EXTINCTION OF A RUNNING RESPONSE AS A FUNCTION OF THE SIZE OF A TUBE-RUNWAY

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

Robert Lloyd Martindale

1955

This is to certify that the

thesis entitled

Extinction of a Running Response as a Function of the Size of a Tube-Runway

presented by

Robert Lloyd Martindale

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Psychology

M. Ray Denny
Major professor

Date September 19, 1955

EXTINCTION OF A RUNNING RESPONSE AS A FUNCTION OF THE SIZE OF A TUBE-RUNWAY

By

Robert Lloyd Martindale

AN ABSTRACT

Submitted to the School of Graduate Studies of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

Year 1955

Approved_____

4-16-55

The experiment was designed to test the possibility that a unique apparatus and procedure might provide a better framework in which to evaluate the implications of an interference theory of extinction. The apparatus was designed to provide a straightway running response that involved a far more limited set of variations in response than with the conventional straight alley. The extinction trials were much more widely spaced than in conventional procedures and this spacing was identical to the intertrial interval used during the acquisition trials.

The subjects were thirty experimentally naive albino rats. The apparatus was a glass tube straighway placed in an enclosure that provided a constant luminance without gradients within the tubes and end boxes. Three different tubes with internal diameters of 62, 72, and 82 milimeters were interchangeable in the enclosure.

The subjects were reduced to 80 to 85 percent of their ad libitum body weights during the experiment. They were also under 12 hour food deprivation for each experimental session. The subjects were trained to run to food reward through the 72 milimeter internal diameter tube with single trials spaced every 24 hours. This training phase lasted 15 days. One group of subjects was subsequently run in the apparatus every 24 hours for a period of 25 days with no food reward present. This group of subjects was divided into three subgroups during this phase. One subgroup ran through the 62 milimeter tube, one ran through the 72 mili-

meter tube, and the other ran through the 82 milimeter tube. The remaining subjects continued running to food reward to provide control groups in a balanced experimental design. Subsequent to this last phase all subjects were extinguished with massed non-rewarded trials.

The results showed no evidence of extinction under spaced trials unless the removal of reward was accompanied by a change in tube size. The data suggested the tentative conclusion that removal of reward in this situation was a far less important factor in producing experimental extinction, than other changes in the stimulus situation which required a modification in the performance of an acquired response. This result was considered consistent with an interference theory of extinction.

EXTINCTION OF A RUNNING RESPONSE AS A FUNCTION OF THE SIZE OF A TUBE-RUNWAY

By

ROBERT LLOYD MARTINDALE

A THESIS

Submitted to the School of Graduate Studies of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

Year 1955

ACKNOWLEDGEMENT

Grateful acknowledgement is made to Dr. M. Ray Denny, under whose supervision this study was carried out, for his guidance and participation in the work herein reported.

Robert Lloyd Martindale

candidate for the degree of

Doctor of Philosophy

Final examination, September 19, 1955, 3:00 P. M., room 16, Psychology Building

Dissertation: Extinction of a Running Response as a Function of the Size of a Tube-Runway

Outline of Studies

Major subject: Experimental Psychology
Minor subject: Philosophy

Biographical Items

Born, April 16, 1927, Detroit, Michigan

Undergraduate Studies, Michigan State College, 1944-49

Graduate Studies, Michigan State College, 1949-50, continued 1952-55

Experience: Graduate Assistant, Michigan State College, 1949-50, 1953-55, Instructor in Psychology, 1952

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION AND THEORETICAL ORIENTATION

A good deal of research on the relative merits of reinforcement and contiguity theories in animal learning has centered around the problems of experimental extinction and their associated phenomena. The reinforcement theorists have modified Pavlov's (1927) notion of internal inhibition and used it as a drive state construct in a two factor inhibition theory to account for experimental extinction (Hull, 1943). The inhibitory drive state, for the most part, is a construct inferred from sheer response. This is to say, that each repetition of a response produces an increment to a tendency not to perform that response on a subsequent occasion. This inhibitory drive state is assumed to dissipate as a function of time.

A permanent tendency not to perform the acquired response is the second factor. This is based on the accuisition of alternative responses including the response of not responding, through the operation of the inhibitory drive state and/or the removal of reward. It is necessary for the reinforcement theorists to retain the inhibitory drive state construct for two reasons. First, they assume reduction of drive to be a necessary condition for learning. The inhibitory drive state is assumed to be the drive reduced by the responses which bring about extinction. Secondly, in order to explain spontaneous recovery, this inhibitory drive

state is assumed to dissipate as a function of time, and by virtue of this dissipation the acquired response is reinstated.

The contiguity theorists, because they do not infer reinforcement as an operation, propose an interference theory of extinction (Guthrie, 1935). This is simply the claim that the sheer performance of alternative responses, resulting from stimulus differences between acquisition and extinction situations, is the necessary condition for the acquisition of competing responses.

Recently, theorists who subscribe to interference interpretation have paid more attention to stimulus differences between acquisition and extinction series. They have noted that the new responses acquired in the extinction situation, which interfere with the original response, are actually acquired in a new stimulus situation. This is to say that experimental extinction is an example of discrimination learning. That is, the animal learns to discriminate between the stimulus situation prevailing during acquisition and that during extinction. An animal responds to each condition with a different set of responses. This is generally referred to as the discrimination hypothesis (McClelland, 1953). In particular, spontaneous recovery is regarded as a case of the reinstatement of cues associated with acquired responses and a change in the cues associated with extinction responses. Recently, a more rigorous development of interference theory

has been undertaken by Maatsch (1954) and by Denny and Adelman (1955). Both of these approaches integrate the discrimination hypothesis into a broader interference approach and a general theory of learning.

