Pittsburg State University
Pittsburg State University Digital Commons

Electronic Theses & Dissertations

Summer 7-1967

THE PRESENTATION AND WITHDRAWAL OF POSITIVE REINFORCEMENT AS A BEHAVIORAL MODIFIER OF HYPERACTIVITY

Michael Bridges Cole
Kansas State College Of Pittsburg

Follow this and additional works at: https://digitalcommons.pittstate.edu/etd

 Part of the Behavior and Behavior Mechanisms Commons, and the Social and Behavioral Sciences Commons

Recommended Citation

Cole, Michael Bridges, "THE PRESENTATION AND WITHDRAWAL OF POSITIVE REINFORCEMENT AS A BEHAVIORAL MODIFIER OF HYPERACTIVITY" (1967). *Electronic Theses & Dissertations*. 63.
https://digitalcommons.pittstate.edu/etd/63

This Thesis is brought to you for free and open access by Pittsburg State University Digital Commons. It has been accepted for inclusion in Electronic Theses & Dissertations by an authorized administrator of Pittsburg State University Digital Commons. For more information, please contact digitalcommons@pittstate.edu.

THE PRESENTATION AND WITHDRAWAL OF POSITIVE REINFORCEMENT AS A BEHAVIORAL MODIFIER OF HYPERACTIVITY

A Thesis Submitted to the Graduate Division
In Partial Fulfillment of the Requirements
For the Degree of Master of Science

By

Michael Bridges Cole

KANSAS STATE COLLEGE OF PITTSBURG
Pittsburg, Kansas
July, 1967

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	The Problem	1
	Statement of the Problem	1
	Need for the Study	2
	Limitations of the Problem	2
	Definitions of Terms to be Used in the Problem	2
	The Hypothesis	5
II.	REVIEW OF THE LITERATURE	6
	Operant Conditioning	6
	Operant Conditioning	6
	B. F. Skinner	6
	Assumptions of the Operant School	7
	Single Organism Research	10
	Apparatuses in Operant Conditioning	14
	Positive Reinforcement	14
	Presentation of Positive Reinforcement	16
	Withdrawal of Positive Reinforcement	24
	Concomitant Presentation and Withdrawal of Positive Reinforcement	29
	Hyperactivity	33
III.	METHOD	37
	Subjects	37
	Apparatus	39
	Design	45
	Design per se	45
	Controls	46
	Procedure	49
	Operant Level	49
	Experimental Phase One	50
	Experimental Phase Two	51
	Experimental Phase Three	52
	Follow-up Phase	52
IV.	RESULTS	53
	Presentation of Operant Level Data Establishing Hyperactivity	53
	S_1's Operant Level Comparison	53
	S_2's Operant Level Comparison	59

CHAPTER PAGE

Presentation of Experimental and Follow-up Phase Results 66
S_1's Operant Level and Experimental Phase One Comparison 66
S_1's Operant Level and Experimental Phase Two Comparison 67
S_1's Operant Level and Experimental Phase Three Comparison 67
S_1's Operant Level and Follow-up Phase Comparison 68
S_2's Operant Level and Experimental Phase One Comparison 69
S_2's Operant Level and Experimental Phase Two Comparison 70

V. DISCUSSION, CONCLUSIONS, SUMMARY AND RECOMMENDATIONS 73

Discussion and Conclusions 73
Summary 80
Recommendations 82

REFERENCES 83

LIST OF TABLES

TABLE PAGE

1. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_1 54

2. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_2 55

3. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_3 56

4. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_4 57

5. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_5 58

6. Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_6 59

7. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_1 60

8. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_2 61

9. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_3 62

10. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_4 63

11. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_5 64

12. Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_6 65

13. Experimental S_1's Operant Level and Experimental Phase One Sitting Behavior Scores .. 66

14. Experimental S_1's Operant Level and Experimental Phase Two Sitting Behavior Scores .. 67

15. Experimental S_1's Operant Level and Experimental Phase Three Sitting Behavior Scores. 68

TABLE PAGE

16. Experimental S1's Operant Level and Follow-Up Phase Sitting Behavior Scores 69

17. Experimental S2's Operant Level and Experimental Phase One Sitting Behavior Scores .. 70

18. Experimental S2's Operant Level and Experimental Phase Two Sitting Behavior Scores .. 71

LIST OF FIGURES

FIGURE PAGE

1. The Exterior Components of the Apparatus 39

2. The Interior Components of the Desk of the Apparatus 41

3. The Components of the Underside of the Chair of the Apparatus 42

4. Electrical Schematic of the Apparatus 44

5. The Effect of the Presentation and Withdrawal of Positive Reinforcement on Hyperactivity 72

Chapter I

Introduction

Operant conditioning had its origin in research with infrahumans and later, when humans were used as subjects, the research was still done in a laboratory. Only within the last half of a decade has it been applied with any frequency to humans outside the laboratory.

This latter work has resulted in a small yet rapidly expanding accumulation of data. These data have suggested that the behavioral principles which have been demonstrated in learning laboratories are applicable to children who are functioning within special education classrooms. A minimal amount of this research has dealt with hyperactivity, a problem central to many special education classrooms.

The research of James (1963), Anderson (1964) and Patterson (1964, 1965) has the most direct bearing in that they have dealt with hyperactivity in classrooms. Although these researchers utilized operant techniques to modify hyperactive behaviors, they did not employ the presentation and withdrawal of positive reinforcement. Ayllon, 1965; Barret, 1966; Baer, 1961, 1962; Burchard & Tyler, 1965 and Wolf, 1964 did utilize these contingencies but the behavior studied was not definable as hyperactive.

The Problem

Statement of the Problem. The problem was to determine

the efficacy of the presentation and withdrawal of positive reinforcement via instrumentation as a behavioral modifier of the hyperactivity of two mentally retarded subjects in a special education milieu.

Need for the study. Research employing the presentation and withdrawal of positive reinforcement in modifying hyperactivity has not been published. The use of instrumentation within public special education classrooms has been nill.

Limitations of the problem. The study was limited through the following:

(1) The sample was two primary level (i.e., a public, special education class composed of students of chronological ages six to ten) educable mentally retarded students who were manifesting hyperactive behavior.

(2) The behaviors falling under the rubric hyperactive were limited to those involving nonsitting.

Definition of terms used in the problem. An operational definition follows for each term central to the problem. Formal academic definitions are in context throughout the remainder of the paper.

(1) Hyperactive. Academically a child has been considered hyperactive when he emits any one or more of the following "behaviors" at a high frequency: talking, inattendance, looking, tapping, squirming, flexing the limbs, and walking about.

Operationally a subject was considered hyperactive when his sitting behavior was significantly less than the operant

level scores of the control subject's.

(2) Nonhyperactive. A subject was considered nonhyperactive during those times when his sitting behavior did not differ significantly from that of the control subjects.

(3) Sitting behavior. Any behavior which resulted in sufficient pressure on the seat of the operant desk to activate the switch which controlled the recording of sitting behavior was sitting behavior.

(4) Nonsitting behavior. Any behavior which resulted in a sufficient lack of pressure on the seat of the subject's desk to activate the switch which controlled the recording of nonsitting was nonsitting behavior.

(5) Operant level. This level was established by measuring the individual's total sitting behavior time (i.e. the dependent variable) for each of eight thirty-minute sessions. The independent variables were not presented.

(6) Intrasubject replication. When a subject's behavior had been modified to meet the criteria for nonhyperactive, hyperactive, and then nonhyperactive, respectively, intrasubject replication had occured.

(7) Withdrawal of positive reinforcement. The withdrawal of one penny for each 60 seconds of nonsitting behavior during the initial and final conditioning phases of the study and the withdrawal of one penny for each 60 seconds of sitting behavior during the second conditioning phase of the study were considered withdrawal of positive reinforcement.

(8) Presentation of positive reinforcement. The presentation of one penny for each sixty seconds of sitting behavior during the initial and final conditioning phases of the study and the presentation of one penny for each sixty seconds of nonsitting behavior during the second conditioning phase of the study were deemed as the presentation of positive reinforcement.

(9) Extinction. For the purpose of the present study a distinction was made between operant and experimental extinction.

Experimental extinction was considered that decrement in sitting behavior which occured during the eight school days between experimental phase three and the follow-up phase. This decrement was measured by comparing the sitting behavior time of each experimental subject's follow-up phase with his operant-level phase. Experimental extinction was said to have occured when either experimental subject's follow-up sitting behavior did not differ significantly from his operant level.

Operant extinction applied to conditioning phase two only. Sitting behavior was considered operantly extinguished when it had met the criteria for hyperactivity, with nonsitting behavior being considered operantly extinguished when it had met the criteria for nonhyperactivity.

(10) English and English (1958) have defined an apparatus as:

"any instrument designed to cause stimulation or to facilitate the measurement of the stimulus, or the response or other

psychological processes (p. 37)."

For the present work apparatus was defined as presented in pages 22 to 27 of this paper.

The Hypothesis

The following was the hypothesis of the problem stated in the null form:

It was hypothesized that the presentation and withdrawal of positive reinforcement via an apparatus within a public, special education classroom would have no significant effect on the hyperactive behavior of two retarded subjects.

Chapter II

Review of the Literature

The following section of this paper has been written to briefly review the literature on operant conditioning. To do this there was an emphasis on Skinner's original work, the assumptions underlying operant conditioning, single organism research and experimental apparatuses. Hyperactivity and positive reinforcement were also covered (with consideration of those studies utilizing the presentation of positive reinforcement and the concomitant presentation and withdrawal of positive reinforcement). Research on operant conditioning within classrooms has been interspersed where germane.

Operant Conditioning

Operant conditioning defined. Operant conditioning has been said to refer to the strengthening of a response by following the response with a reinforcer. Ferster and Skinner (1957) stated this as follows:

"(1) As operation: arranging the reinforcement of a response possessing specified properties, or more specifically, arranging that a given reinforcer follow the emission of a given response. (2) As process: the resulting increase in the rate of occurence of responses possessing these properties [p. 730]."

B. F. Skinner. Skinner was the first to differentiate

between operant or instrumental conditioning as above defined and classical or respondent conditioning. His contention was that the majority of behavior is operant and best fits this paradigm as opposed to the classical one.

B. F. Skinner's contributions, dating from 1930, were indirectly derived from the earlier works of such reflexologists of the Russian school as I. M. Sechenov, I. P. Pavlov, and M. M. Bekterev, with Pavlov exerting the major influence (Kimball, 1961). The behaviorists, as focalized in John B. Watson, with their objectivism and its fight against introspection, did much to set the times for Skinner's work (Boring, 1957). Both schools with their determinism, objectivity and minimization of organismic variables developed the zeitgeist out of which Skinner's work came.

Assumptions of the operant school. That which follows was constructed to present a few of the assumptions underlying research in the operant area, assumptions extending from the reflexologists, behaviorists and Skinner and his adherents.

