mental Deficiency*, 1976, 80, 620-628.

Luria, A. *The Role of Speech in the Regulation of Normal and Abnormal Behavior.* N.Y.: Liveright Publ., 1961.

Milgram, N. A. Cognition and language in mental retardation: Distinctions and implications. In D. Routh (Ed.) *The Experimental Psychology of Mental Retardation.* Chicago: Aldine, 1973, pp. 157-230.

Rattan, M. The role of language, manipulation, and demonstration in the acquisition, retention, and transfer of conservation. *Alberta J. of Educational Research,* 1974, 20, 217-225.

Roos, P. Severely and profoundly retarded students - past and future. In *Educating the 24-Hour Retarded Child.* National training meeting on education of the severely and profoundly mentally retarded, March 31-April 2, 1975. National Association for Retarded Citizens.

Rosenberg, M. *Diagnostic Teaching.* Seattle: Special Child Publ., 1968.

Rosenthal, T., Alford, G., and Rasp, L. Concept attainment, generalization, and retention through observation and verbal coding. *J. of Experimental Child Psychology,* 1972, 13, 183-194.

Rosenthal, T. and Kellogg, J. Demonstration versus instruction in concept attainment by mental retardates. *Behaviour Research and Therapy,* 1973, 11, 299-302.

Rosenthal, T., Moore, W., Dorfman, H., and Nelson, B. Vicarious acquisition of a simple concept with experimenter as model. *Behaviour Research and Therapy,* 1971, 9, 219-227.

Rosenthal, T. and Zimmerman, B. Modeling by exemplification and instruction in training conservation. *Developmental Psychology,* 1972, 6, 392-401.

Rosenthal, T. and Zimmerman, B. Organization, observation, and guided practice in concept attainment and generalization. *Child Development,* 1973, 44, 606-613.

Routh, D. The experimental study of the retarded child. In D. Routh (Ed.) *The Experimental Psychology of Mental Retardation.* Chicago: Aldine, 1973, pp. 1-17.

Siegel, S. Nonparametric statistics for the behavioral sciences. N.Y.: McGraw Hill, 1956.

Stephens, W. B. The severely and profoundly retarded: Current issues and needs. *Education and Training of the Mentally Retarded,* 1976, 11, 3-4.

Tawney, J., Allen, M., O'Reilly, C., Cobb, P., and Aeschleman, S. Developing curricula for errorless learning: A search for order in an unorderly world. *AAESPH Review,* 1975, 1 (2).

Thompson, R. The severely handicapped: A new horizon. *Exceptional Children,* 1976, 43, 141-142.

Woodward, M. and Hunt, M. Exploratory studies of early cognitive development. *British J. of Educational Psychology,* 1972, 42, 248-259.

Yoder, P. and Forehand, R. Effects of modeling and verbal cues upon concept acquisition of nonretarded and retarded children. *American J. of Mental Deficiency,* 1974, 78, 566-570.

Zeaman, D. One programmatic approach to retardation. In D. Routh (Ed.) *The Experimental Psychology of Mental Retardation.* Chicago: Aldine Publ., 1973, pp. 78-132.

Zeaman, D. and House, B. The role of attention in retardate discrimination learning. In N. Ellis (Ed.) *Handbook of Mental Deficiency.* N.Y.: McGraw Hill, 1963, pp. 159-223.

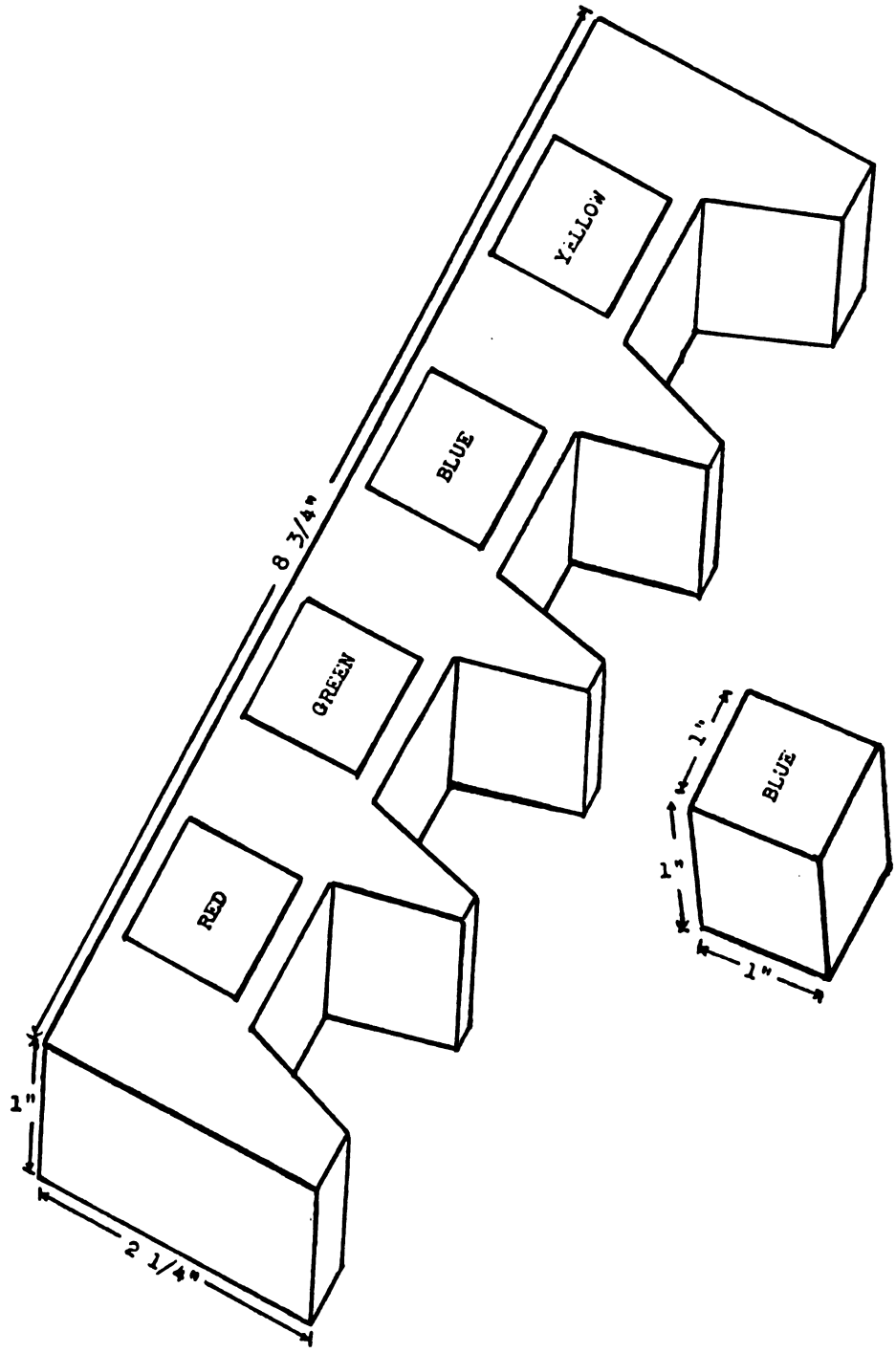
Zigler, E. The retarded child as a whole person. In D. Routh (Ed.) *The Experimental Psychology of Mental Retardation.* Chicago: Aldine Publ., 1973, pp. 231-322.

Zimmerman, B. and Rosenthal, T. Observational learning of rule-governed behavior by children. *Psychological Bulletin,* 1974, 81, 29-42.

APPENDICES

APPENDIX A

SCHEMATIC DRAWING OF MATERIALS



APPENDIX B

FORMS FOR SCREENING AND TRAINING

Preliminary Trials

Student_____

Birthdate_____

Center_____

R & PS Goals:

Location-no match 1	2	3	4	Color Task				#
				R G B Y	G Y R B	R B Y G	Y G R B	16
				Picture Task				
				E D C W	C W D E	C D E W	W E D C	16
				Form Task				
				★ + □ ○	+ ○ ★ □	★ □ ○ +	○ + ★ □	16

Student_____ Center_____

Task_____ Treatment_____

Training Session #_____ Order_____ to_____

Location: no match 1	2	3	4	Location demonstrated			
				2 3 4 1	2 1 3 4	1 2 4 3	4 2 3 1
				4 3 1 2	1 4 3 2	2 1 4 3	3 4 1 2
				2 3 4 1	2 1 4 3		40 Trials