A dilemma has arisen in that both two-factor extinction theorists and interference extinction theorists have taken the same experimental evidence as support for their respective points of view. This is graphically illustrated in the objections to interference interpretations presented by Spence (1951) and in a rebuttal by Maatsch (1954). The present writer regards this dilemma as the result of traditional interpretations of equally traditional experimental apparatus and procedures. This rigidity in experimental technique has led to two basic interpretive biases on the part of reinforcement theorists.

First, the acquired response in the process of extinction has been regarded as the same response that was originally acquired. This acquired response has been regarded as unitary. However, the measures typically employed during acquisition and extinction permit very diverse responses to bring about the same measured result. A derivative effect of this bias has been a failure adequately to observe and evaluate responses occurring in the extinction situation that are different from those performed during acquisition.

Secondly, the stimulus situation prevailing in the extinction of an acquired response has been typically regarded

by reinforcement theorists as the same in which the acquisition of the response occurred. It is against this stimulus bias that most of the experimental work of the interference theorists has been directed.

Most experimental work concerned with the stimulus bias has involved conventional apparatus and methodology. Recent focus has been on the evaluation of differential massing and spacing procedures between acquisition and extinction trial series. In general, these studies have dealt with the differential cue value of different intertrial intervals. Typically, they have supported a general conclusion that the greater the similarity between the acquisition and extinction intertrial intervals the slower the extinction process. An early study by Rohrer (1947) supports this general conclusion. Using a modified Skinner box situation and a response latency measure, he found that extinction was more rapid with massed trials than with spaced trials after spaced acquisition. The author interpreted the results as a confirmation of an inhibitory state hypothesis. That is, massing prevented the dissipation of the inhibitory state and led to faster extinction. However, Rohrer failed to realize that relatively greater massing in extinction as compared with acquisition provides a discriminable cue situation.

A classic study on this problem using a straight alley and a combination of response latency and running time as a measure was conducted by Sheffield (1950). Using intertrial

intervals of 15 seconds and 15 minutes, she found that extinction was most rapid when spaced extinction trials followed massed acquisition. This would support the interference point of view which holds that the dissimilarity of conditions should produce the most rapid extinction.

Stanley (1952) supported the same general conclusion using a running time measure in a T maze situation. However, when using percent correct response as a measure, he found that massed extinction trials led to more rapid extinction other things equal. He accounts for this result with a frustration hypothesis. That is, the more frequent tendency to perform the alternative response under massing results from recoil from the frustrating situation of no reward in the goal box where the reward was present during acquisition.

Another case of interpretive bias is found in a study by Teichner (1952) employing response latency measures in a modified Skinner box situation. Animals were trained under 30, 45, and 90 second intervals and extinguished under 30, 45, 60, and 90 second intervals in a balanced experimental design. The principal finding was that extinction was slower when the same intertrial interval was used in both acquisition and extinction. This finding would be predicted by the discrimination hypothesis. However, the author interpreted his results as a disconfirmation of the predictions of interference theory, because the effects of the time intervals were different for acquisition and extinction. Again, we have a case of the theorist failing to realize that he is dealing

with two different sets of responses in acquisition and extinction. Extinction is not simply the weakening of an acquired response tendency but, rather, is the building up of competing responses that are certainly more diverse than the acquired responses in this type of experimental situation. Teichner's results are also difficult to interpret on a methodological count. His groups were performing at different levels of proficiency at the end of the acquisition trials due to some intertrial intervals being more optimum for learning than others. Accordingly, his acquisition groups began extinction at different levels of performance proficiency.

The study of partial reinforcement has been another area in which the stimulus aspect of the problem has been studied. Using latency measures in a conventional straight alley, Sheffield (1949) found greater resistance to extinction after massed partially rewarded trials than after massed completely rewarded trials. This would be expected under the discrimination hypothesis as partially rewarded acquisition trials bear greater similarity to extinction trials than completely rewarded acquisition trials. However, Sheffield did not find greater resistance to extinction under partial reward when the acquisition trials were spaced.

Wilson, Weiss, and Amsel (1955) carried out a repetition of Sheffield's experiment. They found greater resistance to extinction following partially rewarded acquisition whether the acquisition trials were spaced or massed. There was no

difference in extinction rate between the massed and spaced acquisition trials under partial reward.

This more general effect of partially rewarded acquisition was also supported by a study by Weinstock (1954). He used an L shaped runway with response latency and running time measures. With an acquisition intertrial interval of 24 hours, Weinstock found progressively greater resistance to extinction as the percentage of rewarded trials during acquisition decreased from 100 to 30 percent.

Wells (1952) performed a more definitive study on this problem with a modified Skinner box using approach to reward and number of bar press responses as measures. The results indicated that not only was there greater resistance to extinction after partially rewarded acquisition trials, but that the degree of this resistance could be predicted from animal performance during acquisition. During fixed-ratio reinforcement (partial reward) the animals began to learn to approach the food tray only at the time when food would be present; i. e., they tended to learn not to visit the food tray on the to-be-non-rewarded bar-presses. The degree of resistance to extinction was found to be directly proportional to the degree of discrimination attained during acquisition.

In non-instrumental shock conditioning, Gwinn (1951) has found, in general, that resistance to extinction increased with an increase in the number of shock acquisition trials. However, when strong shock was used, an increase

beyond an optimum number of shock acquisition trials tended to provide decreased resistance to extinction. Gwinn favored a learned fear-drive interpretation of his results, but they are also consistent with the discrimination hypothesis. Increasing the intensity and frequency of the shock beyond an optimum level provides a situation for better discrimination between shock and no-shock trials. Where there is better discrimination between acquisition and extinction situations we would expect lower resistance to extinction.

A more direct evaluation of the discrimination hypothesis has been made by Liberman (1948). He used a straight alley and an L alley with running time measures. Animals were trained on both forms of the apparatus with groups extinguished on just one or both. He found possible slower extinction and definitely less spontaneous recovery by animals extinguished on just one apparatus while continuing to perform on the other.

