WORD ACQUISITION IN ECHOLALIC CHILDREN AS A FUNCTION OF A GENERALIZED REINFORCER vs A SPECIFIC REINFORCER

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ABSTRACT

Word Acquisition in Echolalic Children as a Function of a Generalized Reinforcer vs a Specific Reinforcer

by

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To date there has been little research investigating the nature of generalized conditioned reinforcers. This is especially true of research in human behavioral problems. The purpose of the present study was to investigate the effectiveness of an experimental generalized conditioned reinforcer in relation to an experimental specific conditioned reinforcer.

Two boys, aged 11 and 13, participated in the experiment. They had been diagnosed as exhibiting infantile autism. In Phase I the task at hand was object naming. There were two treatments, i.e., specific reinforcement condition and the generalized reinforcement condition. Both Ss showed less time-out for inappropriate behavior and less errors on previously unknown words in the generalized reinforcement condition. One S (Roy) learned more words in the generalized reinforcement condition than in the specific reinforcement condition although this difference was small.

In Phase I there was some doubt as to whether the results were due to the establishment of a generalized reinforcer. Phase II was carried out to determine whether a generalized reinforcer had in fact been established. It involved having Ss select the token of their choice (generalized or specific) and also noting the frequency of backup reinforcers chosen (coke, candy and popcorn) when the generalized reinforcer token was in operation. Results indicated the Ss did not differentially select the two tokens. However, the data on cumulative frequencies of the backup reinforcers indicated a generalized reinforcer of some magnitude was in effect.

Phase III was carried out in order to substantiate the finding hinted at in the data on cumulative frequencies of backup reinforcers. This last part of the experiment involved a partial repetition of Phase I but the specific reinforcer was changed from popcorn to coke (found to be very reinforcing in Phase II). Results showed that there was a trend toward less time-out for inappropriate behavior, and fewer errors on unknown words in the generalized reinforcement condition. Data on cumulative frequencies of the backup reinforcers for the generalized reinforcer token strengthened the position that an experimental generalized conditioned reinforcer had in fact been established and accounted for the results.

The present study provided some evidence for believing that generalized reinforcers are more effective than specific reinforcers for teaching autistic children to name objects. It attempted to fulfill a need to explore the nature of generalized reinforcers in humans. At the same time, immediate human behavioral problems were dealt with.

CHAPTER I

INTRODUCTION

The experimental control of organisms in a free operant situation has been intensively researched since Skinner gave the movement its impetus in 1938. The result has been the collection of a body of functional principles allowing for a high degree of experimental control of behavior. Within the last 15 years, there has been an increasing expenditure of energy in the direction of incorporating these principles, derived from the experimental laboratory, in applied areas of psychology (Ullman and Krasner, 1965; Ulrich, Stachnik, and Mabry, 1966). The result of these developments is that researchers in operant conditioning are presently engaged in two divergent trends: the experimental analysis of behavior yielding the functional principles, and the application of these laboratory findings to practical and immediate behavioral problems.

Recently, Baer (1968) has advocated for a rapproachment of these seemingly diverse trends within the field of operant conditioning. He has stated "the differences between applied and basic research are not differences between that which 'discovers' and that which merely 'applies' what is already

known. Both endeavors ask what controls the behavior under study." By control it is meant that it is possible to demonstrate the events responsible for the occurrence or nonoccurrence of the behavior under study.

The present study was undertaken within the framework of Baer's comments. It was believed possible to try to deal effectively with an immediate human behavioral problem while at the same time investigate a knotty theoretical issue. The author hoped to change for the better the behavior in question within an experimental design which allowed an evaluation of the role the manipulated variable played in producing such results. This study attempted to examine a particularly troublesome concept in the laboratory (generalized conditioned reinforcers) within an applied setting (teaching object naming behavior to autistic children). Here we have the application of the "spirit of scientific inquiry" to practical behavioral problems.

The term reinforcer has been defined by Reynolds (1968) as "composed of environmental events which follow responses. Reinforcing stimuli increase the frequency of the responses they follow; they increase the probability that these responses will reoccur in the future behavior of the organism." This fundamental principle of operant conditioning has been used in many experiments dealing with immediate human behavioral problems. A review of some of these experiments will be undertaken in terms of the type of reinforcer employed: primary reinforcers, which satisfy

physiological needs or drives (e.g., food, water); conditioned reinforcers, which are stimuli not originally reinforcing which become reinforcing through repeated association with reinforcing stimuli; and generalized conditioned reinforcers, which are conditioned reinforcers that have been paired with two or more primary reinforcers, thus gaining their strength from all the reinforcers on which they are based.

Review of the Experimental Literature

1. Primary Reinforcers

Hudson and Demyer (1968) attempted to use operant techniques to teach 9 schizophrenic and autistic children the simple use of art and craft media. Success was not achieved until strong primary reinforcement (i.e., food) was used. Minimal generalization occurred and none of the children advanced to self-planning or creative activities with craft and art materials.

Individual undesirable behavioral problems have also been dealt with. Marshall (1966) used positive reinforcement to strengthen components of a chain of behaviors leading to appropriate toilet behavior. Punishment, which occurs when responses are followed by an aversive stimulus in order to reduce the rate of responding, consisted of a slap on the buttocks when the child soiled his pants. Success was achieved with the help of the mother who was trained to continue the conditioning procedure.

Punishment was used by Risley (1968) to eliminate highly dangerous and disruptive climbing behavior of a severely deviant child. Shock (preceded by "No") was made contingent upon the undesirable behavior. Side effects in the form of behavioral contrast or "symptom substitution" occurred, but they were primarily desirable.

Wolf, Mees, and Risley (1964) used techniques such as time-out from positive reinforcement and discrimination training in dealing with a pre-school autistic boy. Problems focused on included temper tantrums, bedtime problems, wearing glasses, throwing glasses, verbal behavior, and eating problems. In verbal training, rapid and dramatic effects occurred only when breakfast and lunch were used as reinforcement in the training sessions. In a follow up study (Wolf and Risley, 1967) further observations and modifications of the childs behavior were made. This was an attempt to prepare him for a public school special education class. Procedures for the elimination of self-slapping, pinching, and toilet training are discussed.

2. Conditioned Reinforcers

Metz (1965) trained two autistic children so that "Good" and tokens were reinforcing. Following this, imitative behavior was shaped. Generalization to similar but new behavior occurred without specific training. It was also reported that generalized imitative behavior could persist in the context of reinforcement of other imitative

behavior without specifically being reinforced. Similar results were reported by Baer et al. (1967).

It should be noted that there are few applied studies dealing with simple conditioned reinforcers. However, before considering the large number of studies dealing with generalized reinforcers, it should be noted that generalized reinforcers pre-suppose and are built upon the concept of conditioned reinforcers.

3. Generalized Reinforcers (and other reinforcers)

The term "generalized reinforcer" was first used by Skinner (1953, 1957). Skinner defined a generalized reinforcer as a conditioned reinforcer that is paired with more than one primary reinforcer. Reynolds (1968, p. 58) stated that a generalized conditioned reinforcer gains its potency from all the reinforcers on which it is based. Reese (1966, pp. 51-52) noted that a generalized reinforcer acquires its reinforcing properties through being paired with a variety of other reinforcers. Such being the case, it is often unnecessary to institute any particular deprivation procedures for the primary reinforcers from which the generalized reinforcer gains its strength. The probability of one appropriate state of deprivation to be in effect at a later time is increased when more than one primary reinforcer backs up or is conditioned to the conditioned reinforcer used.

Skinner, (1953, pp. 77-81) discussed such generalized reinforcers as attention, approval, affection, submissiveness, and finally, tokens. It should be noted that there is as yet no evidence that social reinforcers such as attention and approval are in fact generalized reinforcers. Since Skinner's (1953) original theoretical discussion on generalized reinforcers however, these social reinforcers have often been assumed to be generalized reinforcers. They will be discussed in this section subsequently, but it should be pointed out that these social reinforcers constitute what is referred to as "other" reinforcers since their exact nature remains speculative.

Generalized reinforcers were seen by Skinner (1953, pp. 77-81) as powerful reinforcers. He states that they can be effective even though the primary reinforcers upon which they are based are no longer forthcoming. For this to be the case, many pairings of primary reinforcer and the generalized conditioned reinforcer are necessary.

However, the power of generalized reinforcers that is hinted at by Skinner has not been experimentally demonstrated. It was noted that a conditioned generalized reinforcer is more likely to be reinforcing than a simple secondary reinforcer because it is backed up by a number of primary reinforcers. For any given state of deprivation, the generalized reinforcer has a greater probability of being reinforcing than the simple

secondary reinforcer. This seems to imply that, other things being equal, a generalized reinforcer will be more reinforcing, hence strengthen behavior more effectively over time, than simple secondary reinforcers.

However, Lawson, Mattis and Pear (1968) found the opposite effect. In a study using rats that were deprived of food and water, they state that evidence from that particular study "is consistent with the generalization that response tendencies based on food and water do not summate in the fashion that might have been expected of those based on two positive reinforcers." In considering the data as a whole, they conclude that "a response maintained by a simple secondary reinforcer may exist in higher strength than one maintained by a generalized reinforcer."

Kelleher and Gollub (1962) state that there has been very little work done on the investigation of generalized reinforcers. Those studies immediately concerned with generalized reinforcers are typically found in the rat research and are highly specific. Generalizations to humans are tenuous at best.

Although research aimed at exploring the nature of generalized reinforcers has not typically been done using humans, there have been studies utilizing generalized reinforcers and "other" reinforcers (social reinforcers). Staats et al. (1964) developed a systematic method of strengthening reading behavior using experimental procedures

and generalized reinforcers. Tokens were backed up by a variety of toys that were reinforcing for the child, edibles and pennies. More recently (Staats, 1968) his procedure has been used with educable and trainable retarded children with much success.

Ferster and DeMeyer (1962) attempted to develop techniques for achieving a more durable reinforcer and to develop methods for generating more complex activities in autistic children. Ss pressed a key which delivered a coin. This generalized reinforcer could be used in various vending machines for primary reinforcement. Complexity of the task was gradually increased.

Watson (1968) used generalized reinforcers (tokens) which could be inserted into a vending machine with retarded children. Initially, more tokens were spent on manipulative toys than candy, but by session 5 this was reversed. The long term preference (70 sessions) showed that the candy preferences were maintained. This study however does not examine the nature of generalized reinforcers, i.e., how effective or powerful are generalized reinforcers as compared to specific reinforcers.

Birnbrauer et al. (1965) used programmed instruction and a token reinforcement system (stars) in a class of retarded children. Tokens were introduced when it was evident that knowledge of results and social approval were not sufficient reinforcers. Desirable behavior seemed to increase, but the experimental design did not allow them to

attribute the results to the introduction of the tokens. In a later experiment (Birnbrauer et al. 1965) in a similar situation, reversals of the variables were carried out. This allowed the experimenters to attribute the increase in work and decrease in errors to the manipulated variable (tokens).

Lately there have been other studies following a highly sophisticated procedure for the establishment of functional speech in echolalic children (Martin et al. 1968; Risley and Wolf, 1967). Echolalic children are characterized by compulsive parroting of any verbal behavior they hear. Essentially, the operant procedures are: (1) shaping and imitation training for the development and/or strengthening of verbal imitation; (2) fading in of new stimuli and fading out of verbal prompts to transfer the verbal behavior from imitative control to control by appropriate stimulus conditions; and (3) extinction and time out from reinforcement for inappropriate behavior in conjunction with the differential reinforcement of appropriate responses which are incompatible with the inappropriate behavior. Both Martin et al. (1968) and Risley and Wolf (1967) used tokens backed up by primary reinforcement. Risley and Wolf, however, stress the importance of using primary reinforcers for best results.

There have been studies reported on the establishment of token cultures in psychotics (Ayllon and Ayrin, 1965, 1968) and in autistic and retarded children (Girardeau, 1964; Lent, 1968). In these situations, the staff of an institution

exert control over the behavior of patients through the use of a token reinforcement system.

There have been studies that demonstrate the differential reinforcing value of certain reinforcers. Typically "other" reinforcers (social reinforcers) are compared to specific primary reinforcers. Hopkins (1968) made use of social reinforcement and candy in strengthening smiling behavior in two retarded boys. He found that after strengthening smiling behavior with candy, the behavior continued when candy was eliminated. Further investigation revealed that social reinforcement was maintaining the smiling, but could not produce it initially as candy had done.

Risley and Wolf (1967) in working with retarded children found that strong, extrinsic reinforcers (food) were much more effective than attention and priase. Quay et al. (1967) used candy and social reinforcement together to strengthen visual orienting responses in 5 hyperactive, aggressive children. When candy was removed, the behavior was not maintained by social reinforcement alone.

Statement of the Problem

Experimental generalized conditioned reinforcers (tokens) have been established and used in humans, but their relative effectiveness in relation to specific conditioned reinforcers has not been determined. Reinforcers such as

attention and praise have been compared to specific primary reinforcers in autistic and retarded children. Since Skinner's (1953) theoretical discussion of generalized reinforcers, these "other"rreinforcers (social reinforcers) are sometimes assumed to be generalized reinforcers. Since there is as yet no empirical evidence that social reinforcers are in fact generalized reinforcers, there remains a need to assess generalized reinforcers in relation to specific reinforcers.

The present study attempts to determine the effectiveness of an experimentally produced generalized conditioned reinforcer relative to an experimentally produced specific conditioned reinforcer, within the context of establishing desirable behavior in autistic children. That is, the effectiveness of tokens backed up by coke, candy, and popcorn (generalized conditioned reinforcer) will be compared to tokens backed up by either popcorn or coke by itself (specific conditioned reinforcer) in an object naming task. It is predicted that more effective learning will occur under conditions of the generalized conditioned reinforcer.

CHAPTER II

METHOD

Subjects

Two residents from the Manitoba Training School at Portage la Prairie participated as Ss. Terry was an 11 year old boy who had been institutionalized for 3½ years. When first admitted, his I.Q. was considered untestable. He exhibited destructive behavior and was considered a hyperactive child. He was also characterized by being a messy eater, playing alone, and masturbating excessively. He was the third illegitimate child to an unmarried mother and had lived in numerous foster homes. His siblings were normal.

Roy was a 13½ year old boy who had been institutionalized for 1½ years. On admission he was characterized as being a quiet but active boy. His speech was limited but he appeared to understand quite adequately. Appetite and table manners were poor and he was underweight. He apparently came from a normal home.

Both Ss were diagnosed as exhibiting infantile autism. Such being the case, they emitted compulsive parroting of verbal responses known as echolalia.

It should also be noted that one of the Ss (Terry) was

engaged in another ongoing experiment for the duration of the present study. The procedure and task in the two studies were similar. However, it was felt that if positive results were obtained with both Ss, any effects of the other ongoing experiment in Terry would be negligible. The variables examined in the present study would increase in importance, i.e., would be powerful variables, if they were to override such ongoing differences in training between Ss.

Past Conditioning History

Before the present study was conducted, both Terry and Roy were conditioned on token training, sitting quietly, object and picture naming, and tracing and copying (Martin et al. 1968). Before briefly describing such training, it should be pointed out that it was felt it would be advantageous to utilize non naive Ss, i.e., Ss who through their previous structured conditioning history had acquired requisite skills necessary for the present task. In this way E could focus immediately upon the variables to be studied, thus avoiding the time consuming pre-experimental training that would have been necessary had naive Ss been used. The following past conditioning history for Terry can be found in greater detail in Martin et al. (1968), and the past history of Roy was similar to Terry's.