Grunbaum (1966) stated that:

"If human behavior, both individual and social, does not exhibit cause-effect sequences, then the scientific method is essentially irrelevent to the elucidation of the nature of man, and both scientific psychology and the social sciences are permanently barred from achieving the status of science [p. 3]."

In this statement Grunbaum reflected Skinner's assumption of the causality of behavior. A causalist might contend that as long as the causes are available for manipulation then extensive control of human behavior is possible and naturally follows (Ulrich et al, 1966a). Skinner has then concluded that all phenomena, including those of human behavior, fall into causal patterns which fit the thesis of determinism (Grunbaum, 1966).

Skinner (1953) has gone so far as to state that as causal relations are found it should be possible to produce behavior according to plan simply by arranging the proper conditions.

Michael and Meyerson (1966) reflected an additional assumption of the operant school when they stated that behavior is a function of the interaction of hereditary and environmental variables. Their contention was that the inherited genetic and constitutional determinants are not under the control of the direct experimentation of behavioral scientists. The author felt the only channel open for modifying human behavior is the environment. They concluded:

"The phenomenon with which we deal, then, is behavior, and the independent variable which controls behavior must be the environment. A behavioral system attempts to specify, without reference to unobservable, hypothetical inner-determining agents, the conditions and the processes by which the environ-

ment controls behavior [p. 23]."

The preceding reflects Skinner's approach to psychology which, while recognizing intervening physiological links (organismic variables), has ignored them.

The proponents of operant conditioning have contended that all behavior (adaptive or nonadaptive) consists of learned responses and that as such it is available to behavioral modification technique.

Wolpe (1964) has stated that neuroses are persistent, unadaptive habits that have been conditioned (that is, learned). This places him in close association with the above-written views.

Eysenck and Rachman (1965) have concurred in the above trend with the following:

"Learning theory...regards symptoms as simple learned habits; there is no neurosis underlying the symptom, but merely the symptom itself. Get rid of the symptom and you have eliminated the neurosis [p. 10]."

This view has been bolstered by much research, yet perhaps none more graphic than that of Haughton and Ayllon (1965). These investigators produced a stereotyped response in a subject and then had her observed by three psychiatrists. These psychiatrists diagnosed her as a regressed schizophrenic, compulsive, ritualistic , etc., with the primary basis for the diagnosis

being the learned response. Subsequent to the diagnosis the stereotyped response was extinguished.

The preceding study could be interpreted as demonstrating that the behavior modified 1. fit the cause-effect paradigm, 2. was modified through environmental manipulation and 3. that the "nonadaptive" behavior was learned.

Single organism research. Since much of the research on operant conditioning has employed a design utilizing a single subject and the present study involved two subjects used independently, the following material was pertinent.

Claude Bernard (1957) has written:

"I am convinced that, in the experimental sciences that are evolving...the discovery of a new tool for observing or experiment is much more useful than any number of systematic or philosophic dissertations. Indeed, a new method or a new means of investigation increases our power and makes discoveries and researches possible which would not have been possible without its help [p. 1]."

Skinner, in defining operant conditioning and presenting his study of 1932, first reported an experimental method that, with various modifications, has become widely used (Verhave, 1966a). This experiment with its methodologies of a single organism and an apparatus has produced a truly "new tool" as Verhave demonstrated in this statement:

"Ever since 1932 and at a positively accelerated rate, the end of which is not yet in sight, hundreds of rats and pigeons, as well as mice, turtles, chimpanzees, fish, cats, dogs, colleg students, mentally defective persons, psychotic patients and naval trainees have been pushing doors, pressing levers, nosing plastic discs, and pulling all sorts of switches, unwittingly producing cumulative records [pp. 5-6]."

Although "hundreds" of subjects have been used, these subjects were generally used individually. It was of interest to note that the subject of Skinner's original study was "a white rat" and that in the majority of subsequent research "a" subject was employed (Verhave, 1966a).

Ulrich (1966b) aptly defended this type of "single organism research in the following manner:

"A principle is accepted as sound only when it has been demonstrated to apply to each individual organism, under the conditions of the experiment. This emphasis on replication from individual to individual, in contrast to concern with the average of a group, has somewhat erroneously been termed "singl organism" research. The experimental results and principles have not, as the misnomer suggests, been generalized from the behavior of a single animal. Rather the validity and power of the principle rests on the demonstration that it influences the behavior of each organism...

"Establishing the criterion for replication at the level of the individual organism dictates another feature of the present methodology. One of its hallmarks is the establishmen of a stable pattern of performance, called a behavioral baseli as the dependent variable. Changes in the independent variabl the environment--are then studied as they affect the stable baseline of behavior. More conventional experimental designs, convinced of the inevitability of individual differences, have used many experimental subjects for relatively short periods of time...Under such well-controlled conditions stable baseline, replication, etc. changes in the dependent variable, the behavior, can be attributed with great certainty to the relevant independent variables [Pp. 21-22]."

The same view has been presented by Sidman (1960) in a slightly different manner:

"Often, especially in a young science, an experiment is performed for the sole purpose of determining if it is possibl to obtain a certain phenomenon. In such an experiment, demonstration of the phenomenon in one organism, with reliability established by intrasubject replication, is all that is necessary [P. 93]."

Sidman also mentioned that psychologists cannot deal with an average person derived from a group composite. He noted psychologists cannot diagnose or treat a group, but rather

must apply their research findings to individuals.

Reger (1966) concurred with Bergan and Caldwell (in press), who brought the above-expressed views more directly to bear on school psychology in their statement:

"The evaluation of modification techniques developed by the school psychologists and teacher for meeting specific problems of individual children must be based on individual behavioral records rather than on group studies involving the assessment of mean difference between experimental and control subjects [in press]."

Whelan and Haring (1966) have pointed to the applicability of behavior modification techniques to special education classrooms. They also indicated the small amount of research done in this area.

Considering the number of studies which have followed the methodologies presented in the preceding quotations, it has been impossible to mention more than those which were directly related to the independent variables of the present study. The reader is requested to bear in mind that of those studies already mentioned and those that have been mentioned in the remainder of the paper, most have utilized a single subject.

In light of the foregoing, "single organism" research can be seen to be valid and especially applicable to school psychology.

Apparatuses. Townsend (1953) noted an apparatus is designed to systematically present controlled stimuli and to accurately measure behavior following the presentation.

The utilization of instrumentation in conjunction with operant research has extended from Skinner (1932). His apparatus, modified by later researchers, has been widely employed. It consisted of an experimental cage equipped with both a device that dispensed a small pellet of food to the subject when it pressed down on a lever and a recorder that automatically registered the rate of lever pressing.

The use of this type of equipment with human subjects has been quite prevalent. It has been considered desirable in that 1. human subjects are given minimal instructions; 2. the reinforcer is automatically presented; 3. the response is recorded by mechanical or electrical means; and 4. the experimenter has a minimal amount of contact with the subject (Bijou and Sturges, 1959). This automation has generally been employed in laboratory settings, application of it to nonartificial situations having only recently been done in a few experiments (Patterson, 1964; Patterson et al, 1965).

Positive Reinforcement

Within the behavioral school (of which the operantly-oriented psychologists are a significant part) there have been three major types of consequences or contingencies: 1. posi-

tive reinforcement 2. negative reinforcement and 3. both negative and positive reinforcement combined. With the last the desired habits are positively reinforced while undesired habits receive aversive stimuli (Woody, 1966).

Of the above three techniques positive reinforcement has been the most frequently utilized for behavior modifications. It has been used to: 1. shape new behavior repertoires, 2. increase the rate of behaviors occuring at low rates and 3. reinstate behaviors which were once present but which were extinguished.

Definitions for positive reinforcement vary, yet all seem to reflect the same basic concept. In 1953 Skinner defined positive reinforcement as, "Any stimulus the presentatio of which strengthens the behavior upon which it is made contingent p. 185 ."

Verhave (1966b) noted positive reinforcement to be a stim ulus which an organism approaches or will turn on, produce or initiate.

It can be seen from the above, as Hilgard noted in 1956, that positive reinforcement always increases the probability of the response it has been made contingent upon.

Comments on the presentation of positive reinforcement ar a combinationof its presentation and withdrawal are given as

these contingencies were central to the present study.

Presentation of positive reinforcement. Due to the volume of research which has employed the contingent presentation of positive reinforcement, only those few studies which dealt with humans in a classroom setting have been considered.

In 1964 Miller used food in conjunction with flash cards to modify the studying behavior of a seventeen year old girl. The subject had to earn all of her food except breakfast via studying. Through comparing her grade average in the semesters prior to and subsequent to the semester of experimentation it was found that she had a B average in the experimental phase and D's in both other phases.

Zimmerman and Zimmerman (1965) employed teacher recognition to modify the unproductive classroom behavior of two emotionally disturbed boys. One behavior, spelling, was modified by ignoring misspelled words and recognizing correctly spelled words through commendation. They found that the number of incorrect (unreinforced) responses decreased after each spelling word.

Brown and Elliott (1965) studied the control of aggressive response in twenty-seven nursery school boys. The teacher systematically ignored aggressive responses and attended only to the responses incompatible with aggression. Subsequent to a brief conditioning period overall aggressive responses were

significantly modified.

Harris, Johnston, Kelly and Wolf (1964) increased the rate of walking and standing behavior in a crawling child enrolled in a preschool class. They used attention as a positive reinforcer. The researchers also reported having employed a contingency which involved social reinforcement in modifying the "isolation behavior" of a nursery school child. This behavior was effectively removed through ignoring it and through social reinforcement of its opposite. Through reversing the contingencies several times the behavior was modified from isolation to socialization to isolation and back to socialization. Procedures comparable to these were employed with five separate subjects and proved effective in each case. The authors concluded that adult attention was a strong positive reinforcer. Behaviors which were immediately followed by attention increased rapidly in rate, while behaviors ignored had a rapid drop in rate.

Brison (1956) employed social reinforcement and its withdrawal contingent upon talking behavior. He significantly modified the nontalking behavior of a child within a public school setting.

In 1964 Patterson conducted a study which had direct bearing on the present undertaking.

His subject was a nine year old student who was in the

second grade and had been diagnosed by a physician as minimally brain damaged. The student was described as being in almost continuous motion while in the classroom and was said to have been of average intelligence.

Patterson's study can be broken into four general phases: 1. observation 2. pretraining 3. basal and 4. conditioning.

During the observational phase the S was observed for "several hours" both at home and in school to determine the behaviors comprising his hyperactivity. From these observations the following behaviors were selected:

"Talking, pushing, hitting, pinching, looking around the room, looking out the window, moving out of location (walking or moving desk) and moving in location (tapping, squirming, handling objects) [P.372]."

Several short trial runs for pretraining purposes were conducted. The S was taken to a "small room" within the school, where he was given a book to read and told that when the light on top of his desk came on he had earned one candy or one penny. This light was a small flashlight bulb mounted in the top of a box. The box could be placed on the child's desk. During the pretraining phase and the conditioning phases (delineated below) one of three E's activated the light when attending behaviors had persisted for three seconds.