This differential extinction procedure resulted in a discrimination situation. That is, the animal must learn to discriminate between the cues associated with the two different types of apparatus, in order to continue performing on one type while failing to perform on the other. Due to this discrimination, the cues associated with performance are a more limited set than in the ordinary situation. Accordingly, there are fewer acquisition cues reinstated upon a spontaneous recovery test, and less spontaneous

recovery would be expected.

The studies discussed so far have illustrated the stimulus bias as present in traditional interpretations. Perhaps, the examination of the response bias is more important from a broader theoretical point of view. It requires greater revision of traditional apparatus and procedures. Unfortunately, little work has been done in this area as compared with that on stimulus questions. However, at least two experimental publications are notable in that they have not only dealt with the response, but have also departed from conventional methodology.

McClelland and McGown (1953) trained two groups of animals in a circular goal alley. One group always received reward in a specific location and a general-reward group received food reward in four randomized locations in the goal alley. The extinction series employed a choice point on the way to the goal alley. They obtained learning based on the secondary reward value of the goal alley. The general-reward group exhibited greater resistance to extinction than the specific-reward group, both in terms of running time and number of errors at the choice point. McClelland and McGown regard these results as a function of the relatively greater ease of discrimination between acquisition and extinction trials for the specific-reward group as contrasted with the general-reward group.

A particularly relevant study on the response problem

was carried out by Adelman and Maatsch (1955). The significant methodological aspect of this study was the control of response possibilities during extinction. Animals were trained in a conventional straight alley situation. Adelman and Maatsch extinguished their animals with non-rewarded trials at ten minute intervals. However, one group was allowed to recoil back down the straight alley after experiencing non-reward, another was allowed to jump out of the end box, and a third was retained in the end box for a period of time in the conventional fashion. The recoil group exhibited the greatest increase in running times during extinction and the conventional group was somewhat lower. However, the jump group failed to show any evidence of extinction. Adelman and Maatsch accounted for these results with the observation that the more incompatible the extinction responses with the original acquired response, the more rapid was the extinction. This is exactly what would be expected from an interference point of view because the responses performed in an extinction situation must be incompatible with the original acquired response in order for a decrement to occur in the original response performance.

A study by Maatsch, Adelman and Denny (1954) has some relevance to the problem of response bias. They found no differences in the rate of extinction responding for groups of animals trained in a modified Skinner box to depress bars requiring differing degrees of effort. This would be

expected by interference theory, if the degree of effort required did not involve significantly different responses. The different groups were extinguished under the same effort conditions that prevailed during their respective acquisition series and, accordingly, no differences would be expected. However, inhibitory state theorists would expect more rapid extinction under the conditions requiring greater effort. This is true because they assume that greater effort generates larger amounts of inhibitory drive.

It was the purpose of the present study to evaluate a new and unique apparatus and procedure. It was hoped that this apparatus and procedure might permit better observation and control of some of the factors previously discussed. Richard A. Behan (1953) has obtained some preliminary data from running rats through a mailing tube 42 inches long and 4 inches in internal diameter. These data showed some evidence of progressively decreasing running times even though the animals were under no deprivation and never experienced reward in the experimental situation.

The present writer found a similar result with some animals using apparatus and procedure similar to the present study. In other pilot observations the present writer, using the same apparatus and procedures as in the present study, found that two of three animals exhibited progressively decreasing response latencies and running times even though they never experienced reward in the experimental situation.

These animals were run twenty trials at the rate of one trial per day with two of the three animals maintaining running times and response latencies indicative of learning.

These pilot observations suggested that the responses of running through a small diameter tube are a very limited set. Conventional straight alley procedures permit a more extensive variety of response, all of which are regarded as a unitary learned response. If the responses of running through the tube were as limited as indicated by the pilot work, the response, once established, might be extremely stable. It was considered possible that these responses might become relatively autonomous with respect to the goal response. If this were the case, we should expect animals trained to run a tube to food reward not to extinguish even though the reward was removed from the situation. At the very least, it was expected that this apparatus and procedure would allow the study of a running response that was far less varied than in conventional straight alley procedures.

Another consideration in the present study was the possibility that varying tube diameters might systematically vary the variety of response possibilities available to the animal, and concurrently bring about a stimulation change. This variable might provide a method for measuring the effect of stimulus change and change in the variety of response possibility. Accordingly, this should provide a better method

for observing response differences between acquisition and extinction.