Student_____ Center_____

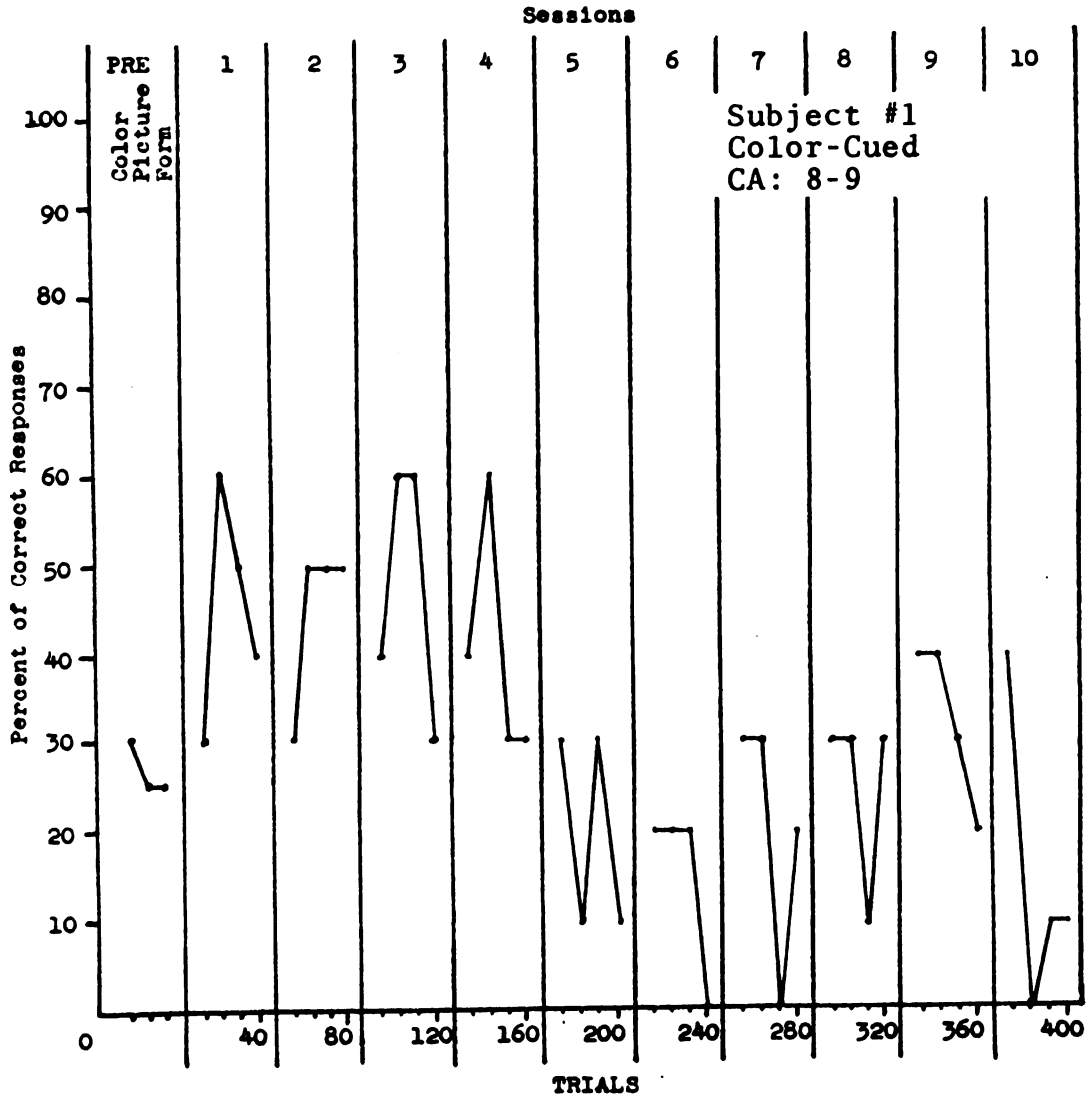
Task_____ Treatment_____

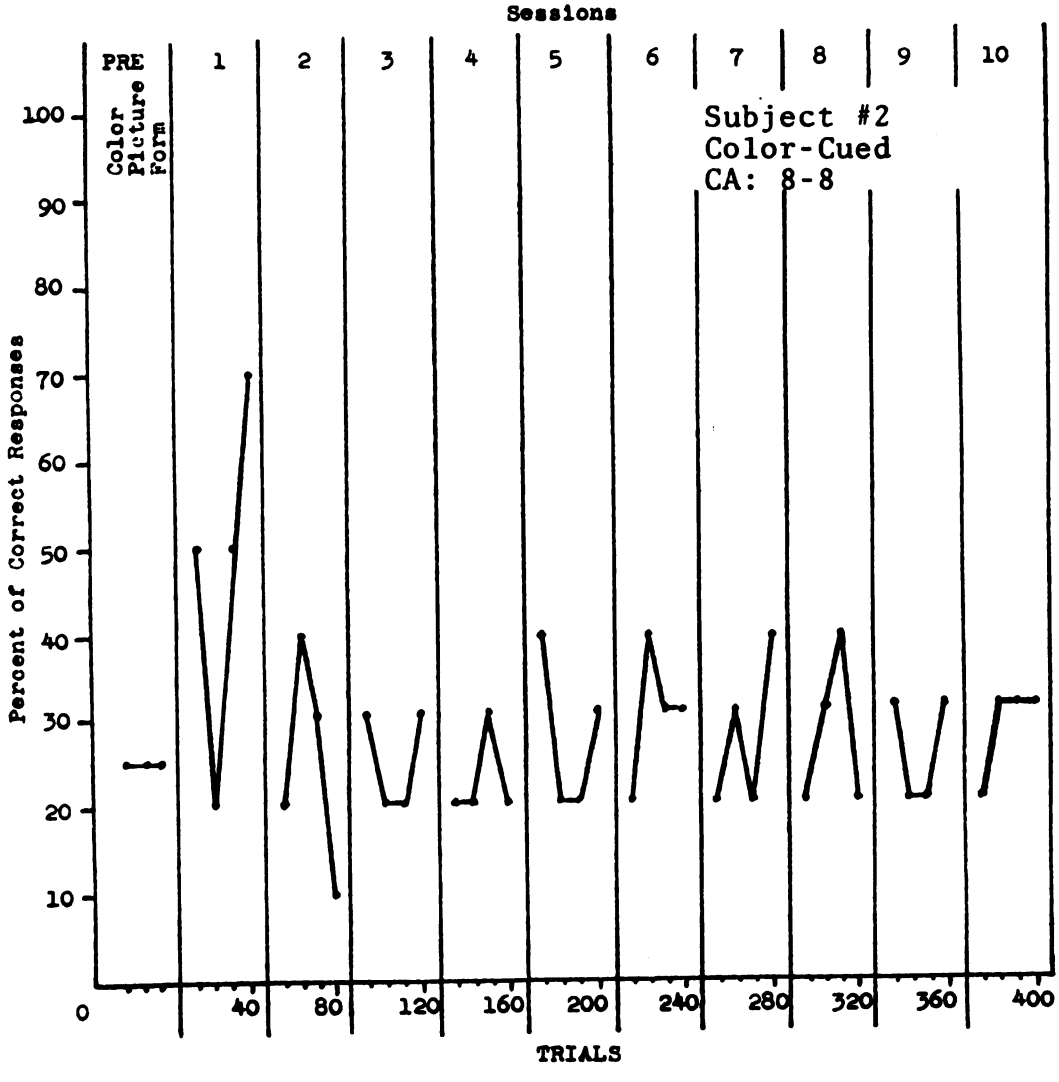
Training Session #_____ Order_____ to_____

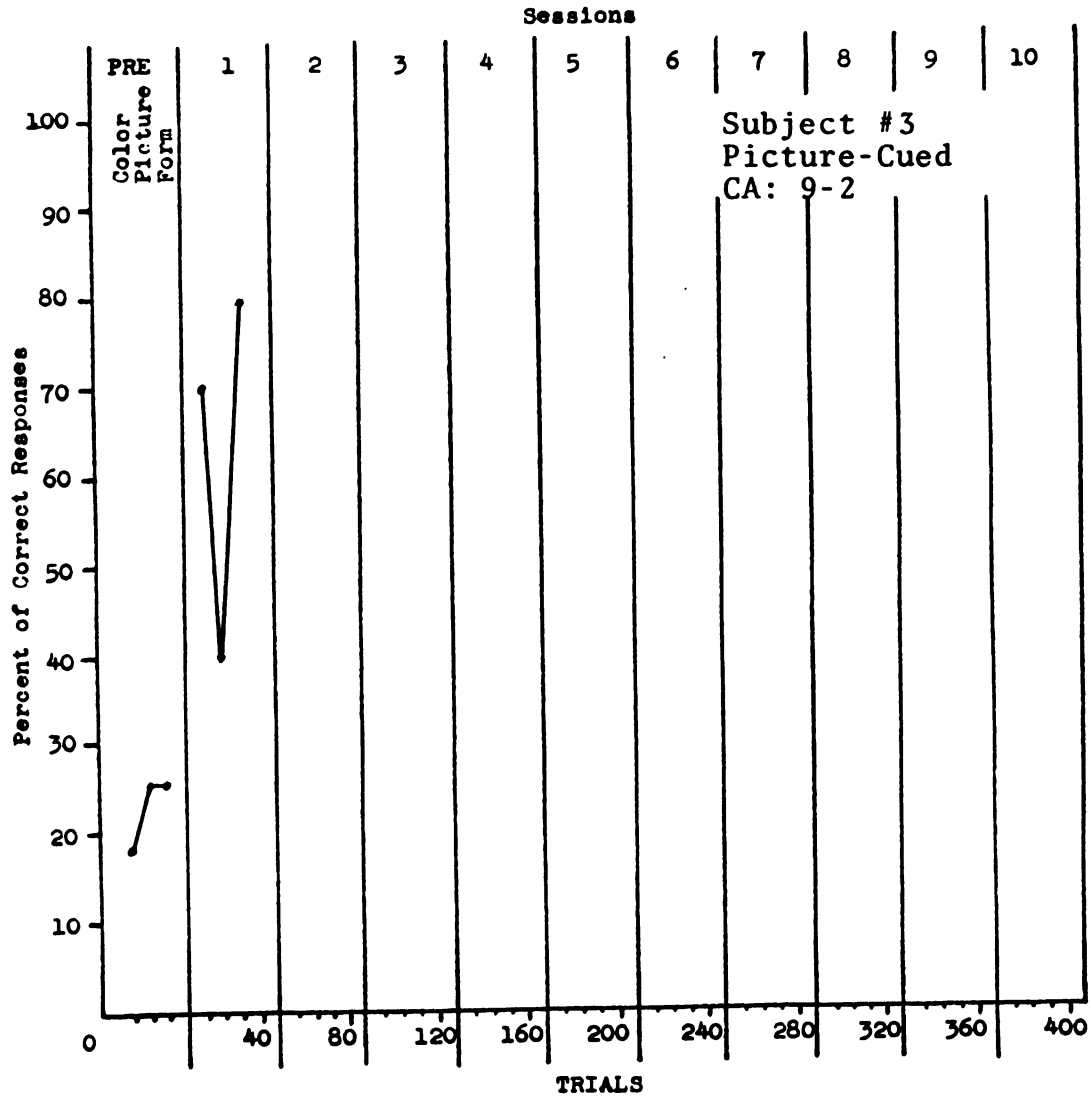
Location: no match 1	2	3	4	Location demonstrated			
				2 3 1 4	1 4 3 2	4 1 2 3	2 3 1 4
				2 1 4 3	1 2 3 4	3 2 1 4	2 4 1 3
				3 2 1 4	4 2 1 3		40 Trials