Basal data was obtained by observing the S 20 minutes

prior to each conditioning session and was also gotten on three classmates. This data was gathered within the regular classroom.

Before beginning conditioning the class as a whole was told of the subject's problem and that he would have a "magic teaching machine" to help him sit still. They were told a counter would keep score and that at the end of each lesson the subject's earned pennies or candy (which were used alternately) would be divided among the class.

During each conditioning session the examiner (from behind a two-way mirror) activated the light for each three-second interval during which no nonattending behaviors occured. A tally was made on the checklist for each occurence of any nonattending behavior. At the end of each conditioning session the subject was given the candy or money to distribute to the class.

The first conditioning trial lasted five minutes while the fifteenth and last session was of thirty minutes' duration. The time was gradually increased from session to session.

Through comparing the basal level with the conditioning scores an 8.4 drop in responses per minute was found. This drop was significant at less than the .01 level of p. This response rate was comparable to that of each of the three control

subjects.

Patterson noted a "follow-up" conducted by talking with the subject's parents four months after the research indicated the child was still "quieter".

The researcher introduced a form of discriminative learning in the last two conditioning trials (sessions fourteen and fifteen) via teaching the subject to use appropriate labels and through teaching him the contingencies between these behaviors and peer and teacher reinforcers. He then had the child verbally identify such behaviors in his classmates and record them on a check sheet.

As the author indicated, the experimental variables (candy, pennies, social approval and discriminative training) were of such a number as to disallow any statement of the effect each produced. In addition to this criticism there would seem to be justification for others. The use of three examiners with the probability of low inter-observer reliability would seem to have been a problem. E's who were not "blind" could have introduced biased observations while the presence of E's in the classroom may have resulted in their becoming a discriminate stimulus. The lack of quantification in the follow-up phase introduced a question as to the duration of the modifications produced.

In 1965 Patterson et al designed a study which had its

inception in the 1964 work. The research was conducted primarily to determine the resistance of the effects of the conditioning procedure to extinction.

An experimental subject and control subject were utilized for the study. Both subjects were educationally retarded. The experimental subject had an atrophication of the right cerebral hemisphere, a hemisphere carriage and gait and his teacher had described him as hyperactive. The control subject had sustained a skull fracture over the left parietal region and had a diagnosis of traumatic hemiplegia. He had a marked spastic functioning of the left extremities and classroom observations revealed hyperactivity.

Procedurally the study consisted of these phases: observation, basal, pretraining, conditioning and follow-up.

The subjects were observed a minimum of ten minutes a day for four days a week. Four observers rotated observation periods. These observations extended over a two-week period and were to determine the specifics of the subjects' non-attending behaviors.

A checklist was devised from these observations that had 60 ten-second observations in sequence on each child. This gave a total of ten minutes per checklist. Also recorded in the checklist was whether the child was 1. working alone 2. in a classroom activity or 3. receiving personal attention

from an adult.

A tape recorder announced each ten-second category (there were seven categories of hyperactivity) to the examiner, who was behind a one-way screen. During each ten-second interval any of the nonattending behaviors which occured was tallied but was tallied only once per ten seconds. A total score for each of the nonattending behaviors and a grand total was recorded for each ten-minute period. This procedure was used in all following phases of the study.

Base line data was collected on both subjects for eleven days. This data was collected using the procedure mentioned in the preceding paragraph.

The adaptation phase consisted of nine days. The subjects were observed with the experimental subject being removed from the class to adapt him to conditioning procedure and apparatus. During this adaptation phase the experimental subject was placed in a room by the examiner and had a small radio receiving unit and a pair of earphones attached to him. He was told that if he heard a buzz it indicated he had earned a piece of candy. The examiner activated the earphones and dropped candy into a small cup in front of the subject for each ten-second period during which nonattending behaviors did not occur.

On the first day of conditioning the class as a whole was told the experimental subject had difficulty sitting still.

It was mentioned that the subject was getting a teaching machine which would let him earn candy and pennies, which he would give to the rest of the class. During the conditioning trials the examiner was in a one-way observation room while the subject was in his regular classroom. Through using a radio transmitter a signal was sent to the experimental subject for each ten seconds during which nonattending behavior did not occur. This fixed-interval schedule was used for the first four conditioning trials then was changed to a variable-interval schedule (2, 5, 10, 20 and 30 seconds). Pennies, candy and plastic soldiers were used as reinforcers. These were given to the subject by the examiner; the subject then passed the reinforcers out to the class. The data for this phase was gathered just prior to each conditioning session.

Nine days of follow-up observations were made three days after termination of the conditioning phase.

The mean frequency per minute of the total nonattending behaviors was used for all three phases of the study and was analyzed with a sign test to compare the total frequency scores obtained on the same days with the two subjects. The analysis showed a nonsignificantly higher frequency of nonattending behaviors during the basal phase of the experiment for the experimental subject. During the adaptation phase this was reversed. With the conditioning phase the experimental subject had sig-

nificantly ($p < .06$) fewer nonattending behaviors while during the follow-up this difference persisted at a $p < .03$.

The reliability of the observations made during the two-week observation period was tested by comparing the observations of each examiner. Correlations were in the .90's.

The authors had three conclusions: 1. that the nonattending behaviors of the experimental subject were modified, 2. that the effects generalized and 3. that these effects persisted over a four-week period.

The major limitation of this study (as indicated by the authors) was the utilization of subjects functioning in a hospital school wherein the tolerance for deviant behavior was greater than in a typical milieu.

As in Patterson's 1964 work there was the possibility of observer bias, as each observer was also an examiner. The use of correlation established inter-observer reliability but the four observers were examiners too. Were the observers reliably biased?

This limited amount of research was thought to provide an empirical basis for the utilization of the presentation of positive reinforcement, as its effectiveness had been demonstrated in classroom-like environments and, in two instances, specifically with hyperactive subjects.

Withdrawal of positive reinforcement. Skinner (1958)

stated that the withdrawal of a positive reinforcer will decrease the frequency of a response. This statement has been virtually ignored by researchers, according to Baer (1966).

Omission training has been considered one of two types of withdrawal of a positive reinforcer. It has been said to be the procedure in which a positive reinforcer occurs if the organism fails to make some particular response (Kimball, 1961).

Omission training differs from the second type of withdrawal of positive reinforcement in which the withdrawal of the positive reinforcement is done when a specific response occurs.

Withdrawal of positive reinforcement when a specific response occurs has been the more prevalent and was the usage intended for the term henceforth.

The removal of a positive reinforcer produces changes similar to those that have been obtained from the presentation of a negative reinforcer, according to Ferster (1957, 1958), as the "time out" acts as an aversive event and therefore increases the frequency of avoidance responses. In the case of the present study, the avoidance behavior of sitting instead of non-sitting would be increased.

The preceding was empirically demonstrated by Baer in 1961 in an experiment which tested the effectiveness of reinforcement withdrawal in weakening a response when a competitive

response was not deliberately strengthened through the presentation of positive reinforcement.

Ten children from a day care center completed the experiment with five as control and five as experimental subjects. All were of normal intelligence and all were from "lower income groups".

The apparatus was housed in a mobile trailer which contained a one-way observation booth for the examiner and a partitioned corner where one adult could sit and not be seen by the subject. Within the trailer was a three-piece apparatus. The first component of the apparatus was a film projector with three cartoons on an endless reel of film and a screen. A white box mounted on a table within reach of the subjects while they were watching the film was the second component. A bar extended from the front surface of the box while a slot from which reinforcers could be presented by bar pressing was in the lower section of the front part of the box. Every bar press resulted in a one-second buzz. At the examiner's discretion a bar press could produce a two-second interruption in the ongoing film. A Playskool toy was on a table which the subject could not reach while observing the film; this was the third component of the apparatus.

The subjects were dealt with entirely by a female adult with whom they were already familiar.

Each subject was individually brought to the laboratory five times.

On the first trip he was adapted to the laboratory through seating him in the proper place and showing him all three films (total time, twenty-one minutes) then returning him to school.

At the second visit a learned response was established in each subject. The subject was shown the white box which dispensed peanuts and was told that it was a peanut machine. As the subject pressed the bar he received a peanut and continued to on the variable ratio scheduled 1, 2, 3, 5, 7, 10, 15 and 20. At 20 the subject was removed from the laboratory.

The third visit began extinction of the learned response. The subject was shown the cartoons and in the case of the experimental subjects the cartoons were interrupted for two seconds for each occurence of the learned response (bar pressing). With the control subjects no interruption resulted from bar pressing. In both groups no reinforcers were dispersed by the "peanut machine" and the buzz did occur. For two minutes after the films were over the subject was allowed to remain in the seat and manipulate the bar press if he so desired.

The fourth visit was to appraise any spontaneous recovery of the learned response. The subjects could press the bar but this did not turn off the cartoon, nor did it provide peanuts. The buzz was still used. Because spontaneous recovery

was expected to be minimal only one cartoon was shown. The subject was retained in the laboratory for two minutes after the film terminated.

The last phase was conducted in a situation where the withdrawal of positive reinforcement was impossible in that the subject could play with the peanut machine or a Playskool toy but cartoons were not shown. The session lasted five minutes.

A cumulative recorder made records of bar pressing for the various sessions. In session three the bar press contingent interruption of the cartoon reduced sharply the number of bar presses. This reduction was durable, too, as it persisted more so with the experimental subjects than the control subjects in session five, wherein the withdrawal of positive reinforcement was impossible, as no film was shown.

The researcher concluded that the withdrawal of positive reinforcement is effective. He further felt the "technique" would be a fruitful one for further study.

The withdrawal of positive reinforcement was selected for the present work as Baer's 1961 research tended to indicate that the contingent withdrawal of positive reinforcement-- initially and over a period of time-- was more effective than normal extinction. It thus seemed likely to assume that it would facilitate intrasubject replication and would produce an effect of longer duration than would the sole application

of positive reinforcement.

Concomitant withdrawal and presentation of positive reinforcement. Few researchers have utilized contingencies involving both the presentation and withdrawal of positive reinforcement. The following was the extent of research in this area known to the present writer.

Baer (1962) has employed what he deemed withdrawal and representation of reinforcement in an extension of his work of 1961. The study consisted of two parts, with the first part involving a five year old nursery school boy.

The general procedure used was the same as that delineated in Baer's 1961 work, which was presented previously in this paper. The observer, behind a one-way mirror, could hold down the key of a cumulative recorder while the child's thumb was in his mouth. This pressing resulted in a pulsing of the recorder for every three-second duration of thumbsucking. The apparatus could be set up so that films were interrupted when the child had his thumb in his mouth and could have the film resumed when the thumb was removed. The film could also be shown continuously or not at all.

