MILD SHOCK FOR UNDESIRABLE BEHAVIOR USED IN CONJUNCTION WITH REINFORCEMENT FOR DESIRABLE RESPONSES AS A PROCEDURE FOR THE TRAINING OF RETARDED CHILDREN

by

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ABSTRACT

A mild electric shock procedure was compared to a time out procedure for eliminating inattentive behavior with two retarded boys. A picture naming task was used which required that the subjects be trained to sit quietly, pay attention to the experimenter and mimic verbal behavior. Also the ratio of incorrect responses per shock was increased, using aversive tokens as conditioned punishers. The shock did not suppress correct responding and was found to be more effective in reducing inattentive behavior. The higher ratios, using aversive tokens, were less effective than shock following every incorrect response.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

GENERAL INTRODUCTION

Historically, the use of electric shock as a punisher procedure has been avoided as a method of modifying human behavior. Reese (1966) presented some of the problems associated with the use of this method. Overall suppression of behavior, changes in emotional responses and variability in the conditions under which the shock is presented are some of the problems she mentioned. In spite of these drawbacks, recent reviews have been less critical of the use of shock because of its success in reducing undesirable behavior (Soloman, 1964; and Gardner, 1969). Shock, however, has been typically used as a severe aversive stimulus to reduce serious behavior problems, usually as a last resort (Risley 1968). Azrin and Holz (1966) suggested that punishment used in conjunction with reinforcement in an attentive response situation reduced some of the undesirable side effects of shock. One of the purposes of this study was to see if mild shock for undesirable behavior used in conjunction with reinforcement for desirable behavior was an effective method of training retarded children to name pictures.

Time out (TO) procedures have been most frequently used in tasks of this nature (Martin et al. 1968). TO is a procedure in which the opportunity for reinforcement is removed following an undesirable response. In a pilot study conducted by the author, however, the ef-

fectiveness of the TO procedure for reducing inattentive responses was questioned. A second purpose of this study, therefore, was to compare TO with a mild shock procedure for reducing wasted time. If shock is found to be effective, a further question could be raised. Namely, could the number of incorrect response per shock ratio be increased by substituting tokens. That is if each response resulted in a negative token and a specified number of tokens resulted in a shock, would the resulting reduction in the number of shocks delivered affect its power as a punisher.

The first section of Experiment I deals with some of the preliminary procedures which were necessary before the experimental task could be undertaken. A picture naming task was used. This task required that the subjects sit quietly, pay attention to the experimenter and mimic words. Experiment I examines two questions. Firstly, can a mild shock used in conjunction with reinforcement for desirable behavior effectively train retarded children to name pictures. Secondly, is shock or TO a better procedure for preventing wasted time? The two Conditions, shock and TO, were run simultaneously, rather than an ABAB design. This was done since in the pilot study it was felt that daily fluctuations and long term changes in the subjects' behavior had more effect on the results than the experimental procedures. Experiment II examines the effect of increasing ratio of incorrect responses per shock (fewer shocks per specified number of incorrect responses) and the effectiveness of aversive tokens for bridging the gap between the incorrect response and the shock. This section also includes a return to the conditions of the first experiment and a reversal to the highest ratio used in Experiment II for each subject.

CHAPTER II

REVIEW OF THE LITERATURE

A. EXPERIMENT I

Time out has been extensively used in experiments as a punishment procedure. Leitenberg (1965) discussed the various time-out paradigms and reviews the literature on the subject. Bostow and Bailey (1969) used a two minute TO for punishing aggressive and disruptive behavior while reinforcing desirable behavior. One of the behaviors to be eliminated was the loud screaming of a retarded woman. The aggressive behavior (biting, kicking, etc.) of a retarded boy was the other undesirable behavior. Following a loud vocal response, the woman was removed from her wheelchair and placed on the floor for two minutes plus a minimum of fifteen seconds of silence. Edible reinforcers were delivered throughout the day for desirable behavior. The other subject was locked in a TO booth for two minutes following an aggressive response. He received edible reinforcers for each two minute period of desirable behavior. The authors state that the frequency of the problem behavior in each patient was reduced to near-zero level in less than a week when the brief TO for undesirable behavior and reinforcement for other behavior was used.

Zimmerman and Baydan (1963) manipulated the duration and frequency of TOs following incorrect responses on a matching task.

The TOs in the alternative response situation were 2, 10, 60 or 120 seconds. The matching accuracy of the human subjects increased as the TOs increased and this result was primarily due to the effect of the TO duration of the punished response. The unpunished responses were not consistently affected except for a suppression of this response during the 120 second TO. Various ratios of TO were then used while holding the TO duration constant. A decrease in matching accuracy was observed when the frequency of TO was decreased.

Wolf et al. (1964) used a TO procedure to reduce temper tantrums, throwing of eye glasses and self-destructive behavior. After an instance of one of these behaviors, the subject was placed in a room and the door closed. This procedure appeared to be very effective in eliminating the undesirable behavior of the retarded boy. A word learning procedure was also described by the author. An attendant would emit the name of the picture until the subject mimicked her. The mimic was reinforced with "Good" or "That's right" and a bite of the subject's meal. Although his repetoire is still below normal it was greatly improved by this procedure. A similar procedure was elaborated further by Risley and Wolf (1967). They used a TO procedure to eliminate undesirable behavior and they also explained how the parents could continue these procedures in the home.

Martin et al. (1968) used a TO procedure in conjunction with reinforcement for desirable behavior to train autistic children to name objects, to trace figures, to identify objects and to respond to various questions. Following undesirable behavior the experimenter removed the opportunity for reinforcement (TO) and ignored the subjects until they sat

quietly and attended to the experimenter for five seconds. The study is of special interest because of the detailed description of the various procedures used.

Risley (1968) used several techniques to reduce climbing behavior in a disturbed girl. A ten minute TO was used in the home but discontinued after fifty days without a reduction in climbing. Reinforcement for incompatible behaviors and extinction for climbing in the laboratory were then used with no apparent effect. A painful shock procedure was finally used to reduce climbing behavior. The voltage ranged from 300 to 400 V with occasional spikes reaching 1000 V. The rate of climbing was almost completely suppressed during the shock sessions. The authors examined the side effects of the shock and conclude: "..... side effects in the form of behavioral contrast or 'symptom substitution' did occur, but these side effects were primarily desirable."

A number of other people have used a severe shock procedure, including Lovaas et al. (1965) and Tate and Baroff (1966). The latter used a painful electric shock to eliminate self-injurous behaviors in an autistic boy. Initially a TO procedure was employed. If the subject hit himself while walking with the experimenters, they let go of his hand and ignored him for the duration of the inattentive responding plus three additional seconds. At the end of this time they again held his hand and continued the walk. Although this procedure was reducing the undesirable behavior, the subject was in danger of destroying his right retina. A stock prod delivering a 130 V stimulus for approximately .5 seconds was therefore used following each self-injurous response. The authors con-

cluded that this behavior was immediately reduced by the painful shock the undesirable behavior had not occurred for a six month period.

Herman and Azrin (1964) reported the effects of punishment by noise in an alternative response situation. A Lindsley manipulanda delivered cigarettes on a one minute variable interval schedule of reinforcement to three male patients from a mental hospital. Two levers were available (R-1 and R-2) during the alternative response situation and either one would result in reinforcement. In the next phase reinforcement continued but a 96 db. noise, considered annoying but not painful was delivered following each response on R-1. In the single response situation only R-1 was available. Under this condition the subjects continued to receive reinforcement on a one minute VI. During one phase they were not punished and during the other they received the noise. In the single response situation the punished responses were only partially suppressed. In the alternative responses, however, the punished response was almost completely suppressed. Also, an increase in the unpunished response occurred when the alternative response was punished.

In summary, it appears that TO has been used to effectively suppress behavior in many situations. However, the evidence also suggests that electric shock has been used more effectively as a punisher than TO.

B. EXPERIMENT II

Ayllon and Azrin (1965) in a classic study showed how a token system can be administered by non-professional personnel, applied to large numbers, and utilizing numerous reinforcement. The results showed

that tokens are very effective reinforcers, in fact token reinforcement "exerted almost complete contorl over whether a patient worked". When tokens were eliminated performance deteriorated to a near zero level. The results also indicated that reinforcement, to be effective, must be contingent on the desired performance. The procedure seemed effective regardless of I. Q., diagnosis, or length of hospitalization.

Girardeau and Spradlin (1964) used tokens as conditioned reinforcers for female retardates. The primary reinforcers included items from the canteen, and objects such as washing machines which could be rented. A chart of reinforcement values for tokens was used and stress was placed on individual improvement. The costs of the primary reinforcers were also manipulated, so that desirable behavior would increase. The authors noted an increase in desirable behavior.

Staats et al. (1964) used a reinforcing token system to teach reading skills to three, four year old children. The tokens (marbles) were backed up with a variety of toys chosen by the child. This system was ineffective in maintaining the child's behavior for long periods of time. The good control established allowed the experimenter to vary other parameters important for reading acquisitions.

Watson (1968) conducted two experiments: one to evaluate the conditioned reinforcement properties of poker chips, the other to determine the primary reinforcement preferences of the severely retarded child. The results of experiment one indicated that the poker chips acquired reinforcement properties as a result of the back-up reinforcers. In the second experiment, 14 severely retarded male children were allowed to select their own primary reinforcement by inserting the tokens earned in-

to various vending machines. Initially more chips were spent on manipulatable toys than candy, but by session 5 this was reversed. The long term preferences (70 sessions) then examined using 7 children showed that the candy preferences were maintained. Wolf et al. (1968) used a trading stamp style of token reinforcement system in a remedial education program. In Experiment I the maximum point value for each reading unit was first decreased and then increased again. The decrease radically reduced the number of stories read while increasing the points increased the reading rate. Experiment II examined the effects of point manipulation on different tasks. Thus the maximum number of points for English could be halved or doubled. Shifts to zero point value caused cessation of the behavior while lesser shifts produced immediate but variable changes. The reading task once increased tended to stay high in spite of point manipulation while the English and math tasks declined under these conditions.

Birnbrauer et al. (1965) established a token reinforcement system in a class of 17 retarded children. In order to determine its effectiveness in maintaining accuracy and rate of studying, the tokens were discontinued and after 21 days reinstated. Verbal reinforcements for correct responses, extinction for incorrect, and a time-out procedure for disruptive behaviors were used during all phases of the program. The effects of this procedure on each of the students were examined and three basic patterns noted. "(1) Five Ss showed, for all practical purposes, no adverse effects of NT (no tokens). (2) Six Ss increased in percentage of errors in NT, but continued to cooperate and to complete the same or greater number of items. (3) Four Ss increased in percentage of

errors, accomplished less work, and became serious disciplinary problems during NT. After tokens were reinstated, most of the Ss completed progressively more work and stabilized at levels of percentage of errors that were lower than at any previous time."

It appears that tokens function well as conditional positive reinforcers under certain conditions. Therefore the question is raised concerning the feasibility of negative tokens.

CHAPTER III

EXPERIMENT I

INTRODUCTION

Time-out has been shown to be effective as a punishment procedure. It has been used in a number of forms and for preventing a wide range of undesirable behaviors. Several experimenters have used it as a punishment procedure in a word learning task. In a pilot study conducted by the author, however, it was felt that time-out was not effective as a punishment procedure for reducing wasted time on a word learning task. In fact, it may have been reinforcing. This effect was also noted by Steeves (1969). Other studies, dealing with serious behavioral disorders, have frequently resorted to severe shock when time-out as a punishment was ineffective. Soloman (1964) and Gardner (1969) in recent reviews have been only mildly critical of shock as a punishment procedure. In these reviews shock has typically been used in a severe form to eliminate chronic behavior disorders which occur frequently. A number of studies have shown that even mild punishment can be effective in eliminating undesirable behavior when a readily available alternative response is reinforced (Herman and Azrin 1964, Azrin and Holz 1966).