Token training. Establishing token training in Terry and Roy involved having the S sit quietly at a desk which was arranged against the wall such that S could not leave the

situation. E then placed a token before S and said "Give me the chip" while E's hand was extended and ready to receive the token. Following this there were four possibilities. These were:

1. If S gave the token to E, E smiled and said "Good Boy" and gave S a bite of food.

2. If the token was not forthcoming, the instructions were restated and E's hand was extended for 5 seconds. Then the token was taken by E, the S ignored for 15 seconds, and step 1 repeated.

3. If the token was thrown away by S, E said "No" sharply, slapped S's fingers and ignored him for 2 minutes. Then the procedure was repeated.

4. If undesirable tantrum behavior, such as crying occurred, E ignored S until such behavior terminated and a brief period of sitting quietly elapsed. Then the procedure was repeated.

When S had completed 5 successive successful trials, E repeated the procedure using 2 tokens for one piece of food. In a similar manner E continued until the ratio of tokens to backup reinforcers was 5:1. This criterion was met within one experimental session.

Conditioning Ss to sit Quietly. Having established a systematic procedure for delivering reinforcement, the next step of the training program involved making the reinforcement contingent upon desirable behavior. This meant having S sit

quietly, since this behavior seemed prerequisite to higher level learning. The procedure followed involved delivering a token contingent upon S sitting quietly for a brief period of time. A "brief period of time" was defined differently for each S. It was arrived at in the first session, whereby E said "Sit still" to S and the appropriate response was timed. The length of time S sat still in this situation became the criteria he had to meet in the present situation. After successive successful trials of reinforcing S for sitting quietly the designated time (e.g., 15 seconds), the criteria was gradually increased (e.g., 20 seconds, then 30 seconds, then 1 minute, etc.). It should be noted that in order for S to meet the requirements of sitting quietly at any particular stage, he had to remain seated and quiet for the duration of the criteria in effect, i.e., if S stood up or was noisy, E retimed the response when sitting quietly was again in effect.

The results of this procedure were that Ss engaged in sitting quietly for a minimum of 5 minutes after two sessions. During the first session, Terry exhibited more noise and left his desk often which resulted in his being punished on 7 occasions with a sharp "No" and a slap on the fingers. However, he did meet the 5 minute criteria of sitting quietly in the second session. After 3 weeks Ss were able to respond to E for the entire session. Infrequent outbursts or fits did occur however. E's social attention

delivered contingent upon undesirable behavior did not help in eliminating these occasional outbursts. This problem of conditioning Es to condition Ss appropriately is examined in a paper by Martin and Pear (1968).

Verbal training (object and picture naming). Echolalia is advantageous in establishing appropriate verbal behavior in autistic children since the prerequisite to appropriate verbal behavior (i.e., understandable verbal behavior, per se) is already in their behavior repertoire. A problem arises, however, in bringing understandable verbal behavior under appropriate stimulus control thereby making it appropriate verbal behavior. Such a goal is possible using the technique known as "fading". Fading was first demonstrated experimentally by Terrace (1963) using pigeons and refers to the process of gradually altering the stimuli controlling a response so that eventually the response occurs to a completely different set of stimuli. Fading, as used in the procedure outlined below, was first used by Wolf et al. (1964) and later by Risley and Wolf (1967).

This procedure was as follows:

- E pointed to his shirt and said "Shirt". This was repeated until S correctly mimicked "Shirt" where upon reinforcement was delivered.

- Having established correct mimicking, E gradually faded in new verbal prompts. These were "What's this? Shirt." while pointing to the shirt. S usually kept

mimicking "Shirt". As trials progressed, E gradually faded out "Shirt" until it was no longer said. The situation now is such that E asked "What's this?" and S responded with "Shirt" upon which S received reinforcement.

- If the fading process outlined above occurred too rapidly, S responded to the question "What's this?" with a wrong word or no answer at all. In this situation E waited 5 seconds and repeated the last step to which S did respond correctly.

Having established token training, sitting quietly, and object and picture naming in Terry and Roy, their vocabulary was increased during subsequent sessions. For example, Terry correctly named 136 out of 200 items he had been exposed to during the summer of 1967. It was this verbal training as well as the token training and sitting quietly behavior that constituted the past conditioning history that was most relevant to the present study since all these behaviors were a necessary pre-requisite to the task to be described subsequently. However, in order to give a complete account of the Ss past conditioning history, listening training, tracing and copying, and matching training will be briefly mentioned. These three tasks which are also described in more detail by Martin et al. (1968), are similar and therefore somewhat relevant to the object and picture naming task that is employed in the present study.

Verbal training (Listening training). After Ss had acquired the ability to name objects, meaningful questions were devised which required Ss to respond with the names of these objects. Fading techniques were used in the procedure. For example, in order to elicit the correct response to the question "Where does milk come from?" E would point to the milk while simultaneously asking "Where does milk come from? Milk comes from a cow." Ss usually mimicked "Cow". Over a number of trials E gradually faded out the correct response "Milk comes from a cow", i.e., E would say "Where does milk come from? Milk comes from a ____" to which Ss responded with "Cow". Prompts were then reduced from "Milk comes from ___" to "Milk comes ____" to "Milk _____" until eventually Ss responded to the question "Where does milk come from?" with the statement "Milk comes from a Cow."

Tracing and copying. The goal of this task was to get Ss to trace lines and figures from a model. The procedure involved E taking S's hand and tracing a figure. Control of this motor response, i.e., E's guidance of S's hand was faded out until Ss were tracing figures upon the command "Trace the ....." Successful completion of the task by S was followed by reinforcement.

Once Ss were tracing adequately, copying behavior was established. This involved having a model of a figure before S (for example, a circle) and a partially constructed figure (a circle outlined by dots) which Ss were to complete

(i.e., join the dots). Gradually cues to the figure in question were faded out until S was able to copy a model of a figure on a blank sheet of paper when the command "Copy a ...." was given.

Matching training. This task consisted of having Ss select from a group of items those ones that matched. Initially, E controlled the response in that to the question "Show me two shoes" he would take S's hands and guide them to the two shoes. This control was faded out until the correct response came under the stimulus control of E's verbal command and the group of items in question. Upon successful completion of this stage of the procedure, Ss were trained to match two items in a group under the control of the command "Show me the items that are the same" by gradually fading out "Show me the two shoes" which followed the former command. The final stage of the task was to condition Ss in a similar manner to mark an X (previously acquired by tracing and copying techniques) on the items that were the same.

Summary. Previous to the present experiment, both Terry and Roy had acquired a basic verbal and motor behavioral repertoire including object and picture naming, listening training, tracing and copying, and matching. Such behavior was acquired using a token reinforcement system in which the ratio to backup primary reinforcement was 5:1. The tasks and the experimental setting (Ss sitting quietly

at a desk opposite E, receiving tokens for correctly emitted behavior) were very familiar to both Terry and Roy at the commencement of the study outlined herein.

Apparatus

The apparatus used was simple in nature and readily available. Pictures from an Eaton's catalogue were randomly cut out and pasted on sheets of paper. A representative sample included pictures of a fireplace, shoe, hammer, carriage, baby, guitar, shovel, crutch, saddle, etc. Tokens used were 5 Canadian pennies and 5 Canadian nickles. The tokens earned by Ss were kept in a circular rubber container $1\frac{1}{2}$ inches in diameter. Popcorn, miniature marshmallows (candy), and coke were used as primary backup reinforcers. Data sheets for collecting the raw data and summary data sheets (described subsequently) were used. A tape recorder was employed on which was recorded "beeps" made by a human voice at 5 second intervals. A clock served to time the sessions.

Design (general considerations)

The design in general incorporated the single-organism (S-O) approach (Sidman,1960). This approach concentrates on only a few individuals as opposed to statistical methods which make use of a large sample of Ss. The S-O approach involves studying these few individuals over a long period of time, developing reliable records of behavior. There is little possibility of "chance" variability misleadingly

affecting these records of behavior since the effect of the manipulated variable is not noted at one particular instance in time (as is often the case in statistical studies). Rather a variable is manipulated and its effect is recorded over several experimental sessions and evaluated in terms of the previous baseline of behavior. Any changes in the behavior records due to the manipulated variable, are often replicated, thus increasing the reliability greatly and reducing to an infinitely small degree the probability of differences due to "chance". The result is that S-O experiments are built on highly reliable records of behavior.

Because individuals are studied over a long period of time, much information on each S is obtained. Also, E monitors S's behavior as it occurs, allowing for flexibility of the research. If unexpected behavior occurs due to an uncontrolled variable, E is able to identify such a variable and take action to control it if desired. Such experimental control is nonexistent in statistical procedures where an uncontrolled variable is often not identifiable. If E is able to identify an uncontrolled variable not previously anticipated in this situation, the data most often is discarded. Unexpected behavioral fluctuations are therefore ignored, whereas the S-O approach has the tools (i.e., method) to follow up idiosyncratic behavior. Here, E is on top of his data, always equipped to manipulate a relevant variable and note the behavioral effects. For a more comprehensive

examination of the S-O approach in contrast to statistical methods in psychology, the reader is referred to Sidman (1960).

Having briefly considered the underlying philosophy of the present design, a more detailed account is now possible. There were three distinct phases in the experiment. Each phase will be considered in terms of design, procedure, results and discussion, rather than the traditional approach of considering the experiment in its entirety under the headings of design, procedure, results and discussion. Such a deviation in presentation of the material is related to and justified by the S-O approach. It will be recalled that in this approach, E is prepared to make modifications of procedure (including the manipulation and control of new variables) as indicated by the results of the data and/or the introduction of unforseen variables that must be controlled for. Because later manipulations and hence records of data are dictated by and built upon previous records, it is difficult if not impossible to get a clear conceptualization of the design and procedure of, say, Phase II and Phase III without first being made aware of the design, procedure, and especially the results of Phase I. It is the latter which determines the form Phase II will take, which in turn determines the nature of Phase III. Therefore the design, procedure, and results and discussion of each of the three phases will be discussed under the headings, Phase I,

Phase II, and Phase III.

Phase I - Object Naming

Design

In Phase I baselines were obtained for rate of word acquisition. For each S there were two half-hour sessions for any given experimental day. One session involved word acquisition using a specific conditioned reinforcer backed up by popcorn. The other session was similar except a generalized reinforcer was used backed up by popcorn, candy, and coke. Within each S, the two treatments were independent in that separate pools of words were used for each, i.e., words used in the session with the specific reinforcer (hereafter termed treatment I) were never used in the session with the generalized reinforcer (hereafter termed treatment II). Different tokens were used in each treatment: pennies for treatment I and nickles for treatment II. Primary reinforcement in both treatments was delivered on a 1:5 ratio to tokens.

Possible order effects such as fatigue or restlessness were controlled for by counter-balancing the order of the sessions each experimental day. Thus any difference that might evidence itself between treatments could be attributed to the manipulated variable, i.e., type of reinforcer used: Specific or generalized. Phase I required 17 sessions on each treatment for each S. A summary of the design for

Phase I can be found in Table 1.

Procedure

Ss were seated opposite E. It was made very difficult for Ss to leave the experimental situation because of the arrangement of the desk, wall, and chairs. The curtains in the room were closed at all times to avoid distractions. Two other Ss involved in an experiment divorced from the present one were present in the room. This stimulus condition would appear to be a source of distraction for Ss, but their past conditioning history included situations similar to the present one. Habituation of these stimuli appeared to have already taken place.

Having selected two Ss with an appropriate conditioning history necessary for the task at hand (word acquisition), the first two experimental days were utilized in forming two independent pools of words. Pictures of different objects were cut out from an Eaton's catalogue and pasted on sheets of paper. Prior to the experiment, E went through these pictures with Ss asking "What's that?" while pointing at the object. Correct and incorrect responses were noted. Ss were reinforced for correct responses with poker chips backed up by popcorn on a 5:1 ratio. Incorrect responses were followed by a sharp "No" and E ignored S for 5 seconds (5 second time out).

On the second experimental day, E went through the exact same list of pictures in a similar manner and noted Ss

TABLE 1

PHASE I OF THE DESIGN

Each Experimental Day

	Treatment I	Treatment II
Task	- word acquisition	Word acquisition
Reinforcer	- specific reinforcer (popcorn)	Generalized reinforcer (popcorn, candy, coke)
Words used	- words from Pool I	Words from Pool II
Tokens	- pennies	Nickels

S_1 Half-hour session - 5 minute break - half-hour session

S_2 Half-hour session - 5 minute break - half-hour session

For each experimental day the order of the treatment was reversed.

responses. For each S, those items that were identified correctly on these two successive occasions were designated "Known Words" (KN). Those items that were incorrectly identified on these two successive occasions were designated "Unknown Words" or new words (NW). Those items that did not fall into one of these two categories were eliminated from the experiment.

Following this, for each S, E randomly assigned words from the known words and the unknown words to two distinct pools. Thus each S had known and unknown words in both Pool I and Pool II. The two pools were determined individually for each S and were independent between Ss and mutually exclusive within each S. In other words, for S_1 a known or unknown word in Pool I would not appear in Pool II and vice versa. However, it was possible that a word from one of S_1's pool of words could appear in one of S_2's pool of words.

Procedure for picture naming

Both treatments in Phase I (specific vs generalized reinforcer) included the same task and general procedure. This involved working on unknown words until they reached a criteria as set out by Risley and Wolf (1967) and by Martin et al. (in preparation). Basically the procedure involved having Ss correctly mimic the new word under the appropriate stimulus conditions (pictures). Known words were interspersed with the unknown words. Ss had to identify a picture by emitting the correct name on its first presentation in three

successive sessions. Such a word is considered learned, since both additional events (other words) and time have been interpolated between the occurrence of the correct response. Recall was carried out after ten additional words had been learned according to the above procedure or criteria.

The above procedure followed is outlined in detail by Martin et al. (in preparation). What follows is a verbatim account of their procedure for learning the names of pictures (tacts).

A. Point to a new picture (NW), (i.e., monkey) and say "What's that? That's a monkey." This is called a prompt trial (P). When the subject correctly mimics "That's a monkey," then point to the picture and ask, "What's that?" This is termed a question trial (Q). When an error at any stage occurs, say "No", ignore the subject for five seconds, then present a P. When the subject correctly responds to P, repeat the trial that was incorrect.

B. When the subject correctly responds to $Q(NW)_1$, repeat Part A (i.e., P and Q) for a known picture (KW)1. Then repeat Part A for NW_1. Then alternate $Q(NW)_1$ and $Q(KW)_1$ to the subject until he makes six successive correct responses. Instructions "A and B" are summarized in Figure I.

C. Repeat Part B with NW_1 in combination with a second known picture $(KW)_2$, then with KW_3, then KW_4, and KW_5.

D. Repeat steps A, B, and C with additional new pictures.

E. At end of each session, transform the data to the summary sheet (see figure 2).

F. At the start of the second and subsequent sessions:

   1. Test tacts that reached Column 4

A.	NW_1	-	P	
			Q	
B.	KW_1	-	P	
			Q	
	NW_1	-	P	
			Q	
	KW_1	-	Q	
	NW_1	-	Q	
	KW_1	-	Q	
	NW_1	-	Q	Criterion of six correct responses required before continuing to NW_2.
	KW_1	-	Q	
	NW_1	-	Q	

Figure I. Summary of Parts A and B of the procedure for teaching picture naming. NW_1 is a new tact. KW_1 is a known tact. P stands for a prompt trial in which the experimenter points to a picture and states, "What's that? That's a ... (name of picture)." Q stands for a question trial in which the experimenter points to a picture and asks, "What's that?"