The same three cartoons (A, B and C) were shown twice during each of three reported experimental sessions. Each of the three experimental sessions did not have the cartoon withdrawn for thumbsucking during the first showing of film A, did have

for film B and had film C as a recovery period wherein the film was shown continuously. During the second showing of the film in each of the three experimental sessions, with A positive reinforcement was withdrawn, B was a recovery period and positive reinforcement was again withdrawn for film C.

He found that during the first showing of film A (the operant level, when the film was shown continuously) the rate of thumbsucking was maximal. During the first experimental session and succeeding control periods (film B of the first showing and films A and C of the second showing) were progressively more effective in decreasing rate. In the second and third experimental sessions the rate was effectively lowered during all control conditions but remained so only during the control sessions.

In the same 1962 work Baer used two five year old boys in a yoked situation. This was an effort to determine the role of the contingent use of the withdrawal and representation of positive reinforcement compared with their random presentation.

The two subjects sat side by side viewing the same film; however, they did have a divider between them and each had his own observer.

Eight adaptation sessions of 30-minute length resulted in observations of 100% thumbsucking for both subjects. During

these eight sessions both subjects viewed the cartoon on an uninterrupted basis.

In session one of the next phase experimental subject one alternately experienced five-minute periods of 1. continuous cartoons and 2. thumbsucking-contingent withdrawal and non-thumbsucking-contingent representation of the cartoons. Experimental subject two experienced the presentation and withdrawal of cartoons on a random basis with his thumbsucking in the first experimental session. In experimental session two the roles of the two subjects were interchanged.

In both of these experimental sessions the subject under contingent presentation and withdrawal of cartoons rapidly came under the control of the contingencies, while the random presentation showed no evidence of effect.

The author concluded that the withdrawal and representation of positive reinforcement weakened the response studied during those times when the contingencies were in effect and that the random application did not appreciably affect thumbsucking.

This research was taken as indicating that a combination of the presentation and withdrawal of positive reinforcement would facilitate intrasubject replication as desired in the present study.

In a manner similar to the above study Barrett (1966) reduced the frequency of gross body tics in a subject through

making the interruption of ongoing music contingent on the occurence of the subject's tics. With his study the effect generalized and had a long duration.

As the experiments by Baer in 1961 and 1962 and Barrett's in 1965 had contradictions as concerned the duration of the effects of their contingencies, a follow-up phase was used in the present experiment. In Baer's 1962 study the effect of his contingencies was manifest primarily in the presence of withdrawal of positive reinforcement. In Baer, 1961, and Barrett, 1965, the withdrawal of positive reinforcement produced an effect of long duration, an effect which was maintained in the absence of positive reinforcement.

In 1965 Ayllon eliminated food stealing from an institutionalized psychotic through making removal from the dining hall contingent upon food stealing.

Earlier, 1964, Wolf employed a time-out technique to control the tantrum and self-destructive behavior of an autistic child.

Burchard and Tyler (1965) reported a case study where isolation was made contingent upon unacceptable behavior and tokens were given as positive reinforcers for acceptable behavior. They reported a 33% decline in the frequency of isolations through comparing the first and fifth months of the study.

In all of these studies there was the contingent withdrawal of the positive reinforcer, except for the Burchard and Tyler study, where a separate positive reinforcer was employed in

addition to non-isolation. These studies established the value of the presentation and withdrawal of positive reinforcement as techniques concurrently employed to modify behavior, yet demonstrated that these contingencies had not been used with hyperactivity.

Hyperactivity

Bergan and Caldwell (in press) reported that in a group of teachers surveyed who had made referrals for psychological services, 94% of the referrals were on individual students. Sixty-two percent of these referrals involved deceleration (get rid of behavior) and 32% involved acceleration. The deceleration referrals most frequently involved talking out, walking without permission, hitting others, tantrums, and crying, respectively. The first three "behaviors" are typically found in hyperactive children.

In Patterson et al (1965) Patterson (1956) was quoted as having collected data from four child clinics which demonstrated "hyperactivity" as one of the most common problems for which children were referred. They stated that extremely high rates of behavior are aversive for other people.

The above tended to indicate that hyperactivity is a significant problem and worthy of consideration.

Hyperactivity fits in the context of a learned behavior, a statement Patterson et al (1965) ascribed to in the following:

"The specific responses emitted by the hyperactive child must be conditioned as a result of the social remarks and punishment provided by parents, teachers and peers [p. 218]."

In 1966 Quay, Werry and Sprague indicated that:

"...the child with cerebral dysfunction might be prone to the excessive emission of motor responses (hyperactivity) but it would be the environment which, through patterns of reinforcement would determine the precise nature of the behaviors observed in the child and would serve to increase or decrease their frequency in various situations [p. 510]."

In 1964 Patterson stated the above slightly better in assuming:

"...regardless of etiology, hyperactive behaviors can be controlled by the application of general principles from learning theories...both environmental and internal stimuli have become conditioned eliciters of such behavior as: squirming, looking around, pinching, tapping, and walking around the room. Theoretically it should be possible to condition a set of responses to these same stimulus matrices that would interfere with the occurence of these 'hyperactive behaviors'...[this] could be achieved by strengthening any number of appropriate attending responses... [p. 371]"

Patterson (1964) empirically demonstrated the above in a study wherein he utilized a conditioning procedure to increase the frequency of attending behaviors in a hyperactive boy.

His design was such that it utilized social reinforcers from the teacher and fellow students and made use of only positive reinforcement[1].

James (1963) programmed a teacher's behavior so that social reinforcers were made contingent on the occurence of socially acceptable behavior in a group of hyperactive children. This contingency reportedly produced dramatic changes in five of the children.

Patterson et al (1965) utilized earphones in a hospital school setting and a secondary reinforcer of a tone while employing yoked experimental and control subjects (2). They found their experimental subject showed a significant decrease in nonattending behavior whereas their control subject showed no significant change[2].

This last study was carried out in a "hospital school" where the tolerance for deviant behavior was thought to be overly high and the programs of the school were tailored for the individual child.

Anderson (1964) and James (1963) dealt with hyperactivity in a public school setting, yet, as did Patterson in his original work, employed different contingencies than the present

---

[1]For a synopsis of this work see pp 17-20 of the present study.

[2]A more detailed presentation of this work may be found on pp 20-24 of the present paper.

study.

Although there have been studies dealing specifically with the hyperactivity of school children and operant techniques, Patterson et al (1965) stated that both his original study and Anderson's had significant confounding of their independent variables. Patterson et al's 1965 study drew its population sample from a hospital setting, thereby severely limiting any generalizations to educable retardates in a public school environment. In all of these studies there was the possibility of observer biasing.

None of the research on hyperactivity has utilized the concomitant presentation and withdrawal of positive reinforcement via an apparatus in a classroom to modify hyperactivity. In light of the preceding it can be seen that additional research was needed in this area.

Chapter III

Method

Subjects

Two subjects were drawn from the population delineated via being referred for psychological services. Subjects were selected whose referrants mentioned hyperactivity as the primary presenting problem. As the frequency of such referrals was highest in the educable mentally handicapped level one class and two of these subjects were shown to be significantly more hyperactive than their classmates, these two were tentatively selected for the proposed study. The subjects' diagnosis of hyperactivity was initially derived from psychological evaluations and behavioral observations of the teacher, parents and the psychologist. The subjects were empirically shown to be hyperactive through statistically comparing their operant level with that of six randomly selected classmates.

The first subject (hereafter designated S_1) was a female, chronological age six years two months at the time of her psychological evaluation (1967). The following excerpts were drawn from her evaluation:

"T—— is functioning at the low borderline level of retardation in measured intelligence and at the mild level of retardation in adaptive behavior (levels I and II of the American Association on Mental Deficiency, respectively). There

appears to be a central nervous system impairment with a psychogenic overlay...the etiology seems to be encephalopathy due to a nutritional disorder (extreme malnutrition at an early age) yet cultural familial factors and especially functional ones are also thought to have contributed [Pp. 2-3]."[1]

S_1 was originally referred for a psychological evaluation by her kindergarten teacher as she was said to masturbate openly, to be hyperactive, over-tense and to have a short attention span. S_1's present teacher had, since receiving her in the middle of January, 1967, constantly mentioned the S's seeming inability to remain in her seat.

The second subject (hereafter designated S_2) was a male, chronological age six years three months at the time of his psychological evaluation. The following diagnosis was excised from the psychological evaluation's Diagnostic Impression:

"M—— is functioning at a moderate level of retardation in measured intelligence and adaptive behavior (Both level III of the American Association on Mental Deficiency... [p.3]."[2]

S_2's first grade teacher indicated him to be "restless"

---

[1]This psychological evaluation was done by M. B. Cole, School Psychologist, in January, 1967 prior to the child's placement in special education.

[2]L. R. Bales, Psychological Consultant, completed the psychological evaluation on this S in December, 1966.

while the teacher of his Educable Mentally Handicapped class, who received S_2 in December of 1966, informed the E of S_2's "extreme hyperactivity". The symptom the latter teacher mentioned most frequently was the S's inability to remain seated.

Apparatus

The apparatus was designed to present the independent variables and to facilitate the objective recording of the dependent variable.

A lower primary solid oak desk and chair was used as the basic framework for the "operant desk".

Figure 1 depicts the apparatus as seen by the S's.

Figure 1. The exterior components of the apparatus.

A denotes that clock which registered the total time out of the chair. It was an A8001 Sunbeam electric clock, case

removed, with the clock set flush with the surface of the desk. B indicates the clock which signified time in the chair. These two indicators were the secondary reinforcing stimuli for the S's.

The letter C indicates a piece of surplus aviational plexiglass which was cut to fit the desk top and mounted with four counter-sunk screws. This clear surface allowed the S's to see the clocks, yet provided a writing surface.

A hinged and spring-loaded seat is denoted via the letter D, which was placed next to a counter-sunk bolt head in the surface of the seat itself.

E is next to the spaghetti which insulated the wiring extending from the clocks and switches in the desk to a three-pole switch in the chair. This wire was of sufficient length (three feet) to allow relatively free movement of the chair and was tacked to the leg of the chair and desk to prevent any pull on the wire from disconnecting it.

F (lower left leg of desk) is in proximity to a female plug which was permanently attached to the desk leg and into which an extension cord (G-15") could be plugged, one extending from an AC 110 outlet.

The view provided in Figure 2 was available only to the

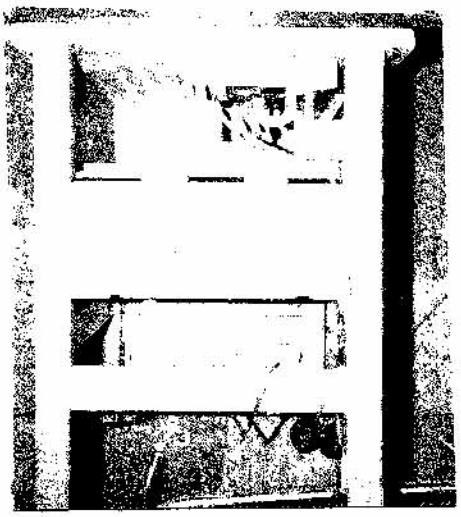

Figure 2. The interior components of the desk of the apparatus.

teacher and present E, both of whom had keys to the locked door (H). To provide the door the dowels holding the section of wood in place were cut and two solid brass butt hinges (5200 SC, Corbin) and a 0666 Corbin Drawer Lock (3/8") were added (see H) to the regular side piece of the desk top.