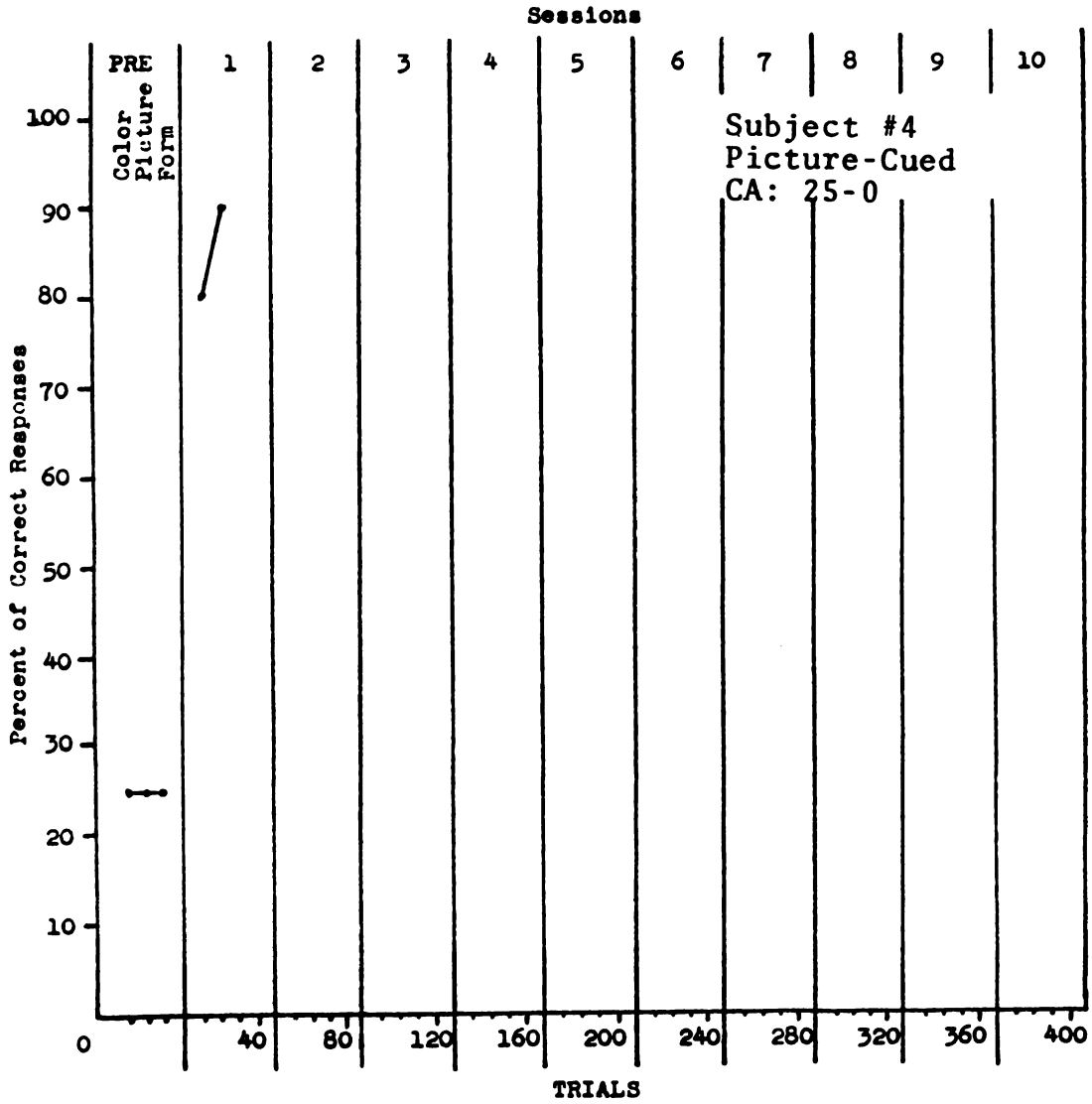
APPENDIX C

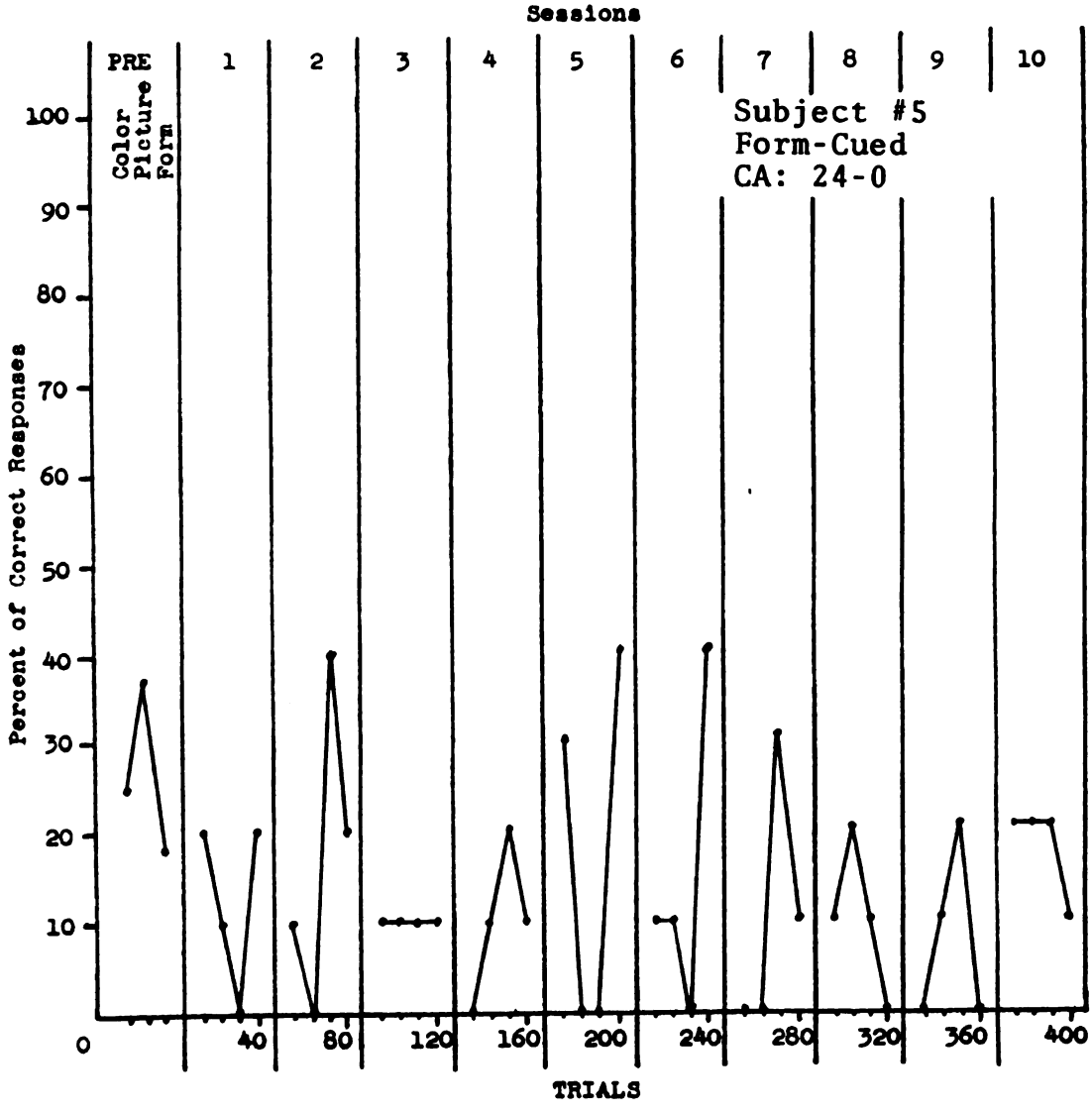
GRAPHS OF INDIVIDUAL STUDENT'S PERFORMANCE

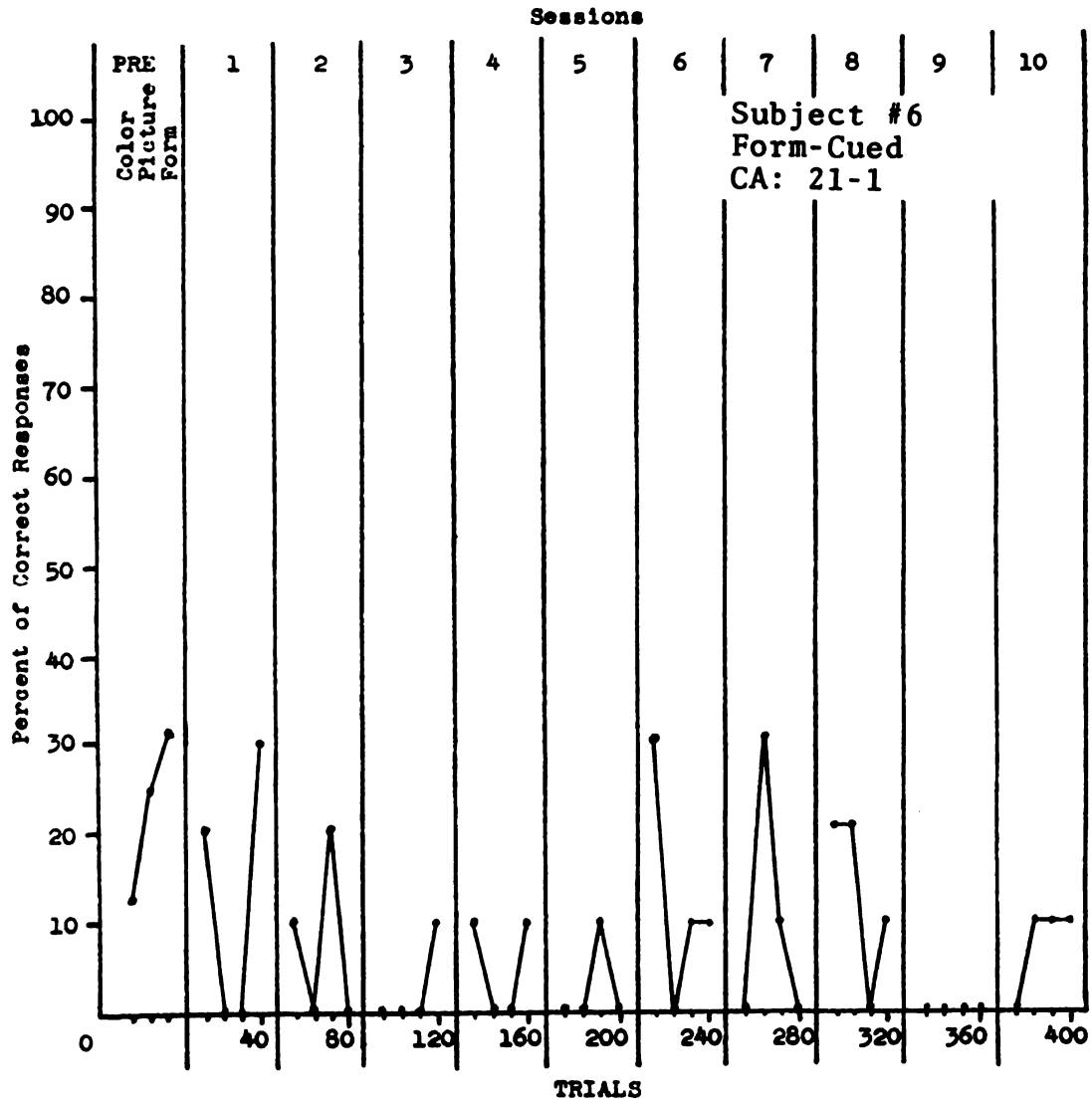

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #1
Color-Cued
CA: 8-9
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

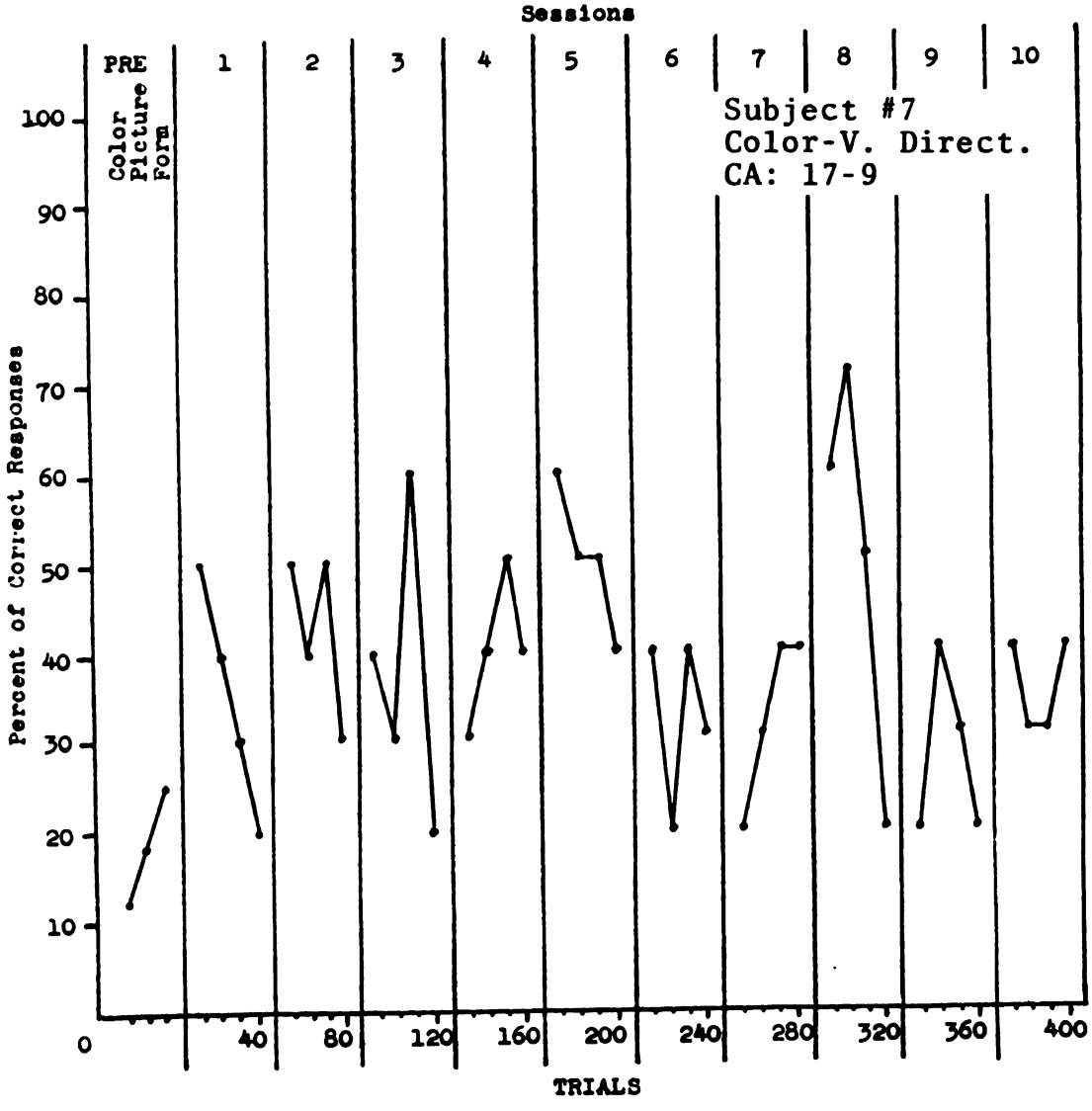

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #2
Color-Cued
CA: 8-8
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

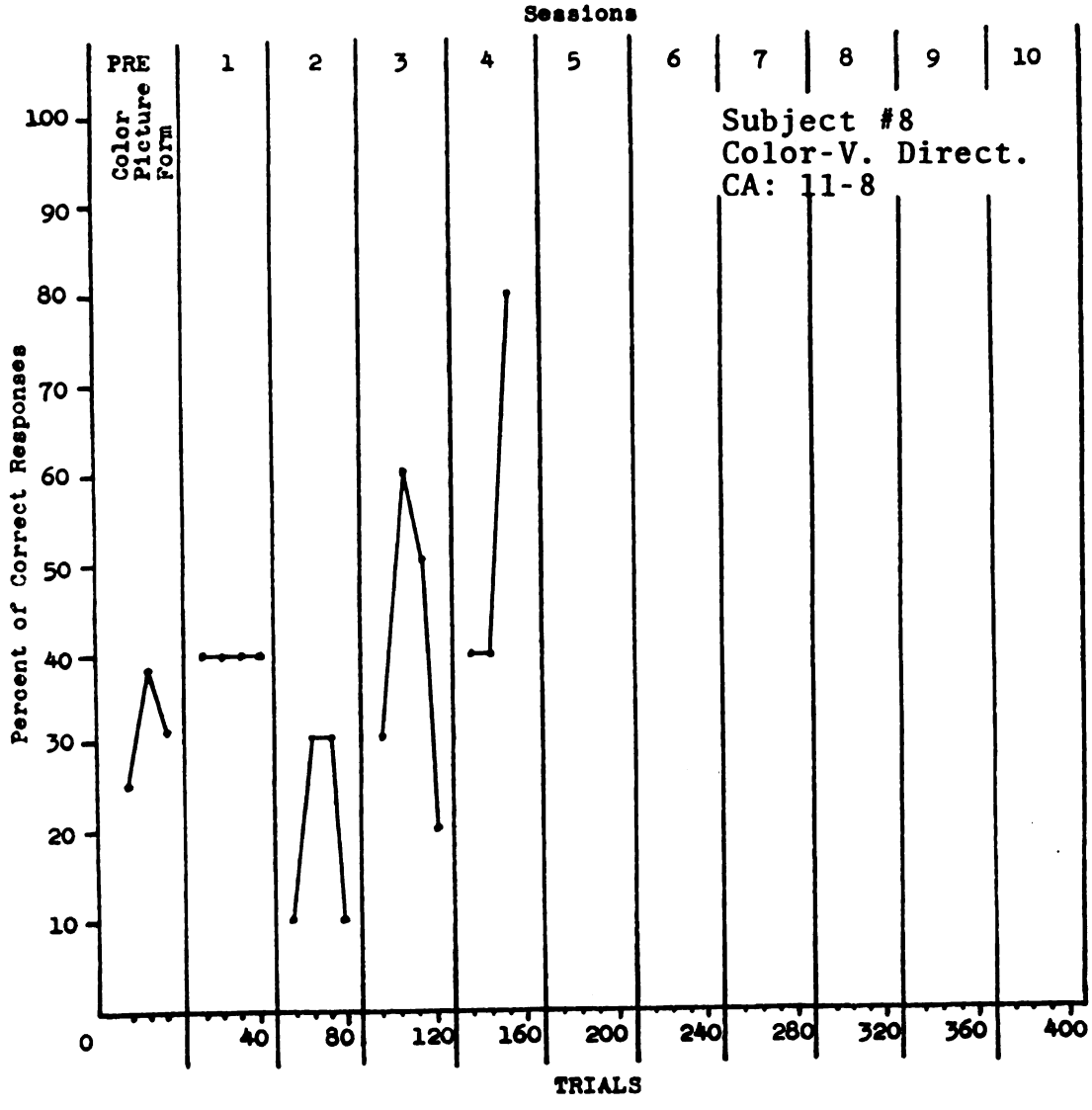

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #3
Picture-Cued
CA: 9-2
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