Although severe shock has usually been used, a mild form might be effective if used in conjunction with reinforcement for desirable be

havior. The use of mild shock would eliminate some of the undesirable side effects associated with the use of severe shock. If this is the case, then mild shock might be an effective procedure in reducing the less chronic types of undesirable behavior. More specifically, mild shock might be an effective method of reducing wasted time and incorrect responding on a word learning task. Time-out in conjunction with reinforcement for desirable behavior has been used as a punishment procedure for tasks of this nature. The first purpose of this experiment was to determine if mild shock is an effective method of reducing incorrect responding on a word learning task. A comparison with a 0 second time-out procedure was used to assess the shock's effectiveness. The second purpose of this experiment is to see if mild shock is a better method than time-out equal in length to the time the subject spends in inattentive responding for reducing wasted time.

PRELIMINARY PROCEDURES

Before investigating these questions, a number of behaviors were required which were not in the subjects' repertoires. The picture naming task required the subjects to sit quietly, attend to the experimenter and to mimic sounds. The task also required limited verbal behavior and therefore subjects had to be carefully selected. The most effective reinforcers for these subjects then had to be determined. As a token system was to be implemented, token training was also necessary.

Subject Selection

One dependent variable in this study was an incorrect to correct

response ratio. In a pilot study, conducted by the author, it was noted that subjects with an extensive vocabulary and experience in a word learning task made very few errors. This limited number of errors would render the measure insensitive. Therefore, only children with no prior experimental experience and with limited vocabularies were used. The task did require the subjects to be able to repeat a word given by the experimenter (mimic). The following procedure was used to pick subjects meeting this very limited verbal behavior requirement.

A list of twenty common objects for the children to mimic was compiled (see Table I). The children in the St. Amant Ward of the St. Vital Hospital, Winnipeg, Manitoba were potential subjects. The children, whose ages ranged from two to eight years, were retarded or autistic. Several of these children were interviewed as follows:

(a) The experimenter pointed to the object to be named and said, "What's that?"

(b) If the child responded correctly the word became a primary word.

(c) If no response was emitted by the potential subject (a) was repeated.

(d) If the object remained unnamed the experimenter said, "That's a SHOE. What's that?" (If the object wa a shoe).

(e) (d) was also repeated if the first trial was not successful. If still unnamed the same procedure was followed on the next object.

(f) If an incorrect response was emitted the experimenter said, "No! That's a shoe. What's that?"

(g) If at any time a correct response was emitted the word

TABLE I

OBJECTS USED IN SUBJECT SELECTION PROCEDURE

finger	water
T. V. * o	mouth
cookie o	door * o
belt o	pen * o
car	thumb
tree *	arm * o
hair	pants
socks	comb o
shirt o	
ring * o	
watch	
ear o	

* The objects Derrick correctly mimicked during the subject selection procedure.

o The objects Bobby correctly mimicked during the subject selection procedure.

became a primary word.

(h) The first two children who had at least five primary words but fewer than fifteen were used as the experimental subjects. The characteristics of the two retarded boys selected, Bobby and Derrick, are described on page 27.

Attention Training

This research required the subjects to sit attentively at a table. This behavior was not in the child's repertoire and had to be taught. Shaping was the technique selected to produce the desired behavior. Shaping is the process of reinforcement in which responses successively similar to the desired behavior are reinforced (See Reese, 1966). A response which the subject does emit can thus be gradually altered until a response not normally occurring is emitted.

Each subject was seated behind a card table in such a way that it was difficult for him to stand up and shaping proceeded as follows: Each time the subject's eyes met the author's, the subject was given a reinforcement. Small sugar-coated chocolate candies (M & M's) and peanuts were used for reinforcement. Two items randomly selected were given for each required response. After about twenty rewarded trials, five seconds of eye contact became the criterion for reinforcement. After one session, the five second requirement was increased to ten seconds. The shaping was considered satisfactory if the subject's eyes met the experimenter's a total of fifteen times in one session. Sessions were held three times a week in the afternoon and lasted for twenty minutes.

Derrick acquired the desired behavior by the end of the second session. He would sit quietly, eyes intent on the experimenter, for extended periods of time. By the end of the fourth session the other subject, Bobby, did not have eye contact with the experimenter for more than five seconds at a time. He would point to various objects in the room, whine, push the table, stand and was extremely hyperactive.

To eliminate this standing behavior the experimenter would, contingent on the undesirable response, say "SIT DOWN!" and force the subject down in his chair. Stimulus control was apparent after two sessions. That is, the verbal command (stimulus) alone elicited sitting behavior. While preventing the undesirable behavior of standing, the experimenter also reinforced the incompatible response of sitting. If Bobby remained seated for approximately fifteen seconds he again received the edible reinforcer.

Bobby continued to point to various objects in the room, scratch his head, try to grab objects, etc. A cardboard screen approximately 10 feet by 4 feet was constructed. This screen was placed on the table behind the experimenter, so that Bobby was unable to see other objects in the room. Simultaneous with screen placement a hand-clasping response procedure was initiated. A fading technique was employed to produce this response. Fading was originally derived from Terrace (1963) and has been used with children by Moore and Goldiamond (1964), Wolf and Risley (1967), and others. In fading, a dimension of the specific stimulus controlling the response is gradually decreased (faded-out), while some dimension of a previously neutral stimulus is slowly in-

creased (faded-in). The neutral stimulus becomes the controlling stimulus without a reduction in the response rate.

Prior to the use of fading, the subject's hands were placed together in a clasped position on the table by the experimenter. The experimenter then placed his hand on top of the subject's hands to prevent movement and then reinforced the subject after each twenty-second period. Within one session the stimulus (experimenter's hand) elicited the desired response (clasped hands without escape responses). The pressure exerted by the experimenter's hand was then faded-out. The hand was lightly placed on top, then near-by and finally removed from the table. However, this response did not reliably occur. To increase the probability of this response, a cue stimulus was used. The experimenter would fold his own hands and tap the table lightly as the cue. When the subject mimicked the handclasp, he received the edible reinforcer. By the end of the second session when the experimenter tapped the table, both subjects folded their own hands, placed them on the table and waited for the reinforcement. When the undesirable response was eliminated, attention training was completed in two more sessions. It is interesting to note that when the experimenter deliberately ignored Bobby during the experimental task, Bobby would mimic this behavior by folding his hands and pounding on the table.

Derrick, although satisfying the original attention requirements, had some behavior to be eliminated. When having eye contact with the experimenter, he would tilt his head back as if peering under glasses. It was noted that Derrick's eyes would follow the reinforcers.

Therefore, the experimenter held the M & M on the table and reinforced the subject for ten seconds of eye contact with it. Upward head movements were then shaped by gradually raising the M & M to the experimenter's eye level. When the M & M was held at this height, Derrick's head and eyes were aimed at the experimenter's. The M & M was then faded-out by covering it with the hand. Then the hand without the M & M was used and finally the experimenter's hand was faded-out, while reinforcing eye contact with the correct head position.

Misbehavior

A number of responses were emitted by the subjects which were undesirable only because they competed with attention responses. This was called inattentive behavior. Crying, pointing, turning in the seat, etc. were all inattentive responses. In addition to the reinforcement for incompatible behavior (attention responses), a punishment procedure was utilized. A punisher according to Azrin and Holz (1966), is a stimulus which, when presented contingent upon some response, decreases the probability of that response occurring again. Time out (TO) was the punishment selected. TO, as used in this study, refers to the removing of the opportunity for the subject to receive reinforcement, immediately following an undesired response.

During the preliminary procedures inattentive behavior was dealt with as follows:

(a) Each and every time an inattentive response occurred the experimenter turned his head sharply to the left and ignored the subject.

(b) The opportunity for reinforcement was eliminated while the subject was emitting inattentive responses.

(c) The TO continued until the inattentive response of the subject ceased. When the subject emitted an attention response the experimenter resumed the preliminary training.

In addition to the inattentive responses, the subjects emitted behavior which was potentially harmful to the equipment, subjects or the experimenter. These responses were collectively called disruptive behavior and included grabbing the microphone, throwing objects, banging their heads against the wall, kicking the experimenter, and so on. The TO punishment requires a number of trials to reduce undesired responses and it was necessary to eliminate the disruptive behavior immediately. Therefore, a more severe punishment procedure was used.

(a) The experimenter said, "No!" immediately after each and every disruptive response, and slapped the child's hand sharply.

(b) If an object was held, the experimenter took it away forcefully and then slapped the child's hand sharply.

(c) If crying behavior was emitted consequently, the TO procedure was used to eliminate it.

(d) The experimenter was prepared to initiate the interrupted reinforcing procedure contingent on an attentive response.

(e) This procedure was repeated if the disruptive responses were not immediately suppressed.

Picture Naming Task

The subjects were trained to name objects and pictures of objects to acquaint them with the experimental task and to control mimicking behavior. The primary words (words which the subject had previously mimicked) were the verbal responses over which the experimenter needed to get stimulus control. For example, if one primary word for a subject was "shoe", this meant that during the subject selection procedure he emitted the response "shoe" while the experimenter pointed to and possibly named the object, shoe. In this case the stimulus which controlled the desired response was the object itself. The following procedure was used to get a picture of the object to elicit the desired verbal response.

(a) The subjects were shown an object and the experimenter said, "What's that, that's a ____ (name of object). What's that?"

(b) If the subject responded "shoe", the experimenter said, "Good boy" and delivered the selected reinforcer.

(c) If the child did not respond in five seconds, (a) was repeated.

(d) If the subject still did not respond the experimenter said, "Say SHOE". This was repeated once more and if still no response was emitted the experimenter proceeded with the next object.

(e) If the subject made a wrong response the author said "No", turned his head away and ignored him for ten seconds (TO).

(f) If the child misbehaved the experimenter said, "No" and slapped the child's hand.

(g) If the subject was inattentive, the author turned his head to one side and did not administer the reinforcer normally re-

ceived (TO).

(h) Contingent on an attention responses for (f) and (g), the experimenter again followed the instructions in (a) - (g).

(i) As soon as the subject emitted three successive successful verbal responses, the experimenter presented a picture of the object rather than the object itself.

The same procedure was followed for the picture naming task except that more correct responses were required. Instead of three successive successful verbal responses, a minimum of thirty correct responses were required.

Selection of a Reinforcer

Various reinforcers have been shown to be effective with retarded and autistic subjects. Isaacs et al. (1960), Ayllon (1963), and others have used edible reinforcers. Davison (1966), Hall and Broden (1967), and others used social reinforcement. Staats et al. (1964) and others used manipulable reinforcers. These reinforcers have been shown to be differentially effective and therefore a selection procedure was necessary to find the most powerful reinforcer for each subject. Punishment literature indicated that the aversive properties of a negative reinforcer generalize to the person present at that time. During the punishment condition of the experiment, therefore, the experimenter would not only be a reinforcer but also a conditioned punisher. During the non punishment condition, however, the experimenter would not have the aversive property. Therefore only manipulable and edible reinforcers, rather than social reinforcers, were tested.

The manipulable reinforcers tested were (a) several puzzles, (b) a number of small cars, trucks, etc., (c) numerous children's books with colorful pictures. A time limit of fifteen seconds was set in order to equate the time spent manipulating these objects with the time spent on consumatory responses with the edible reinforcers. The latter reinforcers were (a) M & M candies and peanuts, (b) cracker jacks and (c) the evening meal (Bobby only). Prior to the selection of a reinforcer, two candies (M & M's or nuts) were used as reinforcers for both subjects. If a more powerful reinforcer had been initially determined, a number of behavior problems and misbehavior might have been eliminated sooner. The reinforcement selection took place during the training for the picture naming task and the procedure is described below.

(a) Each correct response was reinforced with one of the manipulable or edible reinforcers.

(b) The next response was reinforced by an item in the other category. This is, if an edible reinforcer was initially used a manipulable one was the next to be used.

(c) This was repeated with different reinforcers from each category so that all of them were delivered equally.

(d) After two sessions the subjects were allowed to select one of the reinforcers, which were placed in front of them.

(e) When the next four sessions were completed the most frequently selected reinforcer for each subject was used as the experimental reinforcer.