Subject

Experimenter

Date	Session	New Words Worked On	New Words Worked on that Reached Criterion	Criterion words Tested At Start of Session	Words Learned	Words Remembered	Cumulative Errors Per Word	Excess T.O.'s Per Session
July 24	1	turtle	turtle				7(6)	2' 10"
	2			turtle (x)			8(6)	
		turtle	turtle				10(6)	10"
		belt	belt				1(3)	45"
July 25	3			turtle (1)				
				belt (1)				
		bib					10(10)	45"
	4			turtle (2)				
				belt (2)				
		bib	bib				10(11)	2' 40"
July 26	5			bib (x)			11(11)	
				turtle (x)			11(6)	
				belt (3)	belt			
		bib	bib				14(11)	
		turtle	turtle				16(6)	35"
		banana	banana					
		bag	bag				1(0)	50"

Figure 2. Summary data sheet. The numbers in parentheses in Column 5 indicate the number of successive sessions that the response was correct on first presentation. An "x" in parenthesis in Column 5 indicates that the tact was incorrect. The number in parenthesis in Column 8 indicates the cumulative errors on known tacts while the new tact was being acquired. The data presented were recorded during the first five sessions with one of the subjects, Roy.

of the summary data sheet during the previous session. Record the results of the test in Column 5 of the summary data sheet and write, in parentheses, an X if the tact is incorrect, or a 1, 2, or 3 if the tact is correct. The number will indicate the number of successive sessions that the response was correct on first presentation. New tacts that are correct on their first presentation for three sessions in a arow are considered as learned words and should be recorded in Column 6 of the summary data sheet. When a word is learned it should not be tested until ten additional new words have been acquired. Then the word should be retested for memory and the results recorded in Column 7 of the summary data sheet.

2. Test tacts from Column 5 of the summary data sheet that were followed by a 1 or 2 on the test at the start of the previous session.

G. Following the test at the start of each session, work on:

1. Tacts from Column 4 and 5 that were incorrect on the test until they can be replaced inCColumn 4 of the summary data sheet;

2. The tact that was worked on during the previous session that did not reach Column 4 (if such is the case);

3. Additional new words.

In addition, it should be pointed out that the cumulative errors per new word worked in a particular session is recorded in Column 8. The number in parentheses in Column 8 indicates the cumulative errors on known words while the new word was being acquired.

Column 9 is used to record excess time-out (TO) per session. By excess TO it was meant the time lost in the

session because of inattention or misbehavior of Ss. When Ss were not under stimulus control of the task at hand (i.e., were not looking at pictures in question and responding) because of inattention or misbehavior, E recorded the time spent in such behavior. Recording of excess TO was facilitated by a tape recorder which played continuously during all sessions of the experiment. Every 5 seconds, an audible "beep" sound made by a human voice occurred, allowing E to approximate precise timing of excess time out. When S was engaged in time out behavior, E made a penciled tic on the raw data sheet for every 5 second "beep" that occurred. At the end of the experimental session, the tics were counted up, converted to time in minutes, and entered in Column 9.

Initial experience indicated that Roy took very little TO as compared to Terry. In addition, Roy exhibited behavior such as asking inappropriate questions during the experimental sessions which Terry did not. Examples of such questions included "Get a stick later?" "Go outside after?" "Candy later on?" etc. Therefore, in order to get a substantial measure of Roy's excess TO, excess TO for misbehavior came to include inappropriate responding (i.e., asking questions irrelevant to the task at hand). Each time Roy asked an inappropriate question, E made pencil tics on the data sheet (according to length of time the question was asked and repeated by S). In this way a problem of measurement for one of the dependent variables (excess TO) was overcome.

On any given experimental day, the order of the treatments was the reverse of the preceding experimental day (counter balanced). Tokens for correct responses (pennies for treatment I, nickles for treatment II) were placed by E into a circular rubber container $1\frac{1}{2}$ inches in diameter while simultaneously socially reinforcing S with "Good Boy". The rubber container was employed in order to avoid having Ss play, drop, or lose the tokens. An attempt was made to make Ss aware of the two distinct types of tokens used by having them hand the tokens over to E at his request. This was followed by primary reinforcement. The ratio of tokens to primary reinforcement was 5:1.

In treatment I, the specific primary reinforcer was delivered in a straightforward manner when S gave E the 5 pennies. In treatment II, the primary reinforcer backing up the tokens (nickels) was delivered in a somewhat different manner. Upon S handing E the 5 nickles, E always asked S "Now what do you want, popcorn, candy, or coke?", S was required to clearly articulate which primary reinforcer he desired, upon which he received it. All reinforcers were kept out of sight from Ss in both treatments.

The traditional method of determining interobserver reliability was not carried out during the experiment. However, E was observed randomly on 5 experimental days by one of two persons well versed in operant techniques as used in the present setting. Their observations indicated that the

procedure and technique used by E was at a level of competence that should yield reliable data. However, it should be stressed again that different E's were not used in order to get a measure of interobserver reliability.

Results

The dependent variables for Terry and Roy were: cumulative TO in minutes, cumulative errors, and number of words remembered from words learned. The former two measures are examined in terms of sessions and words learned, i.e., cumulative TO per session and per word learned, and cumulative errors per session and per word learned.

Cumulative TO per session and per word learned

The results of cumulative TO per session for Terry and Roy can be found in Figures 3 and 4 respectively. Over a period of 16 sessions on each treatment it can be seen that Terry took more TO in treatment I, i.e., (80' 20") when the specific reinforcer was in operation, than he did in treatment II (55' 45"), i.e., when the generalized reinforcer was in effect. Roy's results were similar, yielding (6' 35") TO in treatment I and (3' 55") in treatment II over a period of 17 sessions for each treatment.

Cumulative TO per word learned can be found in Figure 5 and 6 for Terry and Roy respectively. Of the 9 words Terry learned in each condition, cumulative TO was greatest (53' 10") in treatment I as compared to treatment II (29' 25"). Roy

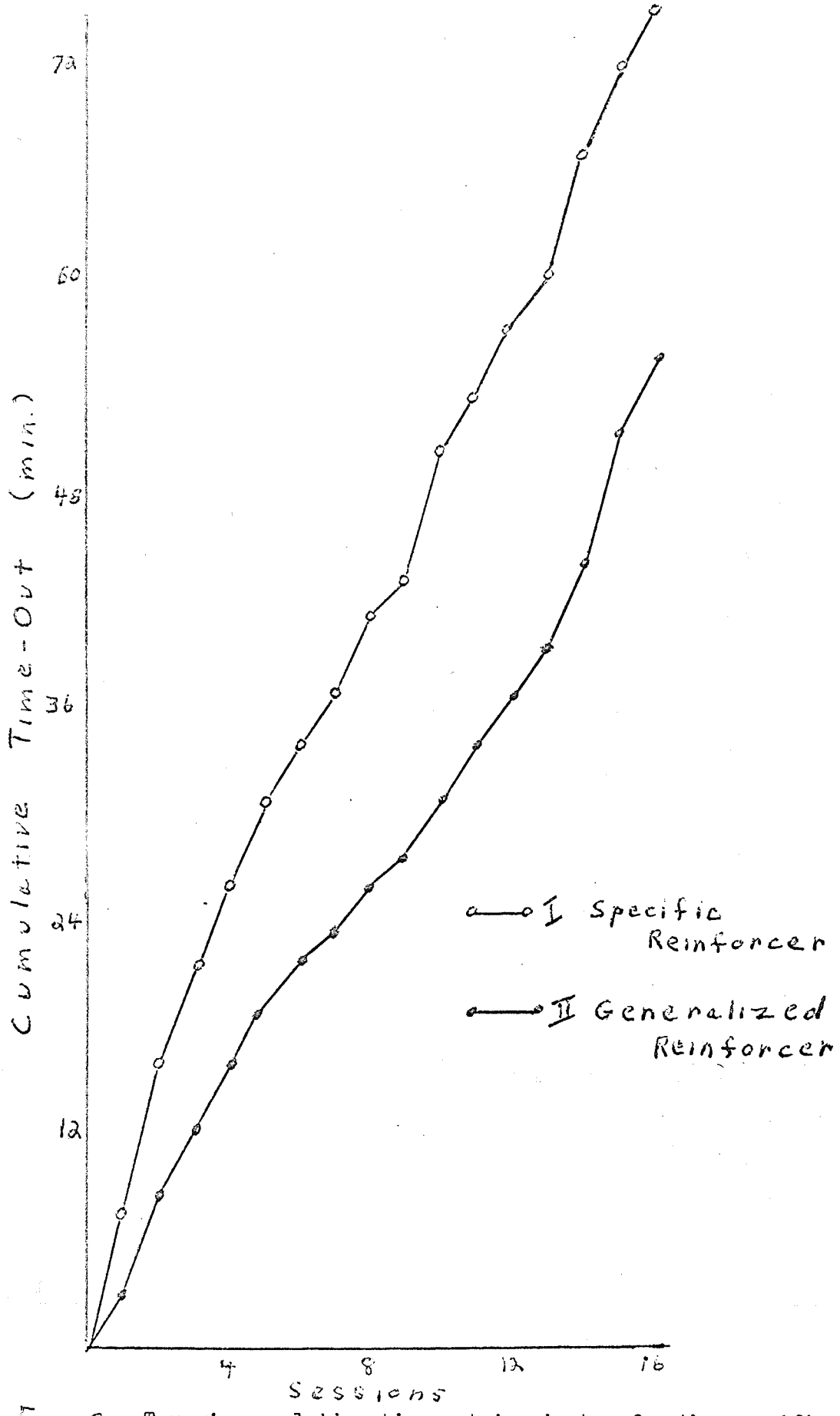

Fig. 3 Terry's cumulative time-out in minutes for the specific reinforcer and generalized reinforcer treatments. Data is recorded over sessions.

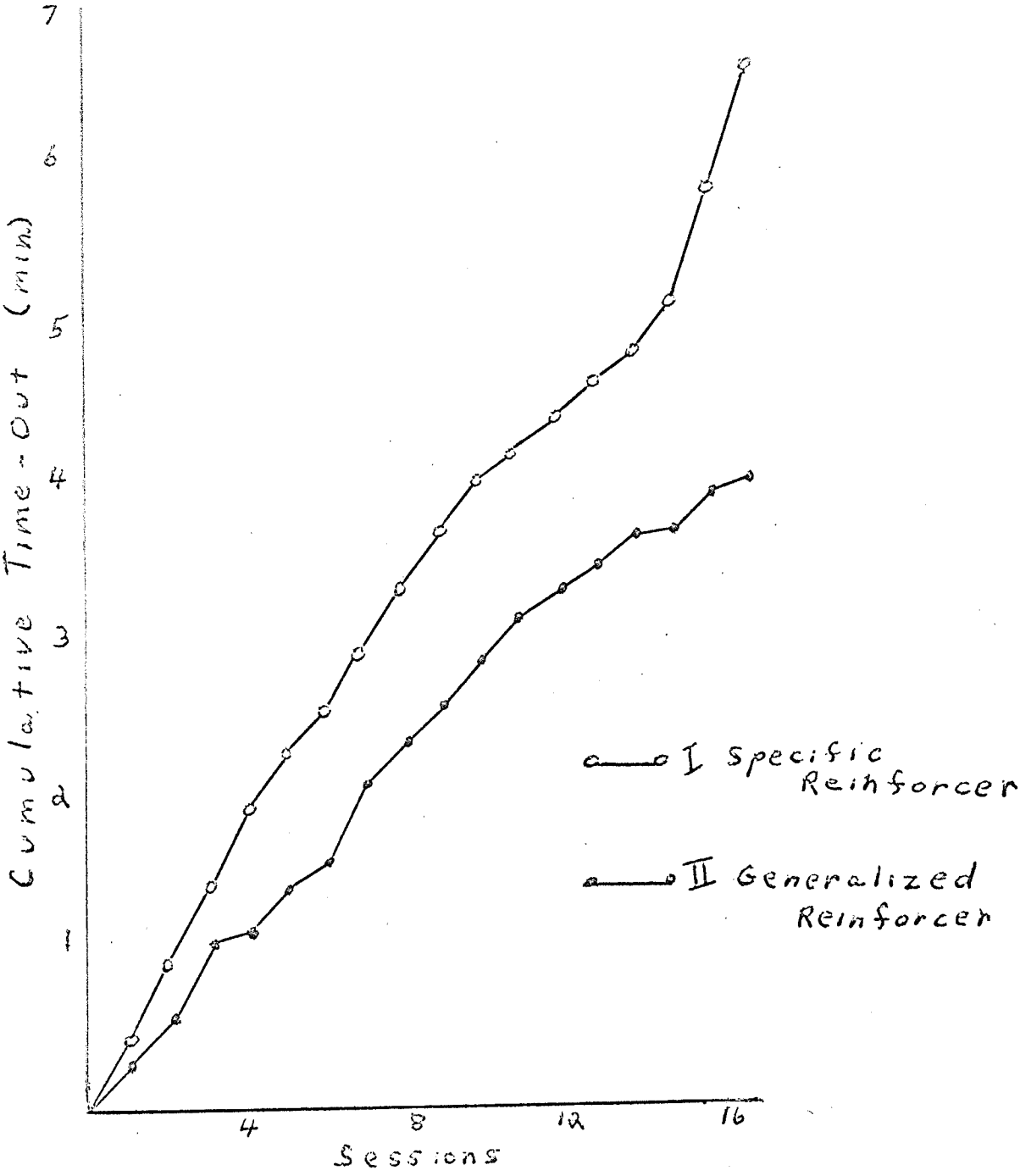

Fig 4 Roy's cumulative time-out in minutes for the specific and generalized reinforcer treatments. Data is recorded over sessions.

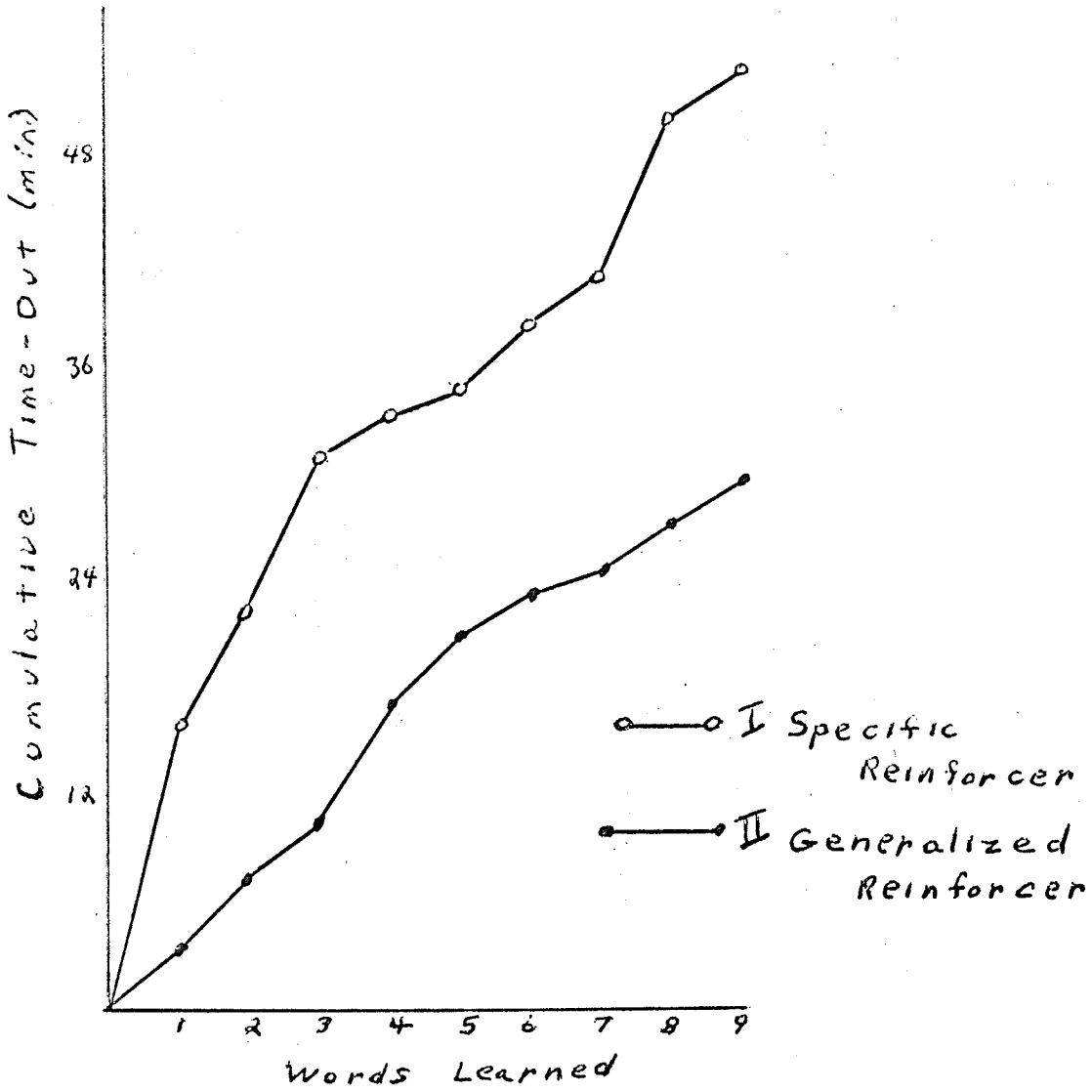

Fig. 5 Terry's cumulative time-out in minutes for the specific reinforcer and generalized reinforcer treatments. Data is recorded over words learned.