I is in proximity to the underside of the "Out" clock and depicted a case constructed to house it and the "In" clock (J). This case was of one-eighth inch formica. Between the letters I and J can be seen the knobs for setting the respective clocks.

A two-pole toggle switch (34-120 radic supply), designated by K, was the master switch for the apparatus and was mounted

on a small piece of formica.

Just behind K (not in view was a fuse clip (102001, radio supply) with one AGC5 fuse.

Figure 3 is a view of the underside of the apparatus's

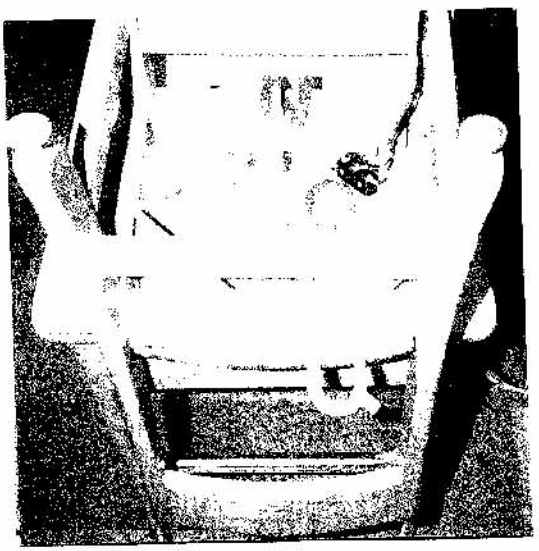

Figure 3. The components of the underside of the chair of the apparatus.

chair.

L indicates a solid oak board which was attached with four screws to the existing front corner braces of the chair. This board had an oval hole in the center of it which left sufficient clearance to allow the bolt to move through it freely, yet let the board stop the spring-loaded seat from raising more than needed.

M is next to a lock nut which held a three-sixteenth inch bolt securely to the seat, thus allowing the bolt to move with

the seat and through the brace (L).

Extending from the nut at M to the board (L) was a small coil spring around the bolt which provided tension for raising the seat. A washer was at either end of this spring.

N shows a double lock nut which could be adjusted to set the "throw" (distance for moving the seat up and down) of the seat.

O is just left of a 10-422 radio supply, three-way, lever-activated switch which was opened or closed through the pressure on it from the seat.

P represents the wires (three) extending from the three-way switch (O) to the spaghetti shown on Figure 1, E.

Q is placed on one of the two four-inch T hinges which were attached to the back underside of the seat and the back brace of the chair frame so as to allow the front of the seat to pivot up and down.

The hinges (Q), crossbrace (L), seat (M) and lock nut (N) allowed the seat to move approximately one-half inch in the front--just sufficient distance to close or open the three-way switch at O. Rubber was attached to contact points to prevent noise.

Figure 4 represents the electrical components of the appa-

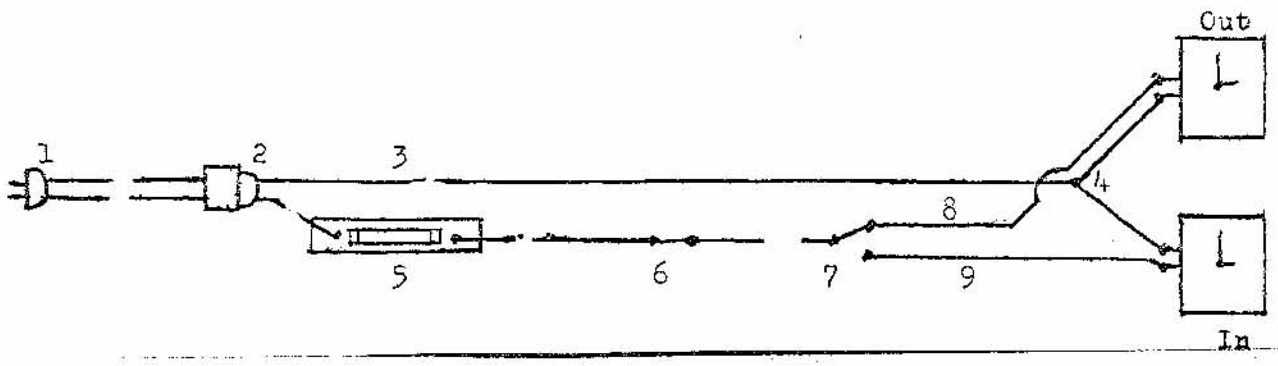

Figure 4. Electrical schematic for the apparatus.

ratus. From the AC plug (1) to the right is indicated a twelve foot extension cord which extended from the 110 AC wall outlet to the plug (2 in Figure 4 or F of Figure 2) on the leg of the desk.

Three represents the common wire which was split (4) and was run to both clocks.

A 102001 fuse clip with an A 605 fuse (5) is the first component on the "hot" wire, while a 34-120 toggle switch (radio supply) was next (6), serving as a master switch for the apparatus.

A 10-422 lever-activated three-pole switch (7) is next in series and along with the extension cord is the only component of Figure 4 which was not in the desk (7 is in the chair, Figure 3, O).

Eight denotes the line running to the "Out" clock while

9 represents that one extending to the "In" clock.

Providing the fuse was functioning properly, that the master switch (6) was closed and that the child was not seated the switch at 7 would route power to the "Out" clock as shown in Figure 4.

The apparatus for the operant levels and follow-up phases (during which sitting time only was measured) consisted solely of those sections which recorded sitting time: those shown in Figure 3, the desk door (H of Figure 2) and the exterior view (D, E, F and G of Figure 1). The "Out" clock (A of Figur 1) was not employed. The desk top of the apparatus was a plai solid oak piece as is typically seen on desks.

The apparatus was placed in a public school classroom for the educable retarded. The desk was in the front row, the extreme left hand side.

Design

Design per se. The design of the study was an operant technique with intrasubject replication and a follow-up phase. Withdrawal and presentation of positive reinforcement were employed as the independent variables with sitting behavior as the dependent variable.

A continuous schedule of reinforcement was utilized to present and withdraw the positive reinforcement (pennies). This same schedule of reinforcement was employed with the

secondary reinforcer (time) in that each response immediately resulted in the withdrawal or presentation of the secondary reinforcing stimuli (time).

Controls. The experimental controls in the present study were of two types: independent-variable-control and extraneous-variable-control.

The independent variables were under experimental control as they were initially introduced at the experimenter's discretion under the conditions delineated within the present paper's methodological section.

With extraneous variables the continuous schedule of reinforcement was used as it was thought it would keep the S's responding when they were only minimally deprived. This was needed as there was a lack of experimental control over the deprivational state of the S's. Two additional reasons for using a continuous schedule were 1. when reinforcement was small the subject would be kept responding and 2. the learned response (sitting or nonsitting) would be readily reversible once the contingencies were inverted.

Through being reinforced for every response, stimulus satiation might have occured. Through utilizing a generalized reinforcer (pennies) this possible satiation was controlled for, as the generalized reinforcer used (money) is paired with virtually all primary reinforcers and it is highly probable

that at any given time the S will be deprivated on one of these primary reinforcers (Skinner, 1953). This generalize reinforcer was relatively independent of the momentary stat of deprivation the organism may have been undergoing.

The primary control technique for extraneous variables was the design. Because the S's served as their own contro no part of the difference in the pre- and post-independent variable (presentation and withdrawal of positive reinforce ment) administration value of the dependent variable (sitti time) could have been attributed to the variability of the subjects (Van Dalen, 1962 and Sidman, 1960).

Each intra-subject replication, which is replication w the original subject of an experiment, has been thought to the probability of any extraneous variable modifying the va of the dependent variable. This is thought as it is highly probable that an extraneous variable could have been preser during each replication and would have exerted a constant e on the dependent variable. Each successful replication lov the probability of extraneous variables having an effect.

Sidman (1960) summarized this in stating intrasubject replication is one of psychology's most powerful tools for establishing the adequacy of our controls of extraneous var and thus for evaluating the resulting data.

The follow-up phase was to ascertain the degree of operant extinction which occured. It was employed to acquire an objec measurement of the duration of any effects produced by the contingencies of the experiment.

The S's received no medication and were naive as concerned the experiment.

Any difference in response rate as a function of time of day was controlled through balancing, that is, alternating the time of the S's run from 9:00-9:30 AM to 12:30-1:00 PM from one day to the next. These times were selected as they were the only times during which a conflict would not ordinarily occur at some point in the week and were the times in which sitting was expected (class reading, math, writing, etc.

The social reinforcemnt derived from peers and the teacher was held to a minimum through specific instructions to the teacher to prevent her approving or disapproving the S's behaviors during data collection and payoffs. It was also minimized through instructing her to maintain her pre-experimental methods of coping with his hyperactivity. Social reinforcemer via peers was minimized through: 1. naiveness as concerned t experiment on the part of the other students, 2. the presentation of the secondary reinforcing stimuli (time) through the visual modality only and in such a manner that only those in extremely close proximity to the desk could discriminate

said stimuli, 3. through scheduling payoffs (pennies) during those times when other children were not present and 4. throug taking S_1 and S_2 "shopping" the last thing Friday afternoon then directly home. This latter procedure allowed the weekend to elapse, lowering the probability of S_1 and S_2 mentioning their purchases to classmates.

Operationally defining hyperactivity in terms of sitting or nonsitting made instrumentation feasible. The reliability and validity of recording the dependent variable changes and presenting the independent variables was therefore increased over that which it would have been should human observers have been used.

Procedure

Procedurally the study consisted of the following five phases.

Operant level phase. The establishment of the operant level for the experimental S's of the study consisted of eight school days over a period of one and one-half weeks with thirty minute runs per day. Nine AM and twelve-thirty PM runs with S_1 and S_2 were alternated from one day to the next during this and all subsequent runs with the experimental S's. One clock was utilized to establish the operant level, a clock mounted in the desk, which had a regular top on it.

An operant level for each of six randomly selected classmates of the experimental S's was established with the same procedure as above, save for the time of the runs. With the control S's the timing was done over a two and one-half week period during those intervals when they could be scheduled in.

S_1, S_2 and the six control S's were told individually (at that point when the first session of the operant level was to begin) that they were to take their books and sit at the new desk. At the completion of a run each subject was told to return to his own desk. The teacher unlocked the desk after each child was timed and recorded the total sitting behavior time.

Experimental phase one. With the first day of this experimental phase S_1 and S_2 were told they could earn money which they would be able to spend at the store of their choice if they remained seated.