The reinforcer selected for Bobby was the evening meal and the reinforcers for Derrick were peanuts and M & M's.

Token Training

Rather than reinforce each correct response with primary reinforcement, a token system was instituted. A token is an object which has reinforcement value due solely to appropriate pairings with primary reinforcement (food, candy, etc.). The token is then a conditioned reinforcer and has several advantages. Tokens can be used to bridge the gap between correct responses and primary reinforcement. This avoids satiation effects and saves time by reducing the number of consumatory and manipulatory responses. Also they can be paired with a variety of reinforcers so that reinforcement value is less variable.

Girardeau and Spradlin (1964), Birnbrauer et al. (1965), and others have demonstrated the effectiveness of token systems with retarded children. The specific procedure used to establish the system was described by Martin et al. (1968) and is presented with only minor modifications.

(a) When the child correctly named the picture, the experimenter placed a token (1 inch toy brick) in front of him. The experimenter then held out his hand and said, "Give me the brick".

(b) If the child put the brick in the extended hand, the author said, "Good boy" and gave him the primary reinforcer.

(c) If the subject picked up the brick but did not put it in the hand, the instructions were repeated.

(d) If the child still did not respond, the experimenter took the brick and gave the primary reinforcer.

(e) If the subject misbehaved, i.e. threw the brick, began

tantrum behavior when the brick was removed, etc., the experimenter said, "No", slapped the child's hand and ignored him for ten seconds (or until the undesirable behavior stopped).

(f) Aften ten successive successful trials, the ratio was increased to 2/1. Thus two correct responses, each of which was reinforced with one brick, were required before the hand was extended, the brick requested, and the primary reinforcement delivered.

(g) This procedure (f) was then repeated, increasing the ratio to 3/1, 4/1 and finally 5/1.

The 5/1 ratio was achieved by both subjects in less than four sessions.

Word Baseline

The subjects rarely used words and knew less than fifteen of the words used in the subject selection procedure. They also had difficulties pronouncing words correctly. The picture naming task required that the words be unknown and clearly pronounced. It was also necessary to have a pool of words, so that when a picture card was completed another could be started immediately. Since the subjects would not name pictures of objects without prompting from the experimenter, the pictures were named by the experimenter and then the subjects were required to recall the names. The cards used had colorful pictures of objects. Primarily one syllable words were selected and are listed in Tables 2 and 3. The following procedure was used.

(a) The first card was placed in front of the subject and the experimenter said, "What's that? That's a _____ (name of object).

TABLE 2

EXPERIMENTAL WORD LIST FOR BOBBY

ruler * * *	rug *
apple * *	boy * *
saw *	house * *
jug * * *	lock
doll *	frog
bird * *	juice * *
duck *	bow
pie * * *	pea
spoon * *	nut
eye * *	boat *
car	jack
bug *	bell * *
bib *	bee *
fox *	slide *
baby * *	nose
flag *	ice *
cake *	box
doggie *	lion *

* Learned words
** Known words
*** Words eliminated after six sessions

TABLE 3

EXPERIMENTAL WORD LIST FOR DERRICK

bee *	horn
apple *	hat *
bell	bib * * *
baby *	fan * * *
cup *	mit *
boy *	house
tie *	drum *
bat *	pie
girl * * *	kite
can	cop
well *	key *
bear	juice *
paper	cow
light *	tray
lady	ice *
pea *	tile
paper	lock
wheel	bow
hoe *	

* Learned
*** Words eliminated after six sessions

What's that?"

(b) Any response which approximated the desired response was reinforced.

(c) If the word was correctly mimicked by the subject, the word was given a pronouncability rating of 3 and a mark was placed in the fifth column of the baseline sheet (see Table 4). If the verbal response was unrecognizable or very poor, it was given a 1 rating and a check placed in the third column of the sheet. If the response approximated the desired response so that an outside observer would recognize the response as a mimic, although the word was not perfectly pronounced, the word was given a 2 rating, and the fourth column was marked.

(d) If an incorrect response or no response was emitted, the experimenter said, "No", turned his head to one side and ignored the subject for ten seconds (10 second TO).

(e) Misbehavior resulted in a "No" and a sharp slap on the hand.

(f) The next card was then presented and the procedure repeated. This was continued until each of the cards had been delivered twice.

(g) Starting with the first card again the subject was asked, "What's that?"

(h) If the subject responded correctly, a mark was placed in the known column of the baseline sheet (column 6). If it was incorrect, a check was placed in column 7.

(i) If the subject did not initially respond, (d) was followed and the question repeated. If there was still no response, the next card was presented. No marks would be placed on the baseline sheet in this case.

(j) G was repeated so that there was a possible total of two marks for each word in the 6th and 7th columns. Similarly, two marks would result when adding columns 3, 4 and 5, unless the child did not respond in one of the trials.

(k) The words selected for tact training had to be unknown (no mark in the 6th column) and pronounceable (at least one mark in column 5). As training progressed it became evident that this criterion was too high, so after two sessions a 2 rating was also allowed.

(l) Words meeting the criterion were circled and randomly divided into two word pools. These pools are presented in Tables 2 and 3 and an example of a baseline sheet is presented in Table 4.

METHOD

Subjects

The subjects for this study were chosen because of their availability, ability to mimic and lack of vocabulary (see subject selection). Both of the subjects were severely retarded. Bobby was six years old and had been hospitalized for almost two years. Derrick was five years old, had first been examined for retardation three years earlier and had been hospitalized for a year before the study began. Neither of the subjects displayed unprompted verbal behavior. Words might be repeated if insisted upon. There was no verbal inter-

Baseline Sheet

SUBJECT Derrick SAMPLE

DATE	WORD	PRONOUNCED 1	2	3	KNOWN	UNKNOWN
IN 3	CAN	1	1			11
	BAT			11	1	1
	(SHOE)*		1	1		11
	(FLY)		11			11
	CAR		1	1	11	
	(TIE)		1	1		11

* Circled words are the words which could be used for the picture naming task.

action between the subjects and the other children or staff although both subjects would sometimes say "No", "Yes" and "Bye". Toilet training was also delayed for both subjects. In spite of frequent opportunities to use washroom facilities, they continued to 'dirty' pants. Bobby and Derrick were both cheerful, healthy and likeable. Typically they played by themselves, except when fighting.

Apparatus

This research was conducted in a large classroom in the St. Amant Ward of the St. Vital Hospital, Winnipeg, Canada. Subjects were seated behind a card table which was located in one corner of the room to reduce the escape behavior of the subjects. On another table, beside the experimenter, were a number of picture cards, a red light, play bricks, M & M's, nuts, an evening meal, shock apparatus and number of data sheets. The 6-3/4" x 9" cards had colorful pictures of various objects. They were first grade picture cards obtained from the Economy Company, Indianapolis. One and two syllable objects were selected from these cards for the experimental task (see Tables 2 and 3). A standard desk lamp with a 60 watt red bulb served as a discriminative stimulus to distinguish the two conditions of the experiment. The toy bricks were used as tokens and were delivered one a 5/1 ratio. The primary reinforcers for Derrick were M & M's and nuts. The primary reinforcer for Bobby was the evening meal. The shock apparatus consisted of a box, approximately 18" x 6" x 5" containing a 6 volt flashlight battery and an auto induction coil, a 10' lead wire, another 10' wire with a push-button switch at the end, and a flexible plastic strap. The lead

wire was attached to the subject's bare calf by means of the plastic strap. The experimenter controlled the delivery of the stimulus by pressing the button at the end of another wire. The range of the shock as observed on an oscilloscope was from 9 to 15 milliamps and the duration was approximately .25 milliseconds. The variation in the intensity of the shock was primarily due to daily fluctuations in skin resistence and the tightness of the strap reduced wasted time indicated that it was punishing. However, it was observed that a slap in the hand resulted in more crying behavior than did the shock. No marks were left on the skin where the electrodes were placed.

Specific Procedure

It was the purpose of this research to compare the effectiveness of two different procedures on retarded children. During one experimental period the subject would first receive a session under the conditions of one procedure, then after a ten minute break he would receive a session of the other procedure. The sequence of the procedures was reversed after each period. Each session was twenty minutes long. The experimenter conducted the periods every other afternoon.

The task used for both procedures was a picture naming task. From the Word Baseline Procedure an unknown word was selected for the subject to learn. A card with a picture of the objects to which the word referred was then placed in front of the child. The experimenter named the object and requested the child to repeat the name. This was called a prompt trial (P). The experimenter then requested the object's name but did not rename the object. This was called a question trial

(Q). This technique was repeated a number of times with both known and unknown objects (see specific procedures). A token was delivered after each correct response. When the child accumulated five tokens they were handed to the experimenter in exchange for the selected primary reinforcement.

Condition I was the non-shock procedure. Errors on the tact were given a 0-second TO. For example, one type of tact test was an incorrect response. If the child responded "dog" when a picture of a cow was presented, the experimenter said, "No" and immediately went to the prompt trial for the known word. The other tact errors occurred if the subject did not respond in five seconds, or if the response was not understandable. Both these errors were treated in the same manner as the example. Inattentive behavior during the tact task resulted in a TO procedure which lasted until an attention response was emitted. If subject looked out the window or was crying, the experimenter turned his head to one side and did not deliver the reinforcement normally given until the child emitted attention responses. Kicking, grabbing equipment, etc., were treated as disruptive behavior rather than inattentive. The experimenter would say, "No", remove any object from the child's hand, and slap the hand sharply. The picture naming procedure was then immediately resumed unless the child was inattentive.

Under Condition II the red light was on and shock was delivered rather than the TO procedure used in Condition I. After any of the three types of tact error, the experimenter said "No" and delivered one shock. Also, after each five scond period of inattentive responses, the experimenter said "No" and delivered the sti-

mulus. Disruptive behavior was treated identically with Condition I.

One of the dependent variables was the frequency of correct responses. It was obtained by counting the number of times the subject correctly named the picture cards presented in each session. A second dependent variable was an error /lo correct response measure. This variable is time independent so that is punishment suppressed responding, or if inattentive behavior was high, Conditions I and II could still be compared. The third measure was total number of time outs per session. A mark for each five second period of inattentive responding was recorded and these marks were summed at the end of each session. The last dependent variable was the cumulative number of words learned. To meet the operational definition of 'learned' meant that the subject had to correctly identify the picture of the object at least twelve times and then correctly name the picture in three successive sessions. This stringent requirement meant that few words could be 'learned' and therefore this measure was not very sensitive. It was an important measure, however, since the basis for the research was to find the best procedure for learning words.

A specific procedure for training retarded and autistic children to name pictures has been described by Martin (1969) and is presented with only minor modifications. Refer to Table 5 when following this procedure.

(a) The experimenter pointed to a new picture (NW) and said, "What's that? That's a _____ (name of object). What's that?" This was called a prompt trial (P). When the subject correctly mimicked the name, the author pointed to the picture and asked, "What's that?" This was termed a question trial (Q). When an error at any stage occurred the

TABLE 5

SESSIONS SHEETS FOR THE PICTURE NAMING PROCEDURE

SESSION I

E Reinforcement S Bobby DATE Jan. 3

NW	cow							NW	dog					
	KW	KW2	KW3			TO		KW	KW2	KW3			
NWP	1	1	1			11111		NWP	1					
Q	1	1	1					Q	1					
KWP	1	11	11			11		KWP	11					1
Q	1	11	11					Q	1					
NWP	1	11	11			1		NWP						
Q	1	11	11					Q						
KWQ	1	1	11					KWQ						
NWQ	1	1	11					NWQ						
KWQ	1	1	11					KWQ						
NWQ	1	1	1					NWQ						
	1(1)				41	8			1(0)				5	1

Column 2 (KW2) is given below as presented to the subject.

NWP	What's that?	That's a cow.	What's that? (subject answers)	cow
Q	What's that?			cow
KWP	What's that?	That's a bat.	What's that?	bat
Q	What's that?			bat
NWP	What's that?	That's a cow.	What's that?	cow
Q	What's that?			cow
KWQ	What's that?			fly

(The correct response here would be bat. Since the subject made an error the procedure is repeated beginning with the third row.)