II. EXPERIMENTAL PROCEDURE

A. Subjects

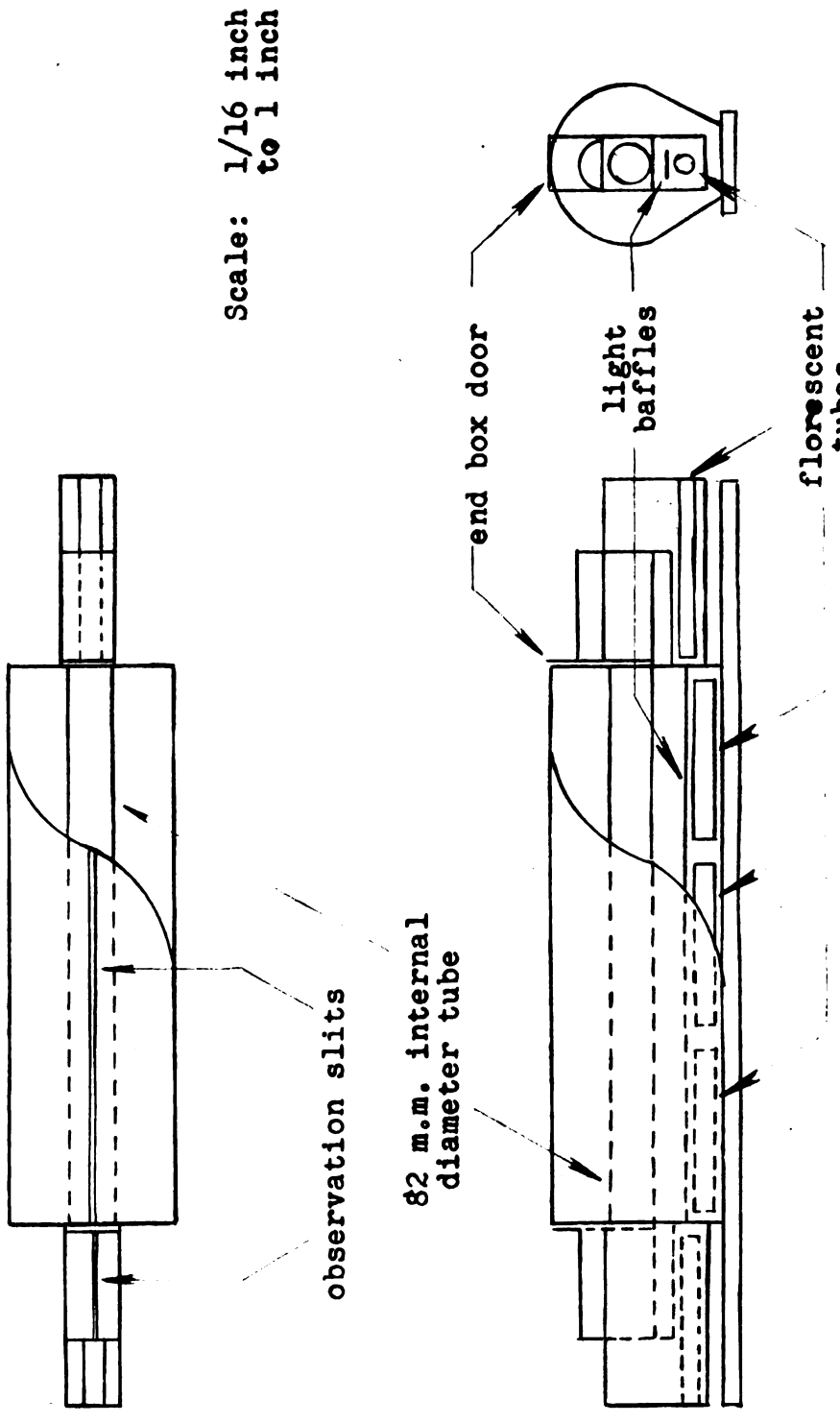
The subjects were naive male albino rats from the colony of the psychology department of Michigan State University. The subjects ranged in age at the beginning of the experiment from approximately 120 to 275 days. Forty-four animals were used of which thirty were carried through to the completion of the experimental period. These were selected animals whose ad libitum weights before deprivation ranged from 335 to 515 grams. This weight range was considerably above the average for the colony.

B. Apparatus

The experimental apparatus illustrated in Figure I was a modified straight alley. The runways were three interchangable glass tubes 48 inches long and 62, 72, and 82 milimeters in internal diameter. The apparatus was designed to provide a uniform luminance from any position or angle of regard within the tubes or end boxes.

These tubes were placed in a sheet metal and wood enclosure containing a light source consisting of three 15 watt florescent tubes placed beneath light baffles at the bottom of the enclosure. The intensity of these light sources could be independently varied. The reflecting

Figure I. Experimental Apparatus



surfaces of the enclosure were designed to diffuse the light as completely as possible. This provided an adjustable and uniform luminance level within the tubes. This luminance level was maintained at about 12 to 15 foot-candles throughout the tubes as measured by a light meter. The tubes were equipped with collars at each end so that all three different tubes were on the same center when installed in the enclosure. All interior surfaces of the enclosure were painted aluminum except the bottom of the light baffle directly above the florescent tubes which was painted flat black.

Identically constructed end boxes were placed at each end of the tubes. The end boxes had a rectangular floor plan and a semi-circular roof. The interior floor of the end boxes measured four and one-half inches wide by ten and one-half inches long. Their maximum interior depth was six inches. The boxes were constructed of wood and metal except for the glass floors which were a flat surface. Except for the glass floor the interior was painted aluminum. The end boxes were adjustable so that their glass floors could be brought even with the bottom of any diameter tube.

A light source consisting of one 15 watt florescent tube was placed beneath the glass floor of each end box. The intensity of these light sources was independently variable. The light enclosure was painted aluminum except for the bottoms of baffles placed directly over the light sources which were painted flat black. This lighting arrangement provided a

uniform luminance level similar to that in the main enclosure. This level was maintained at 12 to 15 foot-candles so as to provide a uniform luminance level without gradients throughout the end boxes and tubes. This level of luminance was well within the range found in the subjects home environment.

The subjects could be observed in the apparatus by a mirror suspended above a one-half inch wide slit running the entire length of the top of the tube enclosure. Similarly, subjects could be observed in the end boxes through a one-quarter inch wide slit running the entire length of the top of the boxes.

This unit was used like a conventional straight alley. Door and hand switches controlled timers that provided three time measures for each run. One measure was from the opening of the starting box door to a ten inch penetration into the tube. A door switch automatically started a timer when the starting box door was opened and stopped it when the door was again closed. The door was closed when the criterion of complete entrance into the tube was met. The criterion for closing the door and, thereby, stopping the timer was the observation by the experimenter that the first part of the subject's body had reached a black line around the tube. This black line was three thirty-seconds inches wide and was placed ten inches along each tube. This measure will henceforth be referred to as response latency and will be abbreviated by L.

The second measure was the time from the 10 inch penetration into the tube until the subject reached the end of the tube. Closing the starting box door simultaneously stopped the first timer and started the second. When the first part of the subject's body was observed to reach the end of the tube the second timer was stopped by the experimenter with a hand switch. This measure will henceforth be referred to as running response time and will be abbreviated by R.

