

TIME OUT AS POSITIVE REINFORCEMENT
FOR A HUMAN OPERANT RESPONSE

A Thesis
Presented to
The Faculty of Graduate Studies and Research
University of Manitoba

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
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May, 1969

c1969



ACKNOWLEDGEMENT

I wish to thank the members of my committee, Dr. J. J. Pear and Mr. G. L. Martin for their comments and assistance. Grateful acknowledgement is also due to Dr. G. Lowther, Medical Superintendent, and the staff at the Manitoba Training School for their excellent co-operation.

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ABSTRACT

TIME OUT AS POSITIVE REINFORCEMENT FOR A HUMAN OPERANT RESPONSE

BY

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Previous research with animals has indicated that time out from positive reinforcement (TO) may function as an aversive stimulus, as punishment, or as a positive reinforcer. Time out has been used as punishment for humans in behavior modification situations. The purpose of the present study was to determine if TO is a positive reinforcer with humans in a behavior modification situation.

Two autistic children who had participated in an earlier experiment, each received training on a verbal and a printing task. For one subject (Peter), within each task a two-ply multiple schedule, was in effect. For one schedule, one operant (the verbal or printing task) was reinforced on a fixed-ratio (FR) 5 schedule with food, while the other operant (a lever press response) was reinforced on an FRL schedule with thirty second periods of TO. On these schedules, Peter did not impose periods of TO on himself. In order to determine if he would impose such TO periods, the FR schedule was increased in the verbal component of the multiple schedule. The contingencies in the other component for the other operants remained the same throughout the experiment. As a consequence of increasing the FR schedule for food, the amount of time Peter spent in inattention increased accordingly, although the frequency of the operant response reinforced by TO did not increase.

For the second subject (Garry), within each component of a two-
ply schedule, one operant (the verbal or printing task) was reinforced
on an FR5 schedule with food, while the other operant (a lever press
response) was reinforced on an FR1 schedule with 30 second periods of TO.

The frequency of the lever pressing response increased when re-
inforced by TO. To determine if Garry was emitting the lever press re-
sponse to obtain periods of TO, the TO reinforcement was eliminated in
both components of the multiple schedule. The lever press response ex-
tinguished when TO reinforcement was eliminated, and thus demonstrated
that TO was reinforcing for Garry.

The present study extends the generality of TO as reinforcement
to human behavior.

CHAPTER I

INTRODUCTION

I. Time out from Reinforcement

If the appearance of a stimulus as a consequence of a response results in an increased probability that the response will reoccur in the future, the stimulus is called a positive reinforcing stimulus or a positive reinforcer. If the disappearance of a stimulus as a consequence of a response results in an increased probability that the response will reoccur in the future, the stimulus is called an aversive stimulus, or a negative reinforcer. Positive reinforcement involves the appearance of a positive reinforcing stimulus as a consequence of a response. Extinction is a procedure in which an operant that has previously been reinforced is no longer reinforced. "Time out from positive reinforcement" (Ferster, 1957) is a period of time in which positive reinforcement is not available. Ferster and Skinner (1957) described four ways in which periods of time out (TO) can be arranged: the animal can be removed from the apparatus, the key or other manipulandum can be removed, a stimulus correlated with no reinforcement may be introduced, or, for pigeons, the lights in the apparatus can be turned off.

Previous studies have indicated that TO may function as punishment or as an aversive stimulus to maintain escape and avoidance behavior. Time out has also been found to function as a positive reinforcer.

Since TO has been used as a punishment with autistic children, but previous studies have suggested that TO may be a reinforcer, this study attempted to determine if TO may function as a positive reinforcer with autistic children.

As there have been several definitions of the term TO in operant conditioning literature, the definition will be restricted in this study. Time out from positive reinforcement will refer to a period of time in which food reinforcement and attention from the experimenter are withheld, the onset of which is contingent upon the subject emitting an operant response.

II. Historical Background

TO as an Aversive Condition

Under some circumstances, TO functions as an aversive stimulus, which may be used to generate avoidance or escape behavior. Ferster (1957) found that chimpanzees suppressed responding on a key during a pre-time-out stimulus. Key presses were reinforced with food on a variable-interval schedule. A red light appeared every 15 minutes for 160 to 180 seconds, depending on the animal's performance. If an animal pressed the key during the last 20 seconds of the pre-time-out period, a 60 minute TO followed; but if it did not press the key during the final 20 seconds, the red light terminated, and no TO could occur until 15 minutes later, when the pre-time-out stimulus reappeared. Ferster reported that the aversive properties of the TO appeared as

suppression of the key-pressing during the pre-time-out stimulus.

Morse and Herrnstein (1956), found similar results using pigeons as subjects (Ss). The pigeons were conditioned to make an avoidance response on one key which postponed the removal of a stimulus correlated with a schedule of reinforcement for food on a second key. As with the chimps, the rate of responding on the avoidance key varied with the duration of the delay by which a response postponed the removal of the stimulus for the food schedule.

Thomas (1964) reported that when the mean interval between reinforcements was changed from nine minutes to one minute, the number of TO's that were avoided decreased. This finding was unexpected because at short mean variable-interval (VI) intervals, Ss lose more reinforcement per TO from food reinforcement than at long mean VI intervals.

Baron and Kaufman (1966) demonstrated that TO from monetary reinforcement can effectively maintain the free operant TO avoidance behavior of human Ss. A signal of monetary payments was terminated for a fixed period of time at designated intervals (the TO-TO interval). Each response when time was in postponed the next TO for a designated interval (the R-TO interval).

Hogan, Baron and Kaufman (1968) using human Ss again, employed similar procedures to study the temporal variables related to the acquisition of TO-avoidance. They reported that acquisition was more rapid in groups where the R-TO interval was longer than in groups where the R-TO interval either equalled or was shorter than the TO-TO

interval. After acquisition, rates of response varied as a function of the R-TO interval.

Kaufman and Baron (1958) believed that TO had not been proven definitively to be an aversive stimulus, because by avoiding TO, the subject spent more time obtaining reinforcement, and as a consequence, obtained a higher density of reinforcement. These authors in a series of experiments using rats as Ss, demonstrated that TO punishment can suppress behavior under circumstances in which suppression could not increase the reinforcement density or frequency.

A popular use of TO as punishment has been employed in matching-to-sample tasks, for studying how TO affects the behavior which produces it. The major variables which have been investigated in the matching-to-sample studies, are TO duration, the schedule by which TO is programmed and the schedule of reinforcement for correct matching responses. Ferster and Appel (1961) found that interval schedules are generally more sensitive to independent variables than are continuous reinforcement or ratio schedules. When correct matching responses were reinforced on a VI 3 minute schedule, the pigeons' accuracy of matching progressively improved as the TO duration for incorrect responses was increased from 1 to 10 to 30 to 60 seconds. However, a TO duration of 2 minutes depressed both correct and incorrect responses.

Zimmerman and Ferster (1963) examined matching accuracy as a function of both TO duration and TO frequency (or ratio size). With intermediate TO durations (10 seconds and one minute), matching accuracy increased as the frequency of TO increased. With an extremely short

(one second) and extremely long (10 minute) TO duration, matching accuracy was poor over the entire range of TO frequencies. These authors reported that the best matching accuracy occurred when every incorrect response was followed by a TO of intermediate duration.

Zimmerman and Bayden (1963) reported similar results using human Ss. The accuracy of matching increased as a function of the TO durations. Similar results were also found by Miller and Zimmerman (1966) who reported that a pre-time-out response-dependent stimulus suppressed incorrect responses in human Ss.

Thomas (1968) believed that TO would be a more effective punishing stimulus if there was an alternative unpunished response available, which would produce the same reinforcement. He found that TO suppressed responding in pigeons when their responses produced the TO stimulus. Responding on a key was maintained by VI reinforcement scheduled concurrently with unpunished responding maintained by an independent but identical VI reinforcement schedule on the same key. Time out occurred on a fixed-ratio (FR) schedule during one of the VI reinforcement schedules. The pigeons switched schedules by responding on a second key. The punishing effects of the TO stimuli were directly related to the FR schedule of punishment and unsystematically related to the duration of the TO stimuli. An increase in response rates on the unpunished schedule was observed when responding on the concurrent schedule was punished by the TO stimuli. Other experimenters, (Holz et al., 1963; Nigro, 1968) also demonstrated that periods of TO may act as punishment.

Behavior modification therapists, using the principles of

operant conditioning, have made such use of TO as punishment. For example, Baer (1966) decreased thumbsucking in three children, by making the withdrawal of cartoons (or TO) contingent upon the childrens' thumbsucking.

Hewett (1965) used TO while teaching an autistic child to speak. The experimenter and child were isolated in a compartment with a shutter between them, and the boy learned to speak to avoid isolation and darkness.

Many other experimenters (Ferster, 1962; Wolf, et al., 1964; Wolf et al., 1966; Risley & Wolf, 1967; Martin et al., 1968) have made use of TO as punishment.

The fact that TO may not be suitable punishment in some cases was found by Risley (1968). This author attempted to extinguish a child's dangerous climbing behavior using TO as punishment. Each time the child climbed, she was taken to her bedroom where she remained for 10 minutes. The use of TO as punishment had no apparent effect in reducing the frequency of the climbing behavior. The use of shock as punishment, however, did reduce the frequency of the climbing behavior.

TO As A Reinforcing Condition

In some situations, experimenters have found that TO has reinforcing properties, which leads to an increase in the rate of the response which produced that TO.

Azrin (1961) demonstrated that on concurrent FR schedules for food and TO, pigeons spent more time in TO as the number of responses

required per reinforcement was increased from 50 to 200 on one key. The TO periods were produced on an FRL schedule on a different key. Azrin suggested that the FR schedule for food reinforcement may at certain stages be aversive.

Verhave (1959) showed that rats on an adjusting FR schedule for TO will impose periods of TO to avoid shock. Similar results were obtained by Verhave (1962) and Sidman (1962).

Thompson, (1964) demonstrated that rats will press a bar three successive times in order to produce 30 second TO periods from FR schedules of reinforcement. When the FR schedule for water reinforcement was raised, more TO periods were produced. As the ratio requirement was systematically lowered, fewer TO periods were produced.

Appel (1963) found that as the FR schedule for food increased on one key, the number of times pigeons pecked at the other key to obtain a stimulus change in which food was still available on the other key, increased as the FR food requirement increased. However, the number of times the pigeons responded on the second key when responding produced a TO, did not increase with increases in the FR food requirement. Appel claimed that responding on the second key to produce a stimulus change explained the reinforcing properties of TO.

Thompson (1965) replicated the study done by Azrin (1961), and used rats as ss, and a 30 second TO period which was produced on an FR 3 schedule. A monotonic relationship was found between the ratio size on the food lever and the number of periods of TO imposed.

Thomas and Sherman (1965) replicated the study done by Thompson

(1965) and used pigeons as Ss. The results only partially replicated Thompson's results, showing an increasing monotonic relationship between TO frequency and FR value, and did not replicate the finding that the TO periods are restricted to the pre-ratio pause. Thomas and Sherman suggested that periods of TO could occur whenever there is a momentary loss of control by the FR schedule. Zimmerman and Ferster (1964) also suggested that the subjects will impose periods of TO due to the temporary loss of control by the schedule of food reinforcement.

Baron, Kaufman and Rakauskas (1967), using human Ss found that TO was ineffective in suppressing a button-pressing response. Initially, the Ss were trained on a chained FR schedule for monetary payment. Twenty-five responses in the presence of a blue light terminated the blue light and produced the green light, which signalled that S was receiving payment, for 15 seconds. After 15 seconds, the green light terminated and the blue light reappeared. Next, after 25 responses in the presence of a red light, the blue light reappeared (ie. TO=0 minutes), and the cycle: blue, green, blue, green, red was repeated. During subsequent training, a TO of either 1 or 4 minutes in duration was made contingent upon completion of 25 responses during the red light component. When the 25 responses were completed, the blue light reappeared and the entire cycle was repeated. These authors found that response rates in the red light component were not lower than response rates in the blue light component for any (0, 1, or 4 minutes) of the TO durations. This finding would not be expected if periods of TO had suppressive effects.