KWP	What's that?	That's a bat.	What's that?	bat
Q	What's that?			bat
NWP	What's that?	That's a cow.	What's that?	cow
Q	What's that?			cow
KWQ	What's that?			bat
NWQ	What's that?			cow
KWQ	What's that?			bat
NWQ	What's that?			cow

experimenter said "No", delivered shock if it occurred in Condition II, and then presented a P. When the subject responded correctly to the P, the Q was repeated.

(b) When the subject correctly responded to the Q for the NW repeat part (a) (i.e. P & Q) for a known picture (NW_1). Then part A was repeated for NW_1. The Q's for NW_1 and KW_1 were then alternated until he made four successive successful responses.

(c) Part (b) was then repeated with a second known picture (KW_2) and then again with (KW_3).

(d) A mark was placed in the appropriate row and column for each correct response on the picture naming sheet (see Table 5). A check was also placed in the last column for each five second period of inattention behaviour observed.

In addition to this session data sheet, a summary data sheet was constructed to record the results over a number of sessions (see Table 6). In the first column the date and number of the session were recorded. Column two contains the new words which were worked on during that session. If the above procedure was completed for the word, the word was placed in the "reached criterion" column. At the beginning of the next session, these words were placed in the next column and tested. If the word was correctly recalled, it received a "1" in parenthesis and was not worked on during that session. If the word was not remembered, an X was placed in parenthesis and the word was worked on in that session. A word correctly recalled in one session was presented in the following session and if correctly recalled this time a "2" was placed in parenthesis. Similarly a "3" was used for the third successive recall.

TABLE 6

SUMMARY OF SESSIONS SHEETS

SUBJECT _____ CONDITION _____

DATE & SESSION	NEW WORDS	REACH CRITERION	CRITERION TESTED	LEARNED	CORRECT RESPONSES	CUMUL. ERRORS/WORD	EXCESS T.O./SESS.
Dec 30	fly	fly			30	0(0) 0(0)	15
1	pie				2	0(1) 0(1)	
Dec 31	pie	pie	fly (1)		35	2(1) 2(2)	4
2	cows	cows			3	1(0) 1(0)	
Jan 2.	pie	pie	fly (2)		30	0(0) 2/2	6
3	dog		pie (X)		4	0(2) 0(0)	
			cows (1)				
Jan 3	cows	cows	dog (3)	fly	41	(1) 2(1)	9
4	dog		cows (X)		5	1(0) 1(2)	
			pie (1)				

See the previous page for the Data Sheet used for the sample on January 3rd.

The word was then placed in the learned column.

The number in the correct responses column indicate the total correct responses for each new word and the known words alternated with it. In the upper left hand corner of the next column the number of errors on that word was recorded. The first number indicated errors on known words, the second (in parenthesis) was errors on the new word. Below those numbers but in the same column were the cumulative errors for these words, i.e. the errors for that session which used these words. The first number refers to known words and the number in parenthesis refers to new words. In the last column the total number of five second periods of inattentive are recorded. If a new word did not reach criterion after six sessions, it was discarded and a new word was presented. The criterion words were the first to be worked on if they were not remembered (received an X). Otherwise, words from the previous session which did not reach criterion were used, or new words, in that order.

This procedure was altered for Derrick after two sessions because he consistently called any new word by the name of the known word worked on during that session. Therefore, rather than alternate known words with new words, the new words were used alone, i.e. the new words replaced the known words in the picture naming procedure. This change in procedure made the task different for Derrick than for Bobby because Derrick worked constantly on the new word. This factor might influence the number of errors, rate of word learning and inattentive behavior.

The evening meal was selected as the reinforcement for Bobby.

After a number of experimental sessions, however, Bobby began to refuse one or more items. Several times he pointed to the books which had been used during the reinforcement selection procedure. On the fifth session primary reinforcement was changed to fifteen seconds of looking at the book. Since the room used was only available during the subject's dinner time, his meal was given to him between the experimental sessions instead of the short recess.

The picture naming task required the experimenter to decide whether or not a verbal response emitted by the subject was correct or incorrect. An interobserver reliability measure was used to check the accuracy of these decisions. Observers were to be present during the experimental sessions and record the responses of the subjects, simultaneously to the experimenter. The presence of an observer, however, caused inconsistancies in the data (see Figures 2 & 3). A tape recorder was, therefore,used to record the subjects' responses during twenty six of the sessions. Observers listened to these tapes and recorded disagreements with the experimenter's decision on the basis of the following rules.

(a) If, in the opinion of the observer, the subject did not respond in five seconds to the P or Q and the experimenter did not say "no", a disagreement was recorded.

(b) If the observer considered he would have been able to have recognized the word emitted by the subject outside the experimental setting and the experimenter did not, a disagreement was recorded.

The interobserver reliability measure was recorded as a percentage. It was obtained by subtracting the total number of disagree-

ments recorded by the outside observer divided by the total number of correct responses recorded by the experimenter from one and multiplying this result by one hundred. The resulting interobserver reliability measure was 97.

Since the disagreements from each of the categories were totaled, it was possible that either (b) or (c) might have had a low reliability in spite of a high overall interobserver reliability measure. To check this thirteen of the tapes were randomly selected and the reliability measure for (b) and (c) were computed separately. However, both (b) and (c) had an interobserver reliability score of 98.

Results

The subjects both spent less time in inattentive behavior under the shock procedure of Condition II, then under the TO procedure of Condition I, as shown in Figure 1. During the eighteen twenty minute sessions Bobby wasted a total of 4,500 seconds under Condition I and 1,220 under Condition II. Although Derrick took fewer time outs under both Conditions than Bobby, Condition II continued to be consistently superior to Condition I in reducing wasted time.

An observer was present for Derrick on two occasions, sessions 8 and 11, and for Bobby on two occasions, sessions 5 and 10. This had no noticeable effect on the measure of inattentive behavior. The task was modified for Derrick after two sessions, with no noticeable effect on inattentive behavior. After session 5, the reinforcer for Bobby was changed from a meal to being allowed to look at a book. This may have initially increased TOs during Condition I but did not influence Condition II.

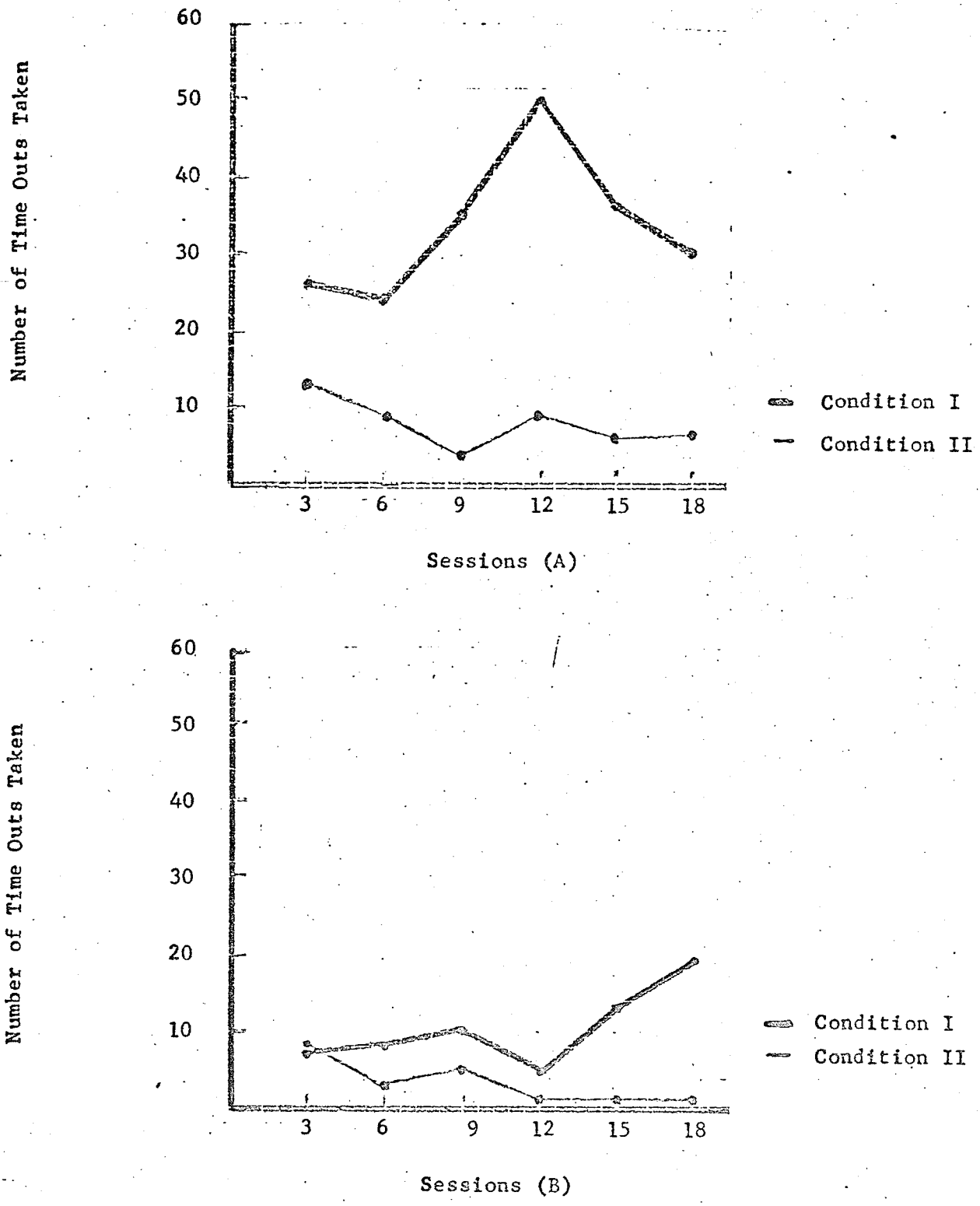


Figure I. The means (per 3 sessions) of the total number of 5 second TOs. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure.