At the terminus of each experimental run (thirty minutes) the teacher unlocked the desk, shut off the apparatus, recorde the time in the chair and then gave the child one penny for every minute of sitting behavior and took one penny back for every minute out of the chair. The teacher said, "Now you have earned __ pennies for sitting __ minutes" [at which point she counted out and gave him the correct number of pennies].

"But you were out of your chair __ minutes so you have to give me back __ pennies". These instructions were the only verbal ones at the time and were presented without praise or condemnation through gestures, intonation, etc.

This payoff occured as soon after each experimental run as the teacher was alone with the child. This was after the other students had been dismissed for music, lunch, or recess and was always undertaken on the same day as the run.

The child's pennies were stored in his desk until each Friday afternoon, at which time he was taken to the store of his choice to spend the money as he pleased, after which he was taken home. If the S had earned no money he was left at school to go home by the normal method.

Experimental phase two. Here the instructions were reversed so the child lost pennies for sitting and got them for nonsitting. Thus, once the S's had undergone the eight days of conditioning in experimental phase one the contingencies of reinforcement were reversed and operant extinction of sitting and the presentation of reinforcement for nonsitting occured until eight days of conditioning had elapsed.

With this procedure it was thought the study would proceed from primarily the withdrawal of positive reinforcement for extinguishing nonsitting behavior to primarily the presentation of positive reinforcement to increase the frequency of sitting

behavior.

Experimental phase three. In this phase the contingencies of experimental phase one were employed, i.e., positive reinforcement was presented for sitting behavior and withdrawn for nonsitting behavior.

Follow-up phase. At the terminus of experimental phase three eight school days were allowed to elapse. After this interval S_1 and S_2 were timed for eight consecutive school days, thirty minutes per run alternating 9:00 AM and 12:30 PM runs. No reinforcement of any kind was given.

The timing was done through an opaque desk top and with the clock concealed behind a locked door inside of the desk.

Chapter IV

Results

A tabular and verbal presentation of the results for the present study follows. These results are divided into two general sections. The first section empirically establishes the hyperactivity of two experimental S's. The second section compares statistically each experimental S's operant level phase with his experimental phases and follow-up phase.

In all cases where there was a probability level given this level was established with the Wilcoxon Matched-Pairs Signed-Ranks Test, utilizing a two-tailed table. This test was selected as the study involved two related samples and had difference scores which could be ranked in terms of greater than or less than. A nonparametric statistic had to be used because of the N involved and the lack of knowledge as concerned the population distribution (Siegel, 1956).

Presentation of Operant Level Data Establishing Hyperactivity

S_1's operant level comparison. S_1 was statistically demonstrated to be hyperactive through comparing her operant level sitting behavior with that of six randomly selected classmates (Tables 1 through 6).

TABLE 1

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_1

Pair	Ex. S_1's operant level in minutes	C. S_1's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	10	30	20	6	
b	8	29	21	7	
c	14	30	16	2.5	
d	11	30	19	5	
e	12	30	18	4	
f	14	30	16	2.5	
g	22	29	7	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

TABLE 2

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_2

Pair	Ex. S_1's operant level in minutes	C. S_2's operant level in minutes	d	Rank of d	Rank with less frequent sig
a	10	29	19	6	
b	8	30	22	7	
c	14	30	16	4	
d	11	29	18	5	
e	12	25	13	2	
f	14	28	14	3	
g	22	30	8	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

TABLE 3

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_3

Pair	Ex. S_1's operant level in minutes	C. S_3's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	10	30	20	6	
b	8	30	22	7	
c	14	30	16	2.5	
d	11	30	19	5	
e	12	29	17	4	
f	14	30	16	2.5	
g	22	30	8	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

TABLE 4

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_4

Pair	Ex. S_1's operant level in minutes	C. S_4's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	10	30	20	6	
b	8	30	22	7	
c	14	30	16	2.5	
d	11	30	19	5	
e	12	29	17	4	
f	14	30	16	2.5	
g	22	30	8	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

TABLE 5

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_5

Pair	Ex. S_1's operant level in minutes	C. S_5's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	10	29	19	5.5	
b	8	29	21	7	
c	14	30	16	3	
d	11	30	19	5.5	
e	12	29	17	4	
f	14	29	15	2	
g	22	28	6	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

TABLE 6

Operant Level Sitting Behavior Scores on Experimental S_1 and Control S_6

Pair	Ex. S_1's operant level in minutes	C. S_6's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	10	30	20	6	
b	8	30	22	7	
c	14	30	16	2.5	
d	11	30	19	5	
e	12	30	18	4	
f	14	30	16	2.5	
g	22	30	8	1	
h	3	30	27	8	
					T= 0.0*

* $p < .01$.

As can be seen, the Wilcoxon Matched-Pairs Signed-Ranks Test yielded a significant difference at less than the .01 level of probability in all six comparisons. S_1's median sitting behavior for the operant level was 11.75 minutes as opposes that of the control S's, which was 30 minutes.

S_2's operant level comparison. Experimental S_2 was shown to be significantly ($p < .01$) more hyperactive than six of his random selected classmates (Tables 7 through 12). S_2's median for the

TABLE 7

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_1

Pair	Ex. S_2's operant level in minutes	C. S_1's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	30	28	8	
b	16	29	13	3	
c	8	30	22	6	
d	4	30	26	7	
e	15	30	15	4.5	
f	19	30	11	2	
g	23	29	6	1	
h	15	30	15	4.5	
					T= 0.0*

* $p < .01$.

TABLE 8

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_2

Pair	Ex. S_2's operant level in minutes	C. S_2's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	29	27	8	
b	16	30	14	4	
c	8	30	22	6	
d	4	29	25	7	
e	15	25	10	3	
f	19	28	9	2	
g	23	30	7	1	
h	15	30	15	5	
					T= 0.0*

* $p < .01$.

TABLE 9

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_3

Pair	Ex.S_2's operant level in minutes	C.S_3's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	30	28	8	
b	16	30	14	3.5	
c	8	30	22	6	
d	4	30	26	7	
e	15	29	14	3.5	
f	19	30	11	2	
g	23	30	7	1	
h	15	30	15	5	
					T= 0.0*

* $p < .01$.

TABLE 10

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_4

Pair	Ex. S_2's operant level in minutes	C. S_4's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	30	28	8	
b	16	30	14	4.5	
c	8	30	22	6	
d	4	30	26	7	
e	15	28	13	3	
f	19	30	11	2	
g	23	30	7	1	
h	15	29	14	4.5	
					T= 0.0*

* $p < .01$.

TABLE 11

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_5

Pair	Ex. S_2's operant level in minutes	C. S_5's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	29	27	8	
b	16	29	13	3	
c	8	30	22	6	
d	4	30	26	7	
e	15	29	14	4	
f	19	29	10	2	
g	23	28	5	1	
h	15	30	15	5	
					T= 0.0*

* $p < .01$.

TABLE 12

Operant Level Sitting Behavior Scores on Experimental S_2 and Control S_6

Pair	Ex. S_2's operant level in minutes	C.S_6's operant level in minutes	d	Rank of d	Rank with less frequent sign
a	2	30	28	8	
b	16	30	14	3	
c	8	30	22	6	
d	4	30	26	7	
e	15	30	15	4.5	
f	19	30	11	2	
g	23	30	7	1	
h	15	30	15	4.5	
					T= 0.0*

* $p<.01$.

operant level phase was 15 minutes, while that of the six control S's was 30 minutes.

Presentation of Experimental and Follow-up Phase Results

S_1's operant level and experimental phase one comparison. A $p < .02$ was obtained when S_2's experimental phase one was compared to his operant level (Table 13). The median for S_1's experimental phase one was 20 minutes.

TABLE 13

Experimental S_1's Operant Level and Experimental Phase One Sitting Behavior Scores

Pair	Ex. S_1's operant level in minutes	Ex. S_1's ex. phase one in minutes	d	Rank of d	Rank with less frequent sign
a	10	15	5	3	
b	8	15	12	6	
c	14	16	2	2	
d	11	17	6	4	
e	12	23	11	5.5	
f	14	25	11	5.5	
g	22	21	-1	-1	-1
h	3	27	24	7	
					T= -1.0*

* $p < .02$

S_1's operant level and experimental phase two comparison. A statistical comparison of S_1's operant level with her experimental phase two demonstrated a significant difference at less than the .02 level of probability (Table 14). A median of 23.5

TABLE 14

Experimental S_1's Operant Level and Experimental Phase Two Sitting Behavior Scores

Pair	Ex. S_1's operant level in minutes	Ex. S_1's ex. phase two in minutes	d	Rank of d	Rank with less frequent sign
a	10	27	17	7	
b	8	16	8	3.5	
c	14	13	-1	-1	-1
d	11	23	12	6	
e	12	20	8	3.5	
f	14	25	11	5	
g	22	24	2	2	
h	3	26	23	8	
					T= -1.0*

* $p < .02$.

minutes was established for experimental phase two.

S_1's operant level and experimental phase three comparison. Table 15 statistically compares S_1's operant level and experi-

TABLE 15

Experimental S_1's Operant Level and Experimental Phase Three Sitting Behavior Scores

Pair	Ex. S_1's operant level in minutes	Ex. S_1's ex. phase three in minutes	d	Rank of d	Rank with less frequent sign
a	10	30	20	7	
b	8	25	17	6	
c	14	29	15	4.5	
d	11	24	13	3	
e	12	27	15	4.5	
f	14	26	12	2	
g	22	29	7	1	
h	3	30	27	8	
					T= 0.0*

* $p<.01$.

mental phase three scores yielding a $p=<.01$; thus a significant difference. The median for experimental phase three was 28 minutes.

S_1's operant level and follow-up phase comparison. S_1's follow-up phase differed significantly ($p=<.01$; see Table 16)

TABLE 16

Experimental S_1's Operant Level and Follow-Up Phase Sitting Behavior Scores

Pair	Ex. S_1's operant level in minutes	S_1's follow-up in minutes	d	Rank of d	Rank with less frequent sign
a	10	28	18	5.5	
b	8	27	19	7	
c	14	28	14	4	
d	11	29	18	5.5	
e	12	24	12	2	
f	14	27	13	3	
g	22	27	5	1	
h	3	28	25	8	
					T= 0.0*

* $p<.01$.

from his operant level. The median was 27.5 minutes.

S_2's operant level and experimental phase one comparison. A comparison of S_2's operant level with his experimental phase one demonstrated a probability of less than .05 (Table 17).

TABLE 17

Experimental S_2's Operant Level and Experimental Phase One Sitting Behavior Scores

Pair	Ex. S_2's operant level in minutes	Ex. S_2's ex. phase one in minutes	d	Rank of d	Rank with less frequent sign
a	2	20	18	8	
b	16	19	3	3	
c	8	20	12	6.5	
d	4	12	8	5	
e	15	3	-12	-6.5	-6.5
f	19	21	2	1.5	
g	23	25	2	1.5	
h	15	19	4	4	
					T= -6.5*

* $p < .05$

A median of 19.5 minutes was found for experimental phase one.