In summary, the literature on TO has presented conflicting findings. Some experimenters have found that animals will work to avoid periods of TO from positive reinforcement. Others have claimed that TO is effective as a form of mild punishment. Evidence, however, has been presented that TO may be neither aversive nor punishing, but in fact, reinforcing in itself.

The preceding literature using animals as Ss, has suggested that in certain situations, periods of self-imposed TO may be reinforcing. Baron, Kaufman and Rakauskas (1967) used humans as Ss, but in contrast to some of the previously mentioned studies, found that TO was ineffective in suppressing human operant behavior. The present experiment was conducted in order to evaluate TO as a positive reinforcer with humans. More specifically, an attempt was made to determine if the frequency of an operant response would increase when TO is used as a reinforcer.

III. Statement of the Problem

The purpose of the present study was to determine if TO may function as a positive reinforcer with autistic children. The children were trained on two tasks, a verbal task and a printing task, from which the children could obtain periods of TO by touching a bar.

The tasks which the subjects performed in the experiment were of the type described by Martin et al. (1968). These tasks were chosen in order that periods of self-imposed TO would be evaluated in a situation similar to those described by several of the authors in the preceding literature who used operant conditioning in behavior modification situations.

It was thought that the results of this study would extend the generality of TO as reinforcement to a behavior modification situation with humans.

CHAPTER II

METHOD

I. Subjects

The subjects were two boys (Peter age 12, and Garry age 15) who live in the Manitoba Training School in Portage La Prairie, Manitoba. Peter was admitted to the Training School on January 12, 1967. Garry was admitted on March 2, 1960. Both boys were diagnosed as having "Infantile Autism". According to hospital records, both boys had low IQ's (Peter's was 44 on the WISC and Peabody, and Garry's was 60), and were observed to display typical defining features of autism, namely withdrawal, self-stimulation (such as constant rocking back and forth), and little or no verbal behavior. The families of both children showed a history of mental illness.

Since May, 1967, both boys have participated in the operant conditioning program conducted by G. Martin at The Manitoba Training School.

As described by Martin et al. (1968), both subjects were trained during the summer, 1967 for $1\frac{1}{2}$ hours in the morning and $1\frac{1}{2}$ hours in the afternoon. The reinforcers consisted primarily of the subject's breakfast (a cereal such as Sugar Pops) in the morning, and the subject's lunch (a cold plate) in the afternoon.

Martin et al. (1968) described the specific procedures for token training, conditioning subjects to sit quietly, verbal training I

(object and picture naming), verbal training II (listening training), and tracing and copying.

Briefly, these procedures are as follows:

Token training. The experimenter (E) placed a token on the desk in front of the child. In order to receive a bite of food, the child was required to place the token in E's hand. Next, two tokens were placed on the desk top and the child was required to return both of them to E for one bite of food. This procedure was continued until the ratio of tokens to back-up reinforcers was 5/1.

Conditioning to sit quietly. Tokens became contingent upon the child sitting quietly, first for 15 seconds, then for 20 seconds and so on. Once the child was conditioned to sit quietly, the reinforcers were then presented contingent upon other desirable behavior.

Verbal training I (picture and object naming). Since the Ss would mimic some words and sounds, E reinforced the child for correctly mimicking a word E had just said, such as "Shirt". Later, E faded in a question such as "What's this?", and faded out the prompt "Shirt", so that eventually, S was responding to E's question with the appropriate answer.

Verbal training II (listening training). To train the Ss to respond to questions about various pictures and events, E asked a question, and then gave a reply in a sentence. The Ss would usually mimic the last word in the sentence. Over several trials, E faded out the reply to the question, until eventually, S was answering E's question with the appropriate sentence.

Tracing and copying. The experimenter placed a pencil in the S's hand and guided the S's so that the pencil actually traced a particular figure. The experimenter then faded out the pressure of his hand, and faded in instructions to the S to trace the figure. Gradually the cues of the lines in the figure were faded out until eventually S was drawing the figure in the absence of cues, in response to E's instructions.

The program was later changed, in that the subject's breakfast and noon meal were gradually eliminated as back-up reinforcers for the tokens and candies, potato chips and popcorn became the back-up reinforcers.

II. Apparatus

The sessions were conducted in a room in one of the cottages at The Manitoba Training School. Three experimenters, each working with one subject, were situated in three locations in the room. The curtains were drawn so as to avoid unnecessary distraction, and the lights were turned on. A clock was situated in the center of the room to accurately time the sessions. A tape recorder which signalled every five seconds was used to time the periods when the subject was involved in TO. The experimenter and subject sat in chairs opposite each other at a small desk. On the subject's right, an upright metal rod, 6 inches high was attached to the side of the desk, six inches from the subject's end of the desk. A toy clock with plastic movable hands was placed on the desk directly in front of Peter when he was being trained to tell time. Both subjects were reinforced with plastic tokens which, when the

subjects had acquired the appropriate number, were exchanged for popcorn. A stopwatch was used to accurately measure certain time intervals. For printing training, the subjects were provided with pencils and paper on which lines one inch apart were drawn across the width of the paper.

III. Procedure

Two experimental sessions of one half hour duration were scheduled three times per week: Monday, Wednesday and Friday. Each subject was trained on two tasks: a verbal task which was conducted during the first session of each day, and a printing task, which was conducted during the second session of each day. Because the procedure differed for each subject, each will be discussed separately.

Peter

Different procedures were followed for both verbal and printing tasks. Therefore, each task will be discussed separately.

(1) Verbal training. During the initial four sessions, Peter was given several verbal tasks, from which one was selected as the task for further training during the course of the experiment. The verbal tasks administered were: questions such as, "What is your name?", "How old are you?", and questions on telling time. By arbitrary decision, the verbal task selected for training was the task on telling time. This task was administered once on each of three days. The procedure followed for teaching time telling was adapted from Martin et al. (In Preparation). The experimenter moved the hands of the clock to

various positions and Peter was asked "What time is it?", to each time indicated on the clock. The responses which were correct on three separate testings were labelled "known words". Responses were incorrect if an error was made in telling the time, or if no response was emitted within 15 seconds. These incorrect responses were labelled "new words". The following is an example of the procedure used for teaching a "new word". The experimenter moved the hands of the clock to 12:15. Then the experimenter asked Peter, "What time is it?"; gave the prompt, "It is a quarter after twelve", and then repeated the question, "What time is it?". This procedure in Figure 1 is called "new word Prompt" or NWP.

Next, the experimenter again asked the question, "What time is it?", this time without the prompt. This is called "new word question", or NWQ.

The experimenter then selected one of the words (or times) from the list of known words, and moved the hands of the clock to that position. The experimenter then asked Peter, "What time is it?". This is called known word prompt, or KWP. Next, the experimenter asked, "What time is it?", without giving the prompt. This is called "known word question", or KWQ.

The NWP and NWQ were again repeated, followed by alternating the KWQ with the NWQ, three times.

A response was correct if the subject said the correct time to the experimenter's question, "What time is it?". A response was incorrect if the subject said anything but the correct time, or if he

made no response at all within 15 seconds. If a response was correct, the experimenter continued according to the above explanation for teaching a new word. If a response was incorrect, the experimenter did not look away from Peter for five seconds, but followed one of two procedures, depending at what point in the teaching of the new word a mistake was made. If a mistake was made at the first NWP or NWQ, the experimenter went back to NWP and began again. If a mistake was made farther along in the procedure, the experimenter returned to the KWP and then continued with the teaching method.

Once the subject had correctly responded to the twelve above questions in the teaching procedure, another "known word" was selected, and the same procedure was followed for the same "new word", but now alternating with a different "known word". The same procedure was followed for five different "known words" in all, for each known word that was taught. Figure 1 presents the summary of the procedure for teaching Peter "new words".

A "new word" is said to have reached "criterion", when all of the questions outlined in Table 1 were answered correctly. When a "new word" reached criterion, the experimenter continued to follow the same procedure for other new words, until the session ended.

The "new words" that reached criterion were tested at the beginning of the first session for the next three days. The experimenter asked, "What time is it?". If the subject responded correctly to the question on the new word on three separate testings, the new word was said to be "learned". If the subject did not respond correctly to the question on the new word, the experimenter taught the word again following the

	KW1	KW2	KW3	KW4	KW5
NW-P					
-Q					
KW-P					
-Q					
NW-P					
-Q					
KW-Q					
NW-Q					
KW-Q					
NW-Q					
KW-Q					
NW-Q					

FIGURE 1. Summary of the procedure for teaching Peter "new words". NW is a new word. KW is a known word. There are five of these (KW1, KW2, KW3, KW4, KW5). P is a prompt trial in which the experimenter moves the hands of the clock to a time and states, "What time is it? It is _____ (the time indicated on the clock)". Q is a question trial in which the experimenter moves the hands of the clock to a time and asks, "What time is it?".

"new word" teaching procedure.

A word was "remembered" when it was tested again after ten sessions had elapsed since the word was "learned". If the subject responded incorrectly to the word after ten sessions had elapsed since the word was "learned", the experimenter taught the word again following the "new word" procedure.

The experimental manipulations involved two main steps.

(a) Establishing a baseline. The first four sessions involved establishing a baseline on touching the bar. The experimenter recorded the number of times Peter touched the bar. Any bodily contact with the bar, either accidental or intentional contact, on the part of the subject was defined as touching the bar. The time Peter spent engaging in inattentive behavior was recorded whenever Peter was not looking at the experimenter's eyes. Whenever Peter was engaged in inattention, the experimenter looked away from the subject, but often glanced at Peter to see whether he was looking at the experimenter. When Peter touched the bar and looked away from the experimenter's eyes, the time Peter spent in inattention was recorded, and also, the discrete touches of the bar were recorded. From the time the subject made bodily contact with the bar until he discontinued this contact, the experimenter recorded one touch of the bar. When Peter looked at the experimenter's eyes and touched the bar, the session continued, and the number of touches of the bar was recorded. No time out was given for touching the bar.

During these four baseline sessions, each time the subject made an incorrect response, either by saying something other than the

correct response, or by not responding at all within 15 seconds, the experimenter withheld the reinforcement and looked away from Peter for five seconds. When Peter made a correct response, E smiled, said, "Good boy", and gave Peter a token. During these four sessions, the subject was on an FR5 schedule for food reinforcement. When he had acquired five tokens for emitting five correct verbal responses, Peter received a piece of popcorn. For all of the sessions, each time Peter made a correct response, E smiled, said "Good boy", and gave Peter a token. He later exchanged the tokens for popcorn, when he had acquired the appropriate number of tokens. Whenever Peter made an incorrect response, E withheld reinforcement, but continued with the task.

(b) Manipulating the experimental variable.

(i) Time out for touching the bar. For the remainder of the sessions, each time the subject touched the bar, a time out of 30 seconds began. The subject did not receive the 5 second time out for an incorrect response. At this time, Peter was reinforced on a concurrent FR schedule; for 5 correct verbal responses (FR5), Peter received food reinforcement, and for each touch of the bar (FRL), Peter received TO reinforcement. During TO, the experimenter looked away from Peter for 30 seconds, which was timed by counting six signals from the tape recorder (one signal every five seconds). At the end of the 30 seconds, the experimenter looked back at Peter. If Peter was looking at the experimenter's eyes, the verbal session continued. However, if Peter was looking away from the experimenter, time was recorded for inattention. If Peter was still touching the bar, another TO of 30 seconds began.

(ii) Increasing the FR schedule. Peter continued on an FR5 schedule until session number 13, when the FR schedule was increased. Since Peter did not impose periods of TO on himself, to determine if he would impose such TO periods, the FR schedule was increased. The FR schedules and the session numbers at which the FR was increased are presented in Table 1.