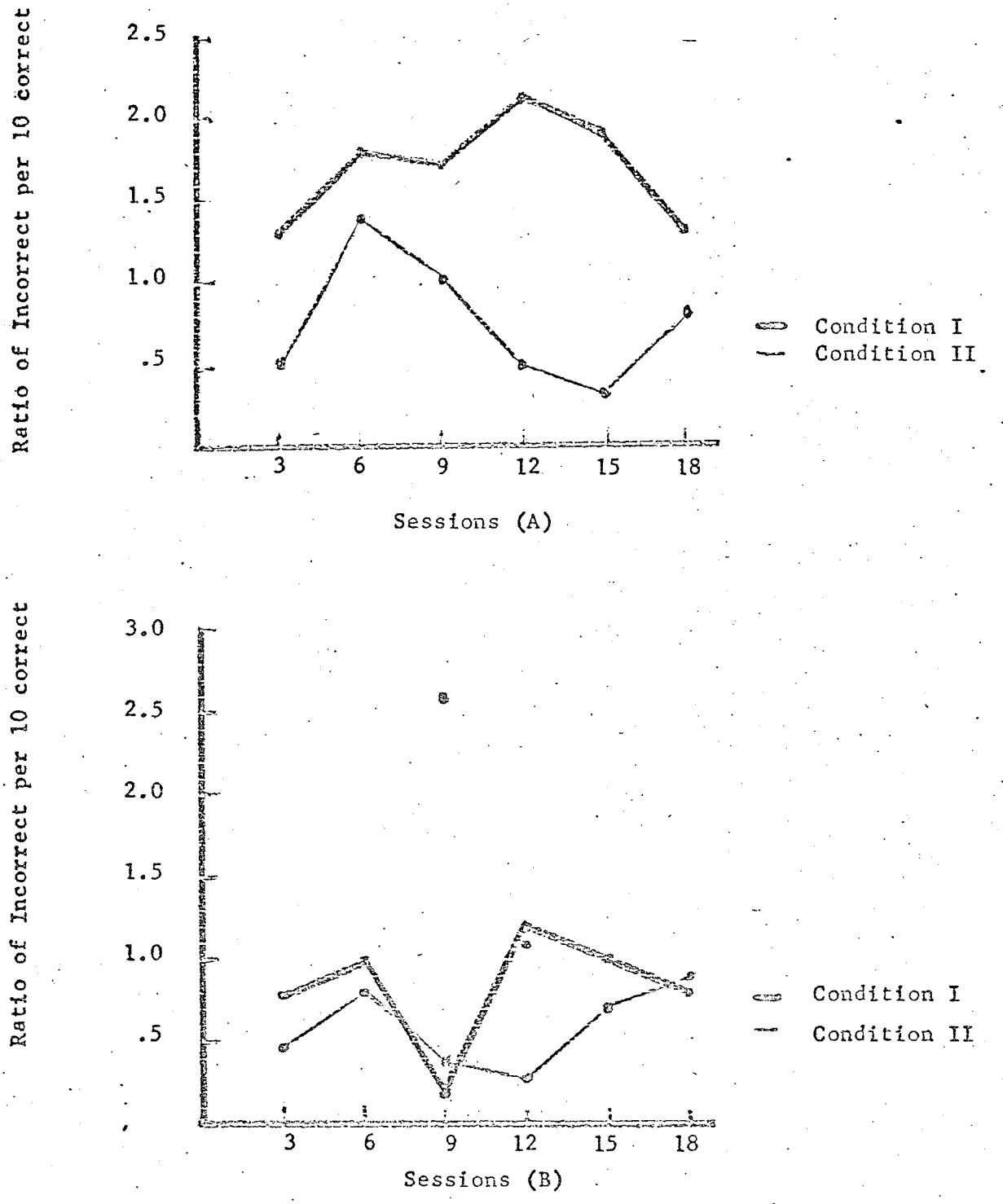


Figure 2. The means (3 sessions) of the ratio of the number of incorrect per 10 correct responses. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure. The two unconnected dots are the results for the means of Condition II including the two scores obtained when an observer was present.

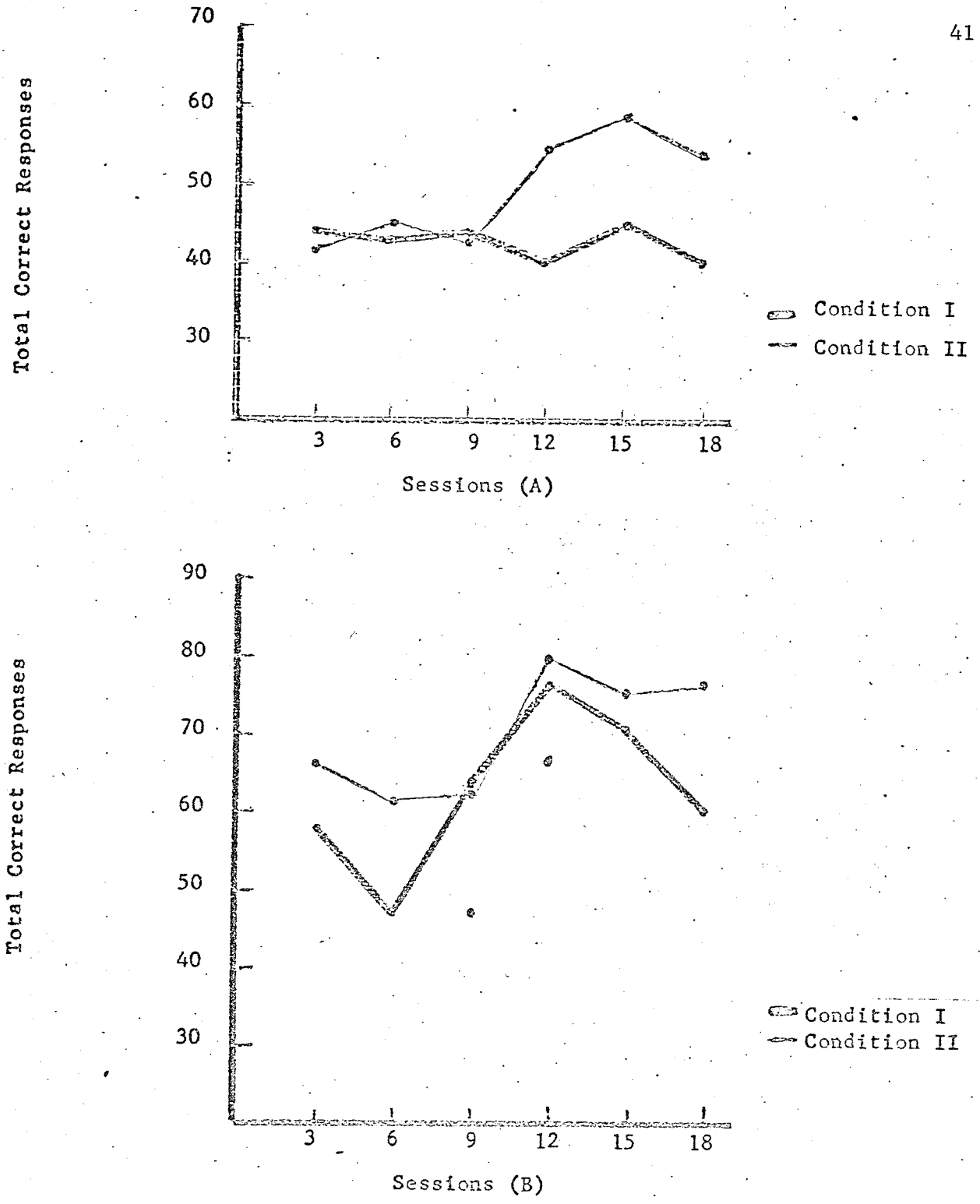


Figure 3. The means (per 3 sessions) of the total number of correct responses (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure. The two unconnected dots are the results for the means of Condition II including the two scores obtained when an observer was present.

shorter time available for correct responding under Condition I because of more wasted time. The increase in the difference in the time wasted between the two Conditions for Bobby, as shown in Figure 1, corresponds to the increase in the difference in correct responses. The presence of an observer caused a decrease in correct responses during sessions 8 and 11 for Derrick. Both the mean and the line on the graph for Condition II do not include these scores. Points representing these results are shown on the graph. The change in reinforcer for Bobby in session 5 appeared to have no effect on the total number of correct responses.

The cumulative number of words learned was higher for both subjects under Condition II than under Condition I (see Figure 4). A word to be 'learned' had to complete the picture naming procedure and then had to be correctly recalled the following three sessions. Thus a minimum of four sessions was required before a word could be termed a 'learned word'. Bobby learned his first word under Condition II after the minimum number of sessions required (4). Under Condition I Bobby did not learn any words until session 15 as indicated in Figure 4. Derrick also learned his first word under Condition II after 4 sessions. Under Condition I Derrick's first word was not learned until session 11. Since the cumulative number of words learned requires several sessions before noticeable changes occur, the data was insensitive to the presence of observers, change of a reinforcer for Bobby and the task alteration for Derrick.

Discussion

The results of this experiment clearly indicate that mild

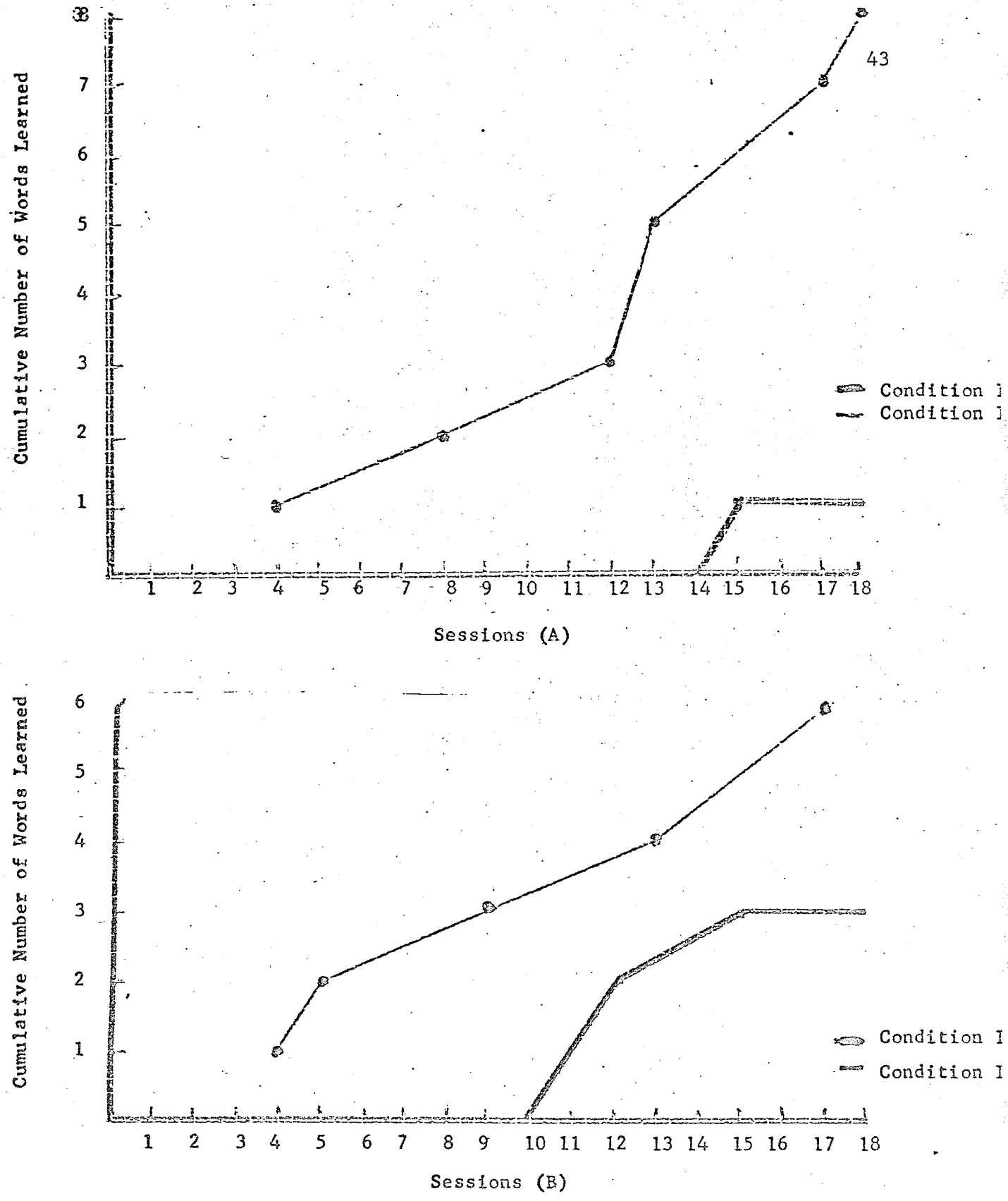


Figure 4. The cumulative number of words learned. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the o second TO procedure. Condition II is the shock procedure.

punishment, used in conjunction with reinforcement for desirable behaviour, is a powerful technique for the training of retarded children. The mild shock was much more effective in reducing wasted time than an extended time out punishment procedure. Furthermore, the saved time was profitably used by the subjects to make more correct responses. Incorrect responding and lack of responding were reduced when shock was used and, although the difference in errors is not extensive, the actual word learning is much better under this Condition. Thus not only did the subjects make fewer errors per session under the shock condition but, more important, they made fewer errors in recognizing the object-word from session to session.

The use of shock has been avoided in the past because of research indicating undesirable effects, moral objections to the use of 'force' techniques and the danger of misuse. By punishing undesirable behaviours with a mild shock and reinforcing all desirable responses, the problems traditionally associated with shock were not encountered in this study. Both Derrick and Bobby seemed to enjoy the sessions. They would frequently run to the experimenter when he arrived to take them to 'school' and sometimes it was difficult to get them to leave upon completion of the session. They both rolled up their own pant legs so that the lead from the shock apparatus could be attached. Misbehaviour following the shock was surprisingly rare. Derrick, on occasion, would hit the table following a shock and Bobby winced. However, slapping the child's hand resulted in much more violent reactions. Following the slap, they would sometimes scream and cry as if being tortured, but when

this behaviour was ignored it usually stopped abruptly, as if it were an attention seeking response.