S_2's operant level and experimental phase two comparison. A probability of less than .02 was derived from comparing S_2's operant level and experimental phase two results (Table 18).

TABLE 18

Experimental S_2's Operant Level and Experimental Phase Two Sitting Behavior Scores

Pair	Ex. S_2's operant level in minutes	Ex. S_2's ex. phase two in minutes	d	Rank of d	Rank with less frequent sign
a	2	30	28	7	
b	16	25	9	2	
c	8	30	22	5	
d	4	27	23	6	
e	15	30	15	4	
f	19	30	11	3	
g	23	30	7	1	
h	15	a			
					T= 0.0*

[a]Experimental S_2 was terminated at this point due to his being hospitalized.

* $p < .02$

The median here was 30 minutes.

Figure 5 is a frequency polygram which summarized the above-recorded study's results. The data presents the total sitting behavior time for each trial of the study's five phases. As can be seen, it pictorally illustrates the trend statistics established in the preceding paragraphs.

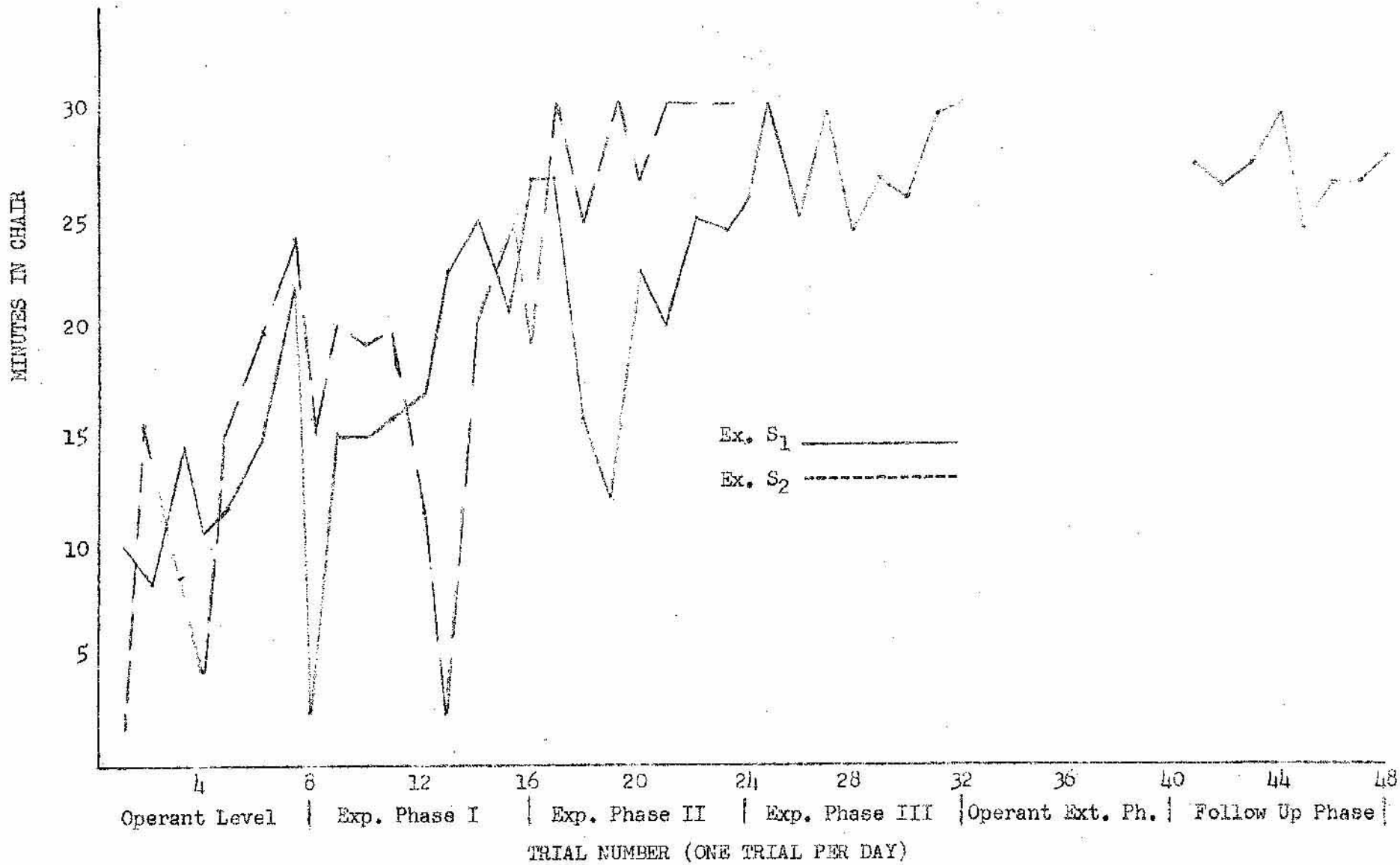

Figure 5. The effect of the presentation and withdrawal of positive reinforcement on hyperactivity.

Chapter V

Discussion, Conclusions, Summary and Recommendations

Discussion and Conclusions

Although Tables 1 through 6 give a specific probability level, establishing S_1's hyperactivity empirically, different medians illustrated this difference quite graphically, too. S_1's operant level sitting behavior median was 11.75 minutes/30 minutes. The real significance of this difference comes when it has been realized that all S's were timed during those intervals when they would be expected to be sitting. S_1 was apparently sitting in her chair even less than half the time her classmates were.

S_1's first experimental phase progressed as expected with time going from an initial 15 minutes/30 minutes to a final 27 minutes/30 minutes, thus establishing that some variable was modifying the S's sitting behavior. The only negatively ranked d shown in Table 13 resulted from the "artificially" high sitting behavior occuring during trial seven. During this particular trial a film was shown.

Experimental phase two did not result in a reduction in sitting behavior. On this basis it was concluded that extraneous variables were operant in addition to the present study's independent variables.

tically done but was a true modification, as this phase did differ significantly from the operant level phase. It was of interest to note that the mean of the follow-up phase (27.5 minutes) was only .5 minutes below that of the highest experimental phase's median (three being 28.0 minutes). The inter-trial variability in the follow-up phase appeared to be comparable to that of experimental phase three.

As mentioned with S_1's operant level time S_2's operant level run seven reflected the fact that a film was presented at the time of this run. S_2's median for his operant level was 15.0 minutes/30 minutes. This was 15.0/30 minutes less than that of six of his randomly selected classmates. While his median exceeded that of S_1 his was still fifteen minutes less than the control S's, a real problem for the teacher.

S_2's experimental phase one median (19.5 minutes) reflected an improvement in sitting of 4.5 minutes over that of the operant level. This difference was significant.

Experimental phase two was noteworthy; as with S_1, S_2's results reflected the presence of extraneous variables. The time of sitting was not decreased but rather was significantly increased relative to the operant level. With S_2 this improvement seemed attributable to the fact that during trials five, six and seven S_2 slept the total thirty minutes at his desk. Subsequent to this time he was absent from school and hospital-

ized for an interval of two weeks. Because of temporal problems (i.e., the approach of the termination of S_2's academic year) which did not allow sufficient time for the completion of his study, S_2 was dropped from the experiment. An additional reason for the termination of S_2 was the effect of his illness on his hyperactivity. Once he returned he still slept the majority of the school days.

In accordance with the data presented in Chapter IV it was concluded that the presentation and withdrawal of positive reinforcement via an apparatus within a public, special education classroom had no significant effect on the hyperactive behavior of two retarded subjects. The reader should be cognizant of the fact that this conclusion was necessitated because intrasubject replication was not obtained, even though the hyperactive behavior of both subjects was significantly decreased and in the one case completed was demonstrated to be nonprosthetic.

It would seem valid to conclude, as have Anderson, 1964; Patterson, 1964; Patterson et al, 1965; James, 1965; and Doubros and Daniels, 1966; that these data offer support for the efficacy of operant conditioning as a behavioral modification technique for the control of the hyperactive child in a classroom. This conclusion seems valid as even though the present study's independent variables were seriously confounded they did ini-

tiate changes in the environment which then significantly modified the child's hyperactivity.

The failure to obtain intrasubject replication was in all likelihood due to one or a combination of several of the three confounding variables presented in the following paragraphs. The possibility that others were operant was not eliminated. It should be realized that through generalization one would expect stimuli in the classroom to come to elicit nonhyperactive behavior.

Researchers (James, 1964 and Harris et al, 1964) have empirically established that the social reinforcement provided by teachers or adults is sufficient to induce favorable changes in hyperactive children. On this basis it would seem logical to assume that the teacher's unwitting verbalizations or gestures confounded the present study's independent variables.

Patterson (1964) noted that the peer group of his subject were a source of social reinforcement and concluded that they undoubtedly had some effect on his S's behavior. In the 1965 work he and his coauthors experimentally established this through setting up contingent social reinforcement of peers to modify nonattending behaviors in a S. Patterson (1965) quoted Straughan (in press) as having demonstrated that the reaction of peers can be made contingent on socially accepted behaviors of experimental S's. Comparable conclusions seem

tenable with the present work when one considers the discussion in the first paragraphs of the present chapter.

Patterson (1964) has mentioned that the E in his study became a descriminative stimulus. His basis for this was that the first one or two minutes of the E's presence in the S's classroom the S's nonattending behavior significantly decreased. In light of the verbalizations of the S in the present work to the E and classmates as concerned her trips to the store it would seem a grave error to fail to mention the confounding nature of the positive reinforcement which was possibly provided by the E.

Validity was given to some of the above conclusions when one realized that the schedule of reinforcement employed in this work (continuous) characteristically has resulted in a rapid operant extinction of the behavior modified by the schedule. It can be recalled that this did not in fact occur in the present study and in all probability did not because of the different schedules of reinforcement which the reinforcing stimuli of the peers, teacher and E presented.

Patterson (1964) and Patterson et al (1965) have corraborated the above in stating that the reinforcement schedules provided by the teacher, peers and E may produce this resistance to extinction of positively reinforced sitting behavior established in experimental phase one. This would explain

why a reversal of contingencies in experimental phase two (positive reinforcement of nonsitting) of the present study did not lead to an appreciable effect and why neither operant nor experimental extinction were found.

Possibly still another explanation for the failure to acquire intrasubject replication lies in the lack of contiguity between the S's responses and the presentation of the intended reinforcement. As may be recalled, the S's sat, received time which was later exchanged for money which still later was exchanged for the item of his choice. It should be realized that there was probably virtually no latency when social reinforcement was applied.

The presentation of the above-delineated confounding variables can little be questioned when it has been realized that the rapid change in the S's hyperactivity in this study was comparable to the results of Patterson (1964) and Anderson (1964). In these studies both reported significant confounding variables. In Patterson et al's 1965 work, where "only" social reinforcement was present, there were less "drastic" results.