(iii) Attempting to instate bar touching. The experimenter thought that if Peter was specifically trained to touch the bar to obtain TO reinforcement, Peter's inattentive behavior might decrease in frequency, and the number of self-imposed TO's increase in frequency, thus demonstrating that TO is reinforcing. At the start of session number 25, the experimenter said to Peter, "Whenever you touch the bar, we will stop working for half a minute". After 36 responses, the experimenter repeated these instructions. Because Peter did not appear to understand these instructions, after another 36 responses, the experimenter said to Peter, "Touch the bar". When Peter touched the bar, the experimenter looked away from Peter for 30 seconds. After the 30 seconds elapsed, the experimenter looked back at Peter. If Peter was looking at the experimenter, the verbal session continued. However, if Peter was looking away, the time was recorded for Peter's inattention. If Peter was still touching the bar, another 30 second TO began. After 36 more responses, the experimenter again said, "Touch the bar", and when Peter did so, the experimenter looked away from him for 30 seconds. Whenever Peter touched the bar voluntarily, (without having been told to do so), a 30 second time out began. During session

TABLE 1

SUMMARY OF THE REINFORCEMENT SCHEDULE

RECEIVED BY PETER

REINFORCEMENT SCHEDULE	SESSIONS PER SCHEDULE	SESSION NUMBERS
mult FR5 (food)FR5(food)	4	1-4
mult (concFR5(food) FRL (TO))	8	5-12
mult (conc FR7 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	13
mult (cond FR10 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	14
mult (conc FRL5 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	15
mult (conc FR20 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	16
mult (conc FR25 (food)FRL (TO)) (conc FR5 (food)FRL (TO))	1	17
mult (conc FR35 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	18
mult (conc FR40 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	19
mult (conc FR45 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	20
mult (conc FR50 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	21
mult (conc FR55 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	22
mult (conc FR60 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	23
mult (conc FR65 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	3	24-26
mult (conc FR5 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	27
mult (conc FR25 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	28
mult (conc FR50 (food) FRL (TO)) (conc FR5 (food) FRL (TO))	1	29

26, Peter was told on three occasions during the session to "Touch the bar".

(iv) Changing the FR schedule. For session numbers 27, 28 and 29, the reinforcement schedules were changed to FR5, FR25, and FR50 respectively, in order to determine if his inattentive behavior would change with the changing FR schedule for food. During these sessions, Peter was not instructed to touch the bar. However, if he did touch the bar, a 30 second TO began.

(2) Printing Training. During the baseline, Peter was given several printing tasks from which one was selected as the task for further training during the course of the experiment. The printing tasks administered were: copying the written letters of the alphabet, copying designs, and printing words. By arbitrary decision, the printing task selected for training was the task on printing words. The experimenter arbitrarily compiled a list of words and said for example, "Print DOG"! This task was administered once on each of three days. No further training was done on words which were "correct" on each of the three separate testings. A response was correct, if Peter spelled the word correctly, and if he printed the word in capital letters, between two lines which were spaced one inch apart, with the top of the letter touching the top line, and the bottom of the letter touching the bottom line. Otherwise, the word was printed incorrectly. A list was then compiled of the incorrectly printed words on which further training was done. Initially, Peter was taught to

print the letters of the alphabet in the correct form as described above. The experimenter printed the letter "A" for example and said to Peter "Print A", the same as this (the experimenter pointed to the example). When Peter printed the letter correctly, the experimenter smiled, said "Good boy", and gave Peter a token. When he printed the letter incorrectly, the experimenter printed the letter again, and repeated the instructions. After Peter had printed the letter correctly five consecutive times, that paper was withdrawn and a clean sheet of paper was presented to him on which he was asked, "Print A". If Peter printed the letter correctly, that letter was covered with another piece of paper, and Peter was asked again to "Print A". This procedure was followed until he printed "A" correctly five consecutive times. If any one of these attempts was incorrect, the experimenter printed an "A" and said to Peter, "Print A", the same as this one (the experimenter pointed to the example). The experimenter then continued the same as above. When Peter had completed printing "A" correctly five consecutive times, without the experimenter's example as a cue, Peter was asked by the same procedure to print "B". This method was used to teach Peter to print all the letters of the alphabet correctly. When the entire alphabet was printed correctly, the experimenter began teaching Peter to print the words on the word list which was compiled during baseline sessions. To teach the word "DOG" for example, the experimenter said, "Print DOG, print D, print O, print G". When Peter printed "D" correctly, he received a token, and the experimenter said, "Print O". When Peter printed "O" correctly, he received a token and

the experimenter said, "Print G". When Peter printed "G" correctly, he received a token. Then the experimenter said, "Print DOG", which Peter printed on the same piece of paper. When Peter had printed the word correctly five consecutive times, he was given a clean sheet of paper and the experimenter said "Print DOG". If this word was printed correctly, the experimenter gave the subject a token and the same procedure was followed until Peter had printed the word correctly five consecutive times, each correct printing being covered with a second piece of paper. If a mistake was made in printing the word, the experimenter said, "Print DOG, Print D", and proceeded to teach the word over again. This same procedure was followed for all of the words on the list which was compiled during baseline.

Beginning at session number 20, the experimenter trained Peter to print two words such as "THE BOOK". The experimenter said, "Print 'THE BOOK', print 'THE'". When Peter correctly printed the word, he received a token and the experimenter said, "Leave a space" (and the experimenter placed her hand over Peter's, and moved Peter's hand so that the pencil touched the paper about two inches to the right and on the same line as "THE"). Peter then received a token for "leaving a space". Then with Peter's pencil still in the same location, the experimenter said, "Print 'BOOK'". When this word was printed correctly, Peter received a token. Pointing to the next line, the experimenter next said, "Print 'THE BOOK'". When Peter had printed this correctly five consecutive times, he was given a clean sheet of paper with the instructions, "Print 'THE BOOK'". If these two words were printed

correctly, with a space between the words such that they could be distinguished as two discrete words, Peter was given a token. The same procedure was followed until Peter had printed the words correctly five consecutive times, each correct printing was covered with a second sheet of paper before Peter was asked to print the words each time.

The experimental manipulations involved two main steps.

(a) Establishing a baseline. The same procedure was used here as was used to establish a baseline on touching the bar in the verbal training sessions.

(b) Manipulating the experimental variable. For the remainder of the sessions, each time the subject touched the bar, a time out period of 30 seconds began. This procedure is the same that was followed when Peter touched the bar in the verbal sessions. The subject did not receive a 5 second time out for wrong responses. Whereas in the verbal sessions Peter received an FR5 reinforcement schedule until session number 13, when the FR reinforcement schedule was increased, in the printing sessions, Peter remained on an FR5 reinforcement schedule throughout the experiment. The experimenter did not attempt to instate bar touching behavior in Peter in the printing sessions, however, if Peter did touch the bar, a 30 second time out period began.

Garry

Different procedures were followed for both verbal and printing tasks for this subject. Therefore, each task will be discussed separately.

(1) Verbal Training. During the baseline sessions, Garry was given several verbal tasks from which one was selected as the task

for further training during the course of the experiment. The verbal tasks administered were: questions about various items, pictures and events (such as "What is your name?", "How old are you?"), arithmetic questions (such as "1+1=___", "1+2=___"), and the imitation of speech sounds, and words composed of those sounds (such as "ee", "feet", "eat", "cheek"). By arbitrary decision, the task selected for training was the task on the imitation of speech sounds and words composed of those sounds.

The experimenter composed a verbal task consisting of twenty-two consonant sounds, each of which was followed by five common words. Besides serving as examples for that sound, these words also included the vowel sounds. Garry's task was to correctly imitate the consonant sounds, and the words containing those sounds. An imitation of a consonant sound or a word was "correct" if it was felt by the experimenter that an observer, who could have heard the imitation and who was unfamiliar with the subject's speech would have easily understood what the subject was saying. Otherwise, the imitation was considered incorrect. During the entire experiment, when a response was correct, the experimenter smiled and said, "Good boy", and gave Garry a token. During the baseline sessions, when a response was incorrect, the experimenter said "No!" sharply, and looked away from Garry for five seconds. When a response was incorrect during the remainder of the sessions, the experimenter did not look away or say, "No!", but merely went back to the beginning of the training on a particular speech sound. This procedure is explained below.

The following is an example of the procedure for teaching a

particular consonant sound.

The experimenter said the sound "t" (the consonant sound, not the name of the letter). If Garry repeated "t" correctly, he received a token, and again the experimenter said, "t". This procedure was followed until Garry had correctly imitated this sound five consecutive times. Then the experimenter said, "to". If Garry repeated the word correctly, he received a token and the experimenter again said, "to". This procedure was followed until Garry correctly imitated this word five consecutive times. If Garry did not say the word correctly, the experimenter repeated "to", until Garry did say it correctly. Then after he said "to" correctly five consecutive times, the experimenter said "t" again, as above. Following five consecutive correct responses, a second word which contained that sound was introduced following the procedure above. This method of five consecutive correct imitations of the consonant sound, followed by five consecutive correct imitations of a word containing that sound continued until, altogether, five words serving as examples of the consonant sound had been learned. After all five words had been learned, the subject was tested on each word. The experimenter said, "to" for example, which Garry imitated. If any imitations in this list of five words were incorrect, the experimenter retrained the subject according to the previously described method, on the consonant sound and the word that was incorrect, and then administered the test again. This procedure continued until all five of the words were imitated correctly. The experimenter trained Garry on all

twenty-two different consonant sounds, in the same manner.

After completing the same procedure for three different consonant sounds (such as "t", "g" and "p"), a second test, made up of all fifteen words learned to that point, was administered. The experimenter for example, said "to". If Garry imitated correctly, he received a token and the experimenter continued on to the next word. If any imitations in this list of fifteen words were incorrect, the experimenter retrained Garry, according to the method described earlier, on the consonant sound and the word that was incorrect, and then this test was administered again. This procedure continued until all fifteen words were imitated correctly. This second test made up of fifteen words followed the completion of the training procedure for every third consonant sound.

The experimental manipulations involved two main steps.

(a) Establishing a baseline. The same procedure was followed here as was used to establish the baseline for touching the bar in the verbal training sessions for Peter.

(b) Manipulating the experimental variable.

(i) TO for touching the bar. For eleven sessions following the four baseline sessions, each time Garry touched the bar, a time out of 30 seconds began. The same procedure was followed as was described earlier, when Peter touched the bar. At this time, Garry was reinforced on a concurrent FR schedule; for 5 correct verbal responses (FR5), Garry received food reinforcement, and for each touch of the bar (FR1), Garry received TO reinforcement. The rein-

forcement schedules Garry received are presented in Table 2.

(ii) Extinction of touching the bar. From session numbers 17 to 24, the time out period did not begin when Garry touched the bar. When the 30 second time out contingency was still in effect, the experimenter looked away from Garry for 30 seconds, and therefore could not record any additional touches of the bar Garry may have made within the 30 seconds. Therefore, to determine the number of times Garry touched the bar during the extinction procedure, a stopwatch began when he touched the bar. Garry's additional touches of the bar within 30 seconds, as timed by the stopwatch, were recorded separately.

If Garry touched the bar but kept looking at the experimenter's eyes, the verbal session continued. However, if Garry looked away from the experimenter while touching the bar, the time was recorded for his inattention. Garry's time for inattention was recorded throughout the session.

(iii) Reinstating bar touching behavior. At the start of session number 25, the same procedure was followed for Garry as was used with Peter to instate bar touching behavior, except that Garry was not told again to touch the bar after session number 25.

(2) Printing Training. Exactly the same procedure was followed for Garry as was used with Peter to teach the correct printing of letters and words. However, the experimenter did not teach Garry to print two words at a time (such as "the Book", which was taught to Peter).

TABLE 2

SUMMARY OF THE REINFORCEMENT SCHEDULE
FOR GARRY

REINFORCEMENT SCHEDULE	SESSIONS PER SCHEDULE	SESSION NUMBERS
mult FR5 (food) FR5 (food)	4	1-4
mult (conc FR5 (food) FRL (TO))	12	5-16
mult (cond FR5 (food) Ext (TO))	8	17-24
mult (conc FR5 (food) FRL (TO))	5	25-29

The experimental manipulations involved two main steps.

(a) Establishing a baseline. The same procedure was followed here as was used to establish the baseline for touching the bar in the verbal training sessions for Peter.

(b) Manipulating the experimental variable. The same procedure was followed here as was used to manipulate the experimental variable in Garry's verbal sessions. However, the experimenter did not attempt to reinstate Garry's bar touching behavior in the printing sessions. If Garry did touch the bar, a 30 second TO period began.