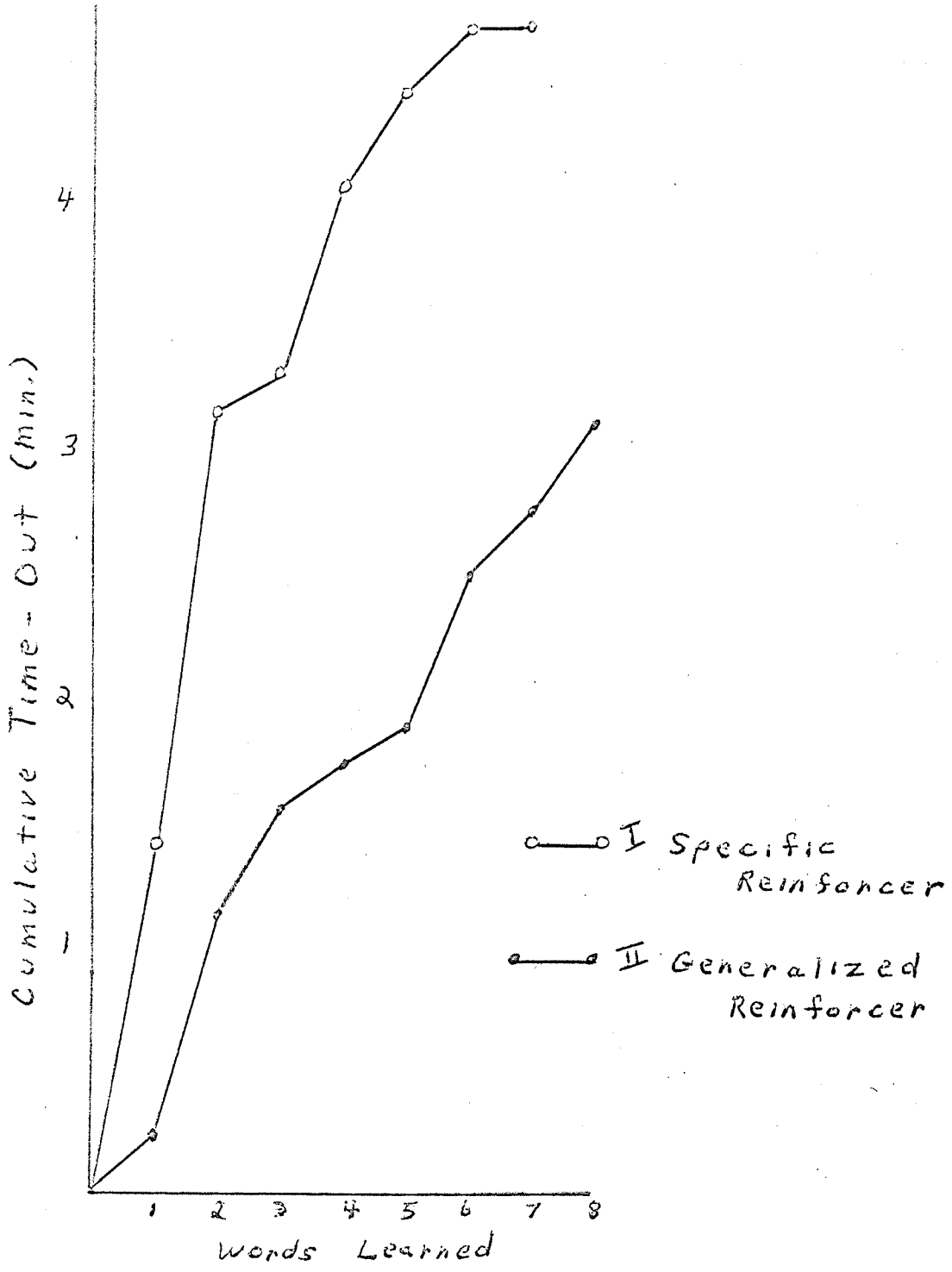

Fig. 6 Roy's cumulative time-out in minutes for the specific reinforcer and generalized reinforcer treatments. Data is recorded over words learned.

showed similar results for the 7 words learned in treatment I and the 8 words learned in treatment II (4' 38" and 3' 05" respectively).

Cumulative errors per session and per word learned

Cumulative errors in each of the treatments is broken down to errors made on unknown words and errors made on known words. It is the errors made on unknown words that is of the greatest concern. Terry's results of cumulative errors per session for each of unknown and known words in each treatment can be found in Figure 7. It can be seen that the discrepancy in errors per session between treatments for unknown words is in the expected direction (66 vs 30). There does not appear to be a meaningful difference in errors per session for known words (13 vs 10).

Figure 8 reveals Roy's results. Cumulative errors per session for unknown words is greatest in treatment I (35 vs 25). Consistent with this is the large difference between treatments I and II on errors per session for known words (19 vs 7).

Cumulative errors per word learned for Terry can be found in Figure 9. Treatment I yields more errors per word learned for unknown words than does treatment II (39 vs 25). However, it should be noted that this difference occurs primarily in the last two words learned (no. 8 and 9). Possibly Terry found the last two words used in treatment I unusually difficult. For known words, there is no meaningful

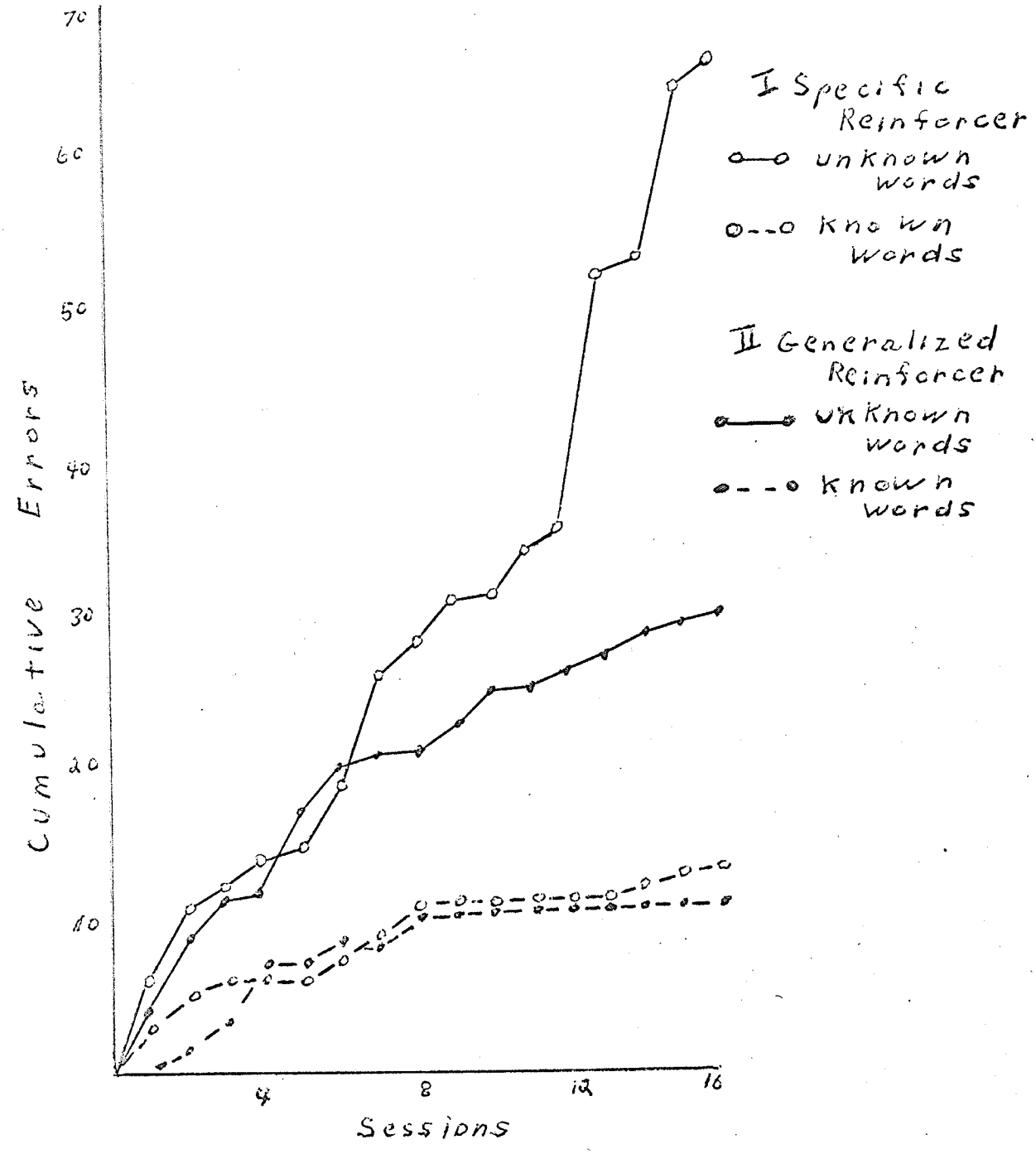

Fig. 7 Terry's cumulative errors per session for each of unknown and known words within each of the two treatments.

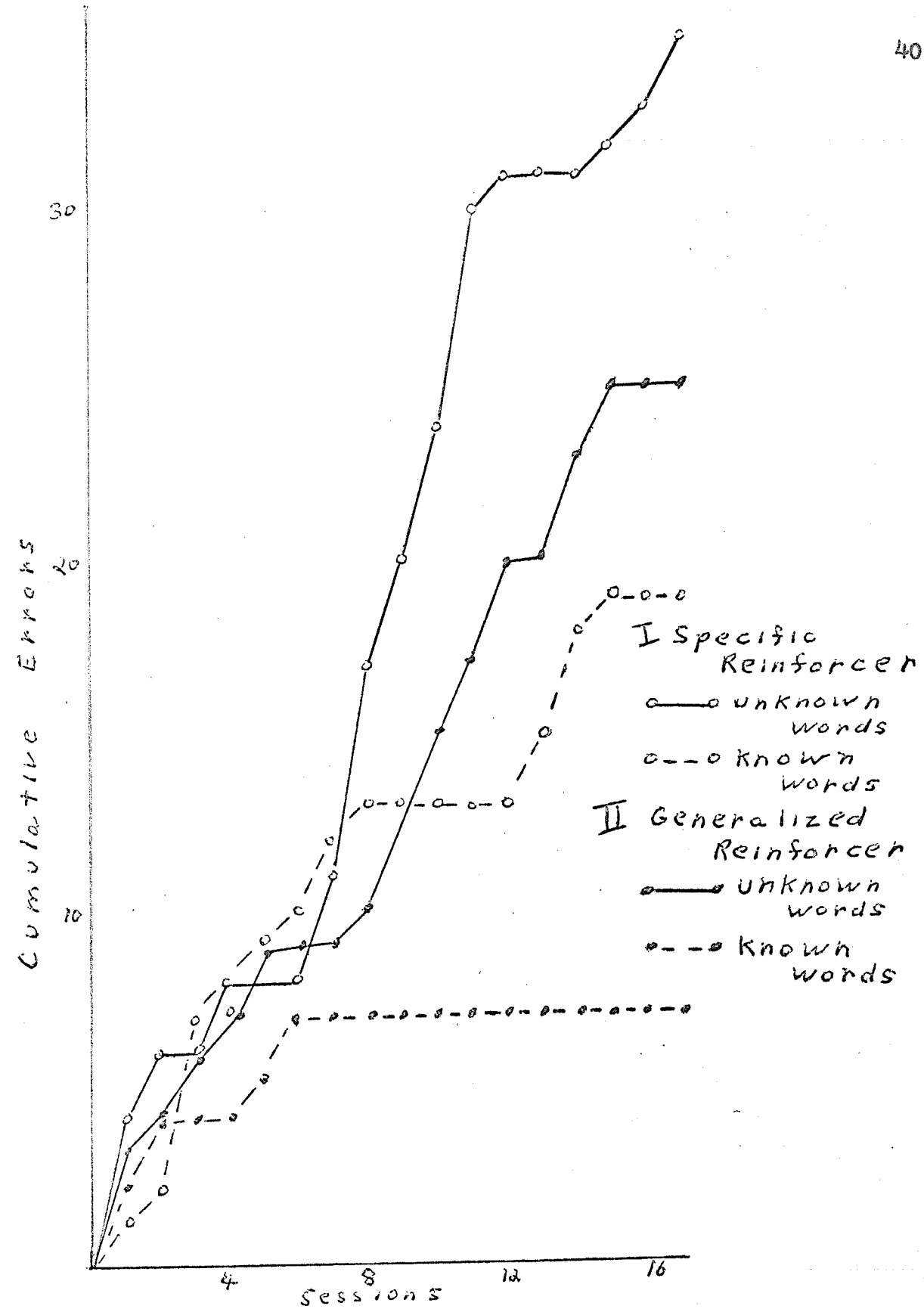

Fig 8 Roy's cumulative errors per session for each of unknown and known words within each of the treatments.