The shock procedure did present one problem with Derrick. When an observer was present, responding was suppressed as noted in Figure 3. He would sit quietly and pay attention but would not audibly respond. This was counted as an error and resulted in punishment. It did not noticably occur under Condition I. Presumably the observer suppressed response in both conditions initially, but the shock under Condition II maintained the suppression, while the 0 second time out did not. Also, Derrick typically made very few errors and consequently received few shocks. The sudden increment in the number could suppress responding and this resulted in more shock and thus a vicious circle.

It appears that the experimental word - objects have generalized to the ward and these words are being used in communication without experimental reinforcers or punishers. For example, Derrick pointed to a previously occupied bird cage and said, "Bird gone". Both words were learned in the experimental sessions. "Bird" was one of the objects named and "gone" was a response emitted if one of the reinforcers was 'all gone'. The two words, however, had never been put together. A number of other instances of this behaviour have occurred. If the child is to function normally, the experimental reinforcers and punishers must eventually be replaced by 'natural' ones present in the experiment. It appears from general observation that this transition is successfully taking place for Derrick after only limited experimental training.'

The results of this study indicated that a mild shock, given

at regular intervals, was more effective for eliminating undesirable behavior than a time out punishment for that period. More research is warranted to see if a specified TO period, e.g. 5 seconds, 10 seconds, etc., is more effective than a shock-reinforcement procedure. Longer TO may in fact be reinforcing for the subjects; they sometimes were for the experimenter in Condition I! Shock punishment has an important advantage over TO in that it does not reduce the amount of time available for desirable responses to be made. The adverse affects of shock were not evidenced in this study. This may have been because an alternative reinforceable response was available to the subject. One of the punishable behaviors was an error on the word learning task. The alternative to this would be a correct response for that object which would have been reinforced. In conclusion, mild electric shock for undesirable behavior in combination with reinforcement for desirable behavior proved to be an effective procedure for teaching the two retarded boys to name pictures. The suppressive effect of shock was not noted. In fact, the number of correct responses was at least as great as under the 0 second TO procedure. Also, shock was more effective in reducing inattentive behavior than a TO equal in length to that behavior. More words were learned under the shock procedure than under the 0 second TO procedure.

CHAPTER IV

EXPERIMENT II

Introduction

The results of the first experiment indicated that mild shock for undesirable behaviour used in conjunction with reinforcement for desirable behaviour was an effective procedure for facilitating learning and for reducing wasted time on a word learning task. The shock was delivered following each undesirable response. This experiment examines what the effect of increasing the number of undesirable responses per shock on the dependent measures would be.

The use of positive reinforcement token systems to develop and maintain desirable behaviour with normal, retarded, and autistic children is widespread (Wolf et al. 1968; Bijou et al. 1966; Girardeau and Spradlin, 1964; Martin et al. 1968). In these experiments tokens were successfully used as conditioned reinforcers. The tokens acquired their reinforcing ability by appropriate pairings with the primary reinforcers. The advantages of the system are that tokens can be delivered immediately, they reduce satiation effects, they can represent a number of reinforcers and they effectively bridge the gap between correct responses and the back up reinforcer. The use of tokens as generalized punishers has received little attention. Tokens as conditioned punishers may have the same advantages as do tokens as conditoned positive reinforcers.

More specifically, aversive tokens may help to bridge the gap between the undesirable response and the primary punishment (mild shock). It was the purpose of this experiment to increase the number of undesirable responses per shock, using an aversive token system.

METHOD

Subjects

Derrick and Bobby continued as the experimental subjexts.

Apparatus

The only additional apparatus required to that used in Experiment I was a 6" x 8" 'magic slate' which served as a means for presenting the aversive tokens. A large black 'X' was drawn on the slate every time an error occurred. The 'X' was vigorously drawn and easily visible to the subject.

Procedure

Condition I was identical to Condition I of the first Experiment. The child received reinforcement on a 5/1 ratio for correct responses on the picture naming task. TO was delivered for inattentive behavior, or incorrect responses, and disruptive behavior resulted in a slap on the hand. Under Condition II reinforcement was continued on a 5/1 ratio and disruptive behavior resulted in a slap on the hand. The shock, however, was not delivered following each inappropriate response. Instead, an 'X' was vigorously drawn on the 'magic slate' and when a specified number of 'Xs' had accumulated, shock was delivered. An incorrect response on the picture naming task, a lack of response after

five secons and five seconds of inattentive behavior were the inappropriate responses. The experimenter used the following procedure.

(a) Following the inappropriate behavior the experimenter said, "No" and vigorously drew a large X on the 'magic slate' in front of the subject.

(b) Since the first experiment had already utilized a 1/1 response shock ratio, a 2/1 ratio was instituted. Thus, after the second error was emitted and second 'X' marked on the slate, the shock was delivered.

(c) After the primary punishment was delivered, the slate was erased by lifting the outer page. This procedure was continued until the relative effect of the conditions was clear.

(d) More aversive tokens were then required before shock was delivered. The ratios to be used were 2/1, and 4/1.

(e) The increase in the ratio was terminated when the difference between the two Conditions was negligable.

(f) Experiment I was reinstituted until the relative position of the Conditions was clear again. That is, shock was delivered on a 1/1 ratio and the aversive tokens were not given.

(g) The highest ratio obtained for each subject was then reinstituted.

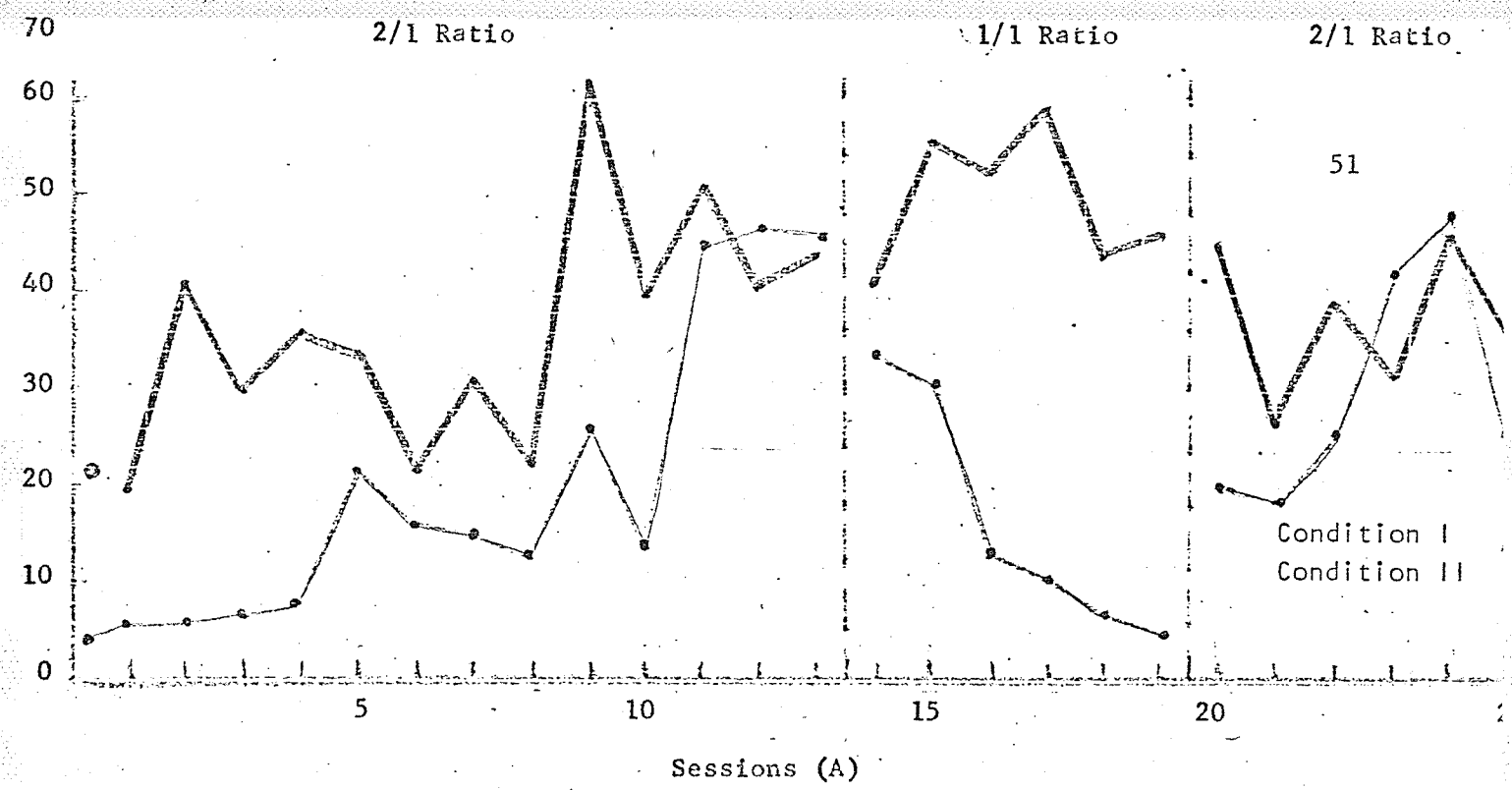
The primary reinforcement for Bobby was fifteen seconds of looking at a picture book. Five books were placed on top of each other and the top book presented when five tokens were handed to the experimenter. After fifteen seconds the experimenter held out his hand for the book. If it was not returned, the book was taken and put on the

bottom of the pile. After five sessions of the 2/1 ratio, Bobby began to refuse some books and point to others. Although it was important to use a powerful reinforcer, the numerous refusals were disruptive. The procedure was therefore modified so that Bobby was given three books all at once. This way he could select the most reinforcing book himself without spending experimental time for selection, i.e. he was still allowed only fifteen seconds for selection and 'reading'.

Results

Under the 2/1 ratio of Condition II for Bobby the number of 5 second TOs Bobby took increased until it became as great as that under Condition I (see Figure 5). Therefore, Experiment I utilizing the 1/1 ratio was reinstituted. Under Condition II using this ratio, the number of 5 second TOs decreased rapidly to the number of TOs obtained under the first experiment conducted (see Figure I). Condition I, however, showed a slight overall increase. When the 2/1 ratio was resumed, the number of 5 second TOs taken under Condition II again became as great as that under Condition I. The modification of the reinforcement procedure for Bobby did not appear to affect the results.