CHAPTER III

RESULTS

I. Peter

Baseline measures

During the first four sessions of both the verbal and the printing components of the experiment, quantitative measures of several dependent variables were taken. These measures provided a baseline against which to determine the effects of changes in the schedule of reinforcement, and the effects of a change in E's behavior, when Peter touched the bar. The following dependent variables were measured: the number of times Peter touched in bar in each component of the multiple schedule; the amount of time Peter took for inattention in both verbal and printing components; the number of mistakes made in each component; the number of back-up (food) reinforcements Peter received per component; and the total number of verbal and printing responses emitted in each session.

Number of times Peter touched the bar

Figure 2 presents the data on the number of times Peter touched the bar for each component of the multiple schedule. It was found that he touched the bar several times during the baseline sessions. Beginning at session number 5, when each touch of the bar by the subject commenced a 30 second TO, touching of the bar decreased in three sessions for the verbal component, and in four sessions for the printing

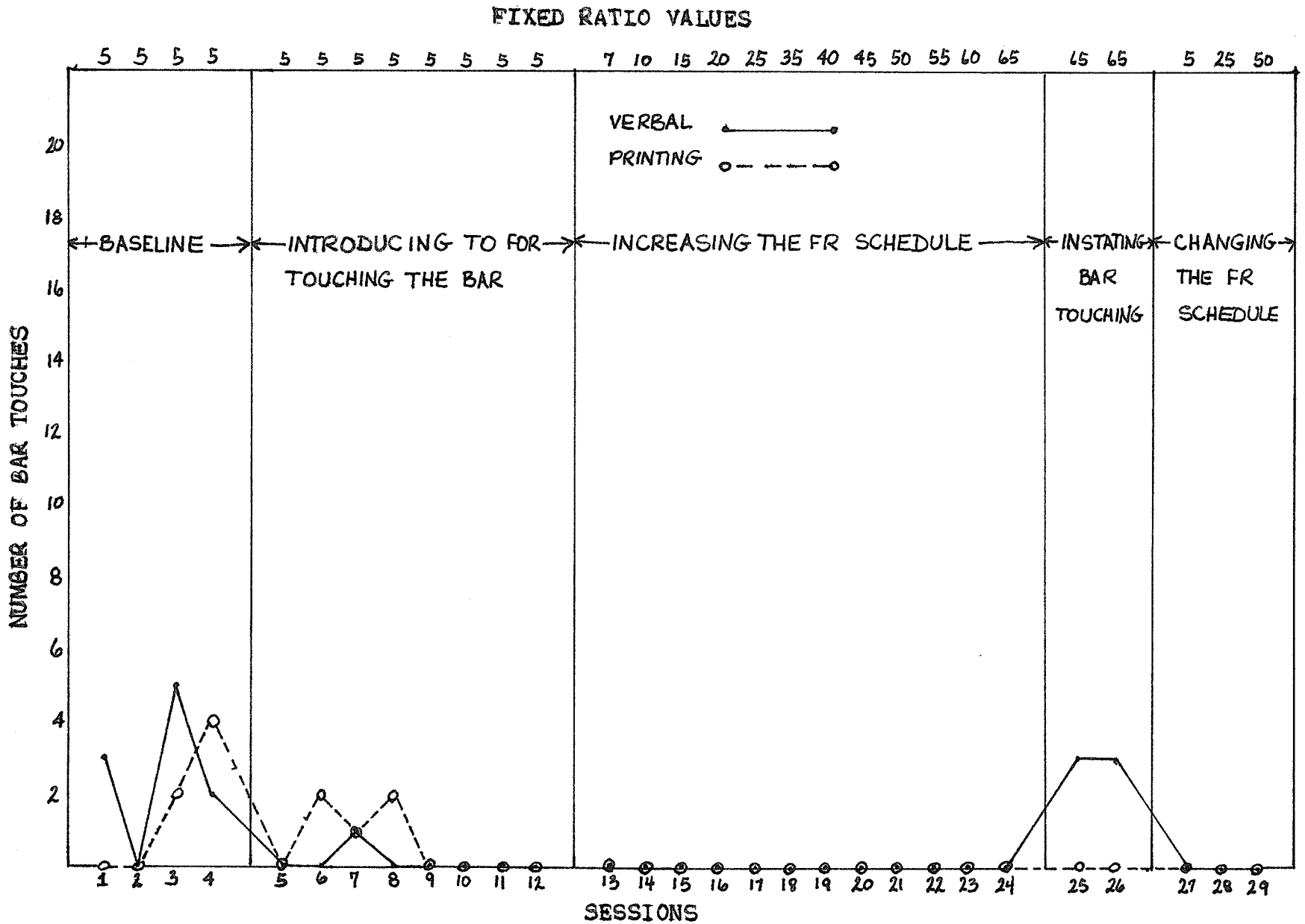


Figure 2. The number of times Peter touched the bar in each component of the multiple schedule.

component. The bar touching behavior remained extinguished for both verbal and printing components of the schedule until session number 25. At that point in the verbal component, E instructed Peter twice to touch the bar. He touched the bar one time voluntarily in that session. In verbal session number 26, E instructed Peter three times to touch the bar. Peter neither voluntarily touched the bar in writing sessions 25 and 26, nor in the verbal session number 26. If TO was a positive reinforcing stimulus, Peter's bar touching behavior should have later occurred with increasing frequency. However, his bar touching behavior decreased to zero within three sessions after the introduction of the TO contingency in the verbal component, and within four sessions in the printing component of the multiple schedule. It would appear that TO was not reinforcing. When the FR reinforcement schedule was gradually increased, in sessions 13 to 24, it was thought that the number of times Peter touched the bar would increase accordingly. But the bar touching behavior had extinguished and did not recover. However, Peter could take time out in another way, by engaging in inattentive behavior.

Time out for inattention

Figure 3 shows the amount of time expressed in seconds, which Peter spent in inattentive behavior. Peter was on an FR5 reinforcement schedule for both verbal and printing sessions for the first 12 sessions. In the verbal sessions, Peter's inattentive behavior had stabilized at sessions 9 to 12, so that he was taking zero seconds time out for inattention. At session number 13, E began to gradually increase the FR until at session number 24, (and for two more sessions), Peter was on an FR65 reinforcement schedule. The total time Peter engaged in inattentive

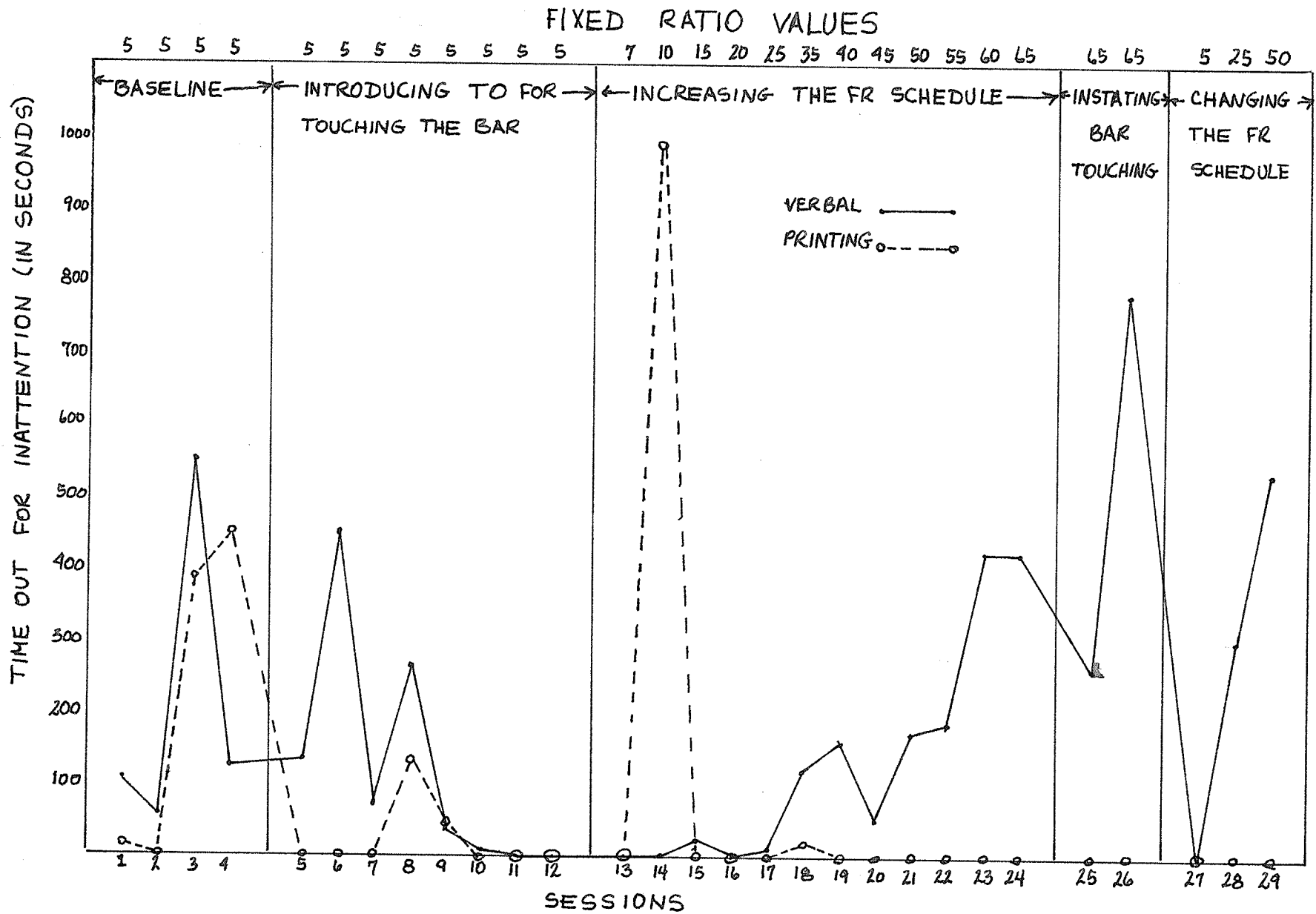


Figure 3. The number of seconds Peter spent in inattention in both components of the multiple schedule.

behavior gradually increased from zero seconds in session 13 to 780 seconds in session 26. When the FR was increasing, it was found that although Peter did not touch the bar in order to receive T0, he did engage in a great deal of inattentive behavior, during which he usually screamed, jumped up and down in his chair, kicked the desk, etc. This behavior did not occur when Peter was on an FR5 reinforcement schedule. That this inattentive behavior was a function of the size of the FR can clearly be seen in the last three sessions of the experiment. The FR reinforcement schedule was switched from FR 65 to FR 5 in session 27, to FR 25 in session 28, and to FR 50 in session 29. Corresponding to this rapid change in the FR schedule the time Peter took for inattention decreased from 780 seconds in session 26, to 15 seconds in session 27, and increased again to 300 seconds, then to 535 seconds in session 28 and 29 respectively.

Peter was maintained on an FR 5 reinforcement schedule for printing throughout the experiment. At session number 10, the time out Peter took for inattention declined to zero seconds. This time out for inattention remained very low, usually at zero seconds throughout the experiment, except for session number 14. The unusually large amount of inattention in this session was possibly due to the fact that just after the session had begun, another experimenter in the room, took his subject back home to another cottage. Peter, wanting to leave too, started putting on his coat. When E told him to sit down, Peter began screaming, kicking the chair, and the bed and the desk, and tearing the paper on which he was to print. It was found that the effects of the increasing FR in the verbal component did not generalize to the printing component,

where Peter spent very little time engaging in inattentive behavior.

Number of mistakes

Figure 4 shows the number of mistakes per 10 minutes of session time in both components of the multiple schedule. The number of mistakes per 10 minutes of session time was computed in this way. The total time Peter spent in the session was found by subtracting the voluntary time out plus the time out for inattention from the total time for a session (30 minutes). During the four baseline sessions, five seconds time out was given for each mistake Peter made. Therefore, to find the total session time in these four sessions the number of mistakes was multiplied by five and this total, plus the total time out for inattention was subtracted from 30 minutes. The number of mistakes was then divided by the total session time to find the number of mistakes per minute. Because these figures were difficult to graph, the number of mistakes per minute was multiplied by 10 to find the mistakes per 10 minutes.