The third measure was the time from reaching the end of the tube until the subject had completely entered the goal box. Stopping the second timer with the hand switch simultaneously started a third timer. When the subject was observed to have completely entered the goal box the third timer was stopped automatically when the experimenter closed the end box door. This measure will henceforth be referred to as goal response and will be abbreviated by G. The apparatus was completely reversible so that either end box could serve as the starting box or goal box. The timing devices were similarly reversible.

B. Habituation Phase

The habituation phase consisted of six days of handling by the experimenter. Starting with the first day of this phase the subjects were placed in individual cages. They remained in these same cages throughout the remainder of all experimental phases. This and all subsequent experimental sessions were

held at approximately the same time daily for each animal.

During the habituation phase each animal was handled briefly by the experimenter and allowed to run free on a small table for about one-half hour. During this time each subject was weighed daily. The subjects were on an ad libitum diet until the first day of the habituation phase. They were totally deprived of food at the time they were first placed in their individual cages. They were first fed again 36 hours later and, thereafter, once every 24 hours throughout all experimental phases. The feeding time was always midway between the experimental sessions and, thereby, provided a 12 hour offset. Therefore, the subjects were on a 12 hour food deprivation schedule in addition to a reduced diet. The food used was Purina Dog Chow checkers of the same type that the animals had been fed throughout their lifetime. Water was continually available in the individual cages.

The feeding schedule was arranged so that the subjects reached 80 to 85 percent of their body weight by the day following the last day of the habituation phase. This was done by feeding each animal three and one-half to four grams of food each day except for the first day when no food was given.

The experiment was run in three sections. The different sections were run at the different times. All subjects in each section were on the same daily phase schedule. Each of these sections was as close as possible to a replication

across all experimental and control conditions.

C. Phase I

This phase started on the first day following the completion of the habituation phase. The weight range of approximately 80 to 85 percent of initial body weight was reached by this day and was maintained at this level throughout all remaining experimental phases. This was done by a daily diet of 12 to 14 grams. All subjects were weighed daily just before their experimental session. This weighing procedure was maintained throughout all remaining experimental phases.

On the first day of this phase each subject was assigned to its respective experimental group. These groups were determined by the two possible reward conditions and the three possible tube diameters in phase II. This provided six different experimental groups each containing five subjects. Groups receiving reward in phase II were designated by C and groups receiving no reward were designated E. Groups changed to the 62 milimeter tube in phase II were designated 1, groups remaining on the 72 milimeter tube were designated 2, and groups changed to the 82 milimeter tube were designated 3. This provided the six different group designations of C-1, E-1, C-2, E-2, C-3, and E-3. This assignment is listed in columns (1), (2), and (4) of Table 1.

However, there were other considerations in the assignment

TABLE 1

EXPERIMENTAL DESIGN AND SUBJECT WEIGHTS

(1) Phase II Tube (m.m.)	(2) Phase II Reward and Group	(3) Running Direction	(4) Subject Number	(5) Section	(6) Initial Weight (grams)	(7) Median Phase I Weight (grams)	(8) Median Phase II Weight (grams)
62	reward C-1	right to left	6 21	1 3	360 445	300 370	305 355
		left to right	12 20 23	2 2 3	390 390 415	330 330 355	315 315 340
	no reward E-1	right to left	10 18 25	1 2 3	390 375 375	310 315 310	300 300 295
		left to right	2 13	1 2	435 360	350 300	350 295
72	reward C-2	right to left	15 3	2 1	380 455	310 365	300 365
		left to right	1 16 22	1 2 3	380 415 340	310 345 285	320 330 275

TABLE 1 (continued)

(1) Phase II Tube (m.m.)	(2) Phase II Reward and Group	(3) Running Direction	(4) Subject Number	(5) Section	(6) Initial Weight (grams)	(7) Median Phase I Weight (grams)	(8) Median Phase II Weight (grams)
	no reward E-2	right to left	9 11 30	1 2 3	400 340 515	335 285 390	330 280 375
		left to right	24 14	3 2	475 410	385 345	365 330
82	reward C-3	right to left	5 19	1 2	420 350	335 295	335 285
		left to right	4 26 29	1 3 3	440 365 395	355 300 305	355 295 305
	no reward E-3	right to left	8 17	1 2	365 410	295 340	300 335
		left to right	7 27 28	1 3 3	415 395 335	340 330 275	335 315 265

of subjects to their respective experimental groups. These considerations were running direction, initial body weight, and section. The running direction is the direction the subjects were run through the tube and, accordingly, determined which end box would be the starting box and which would be the goal box. This direction assignment was consistently maintained the same for each subject throughout all experimental phases. Insofar as possible an attempt was made to counterbalance initial weight, section, and running direction among the experimental groups and subgroups. The assignment of these bases is listed in columns (3), (5), and (6) of Table 1.

With respect to weight, the subjects were selected, insofar as possible, so that they could reverse their direction in the 82 milimeter tube. Previous pilot work indicated that subjects with a body weight of 310 grams or less could reverse direction in the 72 milimeter tube. Those with a weight of 340 grams or less could reverse in the 82 milimeter tube. The initial body weight for each subject is shown in column (6) of Table 1. The median body weights for each subject during phase I and phase II are shown in columns (7) and (8) of Table 1.

The median initial body weight for subjects in the total 62 milimeter tube group was 390 grams, 405 grams for the 72 milimeter tube group, and 395 grams for the 82 milimeter tube group. The median initial body weight for subjects in the total rewarded group was 390 grams and 395 grams for the

non-rewarded group.

The median initial body weight for direction right to left was 305 grams and 320 grams for direction left to right. The median initial body weight for section 1 was 332.5 grams, 300 grams for section 2, and 327.5 grams for section 3.

Phase I lasted 15 days with trials given at the rate of one per day. The experimental sessions were held at about the same time daily. The subject was first weighed and then placed in the starting box. All subjects were run in 72 milimeter diameter tube during this phase. After thirty seconds in the starting box the door was raised and the timing sequence described under apparatus was begun and the various time measures were recorded. Each subject was allowed to remain in the goal box for thirty seconds after starting to eat. All subjects retained for the analysis began to eat immediately after entering the goal box, at least after the first few days in this phase of the experiment. Each subject was returned immediately to its home cage following completion of the trial.