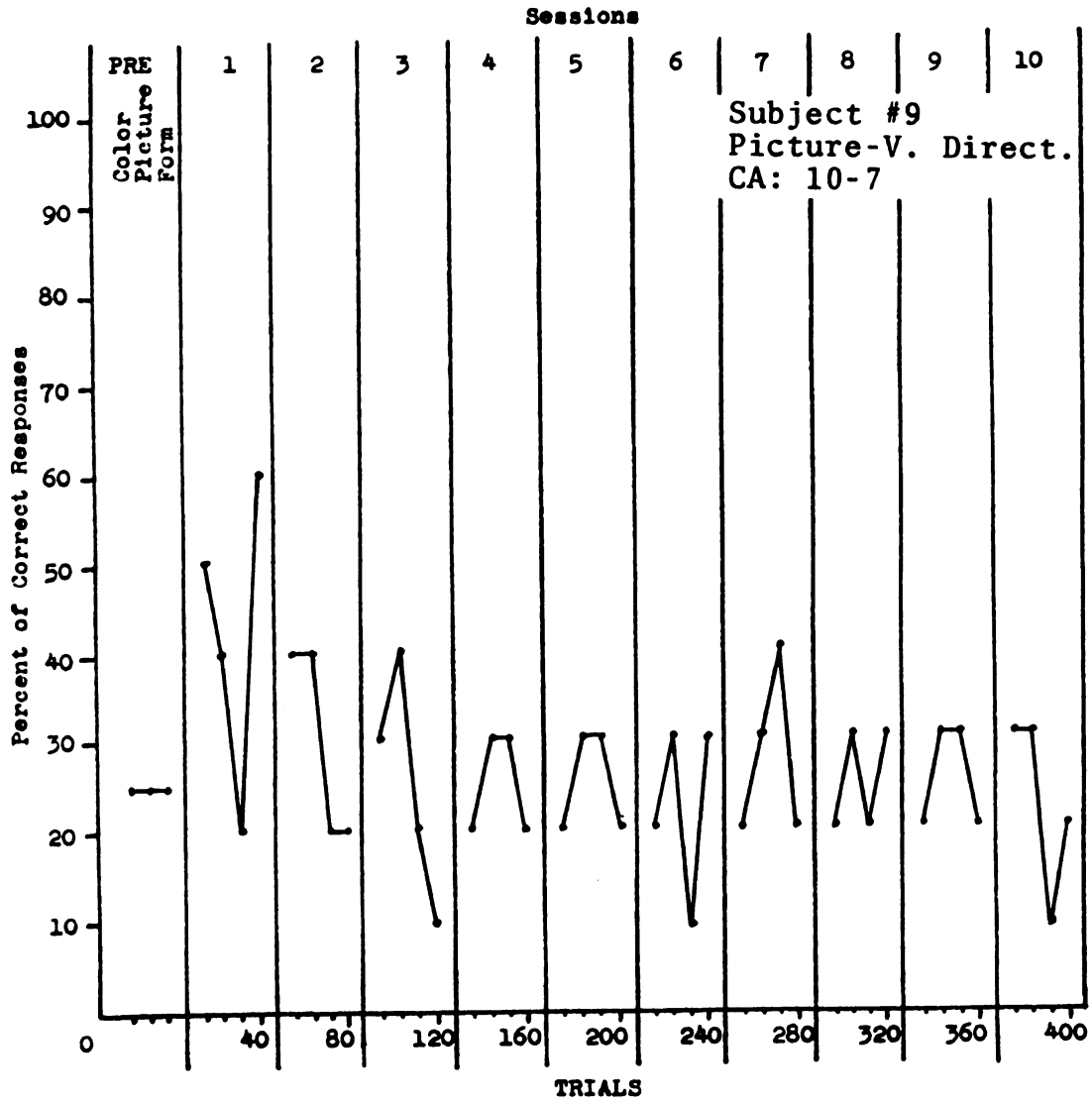

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #4
Picture-Cued
CA: 25-0
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

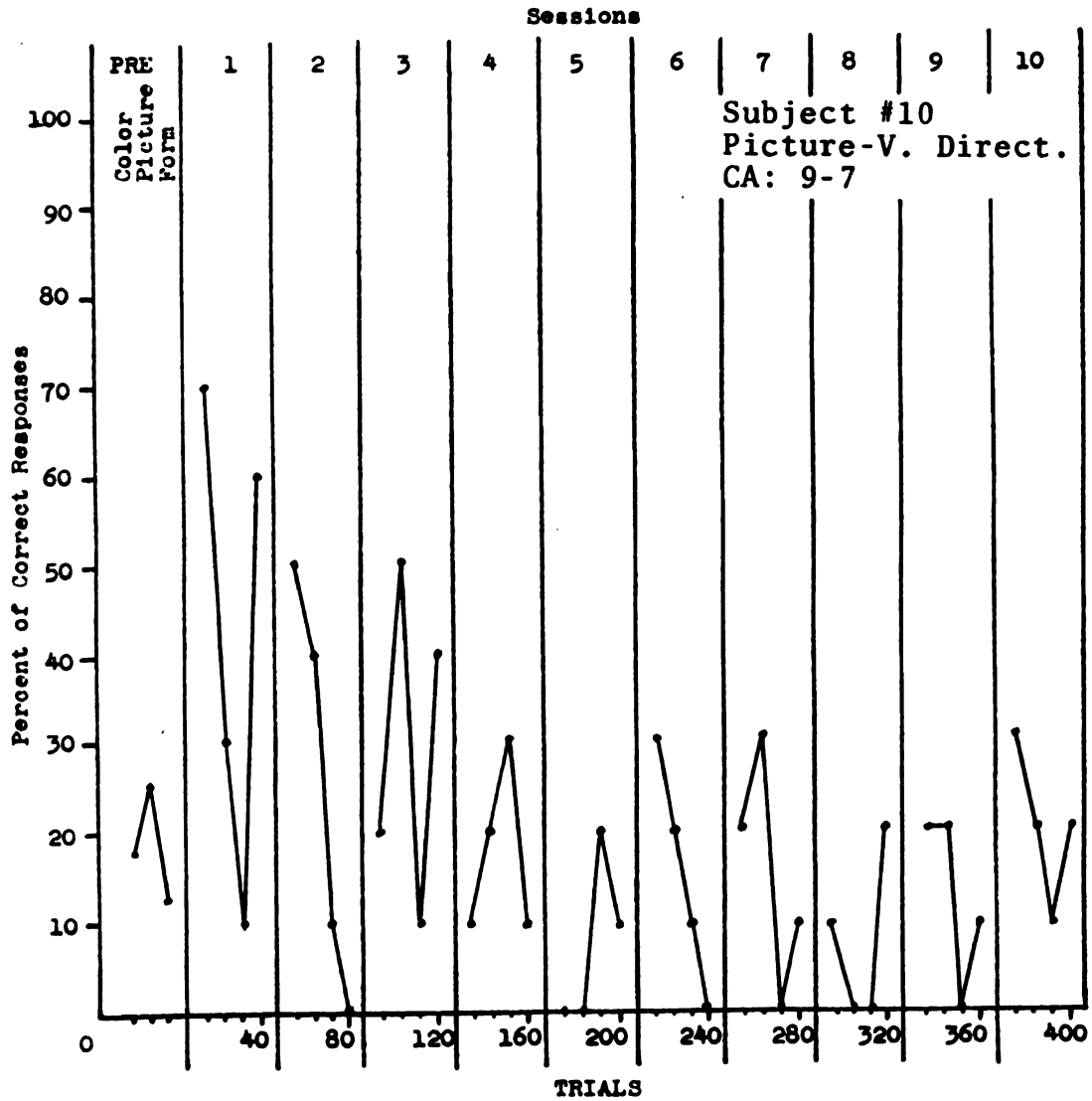

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #5
Form-Cued
CA: 24-0
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

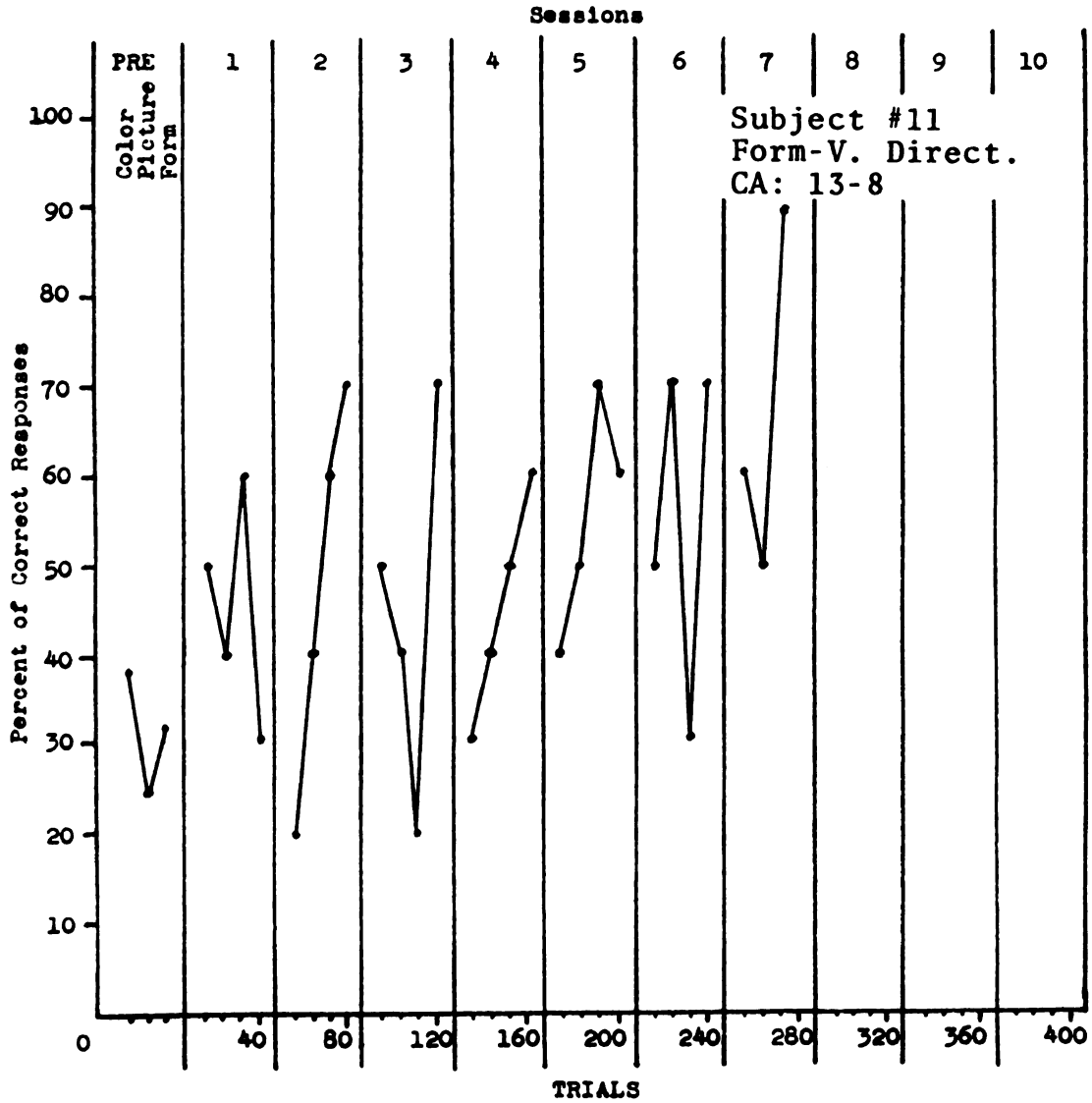

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #6
Form-Cued
CA: 21-1
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