It was found that during the baseline sessions for verbal training, Peter made several mistakes per 10 minutes which may have been his way of obtaining periods of time out. It would be expected in that case, that beginning in session number 5, when Peter was not given the five second TO contingent on an incorrect response, that he would either touch the bar to obtain a 30 second TO, or engage in inattentive behavior. However, it was found in sessions 5 to 13, that Peter made very few mistakes per 10 minutes, and also that by session number 12, both voluntary TO and TO for inattention dropped to zero seconds. From sessions 13 to 25, as the FR schedule for food was increasing, the number

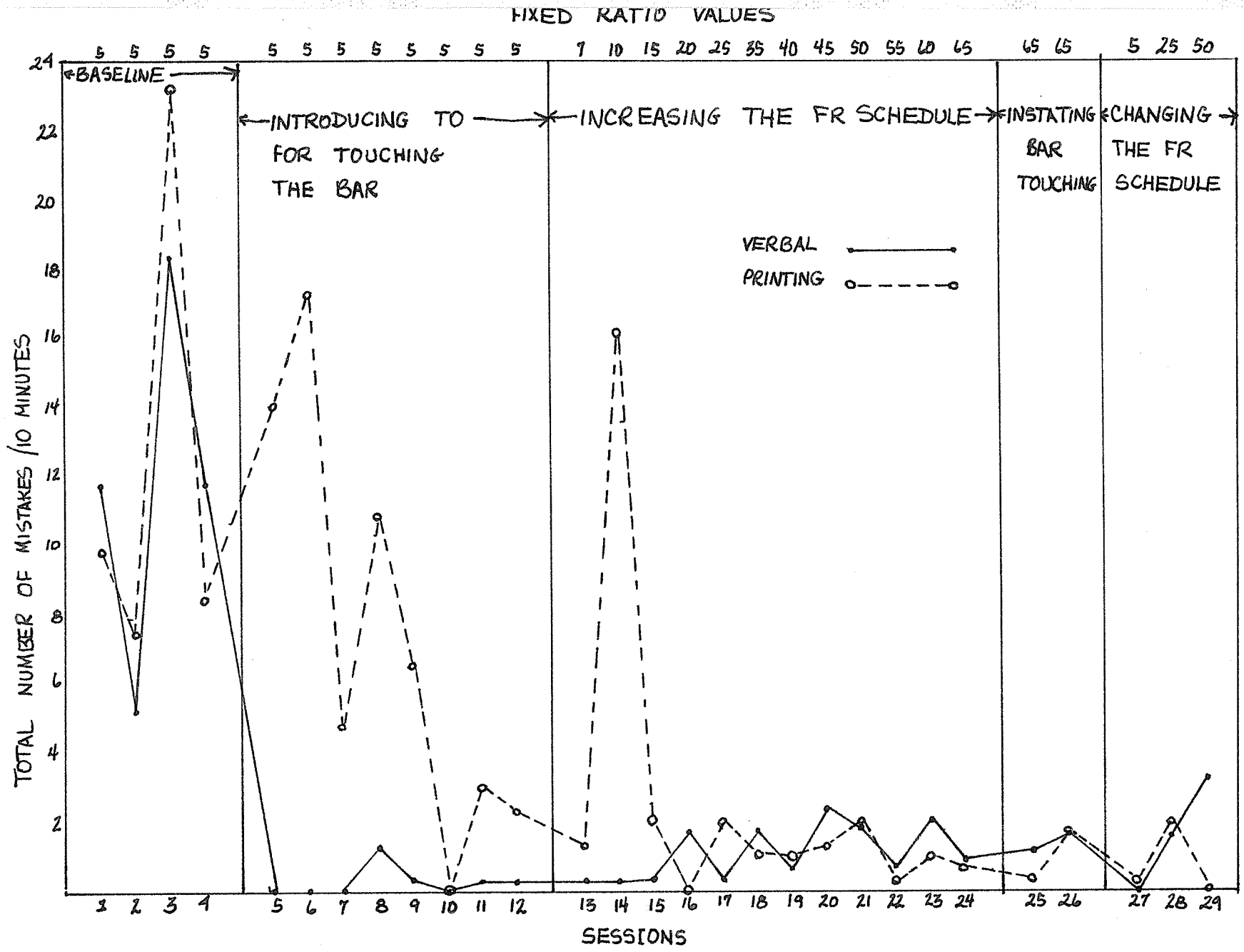


Figure 4: The number of mistakes per 10 minutes of session time for Peter for both components of the multiple schedule.

of mistakes Peter made per 10 minutes also slightly increased. The fact that the number of mistakes Peter made increased with the increasing FR is seen more clearly in the last three sessions. The FR reinforcement schedules for food were 5 (session 27), 25 (session 28), and 50 (session 29), and the number of mistakes per 10 minutes were 0.0, 1.6, and 3.3 respectively.

During the baseline sessions for printing training, Peter made several mistakes, the frequency of which gradually decreased from sessions 5 to 13. The number of mistakes per 10 minutes remained low (2 mistakes or less) for the remainder of the sessions, except for session number 14, the session in which he had a 16 minute tantrum. The decrease in mistakes from sessions 5 to 29 could possibly be due to the fact that beginning at session number 9, Peter was printing more words than letters, and therefore, since he was making less responses, he was less likely to make as many mistakes. There was no effect on the mistakes in the printing sessions from an increasing FR food reinforcement schedule in the verbal sessions.

Number of Back-up reinforcements

Figure 5 presents the number of back-up (food) reinforcements which Peter received throughout both components of the multiple schedule. Peter received an increasing number of back-up reinforcements from sessions 5 to 13 in the verbal component, until E began to increase the FR reinforcement schedule. The number of back-up reinforcements gradually decreased from 21 in session 13 to 2 in session 24. However, Peter continued to emit verbal responses at about the same rate throughout the experiment, as is seen in Figure 6.

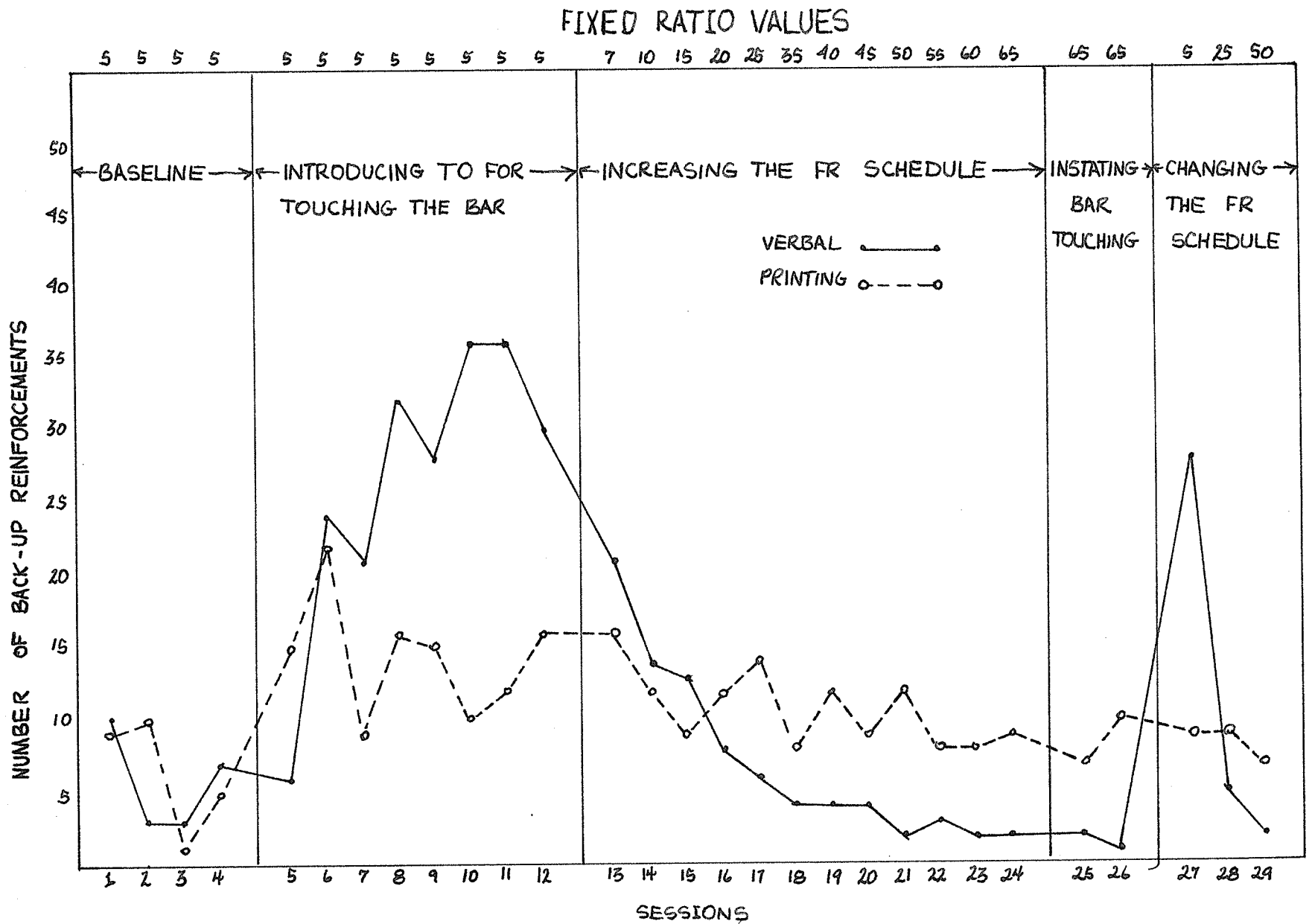


Figure 5. The total number of back-up reinforcements received by Peter in both components of the multiple schedule.

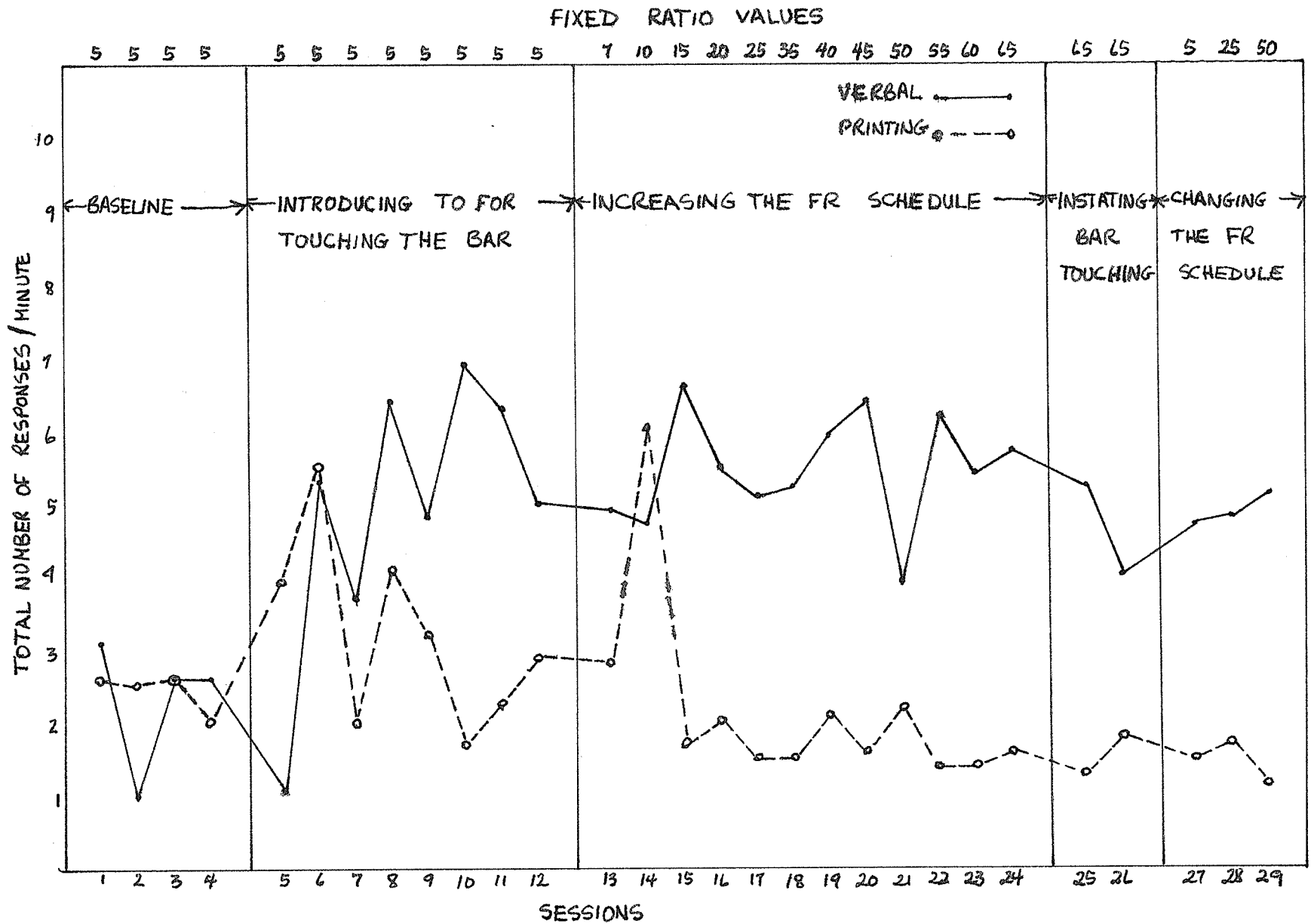


Figure 6. The total number of responses per minute emitted by Peter in both components of the multiple schedule.