Subjects number 31 through 44 were discarded or not used in the analysis. The raw data for these subjects will be found in the appendix. Subjects were discarded who failed to enter the tube, run the tube, or leave the tube for a period of five minutes on five consecutive days during this phase, or who refused to eat within five minutes on five consecutive days during this phase. Subject 31 was not used in the

analysis because, although this subject did not quite reach the discard criterion, it obviously showed no evidence of learning. Subject 32 died on the tenth day of phase II. Animal 33 was discarded because a door was accidently dropped on him on the third day of phase II.

Phase II

This phase was begun on the day following the completion of phase I. The procedure in this phase was identical to phase I except that certain subjects were no longer rewarded and certain others were run through different diameter tubes. This was done according to the schedule shown in columns (1), (2), and (4) in Table 1. During this phase subjects were discarded when they met an extinction criterion of failing to enter the tube, run the tube, or leave the tube for a period of five minutes on two consecutive days. The last trial of phase II was non-rewarded for all subjects.

Phase III

Phase III started immediately following the last trial of phase II. The trials were massed for each subject. Otherwise the trial conditions were the same for each subject as in phase II, except that there was no reward in the end box for any subject. Immediately following the thirty seconds in the end box, the subject was returned to the starting box.

This provided about a five second intertrial interval. This was continued until each subject completed ten trials or had required one minute to enter the tube, run the tube, or leave the tube. After these ten trials or after the one minute criterion had been met the subject was discarded.

III. EXPERIMENTAL RESULTS

For the purposes of analysis, medians were taken for each subject on each successive set of five trials for each of following measures: response latency (L), running time (R), and goal response (G). This provided three indexes on each measure for the 15 trials in phase I and five indexes for the 25 trials in phase II. Means of these medians were then calculated for each of the experimental groups.

Spearman rank-difference correlation coefficients between the three measures were computed for each set of indexes in phase I. These coefficients and their significance levels are presented in Table 2. There was no consistently significant relationship between the measures throughout phase I. Since any indicated relationship was very low, in subsequent analyses each measure was analyzed seperately rather than in combinations.

Group E-1 was not included in the analyses after the fourth set of five trials. This group was obviously extinguishing at a rapid rate. Two of the five subjects in this group met the extinction criterion of phase II by the end of the fourth set. Of the three remaining subjects one met the extinction criterion on trial 38, one on trial 39, and the other failed to meet the criterion. No subjects in the other experimental groups met the extinction criterion in phase II.

TABLE 2

RANK DIFFERENCE CORRELATION COEFFICIENTS BETWEEN MEASURES FOR EACH SET OF TRIALS IN PHASE I

SET 1

Measure	R	G
L	.46*	.16
R	-	.32

SET 2

Measure	R	G
L	.53**	-.11
R	-	.28

SET 3

Measure	R	G
L	.11	.28
R	-	.47*

* A Pearson product-moment coefficient of correlation must exceed .361 at 28 degrees of freedom to be significant at the 5% level of confidence. Each of the above coefficients involved 28 degrees of freedom.

** A Pearson product-moment coefficient of correlation must exceed .463 at 28 degrees of freedom to be significant at the 1% level of confidence.

The means of the medians for each successive set of five trials are presented in Tables 3, 4, and 5 and Figures II, III, and IV for measures L, R, and G respectively. The means of the first three sets are from phase I and constitute the acquisition curves for each group. The means of the last five sets are from phase II. These are the spaced extinction curves for the non-rewarded groups on each of the three tube sizes in the case of groups E-1, E-2, and E-3. Groups C-1, C-2, and C-3 are the rewarded control groups for these five sets on the respective tube sizes.

The Kruskal and Wallis (1952) H test for independent groups was used to test for differences among experimental groups on each set of indexes. These H values are listed in Tables 3, 4, and 5 for measures L, R, and G respectively. This is a test for differences among means and is believed to be very insensitive to differences in variability. It is a test of the deviation of ranks from their expected position in a random ordering. In all cases the H values were corrected for possible attenuation due to tied ranks.

Table 6 lists the means and H values for each measure on trials 15, 16, and 17. These trials were analyzed seperately because of their proximity to the introduction of the experimental variables. Trial 15 was the last trial of phase I. Trial 16 was the first trial of phase II. On trial 16 certain experimental groups were changed to different diameter tubes but none had experienced non-reward before the end of this

TABLE 3

MEANS AND H VALUES ON EACH SET OF TRIALS FOR MEASURE L

	Group Means								
Set	C-1	E-1	C-2	E-2	C-3	E-3	H	DF	Probability
1	82.7	51.6	37.2	117.9	51.9	35.4	.48	5	<1.00
2	80.0	16.7	13.8	98.1	12.2	27.7	.83	5	<.98
3	7.9	4.7	6.4	5.5	2.9	3.4	4.60	5	<.50
4	17.6	90.8	6.4	4.7	2.4	5.2	10.18	5	<.05
5	7.2		4.8	6.3	2.2	6.4	9.44	4	<.10
6	5.0		4.5	7.3	1.9	4.3	11.70	4	<.02
7	5.0		2.9	8.3	2.3	4.7	8.57	4	<.10
8	7.4		4.9	8.9	1.4	6.4	16.54	4	<.01

TABLE 4

MEANS AND H VALUES ON EACH SET OF TRIALS FOR MEASURE R

Set	Group Means						H	DF	Probability
	C-1	E-1	C-2	E-2	C-3	E-3			
1	6.3	17.1	3.2	4.0	9.9	7.0	10.22	5	<.10
2	2.6	3.3	1.8	2.3	2.3	3.0	5.14	5	<.50
3	2.2	2.3	1.7	2.1	2.0	1.8	2.74	5	<.90
4	3.0	63.2	1.7	2.3	2.1	2.2	9.83	5	<.10
5	2.6		1.9	2.6	1.7	1.8	8.72	4	<.10
6	2.5		1.7	3.3	1.9	2.9	14.80	4	<.01
7	2.6		1.8	2.5	2.2	2.5	10.14	4	<.05
8	2.9		2.3	2.8	1.8	2.8	12.53	4	<.02