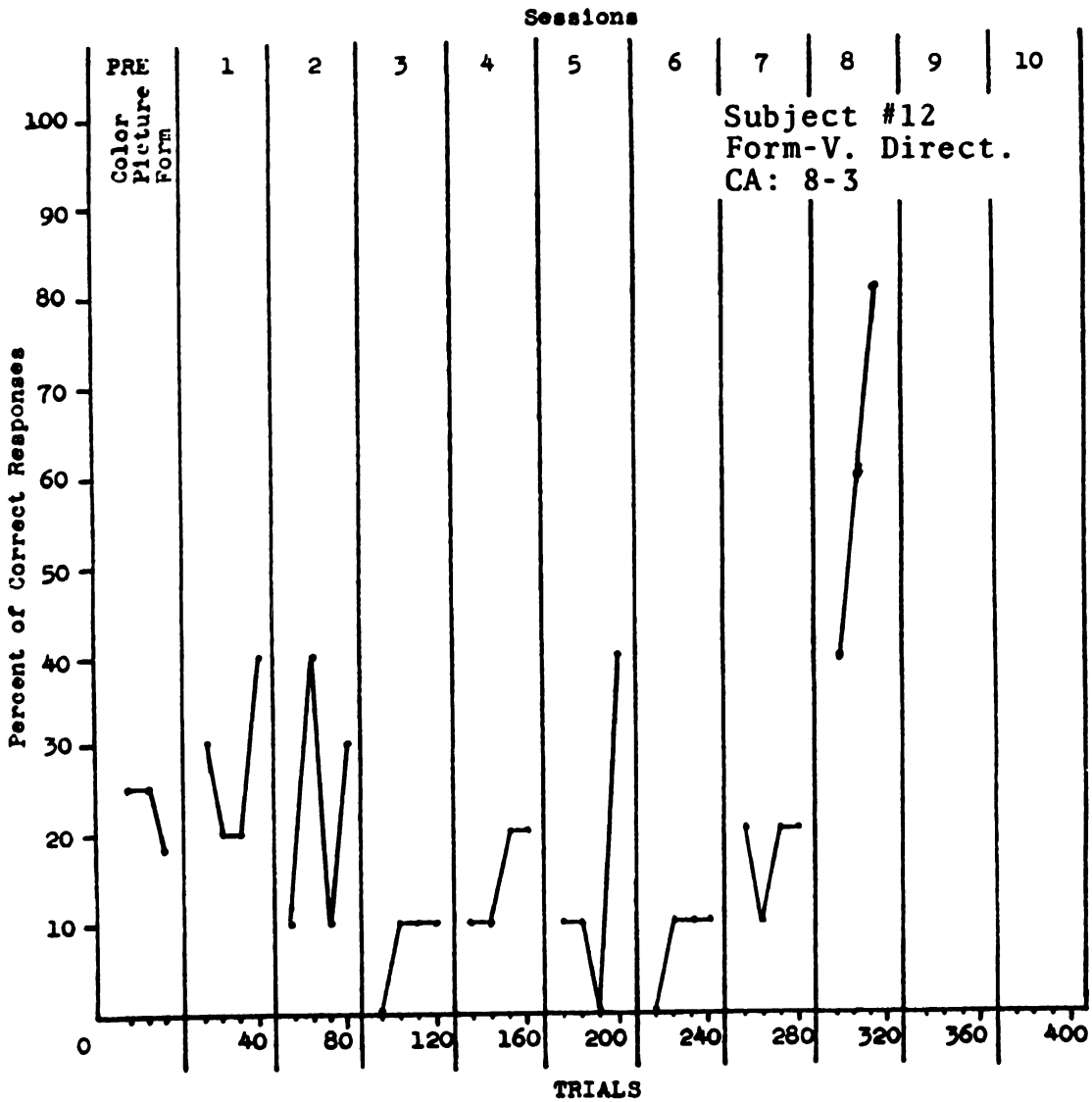

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #7
Color-V. Direct.
CA: 17-9
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

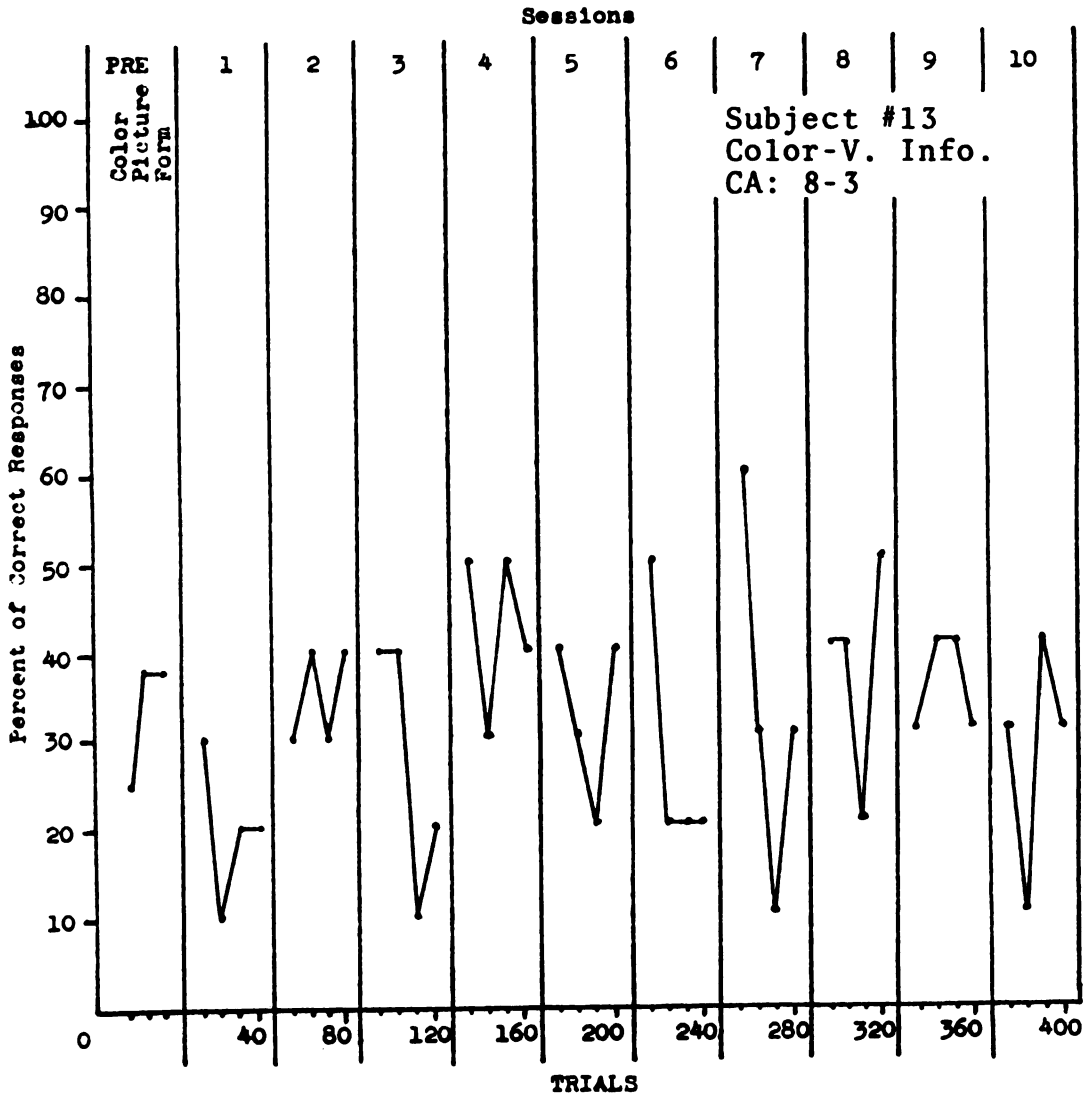

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #8
Color-V. Direct.
CA: 11-8
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

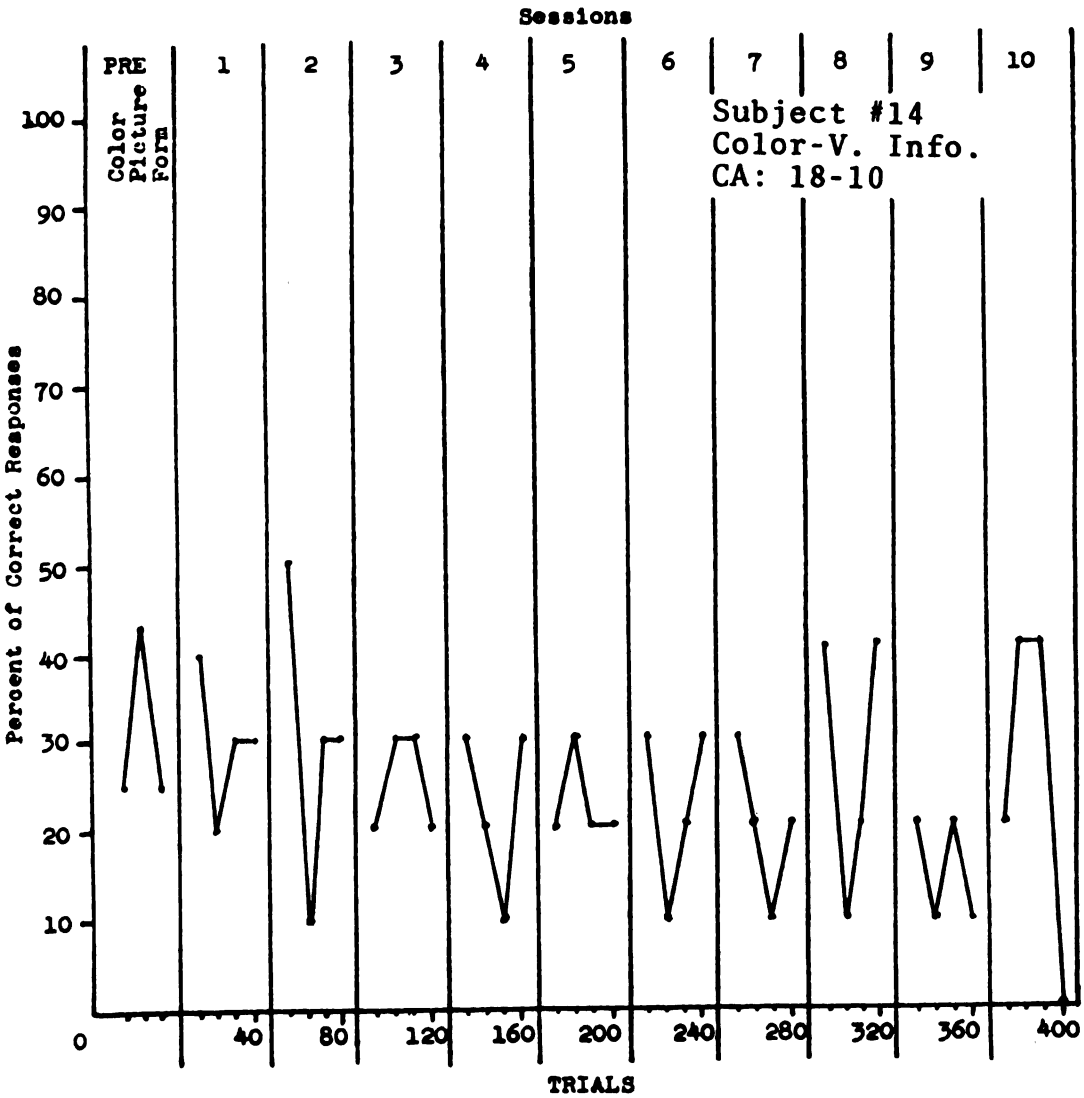

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #9
Picture-V. Direct.
CA: 10-7
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