The number of back-up reinforcements Peter received during the printing sessions decreased slightly from sessions 13 to 29, possibly due again to the fact that he was printing words rather than letters, and therefore as is seen in Figure 5, he was emitting fewer printing responses.

II. Garry

Baseline Measures

During the first four sessions of both the verbal and the printing components of the experiment, quantitative measures of several dependent variables were taken. These measures provided a baseline against which to determine the effects of a change in E's behavior when Garry touched the bar. The following dependent variables were measured: the number of times Garry touched the bar in each component of the multiple schedule; the amount of time Garry spent in inattentive behavior in both verbal and printing components; the number of mistakes made in each component; the number of back-up (food) reinforcements Garry received per component; and the total number of verbal and printing responses emitted in each session.

Number of times Garry touched the bar

Figure 7 shows the number of times Garry touched the bar for each component of the multiple schedule. It was found that from sessions 5 to 16, when a 30 second time out was contingent on Garry's touching the bar, the number of times he touched the bar to receive this time out increased from 2 times in session 5 to 22 times in session 16. The

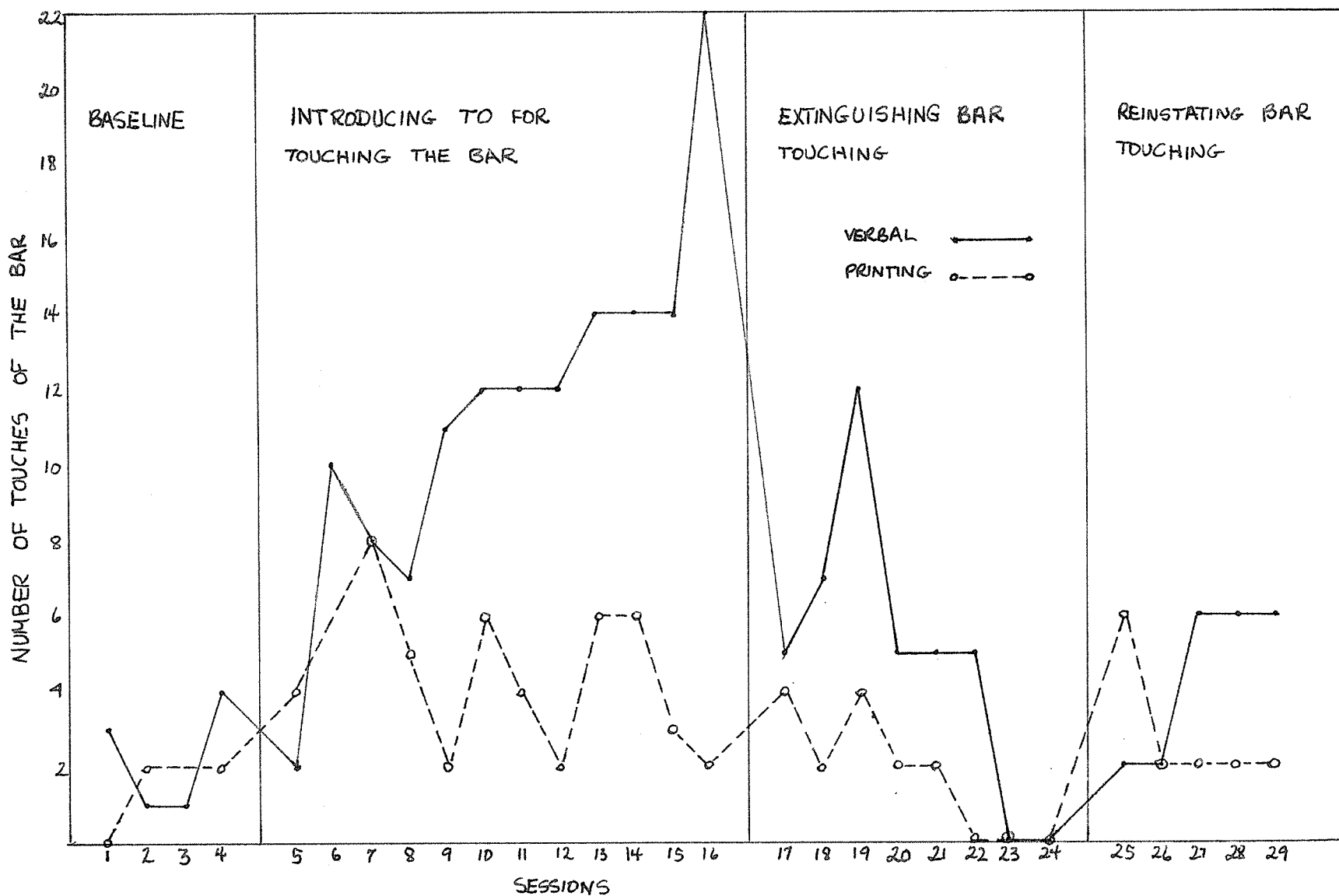


Figure 7. The number of times Garry touched the bar for each component of the multiple schedule.

number of times Garry touched the bar greatly increased from the baseline sessions. Extinction of the bar touching response began at session 17. The number of times Garry touched the bar gradually declined to zero, in session 23, and remained at zero for session 24. In session 25, E attempted to reinstate Garry's bar touching behavior, and a gradual increase in this behavior was found for the last five sessions. It can be seen, especially in the verbal component, that TO was reinforcing for Garry. The number of times he touched the bar increased even though the FR for food remained constant, and when Garry could no longer receive TO for touching the bar, this response extinguished. Some reinstatement of the bar touching response was again found, when FRI for TO was introduced once more.

For the printing component, the number of times Garry touched the bar was found to show some variability during sessions 5 to 16, although the number of touches of the bar during these sessions was increased from the baseline sessions. The number of times Garry touched the bar decreased during extinction, and reached zero at session 22. The bar touching response remained extinguished for sessions 23 and 24. In session 25, the bar touching response was reinstated in the printing component, although E had given Garry instructions to touch the bar only in the verbal component. Garry continued touching the bar in the last four sessions even though he had never been instructed to do so in the printing sessions. That TO was also found to be somewhat reinforcing in the printing component can be seen in the fact that Garry spent some time in TO from sessions 5 to 16, and that the bar touching response soon extinguished when TO no longer commenced when Garry touched the bar.

Time out for inattention

Figure 8 shows the amount of time expressed in seconds, which Garry spent in inattentive behavior. The amount of time out for inattention in the verbal component of the multiple schedule showed some variability from sessions 1 to 16. The amount of time in inattention varied from 45 seconds to 210 seconds. However, from sessions 17 to 24, when the bar touching response was being extinguished, the time Garry spent in inattentive behavior greatly increased until in session 24, he spent 690 seconds engaging in inattentive behavior. Time out for inattention decreased for the last five sessions, when the bar touching response was reinstated.

The amount of time Garry spent in inattentive behavior in the printing component showed some variability from sessions 1 to 16. However, from sessions 17 to 24, the time Garry spent in inattentive behavior increased somewhat. The inattentive behavior showed some decrease again for the last five sessions, when the bar touching response was reinstated.

Number of Mistakes

Figure 9 shows the number of Garry's mistakes per 10 minutes of session time for both verbal and printing components of the multiple schedule. The number of mistakes made by Garry appeared generally to increase in sessions 5 to 15, over the baseline sessions, although there was a sharp reduction in mistakes in session 16. During session 16, Garry was also making less responses, as is seen in Figure 9. The number of mistakes rapidly decreased from sessions 17 to 24, and reached zero at session 24. When bar touching behavior was reinstated in session

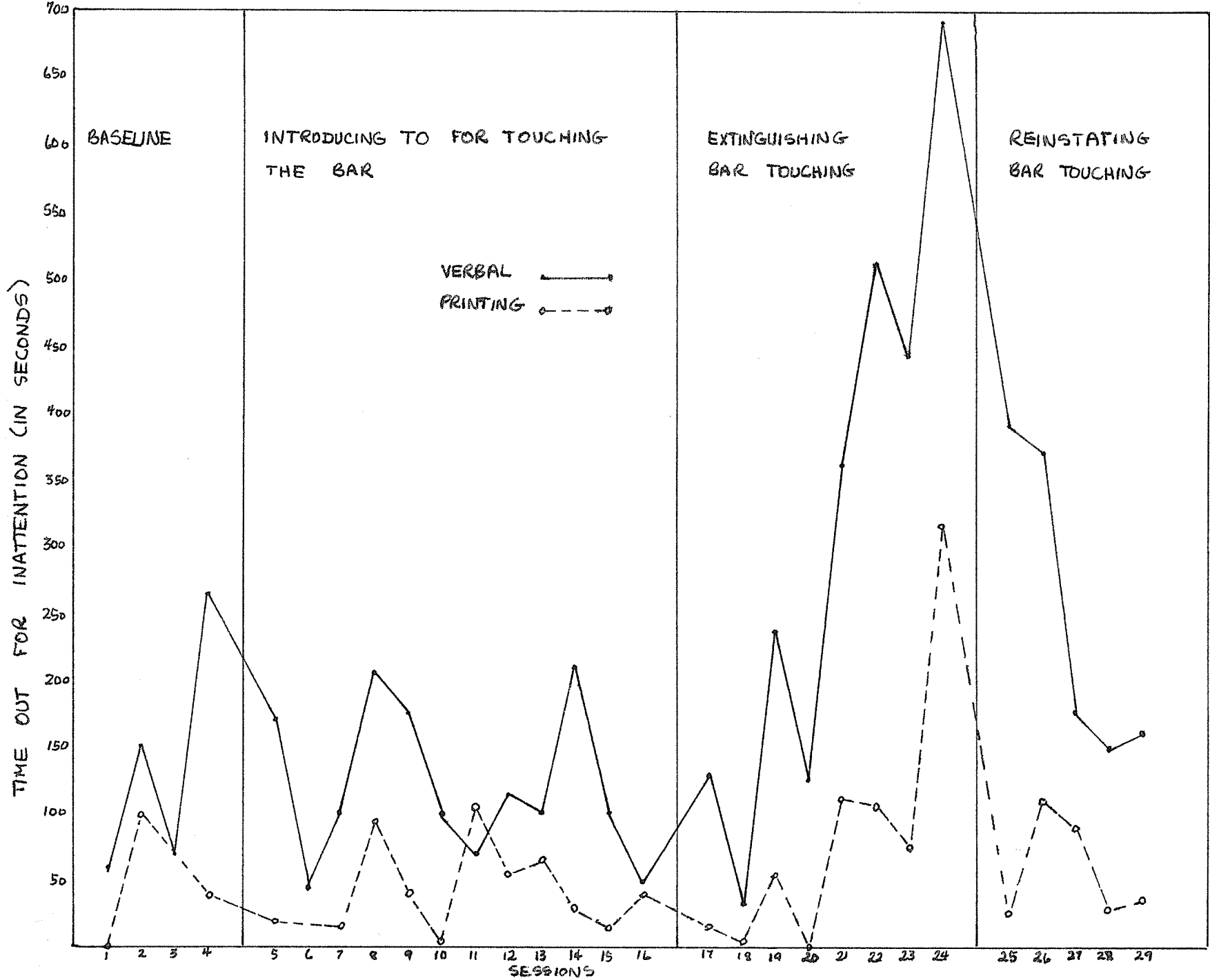


Figure 8. The number of seconds Garry spent in inattention in both components of the multiple schedule.