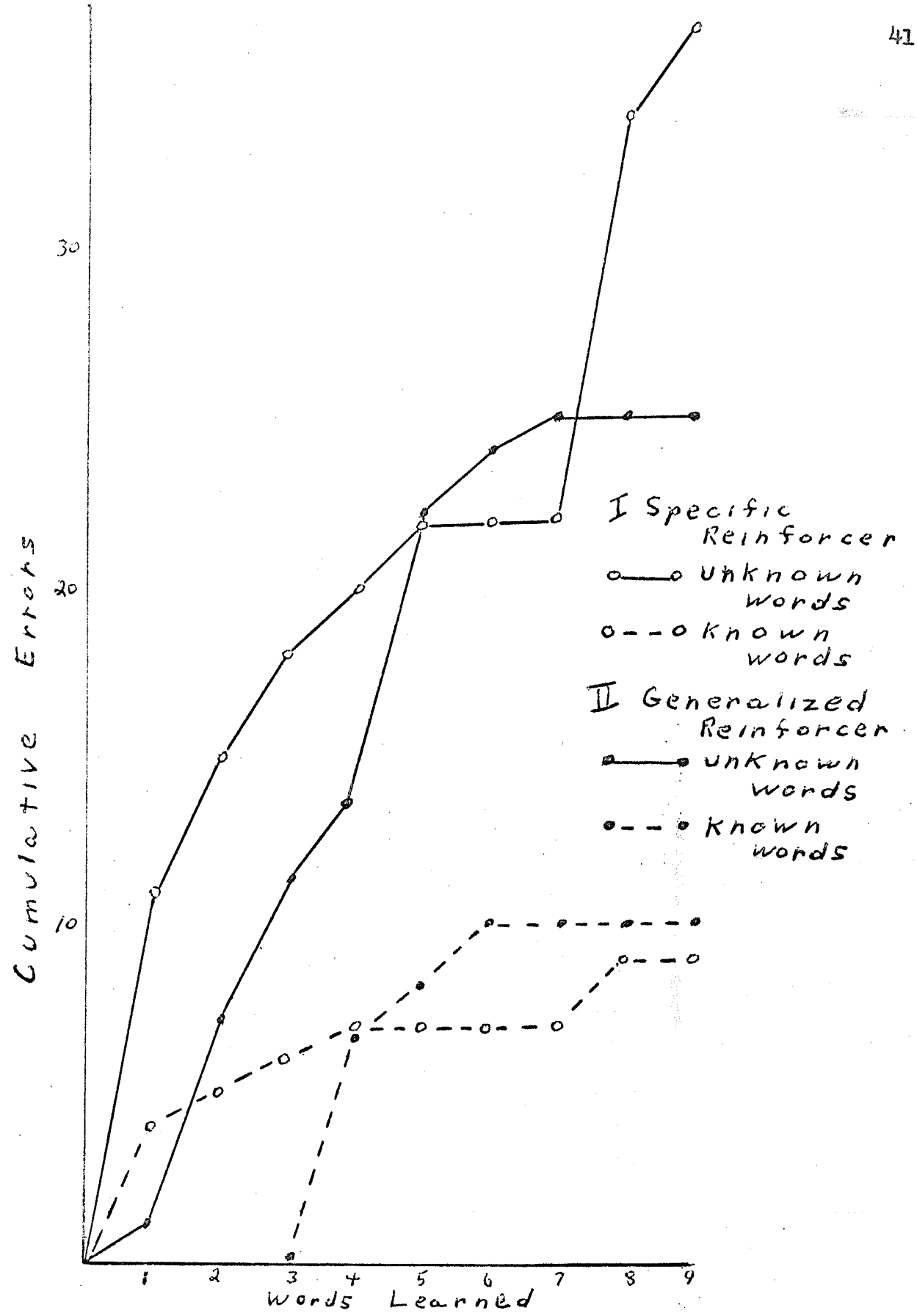

Fig. 9 Terry's cumulative errors per word learned for each of unknown and known words within each of the two treatments.

difference in cumulative errors per word learned between treatments (9 vs 10).

Roy's results for cumulative errors per word learned can be found in Figure 10. For both unknown words and known words, the expected difference between treatments on cumulative errors per word learned was obtained (42 vs 22, and 16 vs 7 respectively).

Words remembered from words learned

Figure 11 reveals the number of words learned (i.e., correctly answered by S on three successive occasions) and the number of words remembered (learned words tested at the end of Phase I that were answered correctly). For each of the treatments, Terry learned 9 words and remembered 7 of those 9 at the end of the phase. His results show no difference between treatments in the number of words learned and number of words remembered. Roy on the other hand, showed results in the expected direction. For treatments I and II the number of words learned was 7 and 8 respectively. Of these, the number of words remembered was 4 and 6.

Discussion

Cumulative TO per session and per word learned

Cumulative TO per session and per word learned yielded obvious and consistent results for both Terry and Roy (Figures 3, 4, 5, 6). Cumulative records on this measure increasingly diverged as a function of sessions or words learned.

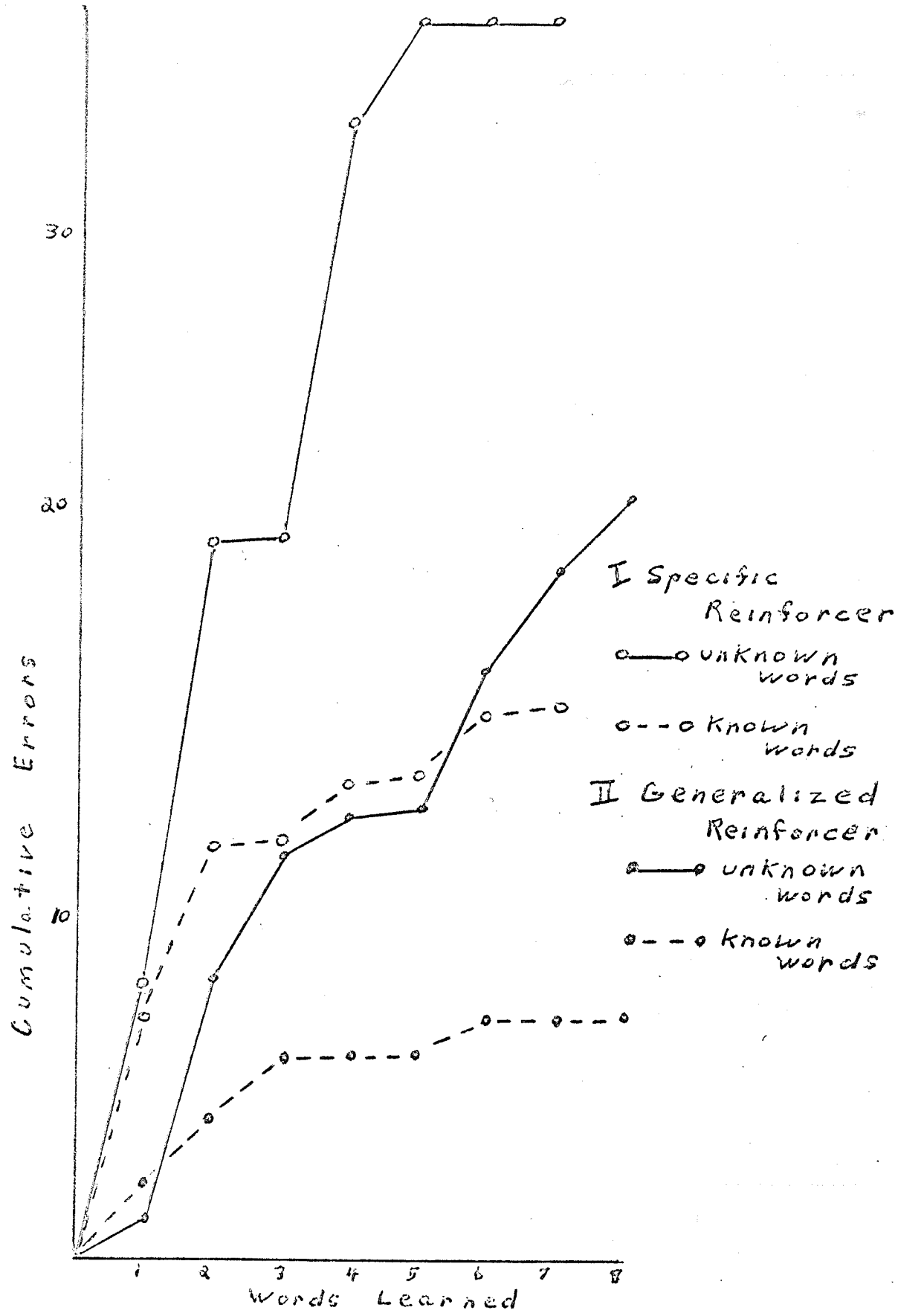

Fig. 10 Roy's cumulative errors per word learned for each of unknown and known words within each of the two treatments.

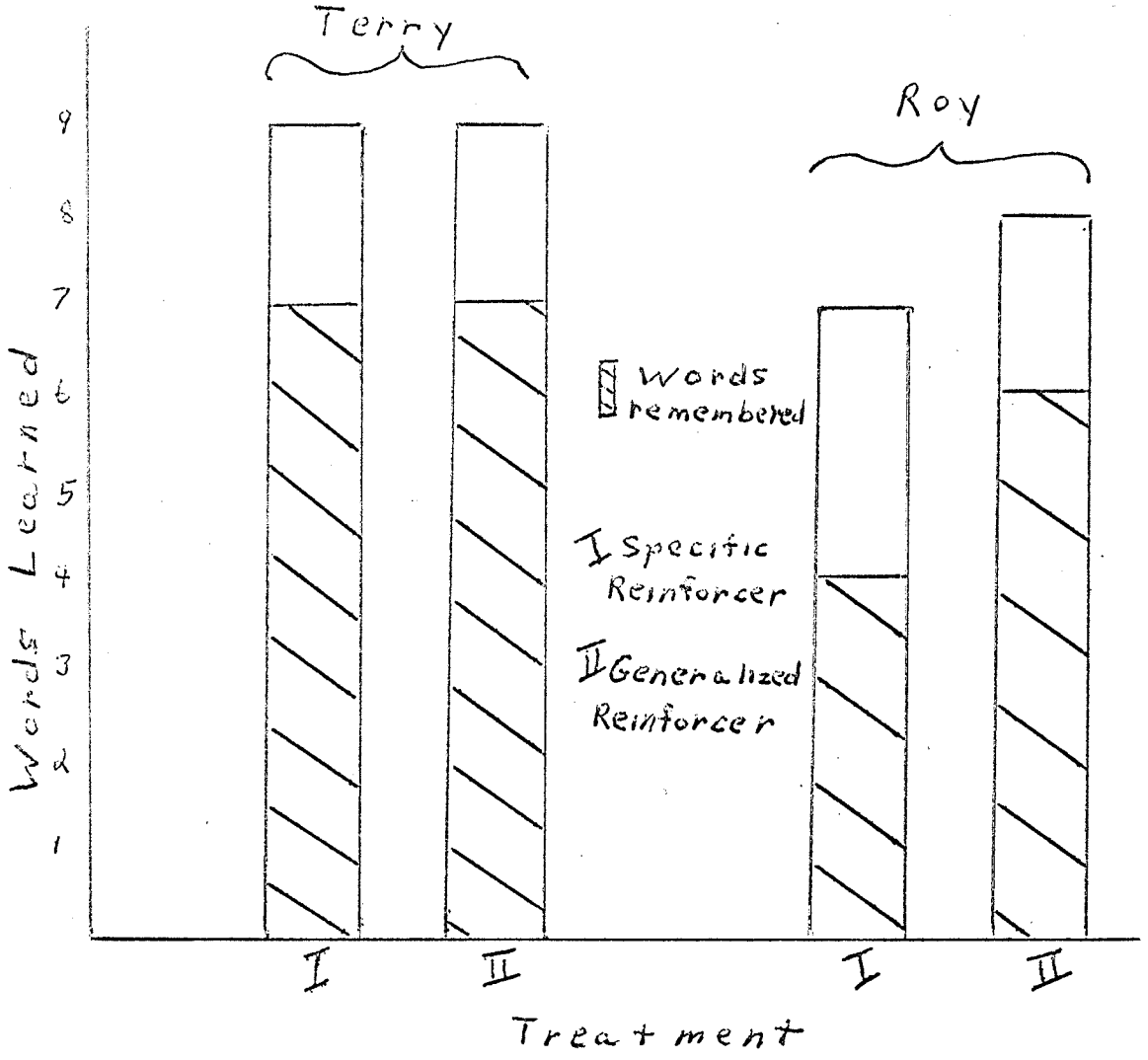

Fig. 11 The number of words learned and the number of words remembered for each of the two treatments for Terry and Roy.

It seems that for both Ss, less TO for inappropriate behavior was taken from the task when the generalized reinforcer was operating than when the specific reinforcer was in effect.

Cumulative errors per session and per word learned

Cumulative errors per session and per word learned showed the expected results for unknown words (Figures 7, 8, 9, 10). This was the case for both Ss. Records on this measure however took a little longer to diverge (Figures 7, 8, 9). But there is a clear difference in cumulative errors, i.e., there are more errors made on unknown words for both Ss when the specific reinforcer is operating than when the generalized reinforcer is in effect. The diverging records showed this effect as a function of sessions or of words learned.

Looking at the cumulative errors made on known words for Roy (Figures 8 and 10), we see the same relation that was found for unknown words, i.e., more errors were made under conditions of the specific reinforcer than the generalized reinforcer. Terry, however, showed no consistent difference on known words.

Differences in errors on known words as a function of type of reinforcer used would seem to be more unlikely to occur than they would on unknown words. In other words, the manipulated variable (type of reinforcer) might not be powerful enough to show an effect when working with words Ss already know. That such a variable (type of reinforcer)

has an effect on Roy for both unknown and known words makes it a more powerful variable for him in this task than it was for Terry. In Terry's case, the type of reinforcer used affects his performance for unknown words, but when known words are used, such a possible effect is overridden. In summary, it can be that the variable manipulated (specific vs generalized reinforcer) has an effect on errors made during word acquisition. For one S this effect was more pervasive than for the other S.

Words remembered from words learned

Terry's results on words remembered from words learned, as a function of the type of reinforcement, show no differences whatsoever (Figure 11, page 44). Roy's results, however, show some differences. Under conditions of the specific reinforcer, Roy learned fewer words and remembered fewer than under conditions of the generalized reinforcer. It appears learning was facilitated by using a generalized reinforcer for Roy. However, the number of words learned was too small to make any definite conclusions. The difference in words learned in the two treatments was only one word. It is difficult to say whether remembering was facilitated by the generalized reinforcer since the number of words learned initially was not equal in the two treatments.

If one looks at the proportion of words remembered to words learned in the two treatments for Roy (4/7 vs 6/8 for specific vs generalized treatments) there seems to be little

difference. Therefore, although Roy's results on words remembered from words learned are in the expected direction, when looked at proportionately the differences are small and they approximate Terry's results which showed no differences. It is noteworthy that Terry's results are not inconsistent with Roy's.

It should be noted that the measure under consideration i.e., words remembered from words learned, is a gross type of measure. It is not as sensitive to differences that might exist between the treatments as were the measures cumulative TO and cumulative errors. However, it is significant that just as the results of the Ss on this measure were not inconsistent with each other, they are also not inconsistent with the results of the previous two measures, i.e., cumulative TO and cumulative errors. In fact, Roy's results on all three measures are in the expected direction. Terry's results are in the expected direction with the exception of cumulative errors for known words and words remembered from words learned, both of which were not inconsistent with expected results.

Conclusion of Phase I

The results of Phase I indicated that a real difference existed between treatments, i.e., type of reinforcer used in word acquisition was a highly relevant variable. Informal observation of Ss in Phase I, however, left some doubt that in treatment II a generalized reinforcer was in fact operating. Ss appeared to be selecting one reinforcer (coke) at a higher

frequency than the others (candy and popcorn). If this was the case, then Phase I was actually a preference study, i.e., which reinforcer is most reinforcing, popcorn (treatment I) or coke (treatment II). This type of information is worthy in and of itself. However, it was deemed necessary at this point in the experiment to establish exactly what was producing the divergent baselines in Phase I: specific vs generalized reinforcer, or popcorn vs coke.

In order for a generalized reinforcer to be operating, it would be necessary that each of the three backup reinforcers contribute to a substantial degree. Also, the token used in the treatment involving the generalized reinforcer should acquire conditioned or secondary reinforcement properties to a greater degree than the token used with the specific reinforcer. In order to find answers to these questions, Phase II of the experiment was carried out.