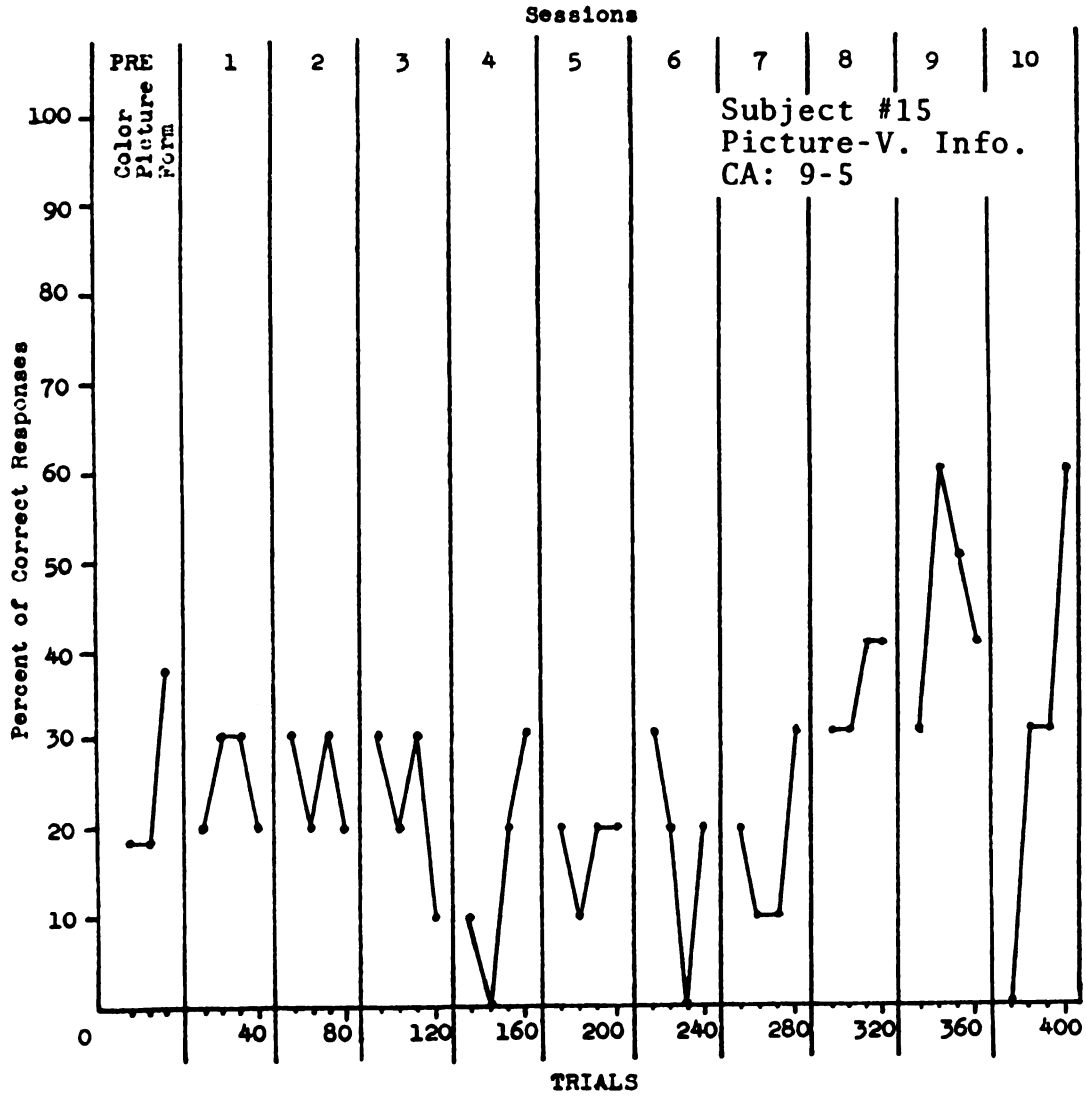

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #10
Picture-V. Direct.
CA: 9-7
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

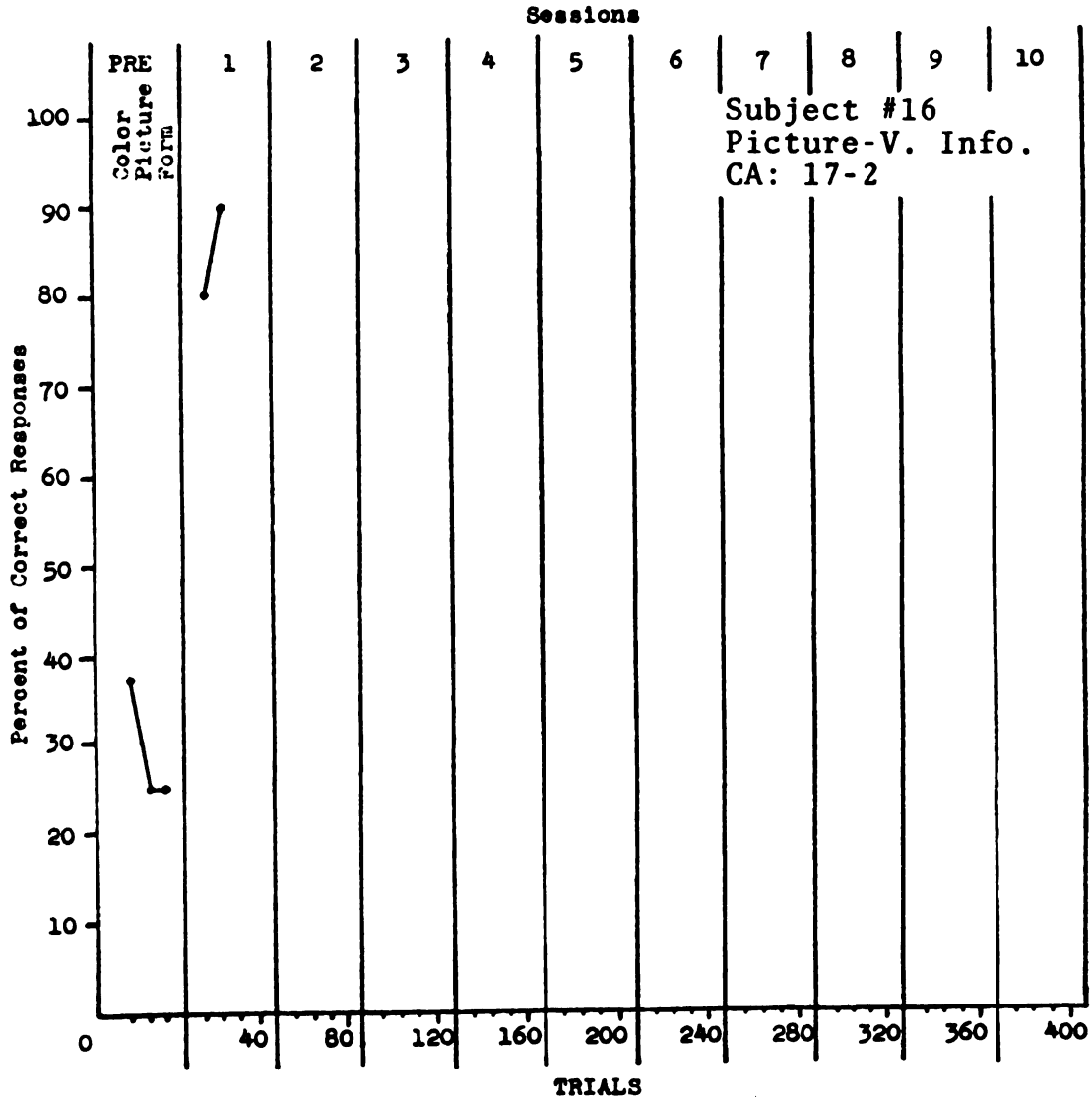

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #11
Form-V. Direct.
CA: 13-8
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

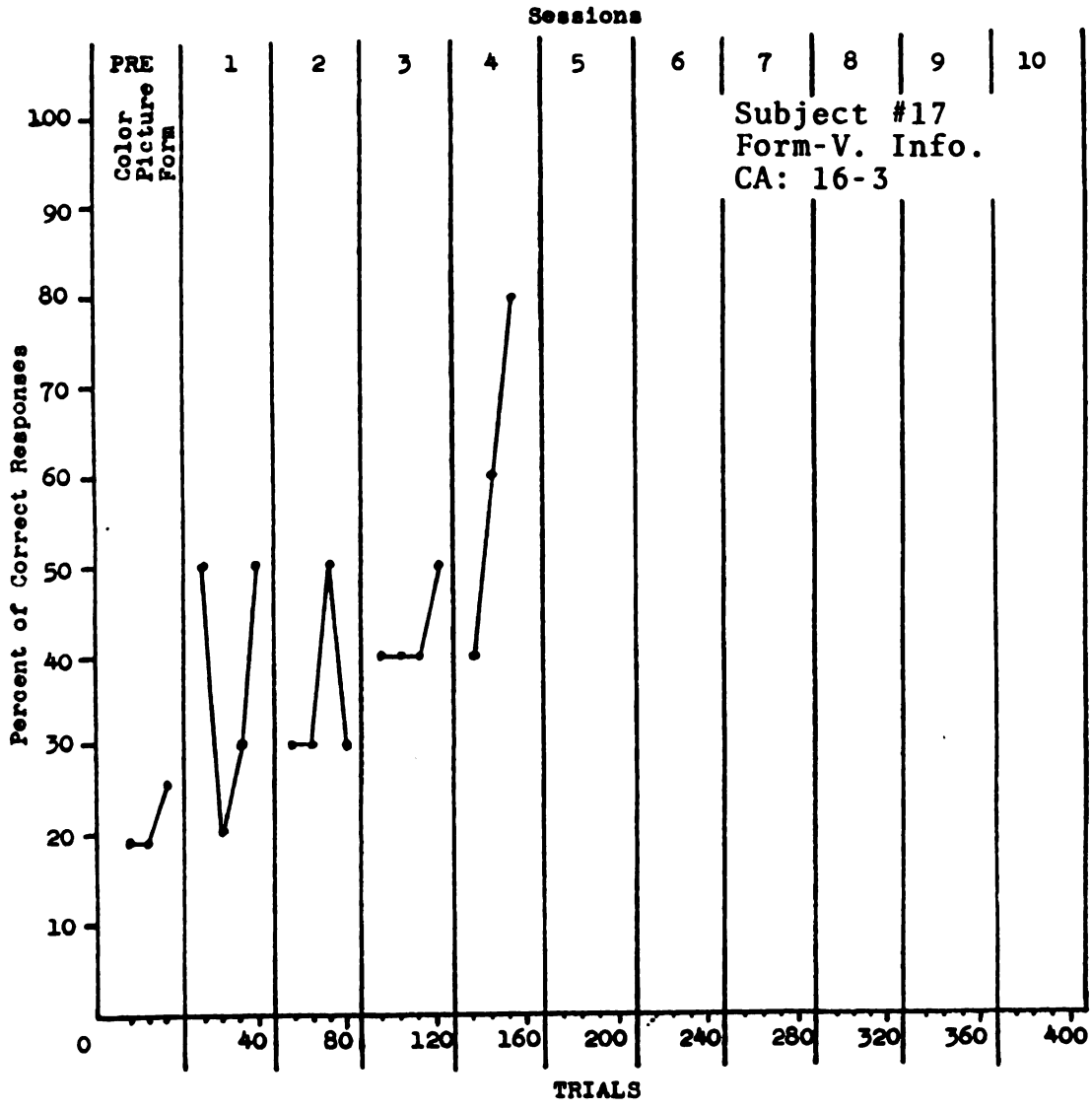

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #12
Form-V. Direct.
CA: 8-3
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

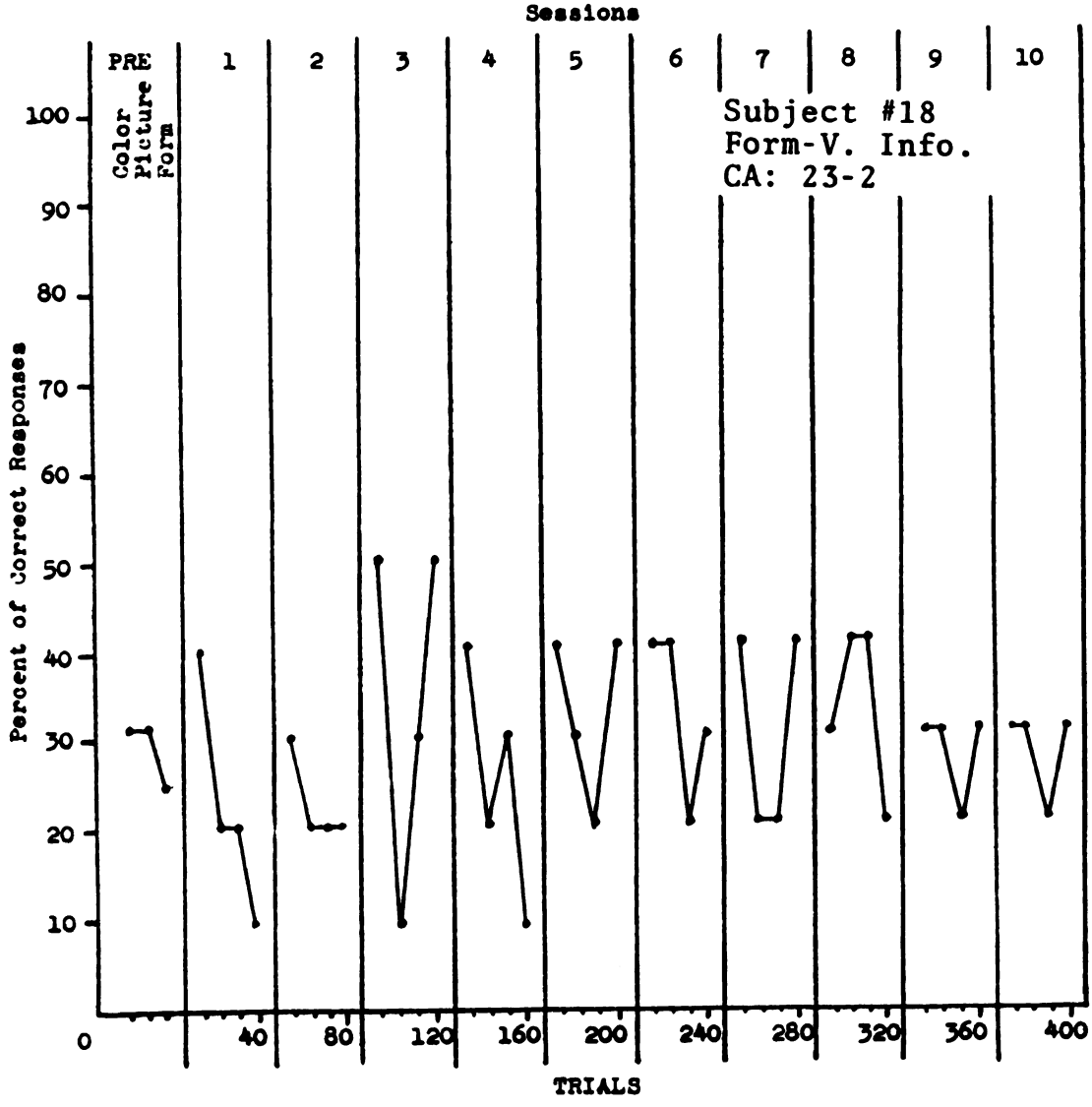

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #13
Color-V. Info.
CA: 8-3
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