TABLE 5

MEANS AND H VALUES ON EACH SET OF TRIALS FOR MEASURE G

Set	Group Means						H	DF	Probability
	C-1	E-1	C-2	E-2	C-3	E-3			
1	3.9	11.1	4.0	2.9	3.2	4.7	11.33	5	<.05
2	4.1	14.8	4.2	2.4	3.3	4.3	9.82	5	<.10
3	3.3	6.0	3.8	2.8	2.3	2.3	9.13	5	<.20
4	4.7	66.3	3.1	4.1	2.7	6.9	14.40	5	<.05
5	3.7		3.8	5.9	2.4	9.6	11.64	4	<.05
6	2.7		3.8	4.6	2.7	12.7	13.97	4	<.01
7	3.3		3.9	3.4	2.0	8.4	14.23	4	<.01
8	3.8		4.1	3.7	2.4	10.0	11.63	4	<.05

Figure II. Response Latency Curves (L) for Experimental Phases I and II

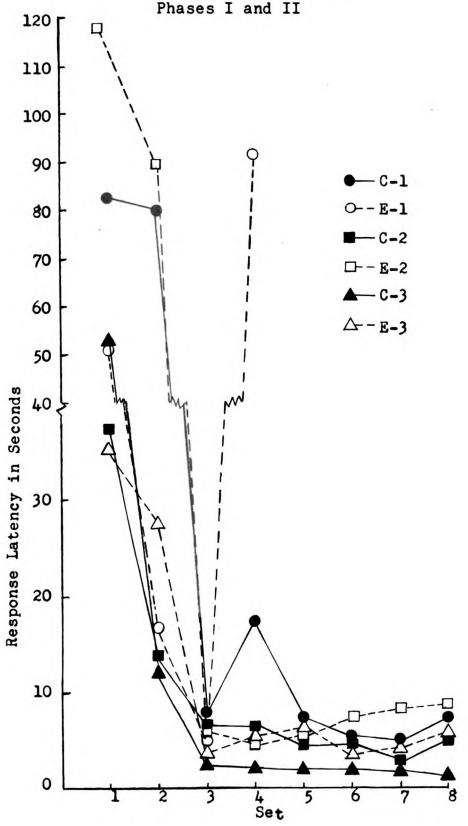


Figure III. Running Time Curves(R) for Experimental Phases I and II

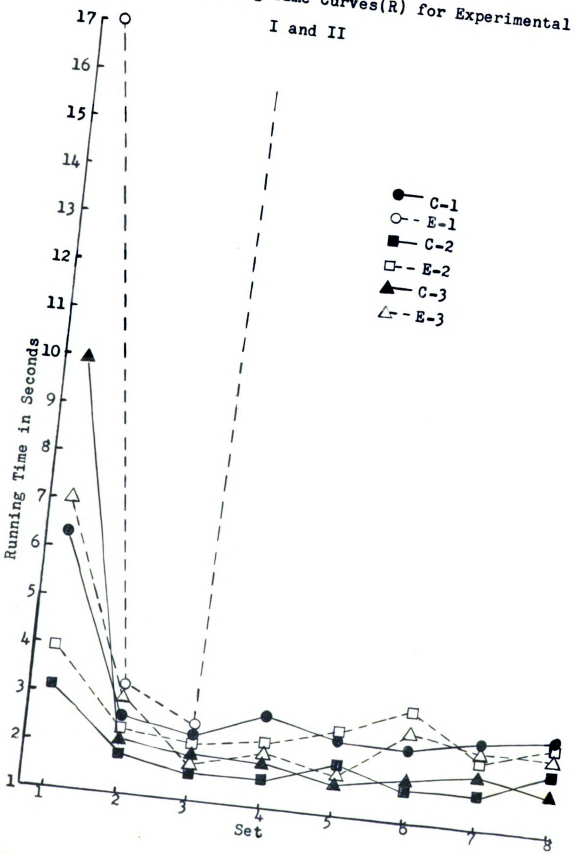


Figure IV. Goal Response Times(G) for Experimental Phases I and II

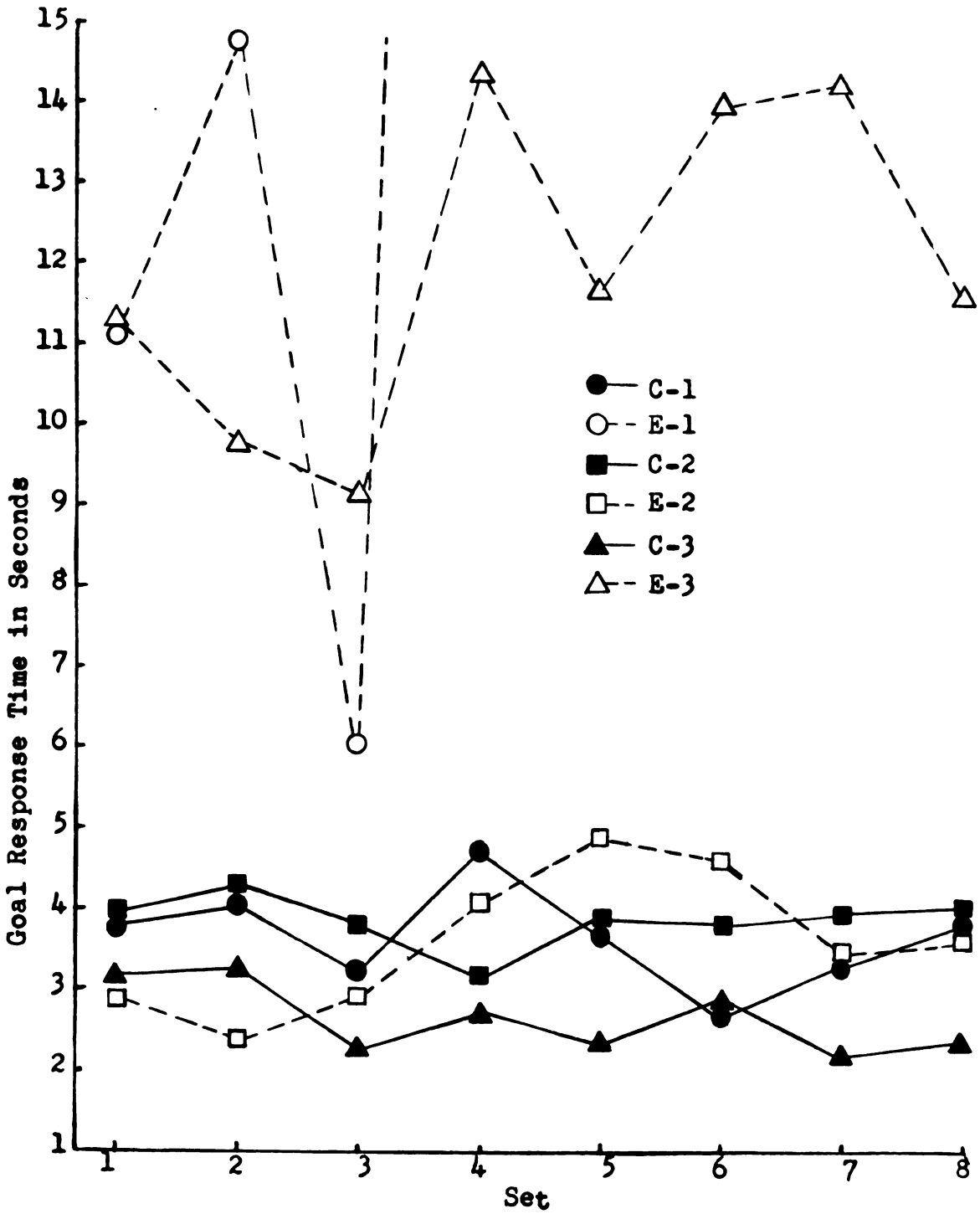


TABLE 6

MEANS AND H VALUES FOR TRIALS 15, 16, AND 17

Trial	C-1	E-1	C-2	E-2	C-3	E-3	H	DF	Probability
	Measure L Group Means								
15	5.0	4.9	3.3	4.6	1.7	2.2	4.73	5	$<.50$
16	15.8	7.1	4.7	2.1	3.1	3.6	6.31	5	$<.30$
17	25.3	09.9	7.0	4.6	7.4	6.9	5.71	5	$<.50$
	Measure R Group Means								
15	2.1	2.0	1,5	2.0	2.0	1.7	3.62	5	$<.70$
16	4.2	2.5	1.5	1.8	2.2	3.1	12.50	5	$<.01$
17	3.4	63.0	1.7	2.1	3.0	1.8	8.21	5	$<.20$
	Measure G Group Means								
15	3.8	6.2	2.9	3.2	1.9	2.2	10.83	5	$<.20$
16	4.3	20.3	2.6	3.9	2.6	3.6	8.86	5	$<.20$
17	5.3	67.0	4.3	5.8	5.2	3.7	5.15	5	$<.50$

trial. Trial 17 was the second trial of phase II. This was the first trial before which certain experimental groups had experienced one non-rewarded trial.

In all cases where an H value among experimental groups significant at the five percent level or less was found, White's (1952) T was calculated between all possible two-group comparisons. This test yields identical probabilities to the H test when only two-groups are compared. Accordingly, in the case of measure L, the T values were calculated on all possible two-group comparisons in sets 4, 6, and 8. These results are listed in Table 7. Out of a possible 100 two-group comparisons for measure L in all sets, two were