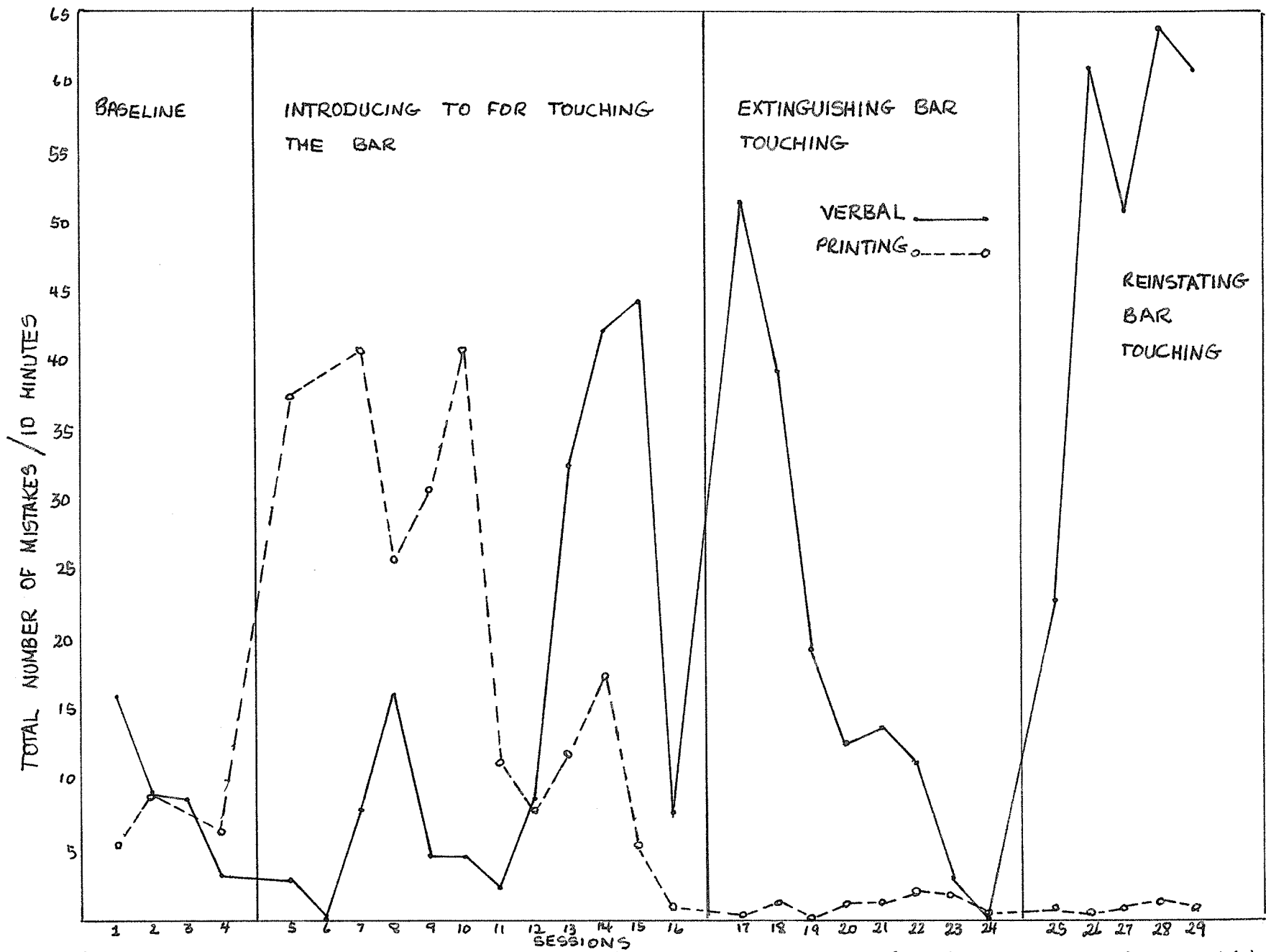


Figure 9. The number of mistakes per 10 minutes of session time for Garry for both components of the multiple

25, the number of mistakes Garry made, sharply increased to a higher number than he had ever made in any of the previous sessions.

Figure 9 is similar to Figure 11, which shows the total number of verbal and printing responses per minute. Garry made more mistakes when he made more responses, although as is seen in Figure 10, he seemed also to make more correct responses, as is indicated by the number of back-up reinforcers he received. It generally appeared from Figure 11 that he made more responses when the 30 second time out was contingent on his touching of the bar.

When Garry took much time out for inattention in sessions 17 to 24, his number of mistakes decreased to zero, but the total number of verbal responses he made also decreased.

The number of mistakes Garry made in printing increased in sessions 5 to 10 over the baseline sessions, but decreased during the remainder of the sessions in the experiment, possibly due to the fact that E began training Garry to print words rather than letters as had been taught from sessions 5 to 10. The number of mistakes Garry made in sessions 17 to 24, declined from sessions 15 to 16, where the 30 second TO was contingent upon Garry's touching of the bar. Generally more mistakes were made in printing during sessions 5 to 16, than in sessions 17 to 24, which is similar to the data on mistakes in the verbal sessions. However, the number of printing mistakes did not increase during the last five sessions of the experiment as was found for the verbal mistakes.

In general, it was found that Garry made more mistakes in both the verbal and printing tasks, in those sessions where he received a 30 second TO contingent upon his touching of the bar.

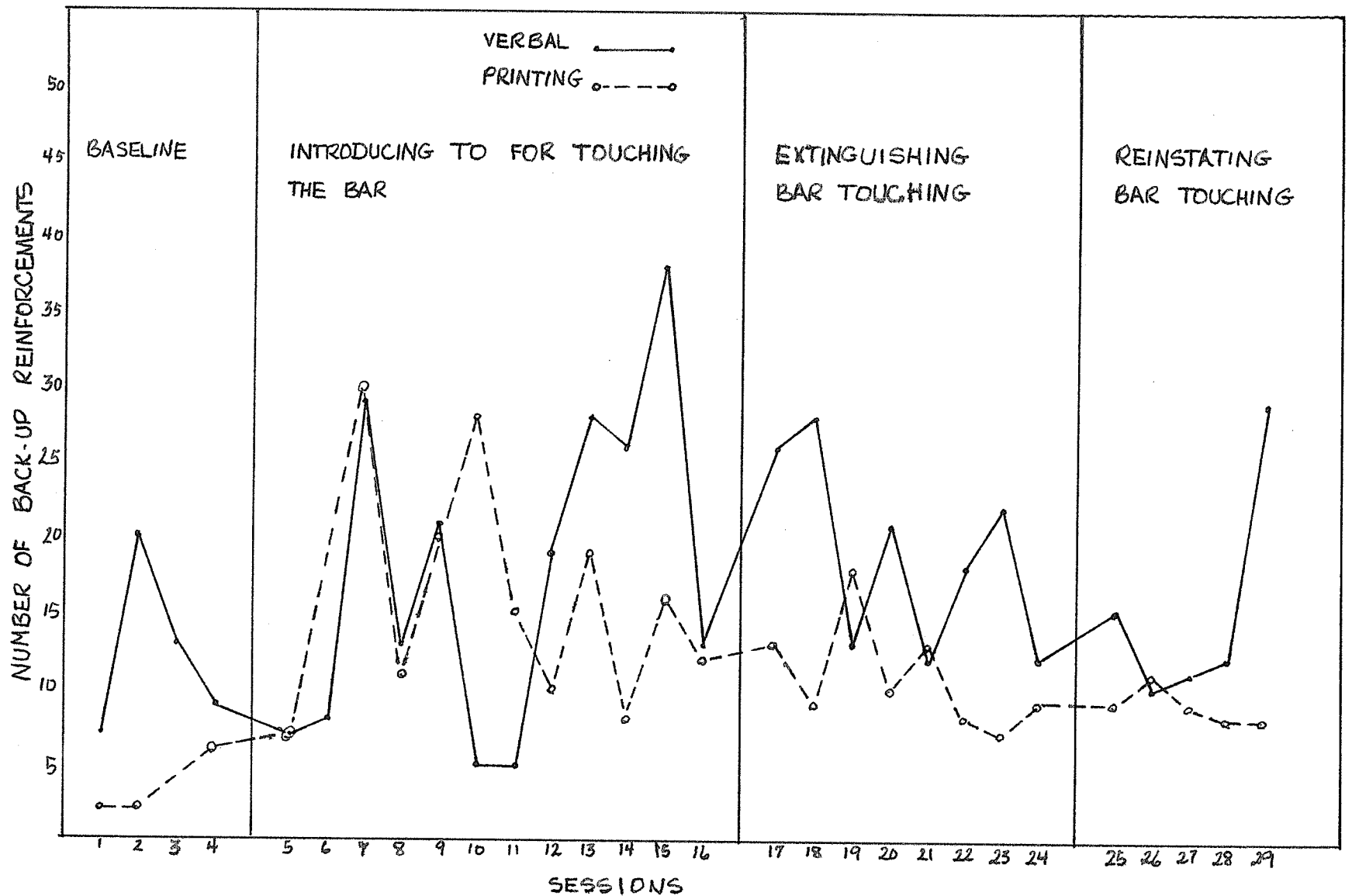


Figure 10. The total number of back-up reinforcements received by Garry in both components of the multiple schedule.

Total Number of Verbal and Printing Responses

Figure 11 shows the total number of verbal and printing responses Garry emitted per minute of session time. Generally, the number of verbal responses appeared to increase throughout sessions 5 to 16, although there was a sharp decrease in total responses in session 16. The total verbal responses decreased in sessions 17 to 24, when Garry's bar touching behavior was being extinguished. Upon reinstatement of the bar touching response for the last five sessions, the number of verbal responses Garry emitted immediately increased again.

Figure 11 generally appeared to be directly related to Figure 7. As the number of touches of the bar increased during sessions 5 to 16, where Garry received a 30 second TO for doing so, the greater was the frequency of both verbal and printing responses during the remainder of the session time. It was found in general that the more time Garry spent engaging in inattentive behavior, the less verbal and printing responses he made during the remainder of the session.