Under the 2/1 ratio of Condition II, the number of 5 second TOs Derrick took was less than the number taken under Condition I (see Figure 5). The relative position of the two Conditions remained similar to that of Experiment I (compare Figures 1 and 5). Since this ratio did not affect the results, a 4/1 ratio was instituted. The number of 5 second TOs taken under Condition II only slightly increased while the TOs taken under Condition I decreased until the two were the same. Since



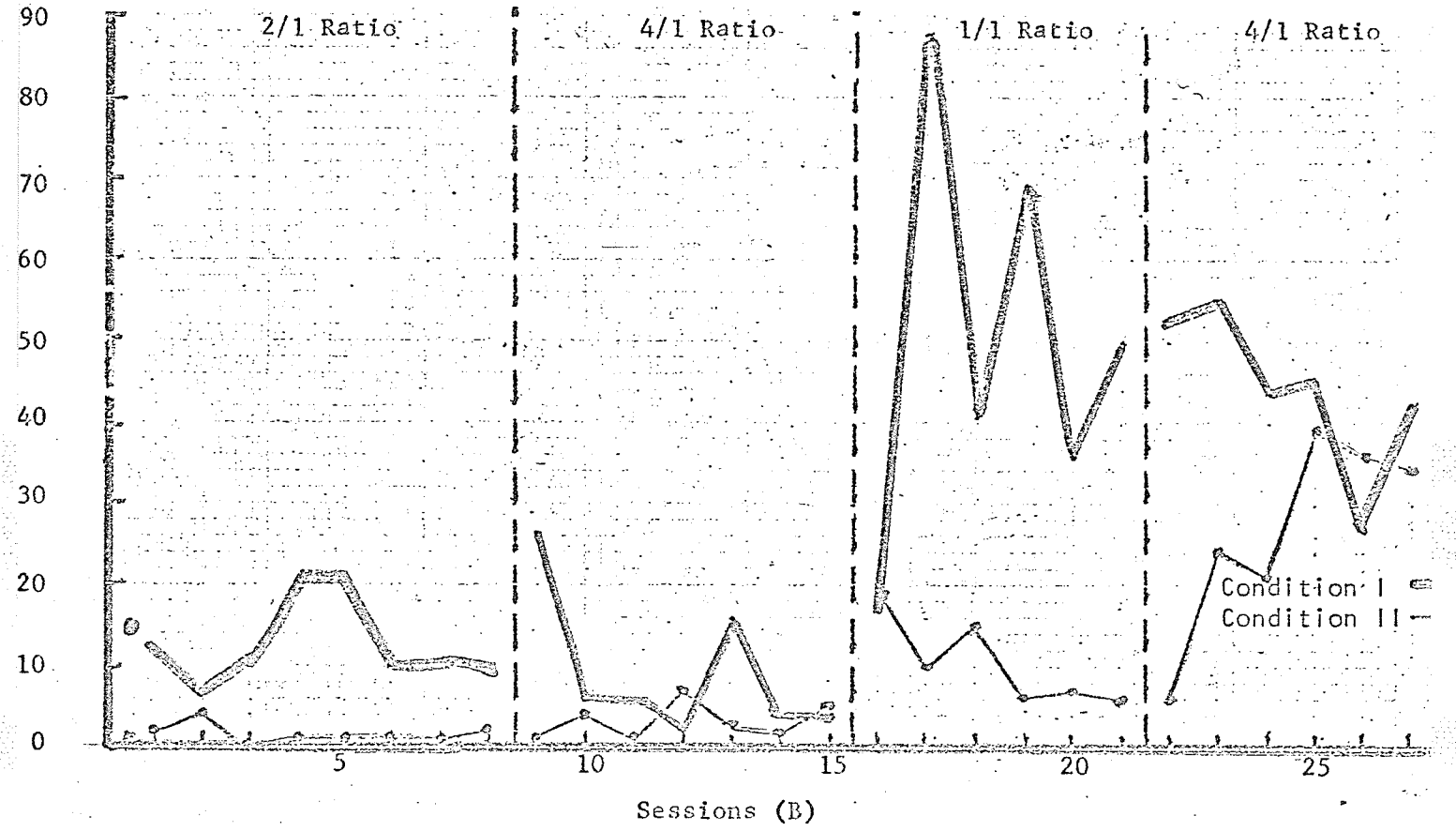
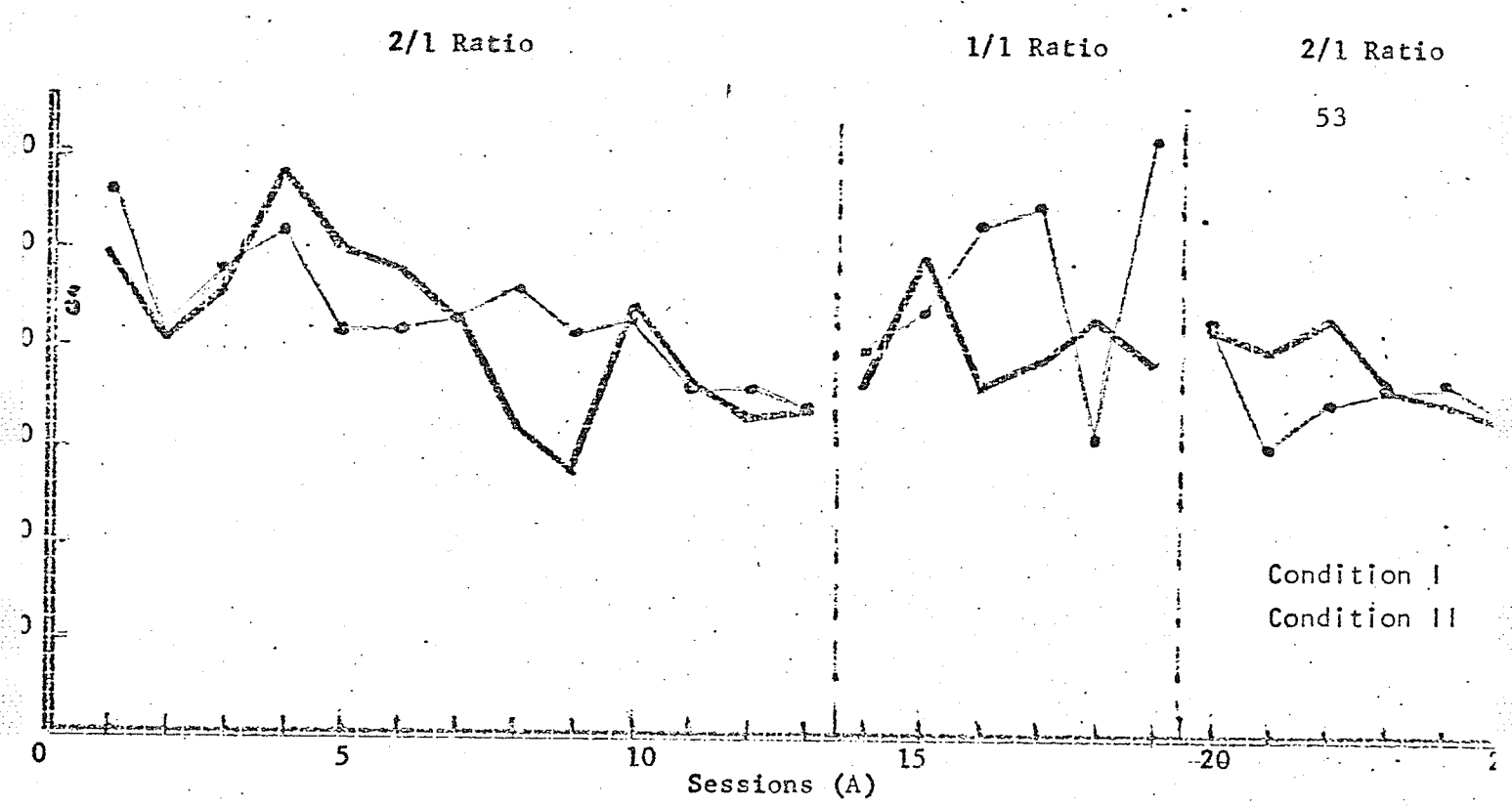


Figure 5. The total number of 5 second time outs taken per session. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure. The points on the graph preceding the first session give the results for the final session under Experiment I. The larger point is Condition I, the smaller Condition II.

the results of the Conditions were similar the 1/1 ratio was reinstituted. The number of TOs taken under Condition II increased but Derrick still spent only approximately one minute in inattentive behavior each session. The number of TOs taken under Condition I immediately showed a large increase. This number remained at a high level throughout the 1/1 ratio. When the 4/1 ratio was resumed, the number of 5 second TOs taken under Condition II increased while the number taken under Condition I decreased until the two were the same.

Under the 2/1 ratio, the total number of correct responses per session for Bobby was approximately the same for both Conditions (see Figure 6). When the 1/1 ratio was reinstituted, the number of correct responses under Condition II slightly increased while the number under Condition I remained the same. When the 2/1 ratio was resumed, the number of correct responses under Condition II decreased to the level reached under the original 2/1 ratio. The change in the reinforcement procedure for Bobby did not appear to affect the results.

Under the 2/1 ratio, the total number of correct responses for Derrick under Condition II was greater than the number under Condition I (see Figure 6). Since the relative position of the two Conditions remained the same as that of Experiment I (compare Figures 3 and 6), the ratio was increased to 4/1. Under this ratio, the total number of correct responses made under Condition II remained the same. Under Condition I, however, the number increased and became as great as that obtained under Condition II. When a 1/1 ratio was reinstituted, the total number of correct responses under Condition II was again greater than the total number obtained under Condition I. After the



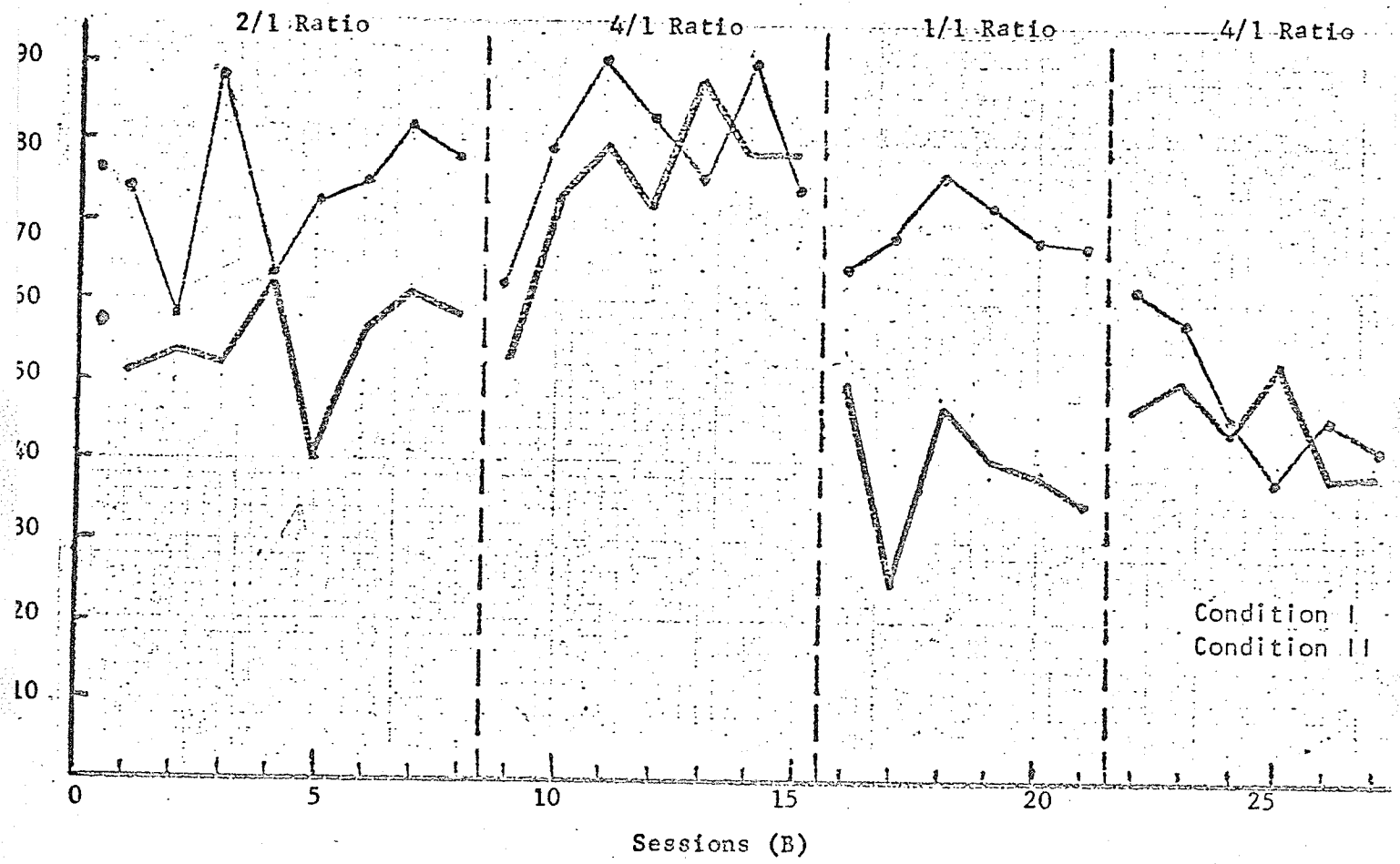


Figure 6. The toal number of correct responses per session. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure. The points on the graph preceding the first session give the results for the final session under Experiment I. The larger point is Condition I, the smaller Condition II.

difference remained constant, the 4/1 ratio was resumed. Under this ratio, the number of correct responses under Condition II decreased while those of Condition I increased until the two reached the same level.