In keeping with the findings of the present work, where the variability of hyperactive responses was decreased as the study progressed, were the findings of Doubros and Daniels (1966). It seems tenable to conclude that the present independent variables (and confounding ones) stabilized the frequency

of hyperactive responses as well as lowered the total number of them. No test of significance was used to demonstrate this due to the small population sample.

As the present study significantly modified the experimental subject's nonsitting behavior, validity was thought to be given to these four assumptions: 1. the specific responses of a hyperactive child seem to be conditioned as a result of punishment and rewards of the environment, 2. experimental apparatuses can be introduced into public classrooms, 3. operant conditioning techniques are of value in the public school classroom and 4. teachers might conceivable function as behavioral modifiers of hyperactivity when provided the techniques by the school psychologist. These assumptions gain support when one considers the present results as additive to those of other researchers.

Summary

Two level one educable mentally handicapped students from a public school classroom were selected and empirically shown to be hyperactive. This was established by comparing their operant level data with that of six of their randomly selected classmates.

It was hypothesized that the presentation and withdrawal of positive reinforcement within a public special education

classroom would have no significant effect on the hyperactive behavior of these students.

An apparatus which electrically timed the S's sitting behavior and presented secondary reinforcing stimuli was utilized.

The design of the study was an operant technique with intrasubject replication and a follow-up phase.

The withdrawal and presentation of positive reinforcement were employed as the independent variables with sitting behavior as the dependent variable. A continuous schedule of reinforcement was used with the reinforcers.

Procedurally an operant level was obtained on the two experimental S's and six control S's (all phases of the study had a duration of eight school days with thirty-minute runs per day). Then three experimental phases were conducted. Experimental phases one and three positively reinforced sitting and withdrew positive reinforcers for nonsitting. Experimental phase two was the reverse of experimental phases one and three. There was a lapse of eight days after experimental phase three then a follow-up phase of eight days.

The null hypothesis was accepted as intrasubject replication was not obtained, even though both S's hyperactivity was significantly decreased.

A discussion of the results in light of germane research,

conclusions and recommendations were made.

Recommendations

The following recommendations had their inception in the present research:

(1). An apparatus which completely removes the need for the presence of the E in the form of a teacher or researcher is needed for experimentation on hyperactivity in the public schools. Such equipment would control for social reinforcement and remove the latency problem in the present study, wherein the contiguity between the S's reinforcement and the actual occurence of the response was nill.

(2). In light of the present work and that of others, contingencies utilizing the social reinforcement of classmates or peers to modify behavior within a classroom should be used. When rapid changes were desired, as is frequently the case in the classroom, a combination of as many variables as practical should be employed.

(3). The reduction in variability of the hyperactive responses found in this research warrants additional study.

(4). School psychologists can and should utilize operant conditioning as it involves a minimal amount of temporal involvement and can be done through teachers.

REFERENCES

REFERENCES

A. BOOKS

Ayllon, T. & Michael, J. The Psychiatric Nurse as Behavioral Engineer. In L. Ullmann and L. Krasner (Eds.), Case Studies in Behavior Modification. New York: Holt, Rinehart and Winston, Inc., 1965. Pp. 84-94.

Baer, D. M. Effect of Withdrawal of Positive Reinforcement on an Extinguishing Response in Young Children. In T. Verhave (Ed.), The Experimental Analysis of Behavior. New York: Appleton-Century-Crofts, 1966. Pp. 171-179.

Barrett, Beatrice H. Reduction in Rate of Multiple Tics by Free Operant Conditioning Methods. In L. Ullmann and L. Krasner (Eds.), Case Studies in Behavior Modification. New York: Holt, Rinehart and Winston, Inc., 1965. Pp. 255-263.

Bernard, C. An Introduction to the Study of Experimental Medicine. New York: Dover, 1957. Cited by T. Verhave, An Introduction to the Experimental Analysis of Behavior. In T. Verhave (Ed.), The Experimental Analysis of Behavior. New York: Appleton-Century-Crofts, 1966. Pp. 1-47.

Boring, E. A History of Experimental Psychology (2nd ed.). New York: Appleton-Century-Crofts, Inc., 1957.

English, H. B. and English, Ava C. A Comprehensive Dictionary of Psychological and Psychoanalytical Terms. New York: David McKay Company, Inc., 1958.

Eysenck, H. J. and Rachman, S. The Causes and Cures of Neurosis. San Diego: Robert R. Knapp, 1965.

Ferster, C. B. & Skinner, B. F. Schedules of Reinforcement. Appleton-Century-Crofts, 1957. P. 730.

Grunbaum, A. Causality and the Science of Human Behavior. In R. Ulrich, T. Stachnik and J. Mabry (Eds.), Control of Human Behavior. Glenview, Illinois: Scott, Foresman and Company, 1966. Pp. 3-10.

Haughton, E. & Ayllon, T. Production and Elimination of Symptomatic Behavior. In L. Ullmann and L. Krasner (Eds.), Case Studies in Behavior Modification. New York: Holt, Rinehart and Winston, Inc., 1965. Pp. 94-98.

Hilgard, E. R. Theories of Learning (2nd ed.). New York: Appleton-Century-Crofts, Inc., 1956.

Kimble, A. Hilgard and Marquis' Conditioning and Learning (2nd ed.). New York: Appleton-Century-Crofts, Inc., 1961.

Michael, J. & Meyerson, L. A Behavioral Approach to Human Control. In R. Ulrich, T. Stachnik and J. Mabry (Eds.), Control of Human Behavior. Glenview, Illinois: Scott, Foresman and Company, 1966. Pp. 23-31.

Sidman, M. Tactics of Scientific Research. New York: Basic Books, Inc., 1960.

Sidman, M. Operant Techniques. In A. Bachrach (Ed.), Experimental Foundations of Clinical Psychology. New York: Basic Books, Inc., 1962. Pp. 171-210.

Siegel, S. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill, 1956.

Skinner, B. F. Science and Human Behavior. New York: The Macmillan Company, 1953.

Townsend, J. C. Introduction to Experimental Method. New York: McGraw-Hill Book Company, Inc., 1953.

Ulrich, R., Stachnik, T., & Mabry, J. Assumptions Underlying the Control of Human Behavior. In R. Ulrich, T. Stachnik and J. Mabry (Eds.), Control of Human Behavior. Glenview, Illinois: Scott, Foresman and Company, 1966a. P. 2.

Ulrich, R., Stachnik, T., & Mabry, J. Principles and Methods in the Experimental Analysis of Behavior. In R. Ulrich, T. Stachnik and J. Mabry (Eds.), Control of Human Behavior. Glenview, Illinois: Scott, Foresman and Company, 1966b. Pp. 21-22.

Verhave, T. An Introduction to the Experimental Analysis of Behavior. In T. Verhave (Ed.), The Experimental Analysis of Behavior. New York: Appleton-Century-Crofts, 1966a.

Verhave, T. Recent Developments in the Experimental Analysis of Behavior. In R. Ulrich, T. Stachnik and J. Mabry (Eds.), Control of Human Behavior. Glenview, Illinois: Scott, Foresman and Company, 1966b. Pp. 32-42.

Van Dalen, D. Understanding Educational Research. New York: McGraw-Hill Book Company, Inc., 1962.

Wolpe, J. Psychotherapy by Reciprocal Inhibition. Stanford: Stanford University Press, 1958.

B. JOURNALS

Anderson, D. Application of a Behavior Modification Technique to the Control of a Hyperactive Child. Unpublished master's thesis, Univ. of Oregon, 1964. Cited in G. R. Patterson et al. A Behaviour Modification Technique for the Hyperactive Child. Behav. Res. and Ther., 1965, 2, 217-226.

Baer, D. M. Effect of Withdrawal of Positive Reinforcement on an Extinguishing Response in Young Children. Child Devel., 1961, 32, 67-74.

Baer, D. M. Laboratory Control of Thumbsucking by Withdrawal and Representation of Reinforcement. J. of Exp. Anal. of Behav., 1962, 5, 525-528.

Bergan, J. R., & Caldwell, T. Operant Techniques in School Psychology. Psychol. in the Sch., in press.

Bijou, S. W. & Sturges, P. T. Positive Reinforcers for Experimental Studies with Children--Consumables and Manipulatables. Child Devel., 1959, 30, 151-170.

Brison, D. W. Case Studies in School Psychology A Non-Talking Child in Kindergarten: An Application of Behavior Therapy. J. of Sch. Psychol., 1956, 4, 65-69.

Brown, P., & Elliott, R. Control of Aggression in a Nursery School Class. J. of Exp. Child Psychol., 1965, 2, 103-107.

Burchard, J., & Tyler, V. The Modification of Delinquent Behavior Through Operant Conditioning. Behav. Res. and Ther., 1965, 2, 245-250.

Doubros, S. G. & Daniels, G. J. An Experimental Approach to the Reduction of Overactive Behavior. Behav. Res. and Ther., 1966, 4, 251-258.

Ferster, C. B. Withdrawal of Positive Reinforcement as Punishment. Sci., 1957, 124, 509.

Ferster, C. B. Control of Behavior in Chimpanzees and Pigeons by Time Out from Positive Reinforcement. Psychol. Monogr., 1958, 72, 1-38.

Harris, F. R., Johnston, M. K., Kelly, C. S., & M. M. Wolf. Effects of Positive Social Reinforcement on Regressed Crawling of a Nursery School Child. J. of Ed. Psychol., 1964, Feb., 35-41.

James, C. C. Operant Conditioning in the Management of Hyperactive Children: Five Case Studies. Unpublished manuscript, Orange State College, 1963. Cited by G. R. Patterson et al. A behaviour Modification Technique for the Hyperactive Child. Behav. Res. and Ther., 1965, 2, 218.

Miller, L. K. A Note on the Control of Study Behavior. J. of Exper. Child Psychol., 1964, 1, 108-110.

Patterson, G. R. An Application of Conditioning Techniques to the Control of a Hyperactive Child. J. of Ment. Def., 1964, 371.

Patterson, G. R., Jones, R., Whittier, J., & Wright, Mary A. A Behaviour Modification Technique for the Hyperactive Child. Behav. Res. and Ther., 1965, 2, 224.

Quay, H. C., Werry, Marjorie, & Sprague, R. C. Remediation of the Conduct Problem Child in the Special Class Setting. J. of Except. Child., 1966, April, 510.

Reger, R. School Psychology: A Critical Note. The Psychol. Rec., 1966, 16, 405-407.

Whelan, R. F., & Haring, N. G. Modification and Maintenance of Behavior Through Systematic Application of Consequences. J. of Except. Child., 1966, Jan., 283.

Wolf, M. M., Risley, T., & Mees, H. Application of Operant Conditioning Procedures to the Behavior Problems of an Autistic Child. Behav. Res. and Ther., 1964, 1, 305-312.

Woody, R. H. Behavior Therapy and School Psychology. J. of Sch. Psychol., 1966, 4, 2.