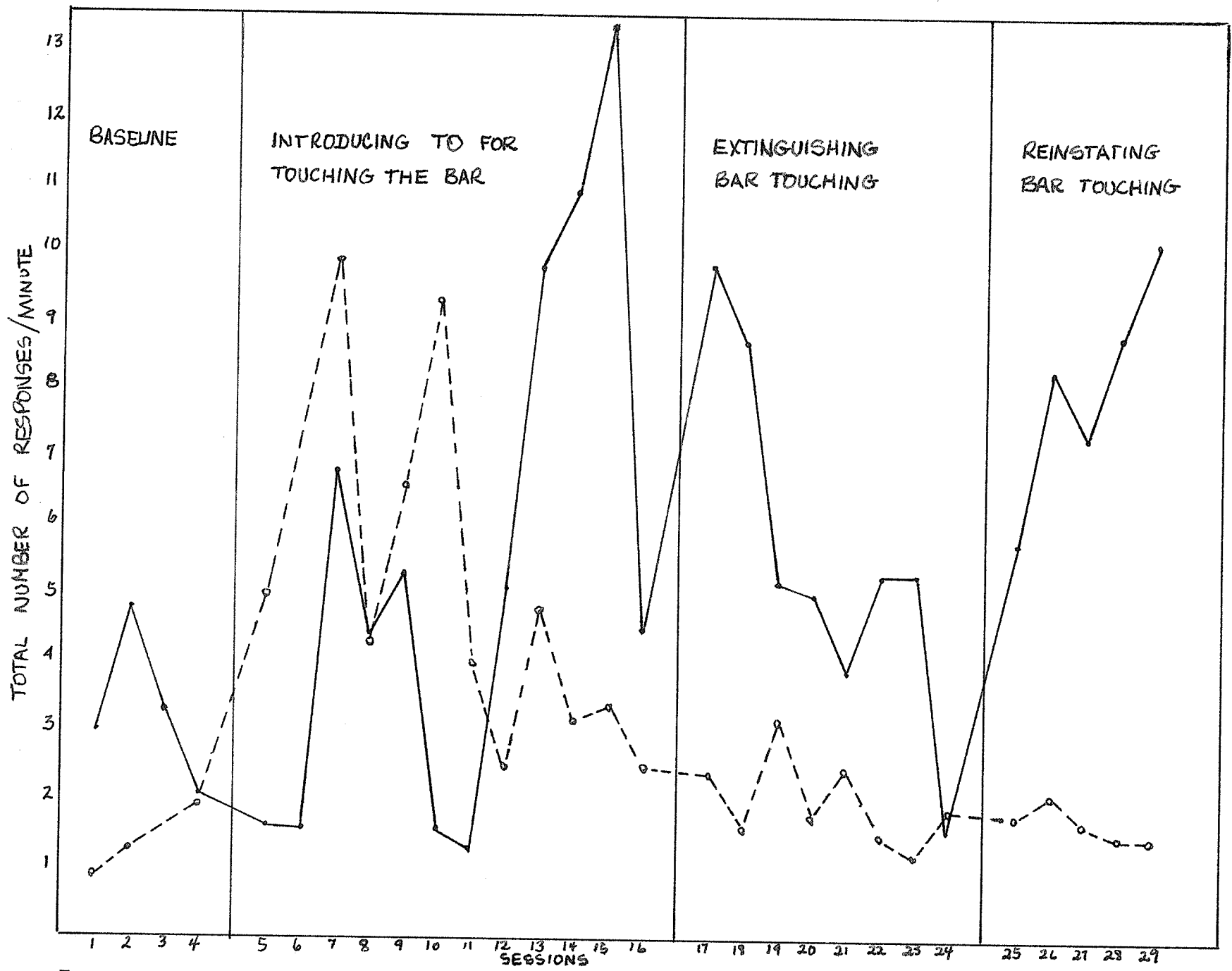


Figure 11. The total number of responses per minute emitted by Garry in both components of the multiple schedule.

CHAPTER IV

DISCUSSION

In general, it appeared as though TO was not reinforcing for Peter, because the number of times he touched the bar to obtain TO, quickly extinguished in both verbal and printing components, and remained at zero for the duration of the experiment. However, during the verbal sessions 13 to 24, when the FR reinforcement schedule for food increased, gradually from 5 to 65 responses required per reinforcement, the amount of time Peter engaged in inattentive behavior increased accordingly. The FR schedule for food in the printing component remained at FR 5 for the duration of the experiment, and both the number of times Peter touched the bar to obtain TO, and the amount of time he engaged in inattentive behavior remained low. Generally, these findings are similar to those found in earlier studies, for example, Azrin, 1961; Thompson, 1964, 1965; and Appel, 1963, where it was found that animals imposed periods of TO from an increasing FR reinforcement schedule. Although Peter did not impose a period of TO by touching the bar, it was easy for him to engage in inattentive behavior and to obtain another form of TO. If these two forms of TO can be equated, it would appear that this form of TO at least became positively reinforcing as the FR (food) schedule was increased. The increasing FR (food) schedule in the verbal component, appeared to be fairly disruptive not only in

that Peter began to engage in inattentive behavior, but also that he began making more mistakes. If TO was reinforcing, it was thought that during the baseline sessions, when each mistake was followed by a five second TO, the number of mistakes would be high, in order to obtain TO. Then during the remainder of the sessions, when each mistake was not followed by a five second TO, the number of mistakes would decrease. As was predicted, the number of mistakes did sharply decrease to zero in the session immediately following the baseline sessions. However, it was felt that the task during baseline was not exactly the same as the task during the remainder of the sessions. Therefore, any conclusions about the reduction in mistakes being due to the fact that each mistake was not followed by a five second TO, could only be tentative.

Previous experimenters using matching-to-sample tasks (Ferster & Appel, 1961; Zimmerman & Ferster, 1963; and Zimmerman & Bayden, 1963), have generally found that matching accuracy increased when each incorrect response was punished by a TO. However, the present study found that for Peter, at least, in the verbal component, that mistakes were emitted at a very low rate, even when they were not followed by a five second TO.

An incidental observation from the study related to Peter's counting behavior was made by the experimenter. Peter had been taught when he was a subject in the experiment of Martin et al. (1968) to count back the tokens to the experimenter after he had acquired the appropriate number, in order to receive a piece of food in exchange for the tokens. Although accurate records were not kept for Peter's counting behavior for this experiment, E noticed that Peter always counted the tokens back

every time he had acquired the appropriate number. It was interesting that Peter's counting behavior continued throughout the entire experiment, even though it was not specifically reinforced, although it was closely followed by the food reward. On an FR 5 reinforcement schedule for food, Peter counted back the tokens, one-by-one to the experimenter. Peter continued counting the tokens one-by-one as the FR food schedule was gradually increased, until session 16, where 20 responses were required for food reinforcement. At that point, Peter began picking the tokens up in bunches (of no set number), and counting each bunch as "one". He did not always end the counting at the number "five"--the number he counted to varied between 5 and 10. In direct relation to the different manner in which he counted the tokens, Peter began whining as he was counting back the tokens--a behavior he had never before engaged in when he was counting five tokens back to receive a reward.

A second interesting observation concerned Peter's tantrum behavior. Martin et al. (1968) found that Peter often had tantrums in which he screamed, cried, whined, kicked objects and pointed to his arm, saying, "Cut", "Needle", "Doctor", in varying combinations. By ignoring Peter when he had a tantrum, his tantrum behavior was fairly well extinguished. However, in this study, it was found that Peter occasionally emitted some of this tantrum behavior. The present experimenter followed the same procedure as was used by Martin et al. (1968) to reduce Peter's tantrums--ignoring Peter when he had a tantrum. Occasionally, the experimenter slapped Peter sharply on the arm when his tantrum was severe enough so as to be disruptive to the other experimenters and subjects in the same room. It was interesting to note the occasions for

the occurrence of such tantrums. These occasions followed fairly closely the times Peter engaged in inattention, as is seen in Figure 3. During the baseline sessions in both verbal and printing components, Peter had several tantrums, although the number and duration of these tantrums were not accurately recorded. It seemed that after Peter made several incorrect responses, he had a tantrum. The sessions in which Peter emitted such tantrum behavior were noted. When Peter was on an FR 5 schedule for food reinforcement, and for the low ratio (FR 7 to FR 25) schedules, there were no tantrums, and the amount of time Peter engaged in inattention was low. Tantrum behavior seemed related to the FR schedule. Although he did not have a tantrum during every session when the FR for food was increasing from 35 to 65, Peter's tantrum behavior did increase with the increasing FR schedule. Also, the severity of the tantrums appeared to increase with the increasing FR schedule, from moaning and whining and fidgeting in his chair at FR 35, to jumping up and down in his chair, whining louder, crying, screaming and occasionally kicking the desk, and trying to bite the tokens at FR 65. That the tantrums were related to the FR schedule for food, was seen even more clearly in the last three sessions. In sessions 27 and 28, when the FR schedule for food was 5 and 25 respectively, there was no tantrum behavior. However, Peter did have a tantrum in session 29, when he was reinforced with food on an FR 50 schedule. This behavior seems to support earlier literature, for example, Azrin (1961), who suggested that TO may be reinforcing because of the aversive aspects of the FR schedule.

In general, it seems that TO was reinforcing for Garry. He learned to touch the bar to obtain TO from an FR 5 food reinforcement

schedule. This bar touching behavior soon extinguished when Garry could no longer obtain TO by touching the bar. The finding that Garry would touch the bar to obtain TO from an FR 5 food schedule is unlike the results of previous experimenters, for example, Azrin (1961), Thompson (1964; 1965) who reported that their subjects spent increasing amounts of time in TO as the FR schedule increased, and very little time in TO at low FR food schedules. It appeared that the task for Garry was aversive, or that the popcorn was not an effective reinforcer.

The number of self-imposed TOs and the amount of time Garry engaged in inattentive behavior appeared to be inversely related. When Garry could obtain TO by touching the bar, the amount of time spent in inattention was relatively low. The amount of time Garry spent in inattentive behavior greatly increased when Garry could not obtain TO by touching the bar. This finding again appeared to confirm the view that for Garry at least, either the task was aversive, or the reinforcer was ineffective. The FR schedule for food was not likely aversive, since the FR was low (FR 5), throughout the experiment.

Although Garry made many more mistakes when he could obtain a TO by touching the bar, the total number of responses Garry emitted in both the verbal and printing components was also higher for the sessions when Garry could obtain TO by touching the bar, than when he could not. He seemed to overcompensate for the amount of TO he was taking by making more responses. It was thought that Garry may have made mistakes when mistakes were punished by TO during baseline sessions, in order to receive extra TO. However, when Garry did not receive a five second TO contingent upon incorrect responses, the number of mistakes he made

increased, as did the number of TOs he imposed on himself. It appeared that the number of responses (both correct and incorrect responses) Garry emitted was directly related to the number of times he touched the bar. In general, the more times he touched the bar to receive a TO, the more responses he made in the remaining session time.

It was interesting to observe Garry's behavior when his touching the bar initiated a 30 second TO. Although accurate records were not kept on this point, the experimenter observed that Garry touched the bar, and then sat back and relaxed in his chair until the experimenter turned back to him again after the 30 second TO. Then he would sit up and fold his hands on the desk top to continue with the session. When Garry could not obtain TO by touching the bar, it was noticed at the beginning of the extinction of the bar touching response, that Garry would touch the bar and sit back in his chair. If he was still looking at the experimenter, the session continued, and Garry would sit up again in his chair and fold his hands on top of the desk. However, he then began to engage in inattentive behavior--looking away from E and fidgeting in his chair. Possibly an explanation for Peter's behavior (tantrums) was that he did not learn to touch the bar to receive a TO. If he had learned to impose such periods of TO, his tantrum behavior may have been reduced.

This experiment differs from previous experiments on TO from positive reinforcement, in that (1) humans were used as Ss, and (2), the tasks used were of a beneficial nature to the subjects, in that the subjects learned behavior which would be useful to them in other situations. The fact that such tasks were used, made for a less rigorously

controlled experiment, which undoubtedly accounts for the divergent results found between the two subjects. However, since TO was found to be reinforcing, which was more clearly demonstrated by Garry than by Peter, it can be argued that this result is even more conclusive when found in a more "natural" setting, rather than in a very controlled laboratory setting.

Since previous research has found that TO is reinforcing to animals, the present study is important in that it extends these results to humans in a fairly "natural" setting. Studying humans in such settings is important for two reasons. (1) In order to understand the "everyday" behavior of humans in their usual environment, it will be necessary to conduct experiments with humans in settings approximating these natural ones. Time out is important to study in "natural" settings, for it is present in the natural environment of human beings, in the form of weekends, and holidays. (2) It is necessary to be able to extend the principles and results from the laboratory into "therapy" situations, using operant conditioning techniques. These techniques have been found useful in correcting, eliminating or otherwise changing many aspects of human behavior, as was noted in the literature mentioned earlier. As related to the present study, the finding that TO is reinforcing would be of use in behavior modification situations, since up to the present time, TO has been used as a form of punishment for incorrect responses, or for behavior which the behavior therapist is attempting to eliminate. Possibly, incorrect responses would be suppressed more readily with a stronger form of punishment. However, much work remains to be done in the study of TO with humans. In this study, although

time out was found to be reinforcing, TO was found to occur at different levels in the FR reinforcement schedule for each subject. More research must be done to discover whether the schedule of reinforcement, the task itself, or the value of the reinforcer is what leads the subject to impose periods of TO from positive reinforcement.

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