For Bobby, relative position of the two Conditions under the 2/1 ratio in terms of errors was initially the same as that of Experiment I (compare Figures 2 and 7). As the sessions progressed, however, the number of errors per 10 correct responses increased under Condition II and decreased under Condition I until the two were the same. When the 1/1 ratio was reinstituted, the number of errors per 10 correct decreased under Condition II but remained the same under Condition I. The number again increased for both Conditions when the 2/1 ratio was resumed. The modification of the reinforcement procedure appeared to have no effect on the results.

For Derrick, the number of errors per 10 correct responses, made under Condition II was lower than the number made under Condition I (see Figure 7). Because of the difference a 4/1 ratio was initiated. Under this ratio, the number of errors per 10 correct responses became the same for both Conditions, primarily due to the increase under Condition II. The results did not appear to be affected when the 1/1 ratio was reinstituted. Similarly the results were not conclusively affected by the resumption of the 4/1 ratio.

Discussion

The shock condition appeared to be less effective in terms of the total number of 5 second TOs taken when the ratio of shocks per

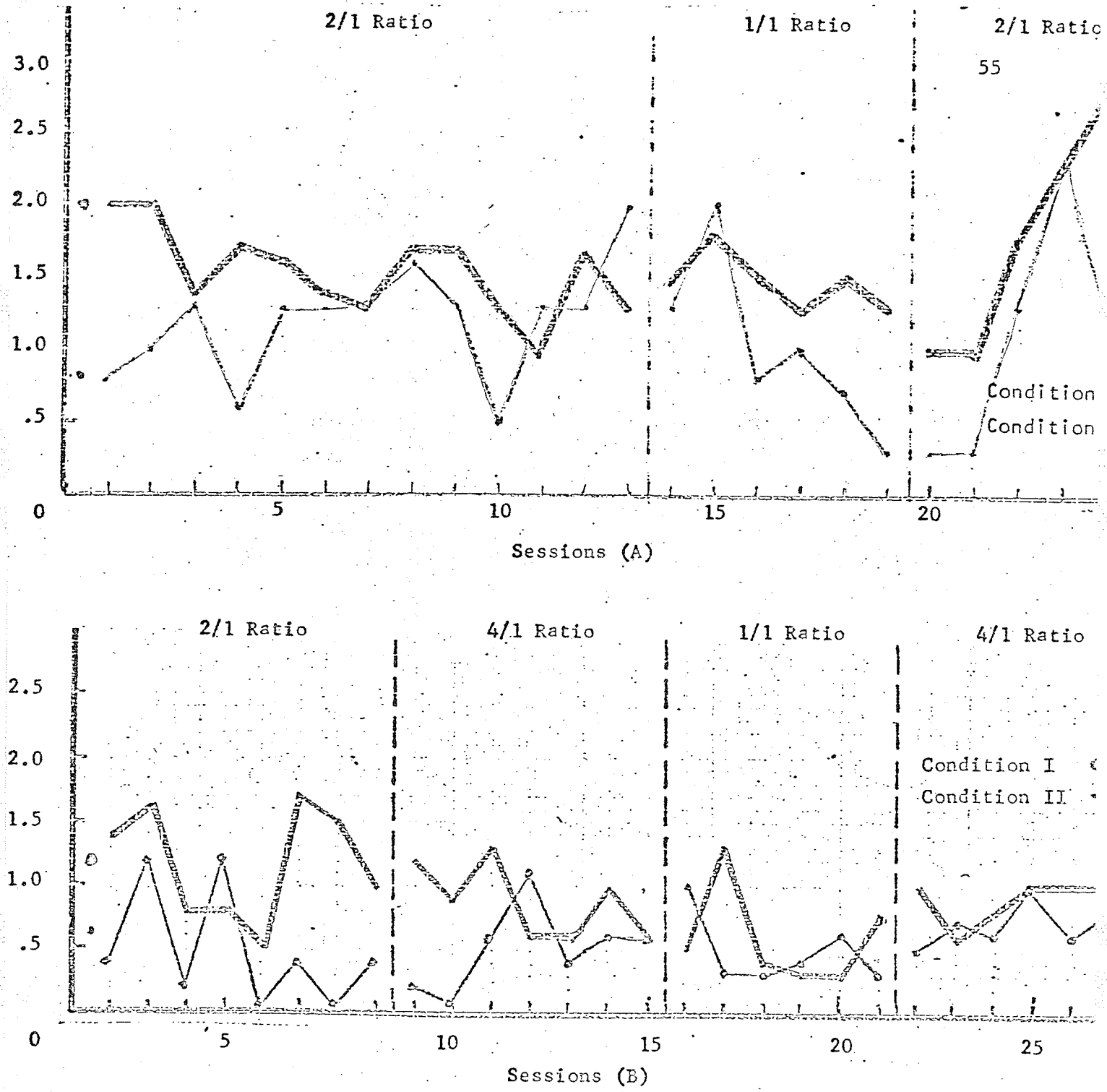


Figure 7. The ratios of the number of incorrect per 10 correct responses. (A) gives the results for Bobby. (B) gives the results for Derrick. Condition I is the 0 second TO procedure. Condition II is the shock procedure. The points on the graph preceding the first session give the results for the final session under Experiment I. The larger point is Condition I, the smaller Condition II.

incorrect response was increased. The measure of the total number of 5 second TOs was the most sensitive to the ratio manipulation. The total number of correct responses was not conclusively affected. Any difference could be explained in terms of less time available for responding. The error measure also was not consistently affected by the change in ratio.

The total number of 5 second TOs per session measure was used to compare the effectiveness of shock per inattentive response with a TO procedure. Under the TO procedure, the experimenter ignored the subject for a period of time equal in length to the time the subject spent in inattentive responding.

Initially under a 2/1 ratio the shock was more effective for Bobby and Derrick than TO for preventing inattentive responses. This remained the same for Derrick throughout this ratio but after ten sessions this ratio no longer appeared to be effective for Bobby. This may be due to the decrease in punishment value of the aversive tokens as compared to shocks given for every error. Since the 2/1 ratio was effective in preventing an increase in the number of 5 second TOs taken, a larger ratio (4/1) was used for Derrick. This ratio was not used for Bobby since the 2/1 seemed ineffective by the tenth session. Under the higher ratio for Derrick, shock was no longer conclusively more effective than the TO procedure. Since the aversive tokens were no longer effective as punishers under the 4/1 ratio, an 8/1 ratio, originally planned, was not used.

Following the use of the higher ratios, the 1/1 ratio of Experiment I was resumed. This was done in order to confirm the con-

clusions made after Experiment I and to provide a basis for a reversal so that the effect of using a higher ratio could be examined. The 1/1 ratio of Experiment II confirmed the results of the first experiment. That is, shock was a more effective procedure than TOs in a word learning task. Since the relative position of the Conditions returned to that of the first experiment, the highest ratio for each subject was resumed. The results of this reversal were consistent with the previous use of these ratios. That is, under the higher ratio of shock inattentive responding increased to that of the TO procedure.

It should be noted that, although Condition I remained unchanged throughout the ratio manipulation, the results appeared to vary with changes of the shock condition. When fewer shocks were delivered, the amount of inattentive responding under the TO procedure decreased. When more shocks (lower incorrect per shock ratio) were delivered inattentive responding under the TO procedure increased. That is, the subjects wasted more time under the non-shock condition when more shock was delivered for wasted time under the shock condition. This phenomenon is similar to that noted by Brethower and Reynolds (1962). Using pigeons on a variable interval schedule of reinforcement for each of two stimuli, punishing one of these affected the rate of responding on the other. They state that when punishment was introduced for one stimulus, ".... the rate of punished responding decreased and the rate of unpunished responding increased ....". Also the rate of unpunished responding decreased when punishment of the other stimulus ceased. They termed this effect behavioural contrast.

It was very important in this study to consider the effect of

shock on the subjects' emitting words. If shock suppressed verbal responses in the picture naming task, it could not be used as an alternative to the TO punisher. For this reason, the total number of correct responses per session was examined. If shock had a suppressing effect, the total number of correct responses per session would have been lower under Condition II than under Condition I. Also under the higher ratio (fewer shocks) the number of correct responses under Condition II should be greater than that of Condition II under the lower ratio (more shocks). The suppressive effect was not noted in the results. In fact, the total number of correct responses was in general higher under the shock condition than under the 0 second TO procedure. Also under the higher ratio, the total number of correct responses did not increase. Under the lower ratio response per shock ratios (2/1 & 1/1) for Derrick Condition II was superior to Condition I in terms of the number of correct responses. However this difference can be accounted for by the reduction in the amount of time available for correct responding under Condition I due to the increase in wasted time (compare Figures 5 & 6). In general, the total number of correct responses under both conditions for Bobby was not markedly affected by the ratio manipulation. Any differences which did occur can be explained in terms of the wasted time. The effect of aversive tokens cannot be evaluated in terms of the total number of correct responses since any difference in the lower ratio has already been explained in terms of wasted time. It would be expected that increasing the ratio (fewer shocks) could only decrease the number of correct responses to the number obtained under Condition I (0 shocks). Since the two conditions were already the same in terms of the total number of

correct responses, the effect of the aversive tokens cannot be evaluated by increasing the ratio.

A ratio of incorrect per 10 correct response measure was used to eliminate any difference between the Conditions which might be due to time wasted in inattentive behavior. Also a measure of errors was considered necessary since it was the errors and not the correct responses which resulted in shock. Shock appeared to be slightly better than a 0 second TO in reducing the number of errors per 10 correct responses under all of the ratios. Under the higher ratios (2/1 for Bobby and 4/1 for Derrick) were more effective in preventing incorrect responding. The results under the 1/1 ratio for Bobby supported the results of Experiment I. That is, shock was more effective in preventing incorrect responding. The 1/1 ratio for Derrick, however, did not support the results of Experiment I. A greater difference between the Conditions was expected. The reason this difference was not obtained may be due to the use of the 1/1 immediately following the 4/1 ratio. Another factor might be that since the number of errors was relatively very low under the 4/1 ratio, a further decrease would be difficult. That is, it appeared that the effect of punishing errors under the shock Condition has generalized to the 0 second TO procedure. Thus the incorrect per 10 correct response ratio under Condition I gradually decreased throughout the manipulation. Again the influence of the aversive tokens was difficult to evaluate since the difference between the conditions was small.

From the experiment it is difficult to evaluate the effect of using a conditioned punisher. In addition to the lack of sensiti-

vity of the dependent measure to this variable several other factors might account for the lack of significant results. The aversive token acquires its punishing value from the primary punisher. The weaker the latter is, the smaller is the punishing ability of the conditioned punisher. It was the purpose of the Experiment to use a mild punisher in conjunction with reinforcement for correct responding in a picture naming task. Therefore the shock used in this study may not have been severe enough to ensure the successful use of aversive tokens. The power of the tokens is also a function of the number of pairings with the primary punisher. Since shock effectively reduced undesirable responses, the number of pairings of the shock with the aversive tokens was small.

CHAPTER V

SUMMARY

From the results of this study it appears that mild shock for undesirable behavior used in conjunction with reinforcement for desirable behavior, can be used to train retarded children to name pictures. No undesirable side effects of shock were noted. In fact, a comparison between a 0 second TO procedure and shock indicated that the latter was, in general, a superior method for the experimental task. It was also shown that mild shock was more effective than a TO procedure that was equal in length to the time the subject spent in attentive responding. From the second experiment it appears that shock is more effective when it immediately follows an incorrect response than when aversive tokens are used to increase the ratio of incorrect responses per shock.

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