Phase II - Choice Situation

Design and Procedure

In Phase II the same task (word acquisition) as used in Phase I was employed. Six half-hour sessions on each S were carried out to determine token preference (pennies or nickles). At the same time, when nickles were chosen, frequency of popcorn, candy, and coke selected by Ss was recorded to establish the relative reinforcing value of each.

This phase was an attempt to see if the tokens had

acquired differential secondary reinforcement properties in Phase I, i.e., had the nickles become reinforcing in and of themselves (generalized reinforcer). If they had, presumably they would be chosen by Ss more often than pennies. If this did in fact occur, it would still be necessary to determine the relative contribution of each of the backup reinforcers of the generalized reinforcer token, since Ss might be selecting one of them at an extremely high relative rate. If the later condition were the case, the results in Phase I could be attributed to one specific reinforcer being more reinforcing than another, rather than a generalized reinforcer being more effective than specific reinforcer.

The same task and procedure as before was used with slight modifications. When S correctly responded, E presented a nickle and a penny. S selected one of the tokens. When 5 pennies or nickles were accumulated by S, the appropriate reinforcement was delivered, i.e., for pennies - popcorn, for nickles - a choice of popcorn, candy, or coke.

It should be noted that E presented Ss the two tokens in 5 different ways. Distance, height, left or right hand, were all varied. This was done in order to determine what was operating when Ss selected a token, i.e., would any differential secondary reinforcement properties between the tokens override strictly physical considerations? A summary of Phase II can be found in Table 2.

TABLE 2

PHASE II OF THE DESIGN

For each S each experimental half-hour session

Task	1. Word acquisition 2. Selecting specific reinforcing tokens (pennies) or generalized reinforcing tokens (nickles) i.e., choice situation. 3. When generalized reinforcing token exchanged, select one of popcorn, candy, or coke.
Reinforcer	Specific or generalized reinforcer delivered appropriately.
Words used	Mixture from Pool I and Pool II (randomly)
Manipulation	Distance, height, right-left side of pennies and nickles in the choice situation

S_1 Half-hour session - 5 minute break - half-hour session

S_2 Half-hour session - 5 minute break - half-hour session

Results and Discussion

Results for the frequency the tokens were chosen in each of the 5 conditions can be found in Table 3. It can be seen that within each S, there is little if any discrepancy in the frequency the tokens were chosen in all 5 conditions of presentation. It is necessary to understand why this was the case. In any given condition, the tokens were reversed after each trial of presenting them (counter balanced). Thus, if Ss kept selecting from one hand, the frequency of the two tokens would yield the same results. This is exactly what happened. Both Ss selected from the right hand (cond. 1) when distance and height were equal, the closest token (cond. 2) when height was equal, and the highest token when distance and left-right hand were controlled (cond. 3, 4, 5).

What these results indicate is that the tokens had not acquired differential secondary reinforcing properties. Ss selected tokens according to strictly physical considerations, i.e., which token was closest, easiest to reach, etc.

When Ss chose nickles, the backup reinforcer they selected was recorded. The cumulative frequencies of the backup reinforcers in this situation for Terry and Roy can be found in Figures 12 and 13 respectively. Terry chose coke in 22 cases, candy in 6, and popcorn 0. It is obvious that coke was contributing to the generalized reinforcer token to a great degree, candy to a lesser extent, and popcorn not at all.

TABLE 3

RESULTS OF TOKEN CHOOSING IN PHASE II

	Physical Presentation of tokens	Frequency of Tokens	
		Terry	Roy
1.	Same distance and height	26(n), 24(p)	23(n), 23(p)
2.	One token in front of the other (same height)	29(n), 28(p)	28(n), 27(p)
3.	One token 2 inches higher (same distance)	24(n), 24(p)	27(n), 18(p)
4.	Right hand always higher (same distance)	27(n), 27(p)	31(n), 31(p)
5.	Left hand always higher (same distance)	28(n), 28(p)	27(n), 23(p)

In each of the 5 presentations, coins were counter-balanced each trial, i.e., tokens reversed.

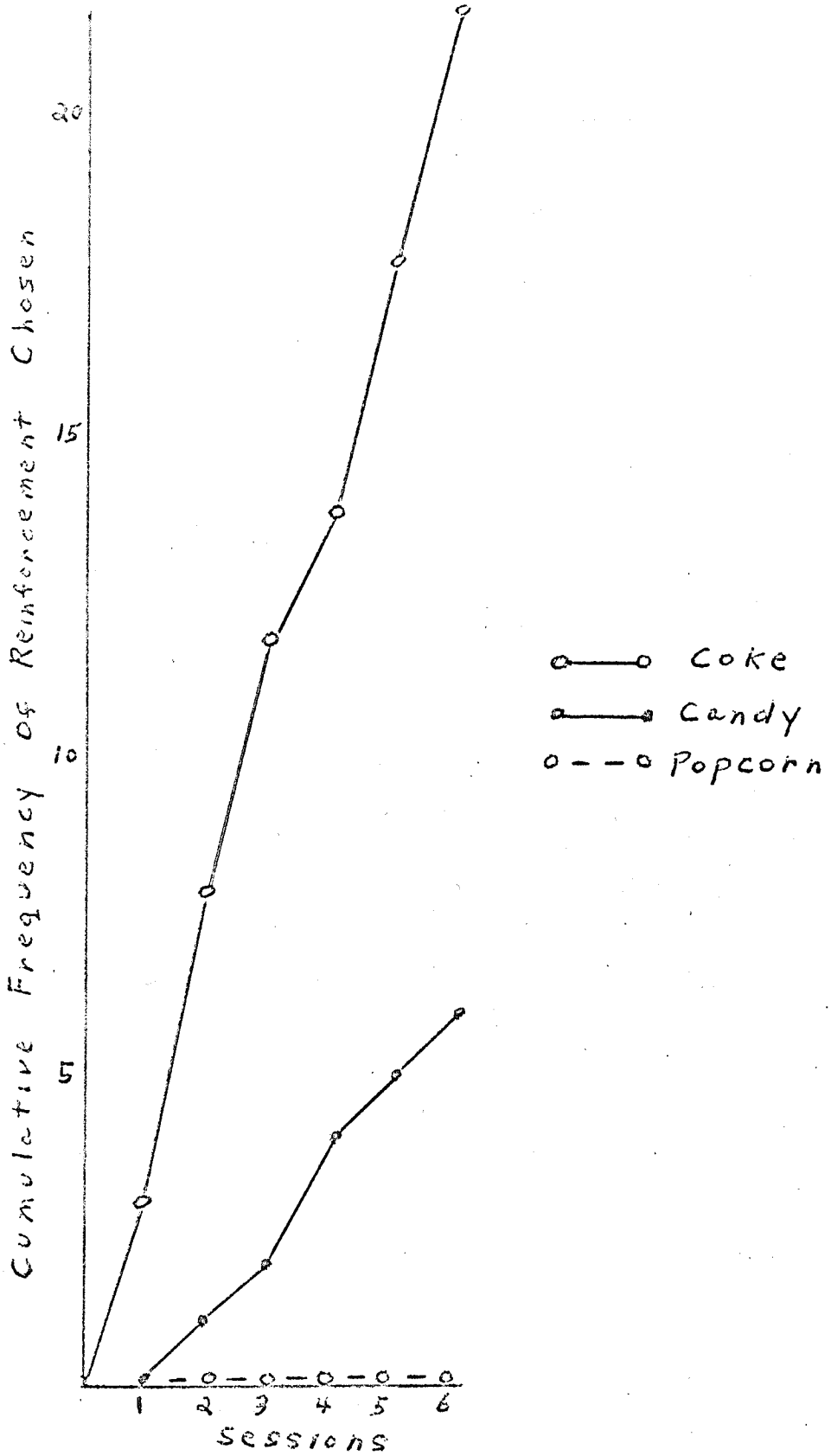

Fig. 12 Terry's cumulative frequency of reinforcement chosen per session in exchange for the generalized reinforcer token.

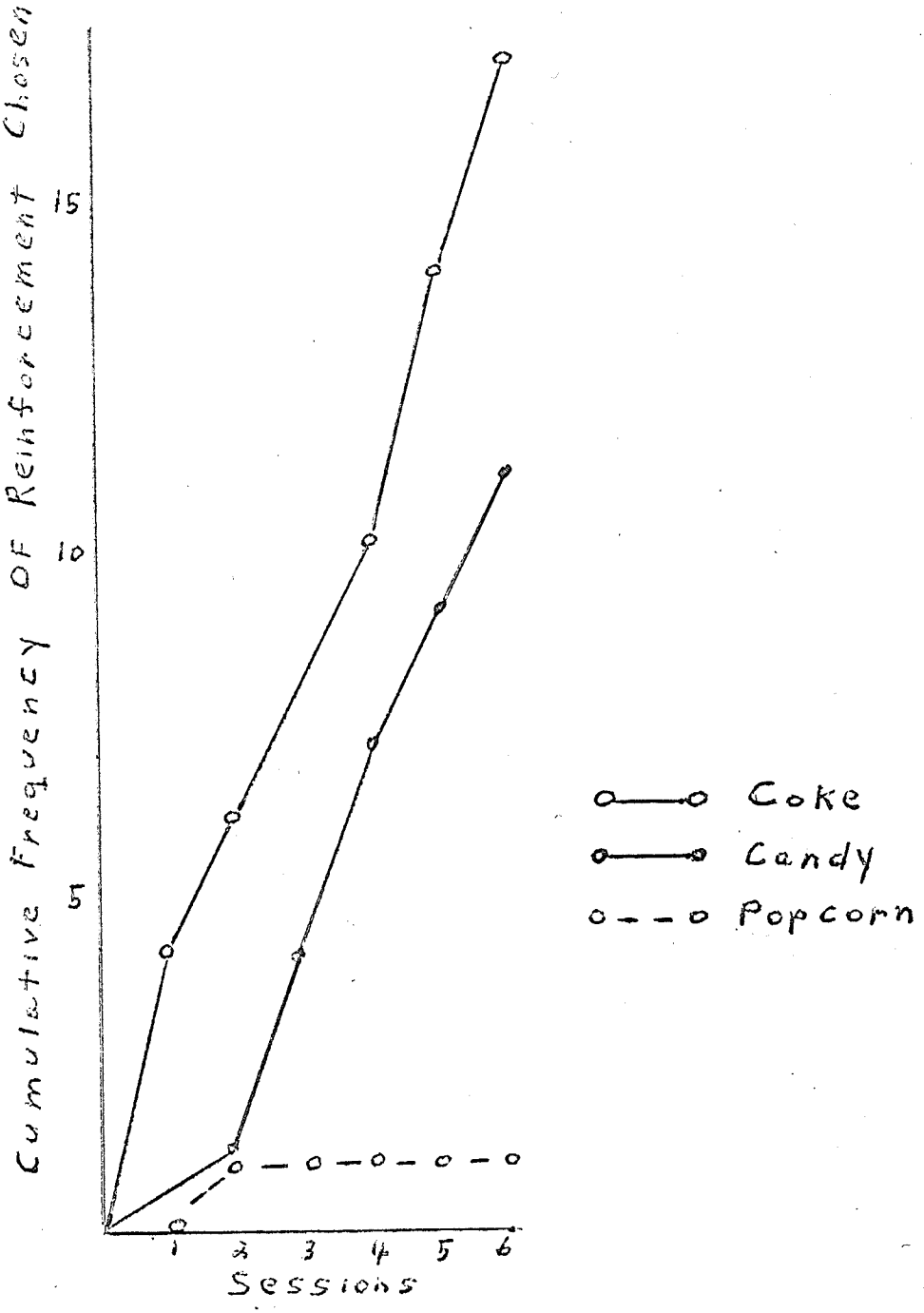

Fig. 13 Roy's cumulative frequency of reinforcement chosen per session in exchange for the generalized reinforcer token.

Roy on the other hand selected coke in 17 cases, candy in 11, and popcorn 1. Again coke was the preferred reinforcer, but candy made a substantial relative contribution.

What are the implications of the results in this phase? We have noted that the tokens did not acquire "meaning" independently from their backup reinforcers, i.e., there was no differential secondary reinforcement established between tokens. But this does not deny the fact that the two reinforcement treatments had produced the diverging baselines. In other words, Phase I could have been carried out using only one token for both treatments. The same results seem likely, since we've now established that differential reinforcement properties of the tokens could not have contributed to the results (since none existed). In other words, one could tentatively speculate that the conditions for establishing a generalized reinforcer were in effect (based on the results of Phase I) but the training was not carried out long enough for the tokens to acquire differential secondary reinforcement (based on the results of Phase II, i.e., token choosing).

But one may criticize this last statement. Did the conditions for establishing a generalized reinforcer in fact exist in Phase I? The cumulative frequencies of the backup reinforcers of the generalized token (Phase II) attempted to answer this question. It appears that the three reinforcers did not all contribute a substantial degree to the generalized

reinforcer. Yet one reinforcer was not chosen exclusively. Coke was most reinforcing, but candy was important also, especially in Roy's case. This part of Phase II does not give conclusive evidence that conditions for the establishment of a generalized reinforcer existed, although there is the indication that this was possible (coke was not chosen to the exclusion of candy).

In summary, it can be said that Phase II indicated that the generalized reinforcing token had not acquired differential secondary reinforcing properties. However, the conditions for the establishment of a generalized reinforcer still may have existed, but not for a long enough period of time. We also saw that the cumulative frequencies of backup reinforcers of the generalized reinforcer token did suggest that a generalized reinforcer of some magnitude was operating. This last finding strengthens the case for the generalized vs specific reinforcer as opposed to the specific vs specific reinforcer (preference study). But the case for the generalized reinforcer is not as yet conclusive.

At this stage of the experiment, it was decided that it would be worth while to change the specific reinforcer of popcorn to the more reinforcing reinforcer, coke. In this situation, if the generalized reinforcer (coke, candy, and popcorn) produced better word acquisition than the specific reinforcer (coke), then the other two reinforcers (candy and popcorn) in the former condition must be contributing

to make the generalized reinforcer more effective. On the other hand, if candy and popcorn did not contribute to the generalized reinforcer condition, we would expect no difference between treatments since this would be a case of comparing two identical specific reinforcers: coke and coke. With these considerations in mind, Phase III was initiated.

Phase III - Partial Repetition of Object Naming

Design and procedure

Phase III was an extension of the purpose of Phase II, i.e., was a generalized reinforcer operating on Ss to produce the divergent baselines rather than one specific reinforcer vs another. Essentially, Phase III was a partial or brief repetition of Phase I with slight modifications. As before, the task was word acquisition. Treatment I (specific reinforcer) and treatment II (generalized reinforcer) were used as before. An independent pool of words was used for each. The order of the two treatments was counter balanced each experimental day. However, in this phase the specific reinforcer was coke rather than popcorn. This was the only change in the design and procedure from Phase I. Phase III involved five one-half hour sessions on each treatment for each S. A summary of Phase III can be found in Table 4.

Results and Discussion

TABLE 4

PHASE III OF THE DESIGN

	Each Experimental Day	
	Treatment I	Treatment II
Task	Word acquisition	Word acquisition
Reinforcer	Specific reinforcer (coke)	Generalized reinforcer (popcorn, candy, coke)
Words used	Words from Pool I	Words from Pool II
Tokens	Pennies	Nickles

S_1 Half-hour session - 5 minute break - half-hour session

S_2 Half-hour session - 5 minute break - Half hour session

For each experimental day the order of the treatments was reversed.