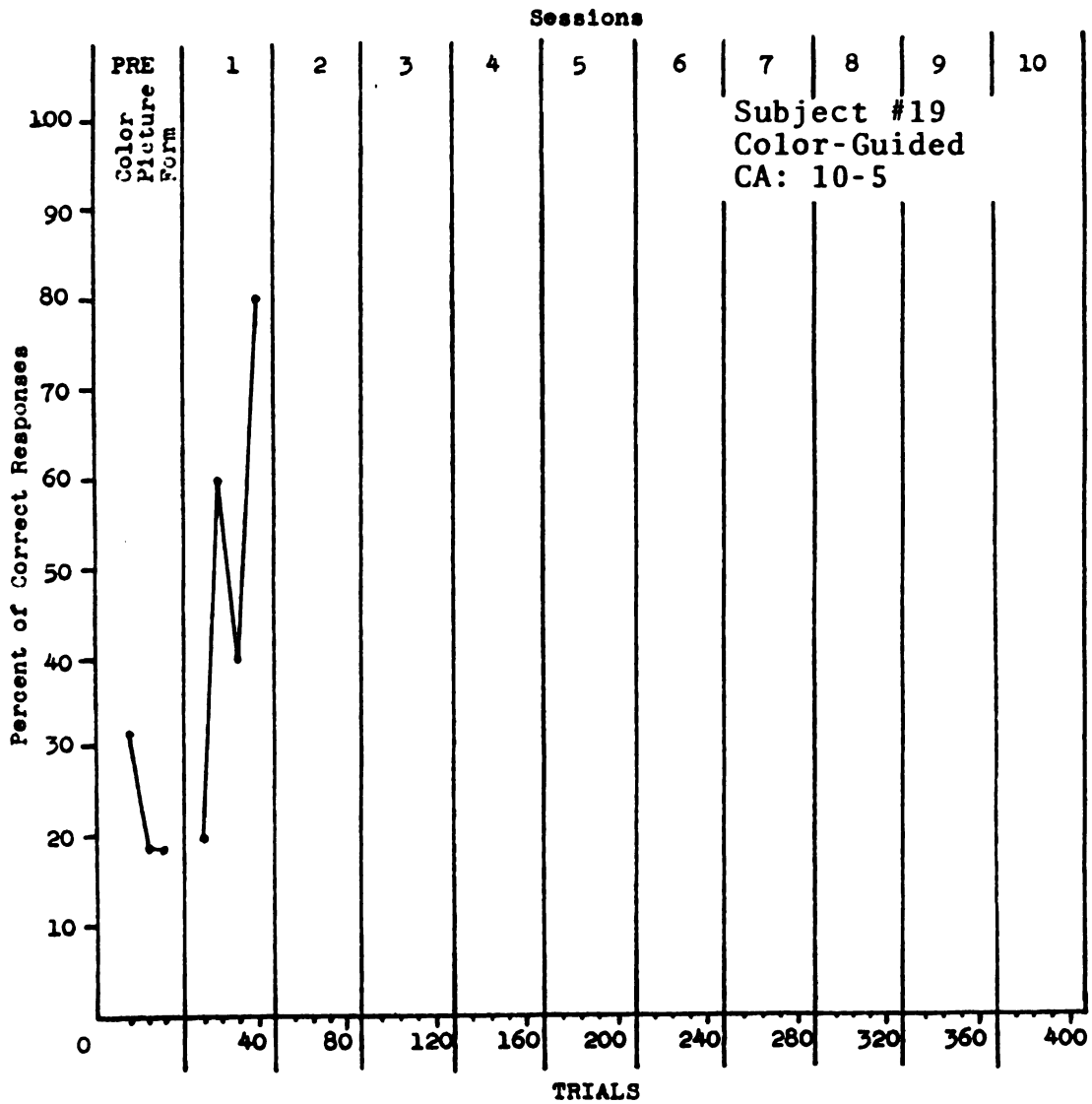

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #14
Color-V. Info.
CA: 18-10
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

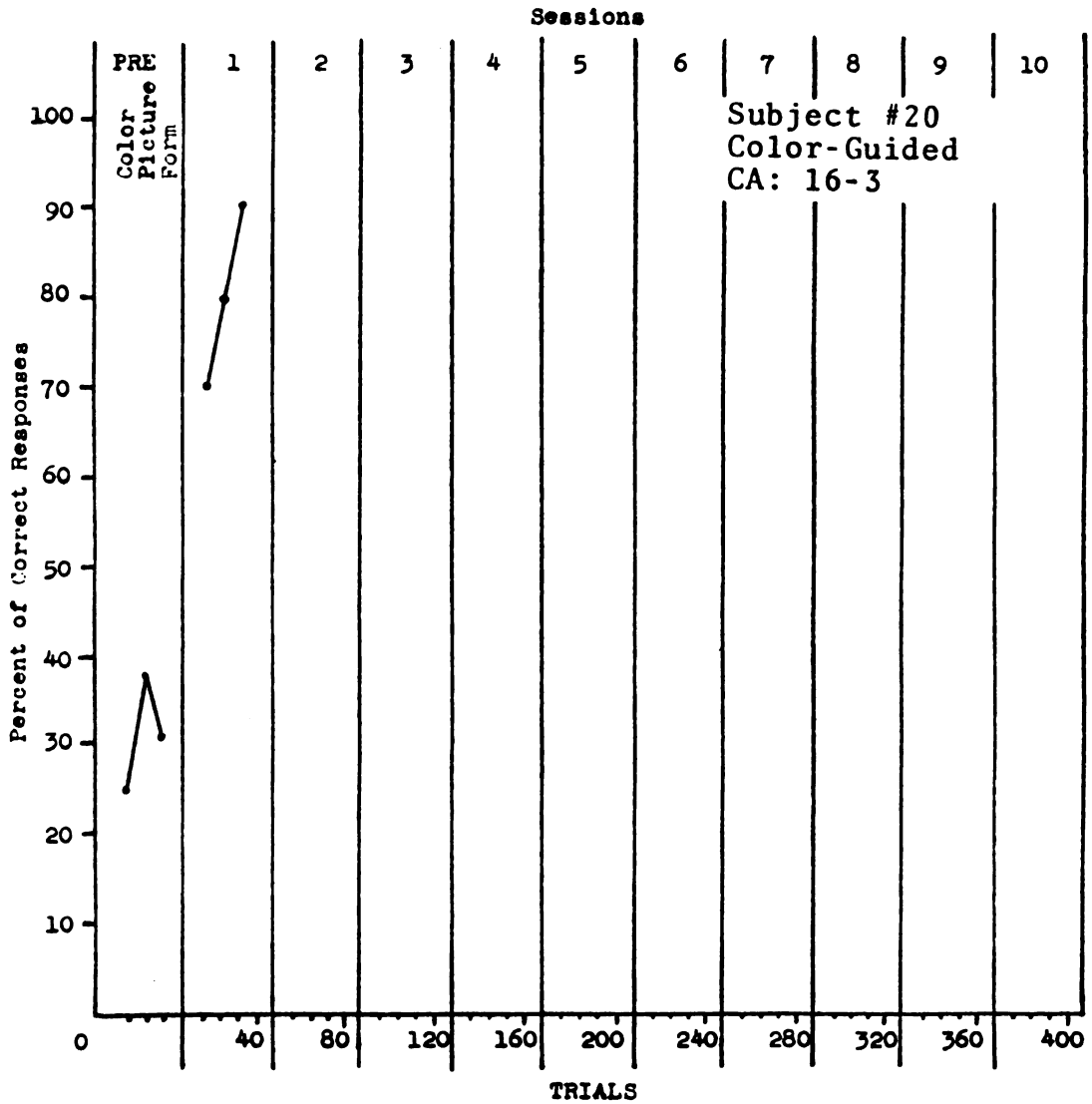

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #15
Picture-V. Info.
CA: 9-5
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

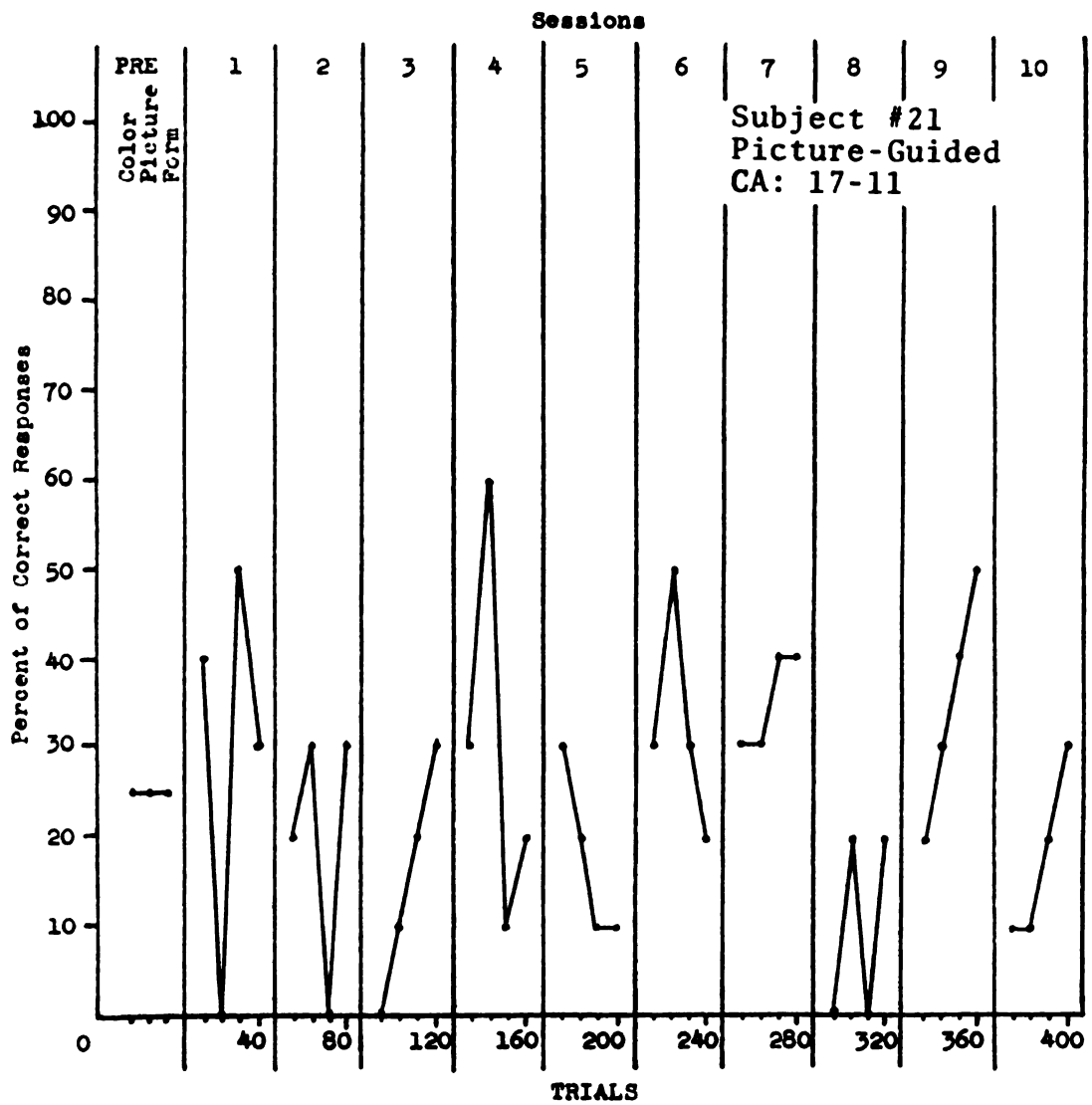

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #16
Picture-V. Info.
CA: 17-2
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