Cumulative TO per session

Results for cumulative TO per session for Terry and Roy can be found in Figures 14 and 15. Terry's cumulative TO for specific and generalized reinforcers was (7' 25" and 6' 55") respectively. One can conclude that no real meaningful difference has been demonstrated thus far, although there is the indication that had Phase III been continued for Terry, the curves would have diverged in the expected direction.

Roy's results for cumulative TO were more positive (2' 05" vs 35"). The generalized reinforcer condition yielded much less TO than did the specific reinforcer condition.

Cumulative errors per session

Cumulative errors per session for Terry and Roy can be found in Figures 16 and 17. For unknown words, Terry showed more errors in the specific reinforcer condition than he did in the generalized reinforcer condition (12 vs 9). The same relationship can be seen for known words (4 vs 0). Roy's results are consistent with Terry's: 3 vs 2 for unknown words; 2 vs 1 for known words; for specific vs generalized reinforcer respectively. The curves for Roy, however, are not as dramatic as Terry's on this measure. Again one can speculate that the curves would continue to diverge had Phase III been extended.

Cumulative frequency of reinforcers chosen in generalized reinforcer condition.

In addition to cumulative TO and cumulative errors per

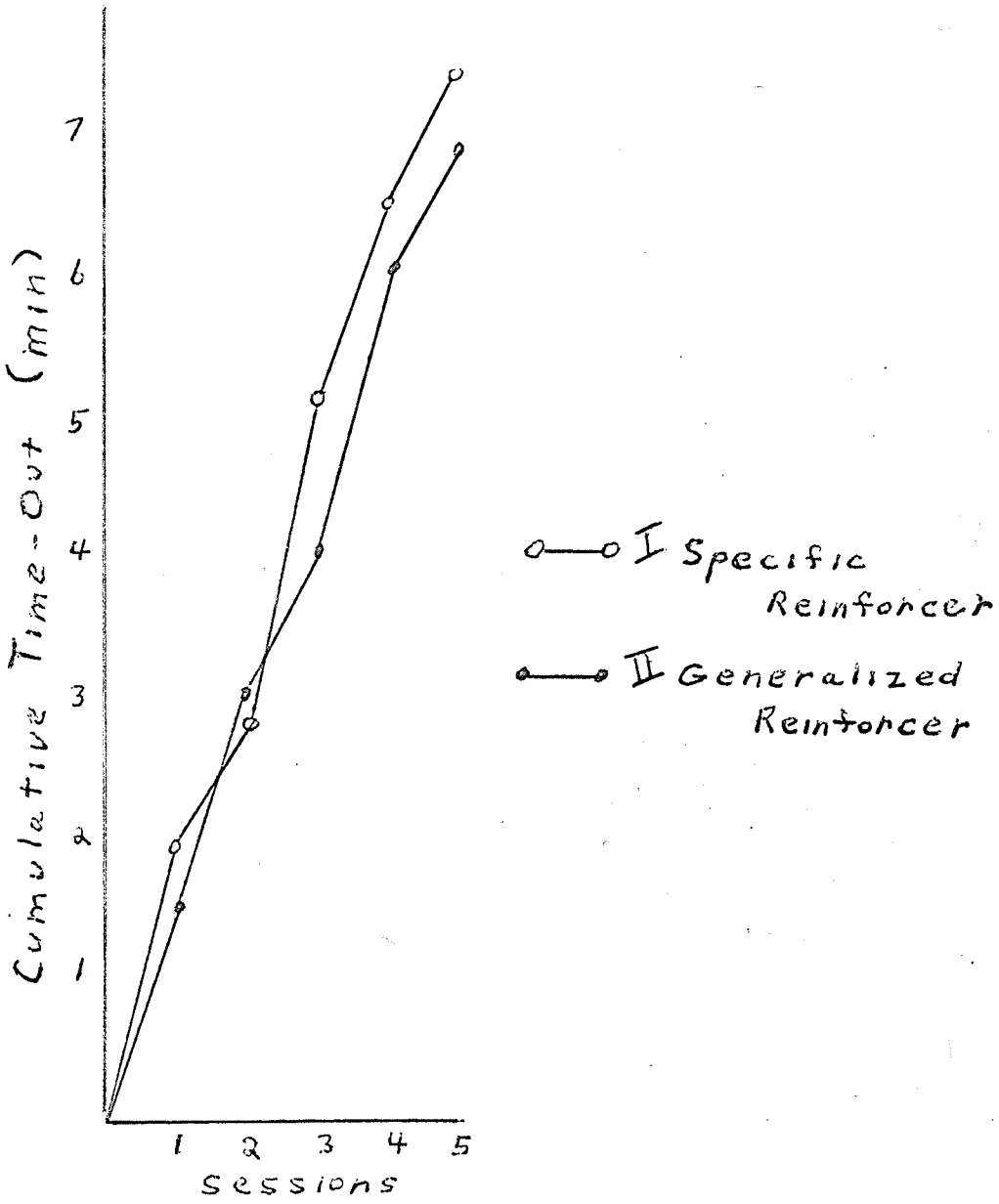

Fig. 14 Terry's cumulative time-out in minutes for the specific reinforcer and generalized reinforcer treatments. Data is recorded over sessions.

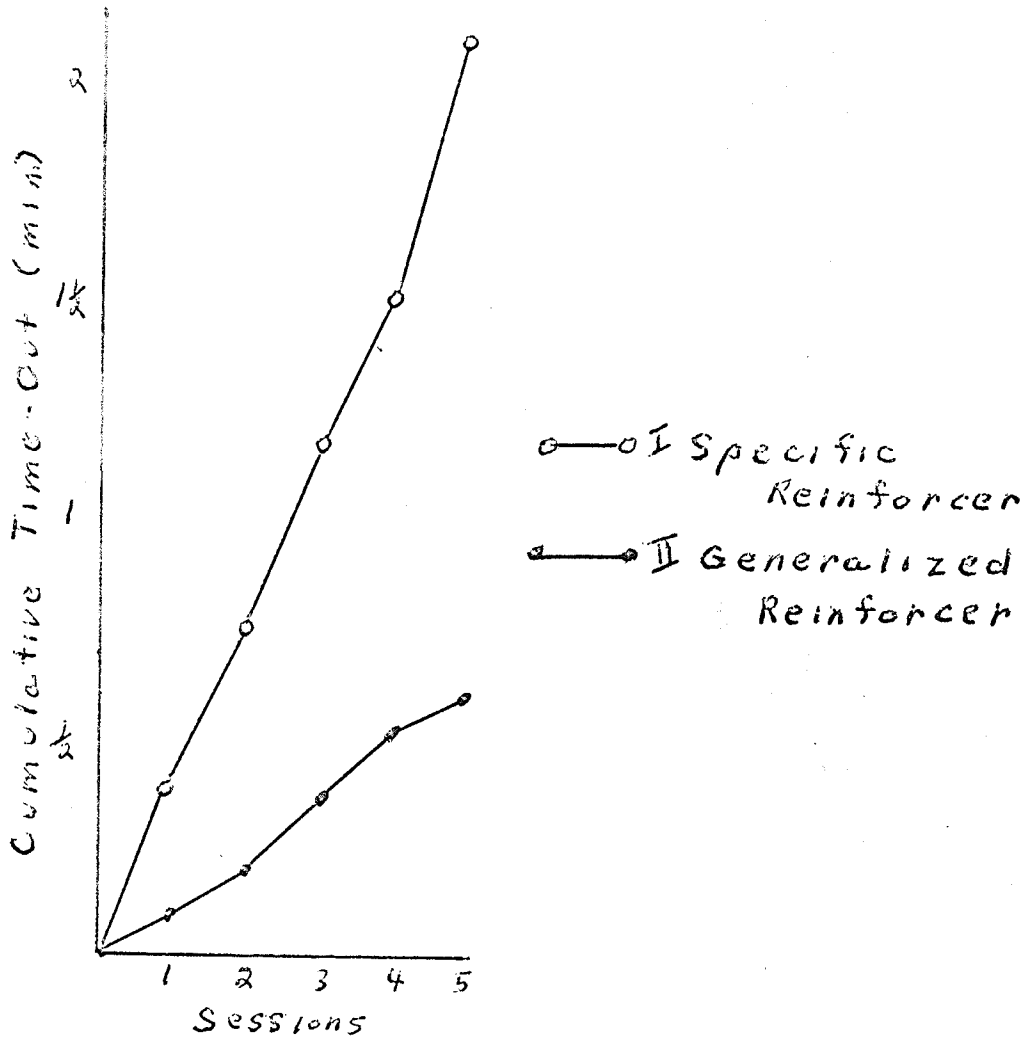

Fig. 15 Roy's cumulative time-out in minutes for the specific reinforcer and generalized reinforcer treatments. Data is recorded over sessions.

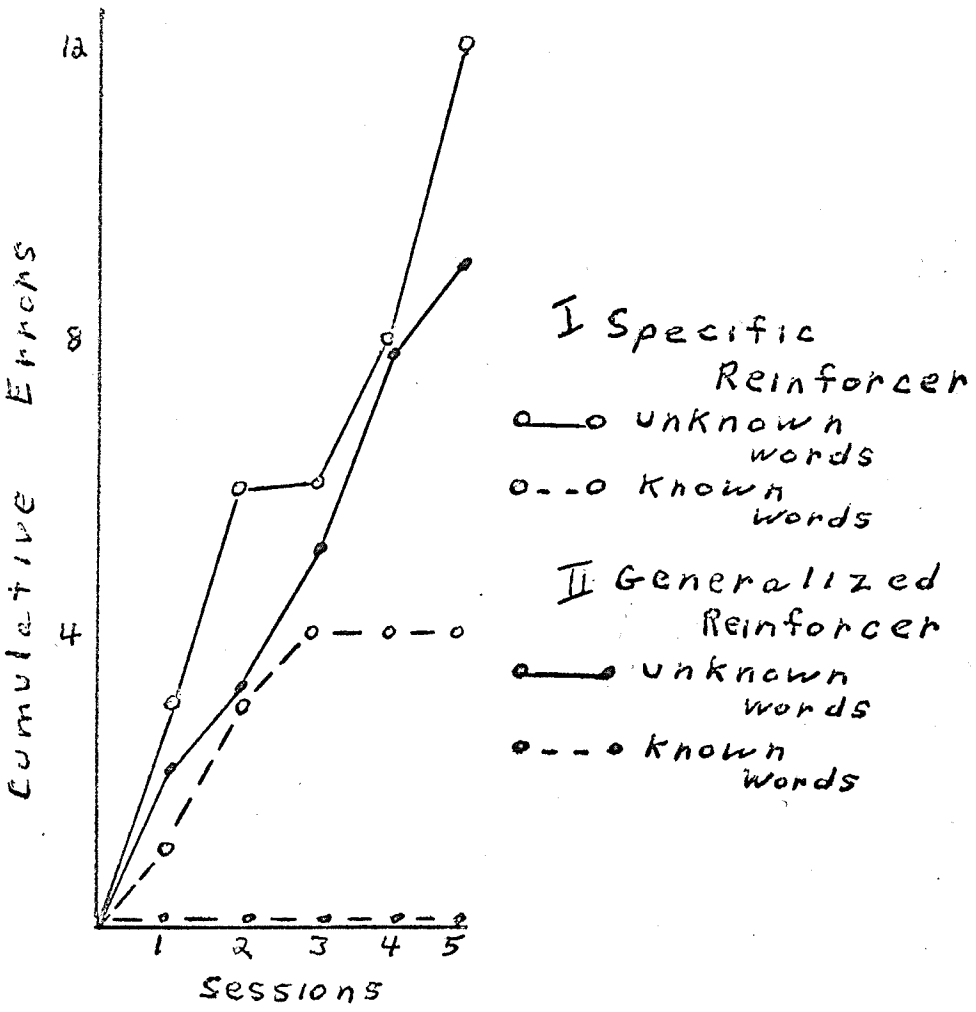

Fig. 16 Terry's cumulative errors per session for each of unknown and known words within each of the two treatments.

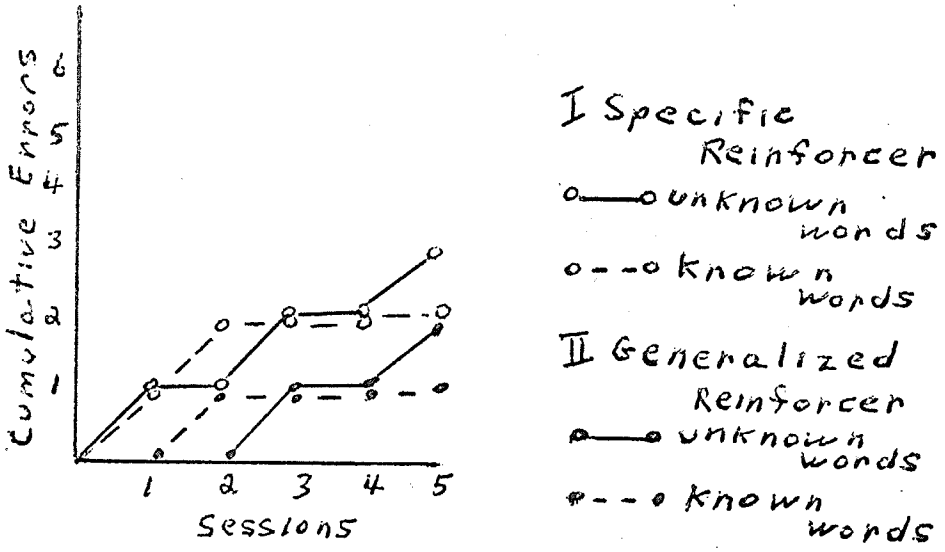

Fig. 17 Roy's cumulative errors per session for each of unknown and known words within each of the two treatments.

session, the cumulative frequency of reinforcement chosen in the generalized condition was recorded. Results can be found in Figures 18 and 19. Terry showed a high frequency of selecting coke (51). Candy was chosen on 17 occasions while popcorn was never chosen. Roy's results are dissimilar. Candy showed the highest frequency (43), then coke (24) and finally, popcorn (14).

Clearly, candy, and in the case of Roy, popcorn, contributed to the strength of the generalized reinforcer. This is demonstrated by data on Ss selection of backup reinforcer when the generalized reinforcer condition is in operation. For Terry, coke was most reinforcing, but candy was also important in this respect. For Roy, we saw that candy was most reinforcing at this stage of the experiment, with both coke and popcorn contributing to the strength of the generalized reinforcer. The data on this last measure substantiates the results on cumulative TO and cumulative errors in that Terry and Roy both did better on these two measures in the generalized reinforcer condition than in the specific reinforcing condition, even though coke was the specific reinforcer (shown in Phase II to be highly reinforcing).

In summary, it can be said that Phase III further supports the notion that the results in Phase I were due to the differential effects of generalized reinforcers vs specific reinforcer, rather than a specific reinforcer vs specific reinforcer.

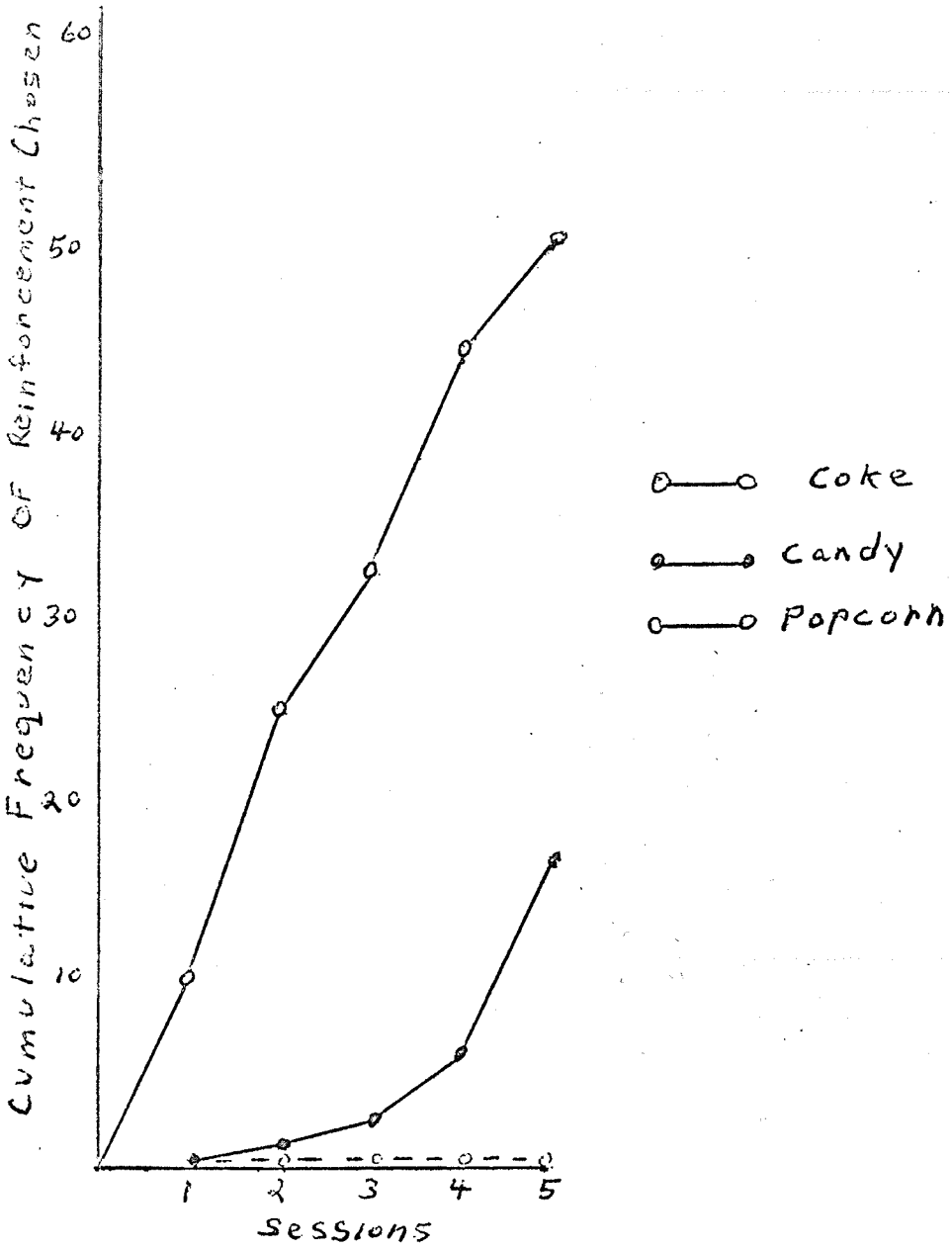

Fig. 18 Terry's cumulative frequency of reinforcement chosen per session in exchange for the generalized reinforcer token.

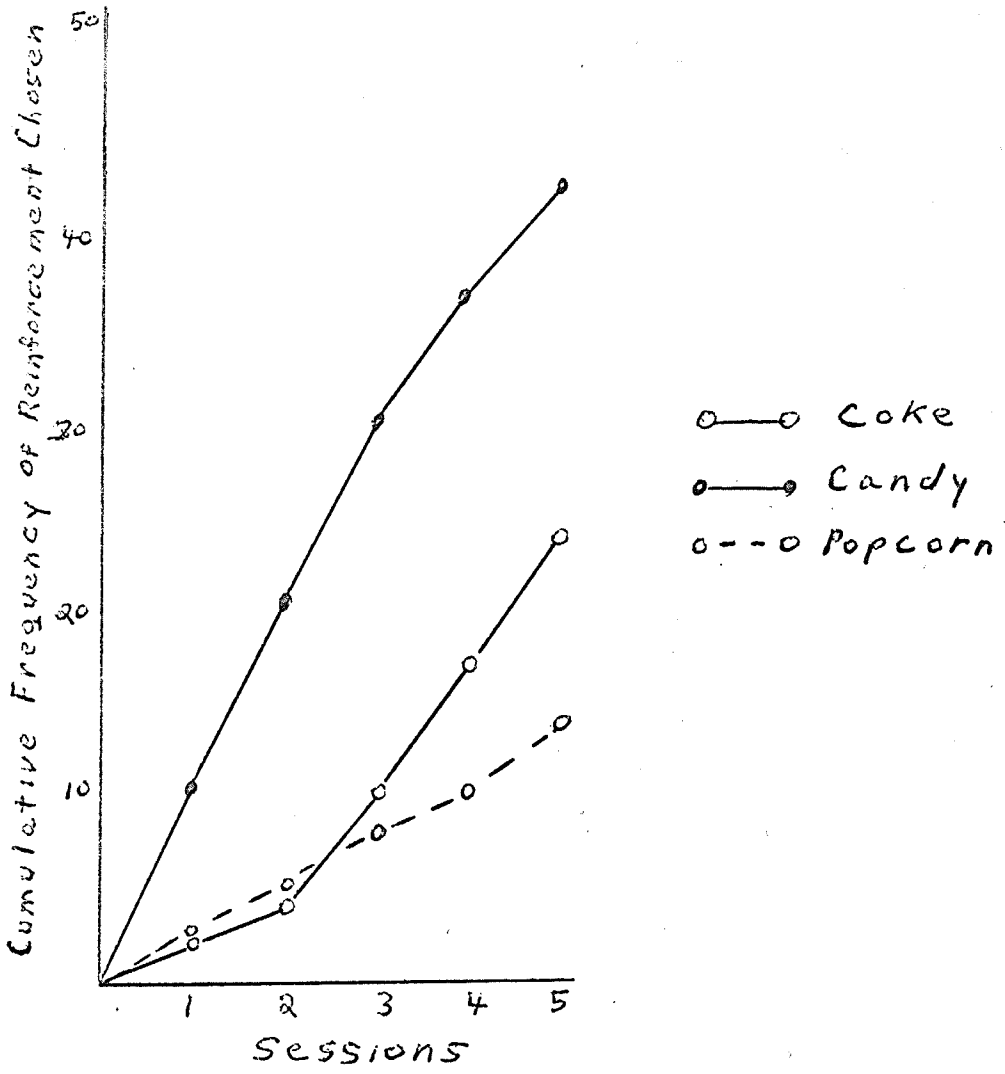

Fig. 19 Roy's cumulative frequency of reinforcement chosen per session in exchange for the generalized reinforcer token.

CHAPTER III

DISCUSSION

The results of each of the three phases has already been discussed in considering each separately. This section will deal with a brief discussion of the results as a whole, and make tentative recommendations for future research.

In Phase I, the generalized reinforcer resulted in more effective word acquisition than the specific reinforcer (as shown by TO and error measures). However, there were no consistently large differences in words remembered between the two conditions. Similar results were reported by Risley and Wolf (1964). They used praise plus food vs praise alone in word acquisition with an autistic child. Although praise plus food resulted in better word acquisition than praise alone, no differences in words recalled were found. Thus it appears that words recalled is not differentially affected by the type of reinforcer used, although it is possible that not enough words were acquired to detect the difference. It seems that if one is to assess relative effectiveness of any two types of reinforcers, a greater number of words should be acquired. In terms of the present study, Phase I could have been extended in order that it would be more likely that any true

differences in words recalled would have been detected.

Phase II attempted to verify that an experimental generalized reinforcer had in fact been established in Phase I and accounted for the positive results. Although there was evidence that a generalized reinforcer of some degree was operating (candy contributed as well as coke) there was also evidence that the tokens had not acquired differential secondary reinforcement value (no differential frequency rate of tokens in choice situation). Again one could propose that Phase I should have been carried out longer in order for the tokens to acquire differential secondary reinforcing properties. However, because the Ss who participated in this experiment were diagnosed as exhibiting infantile autism, they might have never acquired the "meaning" of the tokens.

Phase III attempted to show that if in fact a generalized reinforcer was established, it should be more effective than any of its separate specific reinforcing components, including the strong reinforcer coke. Thus the generalized reinforcer was compared to the specific reinforcer coke rather than popcorn. Results here were promising, but it would have been better to extend Phase III to get more stable curves. Also, a phase IV would have been desirable, where the generalized reinforcer was compared to the third component candy. If it was found that the generalized reinforcer was more effective than any of the three specific reinforcers of which it was composed, then the superiority of the generalized reinforcer

could not be disputed. Future research along the lines mentioned above seems to be warranted by the results of the present experiment.

CHAPTER IV

SUMMARY

In Phase I, object naming was the task. The generalized reinforcement treatment yielded less cumulative TO per session and per word learned and less errors per session and per word learned for unknown words. One S (Roy) learned more unknown words when the generalized reinforcer was in effect although this difference was very small.

Phase II was the choice situation. The tokens were not chosen by Ss at differential rates. However, the cumulative frequencies of the backup reinforcers of the generalized reinforcer did suggest a generalized reinforcer of some magnitude was operating.

Phase III was a partial repetition of Phase I. using coke as the specific reinforcer instead of popcorn. The trend in results on TO and errors was the same as that reported in Phase I. In addition, cumulative frequency of the backup reinforcers of the generalized reinforcer indicated (as did Phase II) that a generalized reinforcer of some magnitude was operating.

The present study provided some evidence for believing that generalized reinforcers are more effective than specific

reinforcers for teaching autistic children to name pictures of objects. It attempted to fulfill a need to explore the nature of generalized conditioned reinforcers in humans. At the same time, immediate human behavioral problems were dealt with.

REFERENCES

Ayllon, T. and Ayrin, N. H. The measurement and reinforcement of the behavior of psychotics. J. Exp. Anal. Behav. 1965, 8, pp. 357-383.

Ayllon, T. and Ayrin, N. H. Reinforcer sampling: a technique for increasing the behavior of mental patients. J. Applied Behav. Anal. 1968, 2, pp. 13-20.

Baer, D. M., Peterson, R. F., and Sherman, J. A. The Development of imitation by reinforcing behavioral similarity to a model. J. Exp. Anal. Behav. 1967, 10, pp. 405-416.

Baer, D. M., Wolf, M. M., and Risley, T. R. Some current dimensions of applied behavior analysis. J. Applied Behav. Anal. 1968, 1, pp. 91-97.

Birnbrauer, J. S., Bijou, S. W., Wolf, M. M., and Kidder, J. D. Programmed instruction in the classroom. In L. P. Ullman and L. Krasner (eds.), Case Studies in Behavior Modification. New York: Holt, Rinehart & Winston, 1965, pp. 358-363.

Birnbrauer, J. S., Wolf, M. M., Kidder, J. D., and Tague, C. E. Classroom behavior of retarded pupils with token reinforcement. J. Exp. Child Psy., 1965, 2, pp. 219-235.

Ferster, C. B., and DeMeyer, M. K. A method for the experimental analysis of the behavior of autistic children. Amer. J. of Ortho-psychiat., 1962, 32, pp. 89-98.

Girardeau, F. L., and Spradlin, J. E. Token rewards in a cottage program. Mental Retardation, 1964, Dec. pp. 346-351.

Hopkins, B. L. Effects of candy and social reinforcement, instructions, and reinforcement schedule leaving on the modification and maintenance of smiling. J. Applied Behav. Anal., 1968, 1, pp. 121-129.

Hudson, E., and DeMeyer, M. K. Food as a reinforcer in educational therapy of autistic children. Behav. Res. and Therapy, 1968, 6, pp. 37-43.

Kelleher, R. T. and Gollub, L. R. A review of positive conditioned reinforcement. J. Exp. Anal. Behav., 1962, 5, pp. 543-595.

Lawson, R., Mattis, P. R., and Pear, J. J. Summation of response rates to discriminative stimuli associated with qualitatively different reinforcers. J. Exp. Anal. Behav., 1968, 11, pp. 561-568.

Lent, J. R. Mimosa Cottage: Experiment in hope. Psychology Today, 1968, 2 (1), pp. 51-58.

Marshall, G. R. Toilet training of an autistic eight-year-old through conditioning therapy: a case report. Behav. Res. & Therapy, 1966, 4, pp. 242-245.

Martin, G. L., England, G., Kaprony, E., Kilgour, K., and Pilek, V. Operant conditioning of kindergarten class behavior in autistic children. Behav. Res. & Therapy, 1968, 6, pp. 281-294.

Martin, G. L., Moir, J., and Skinner, M. The effect of time-out from positive reinforcement for errors during tacting training with autistic training with autistic children. In preparation.

Martin, G. L., and Pear, J. J. Short term participation by 130 undergraduates as operant conditioners in an ongoing project with autistic children. Paper presented to American Psycol. Assoc., San Francisco, 1968.

Metz, J. R. Conditioning generalized imitation in autistic children. J. Exp. Child Psychol., 1965, 2, pp. 389-399.

Quay, H. C., Sprague, R. L., Werry, J. S., and McQueen, M. M. Conditioning visual orientation of conduct problem children in the classroom. J. Exp. Child Psychol., 1967, 5, pp. 512-517.

Reese, E. P. The Analysis of Human Operant Behavior. Wm. C. Brown Co. Publishers, 1966.

Risley, T. R. The effects and side effects of punishing theautistic behaviors of a deviant child. J. Applied Behav. Analy., 1968, 1, pp. 21-34.

Risley, T. R., and Wolf, M. M. Establishing functional speech in echolalic children. Behav. Res. & Therapy, 1967, 5, pp. 73-88.

Risley, T. R., and Wolf, M. M. Experimental manipulation of autistic behaviors and generalization into the home. Paper read at American Psychological Association, Los Angeles, September, 1964.

Reynolds, G. S. A Primer of Operant Conditioning. Scott, Foresman and Co., 1968.

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

Skinner, B. F. Behavior of Organisms. New York: Appleton-Century-Crofts, 1938.

Skinner, B. F. Science and Human Behavior. The Macmillan Co., 1953.

Skinner, B. F. Verbal Behavior. New York: Appleton-Century-Crofts, 1957.

Staats, A. W., Minke, K. A., Finley, J. R., Wolf, M. M. and Brooks, L. A reinforcer system and experimental procedure for the laboratory study of reading acquisition. Child Development, 1964, 35, pp. 209-231.

Staats, A. W. Learning, Language and Cognition. Holt, Rinehart & Winston, Inc., 1968.

Terrace, H. S. Discrimination learning with and without 'errors'. J. Exp. Analy. Behav., 1963, (a), 6, pp. 1-27.

Terrace, H. S. Errorless transfer of a discrimination across two continua. J. Exp. Anal. Behav., 1963, (b), 6, pp. 223-232.

Ullman, L. P., and Krasner, L. (eds.) Case Studies in Behavior Modification, New York: Holt, Rinehart & Winston, 1965.

Ulrich, R., Stachnik, T., and Mabry, J. (eds.) Control of Humans Behavior, Scott, Foresman and Co., 1966.

Watson, L. S., Jr. Reinforcement preferences of severely mentally retarded children in a generalized reinforcement context. Amer. J. Mental Deficiency, 1968, 72, pp. 748-756.

Wolf, M., Mees, H., and Risley, T. Application of operant conditioning procedures to the behavior problems of an autistic child. Behav. Res. & Therapy, 1964, 1, pp. 305-312.

Wolf, M., and Risley, T. Application of operant condition-procedures to the behavior problems of an autistic child: a follow-up and extension. Behav. Res. & Therapy, 1967, 5, pp. 103-111.