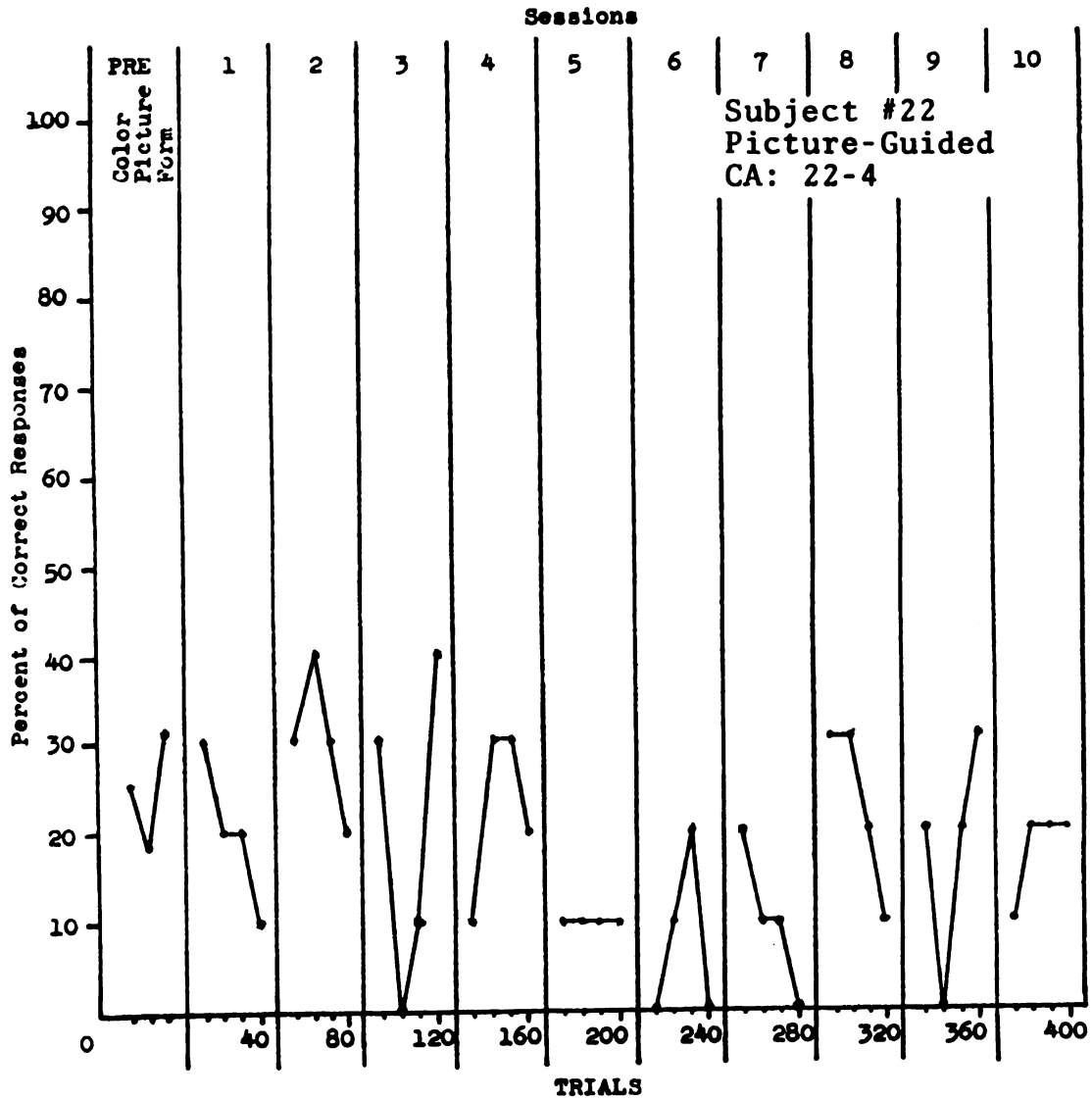

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #17
Form-V. Info.
CA: 16-3
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

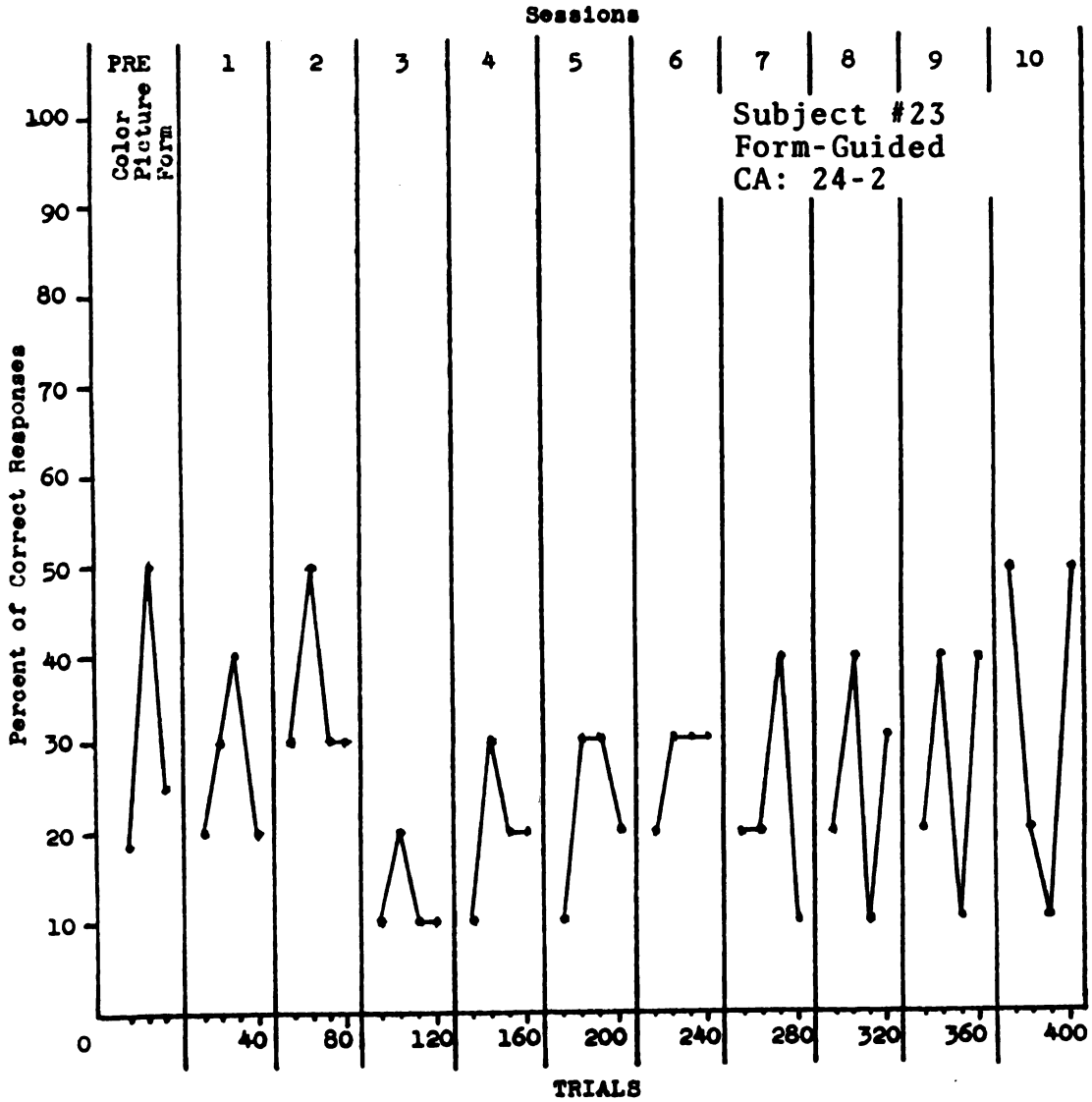

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #18
Form-V. Info.
CA: 23-2
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS

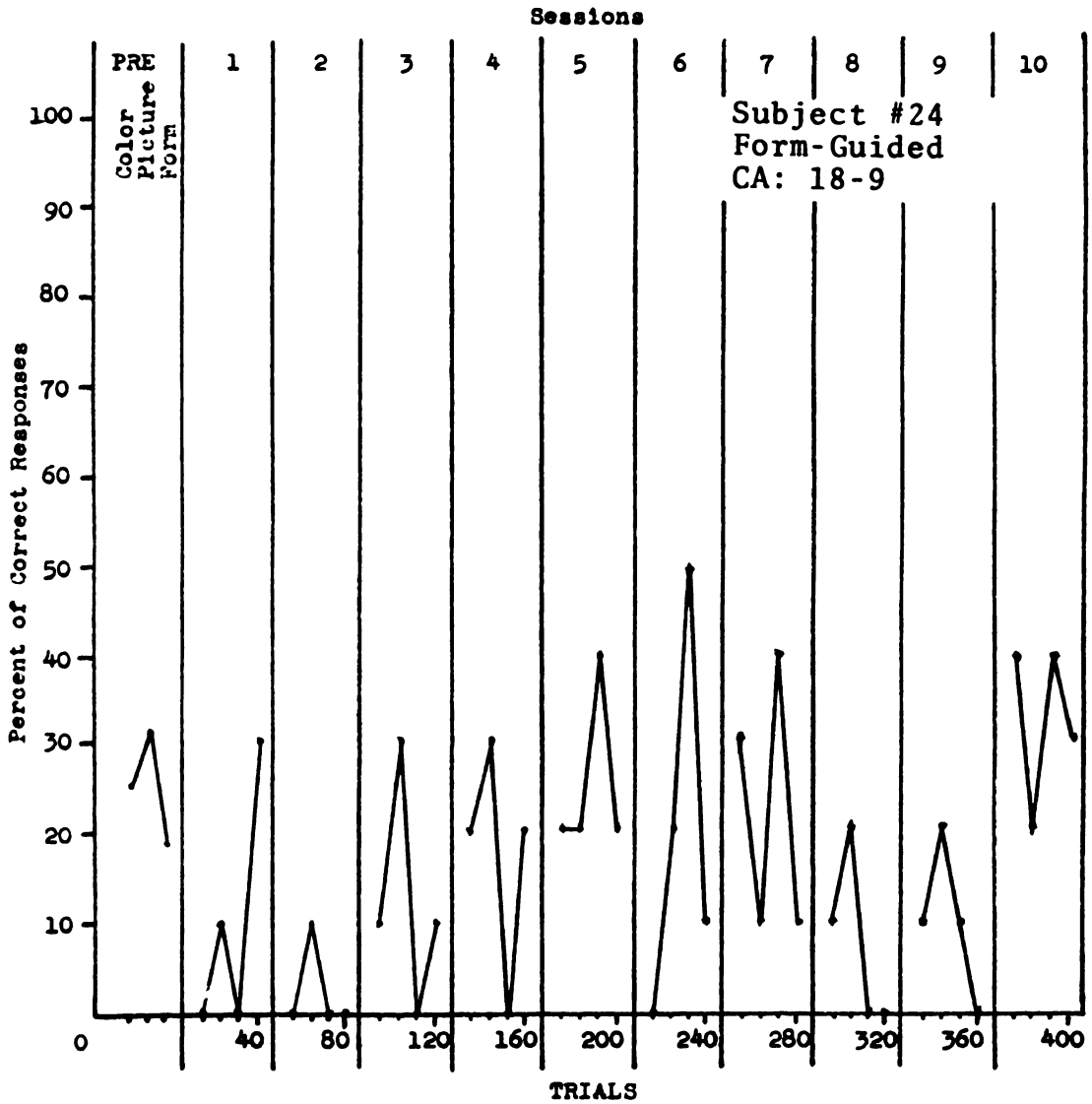

Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #19
Color-Guided
CA: 10-5
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS


Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #20
Color-Guided
CA: 16-3
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS


Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #21
Picture-Guided
CA: 17-11
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS


Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #22
Picture-Guided
CA: 22-4
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS


Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #23
Form-Guided
CA: 24-2
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS


Sessions
PRE
1
2
3
4
5
6
7
8
9
10
Color Picture Form
Subject #24
Form-Guided
CA: 18-9
Percent of Correct Responses
100
90
80
70
60
50
40
30
20
10
0
40
80
120
160
200
240
280
320
360
400
TRIALS