significant at the five percent level and three were significant at the one percent level. Inasmuch as there were no discernable trends in these differences and as this number of differences would not deviate significantly from expectancy in 100 independent comparisons, no differences were considered demonstrated.

The T values were calculated for all two-group comparisons in sets 6, 7, and 8 for measure R. These are listed in Table 8. Out of a possible 100 two-group comparisons, three were significant at the five percent level of confidence and one was significant at the one percent level. For the same reasons as in measure L no differences were considered demonstrated in this case.

TABLE 8

T VALUES BETWEEN TWO-GROUP COMPARISONS ON MEASURE R FOR SETS 6, 7, AND 8

Set 6

Group	C-2	E-2	C-3	E-3
C-1	18	27	25	24
C-2		22	21	15**
E-2			24	24
C-3				16*

Set 7

Group	C-2	E-2	C-3	E-3
C-1	22	25	16*	27
C-2		22	24	24
E-2			19	27
C-3				20

Set 8

Group	C-2	E-2	C-3	E-3
C-1	21	26	16*	28
C-2		22	24	24
E-2			19	26
C-3				20

* A T value this small or smaller would be expected by chance less than five percent of the time.

** A T value this small or smaller would be expected by chance less than one percent of the time.

The T values were calculated for all two-group comparisons in sets 1, 4, 5, 6, 7, and 8 for measure G. These values are shown in Table 9. In this case there were a sufficient number of differences between groups and indications of trends to conclude that differences had been demonstrated. Group E-3 had consistently longer goal response times than groups C-3 and C-1 throughout phase II. That is, the non-rewarded group changed to the larger tube in phase II had consistent significantly longer goal response times than both rewarded groups changed to different tube sizes in phase II. However, the interpretation of this trend is attenuated by a large variability difference between these groups during phase I. This difference is indicated in Figure III. This apparent difference between the E-3 curve and curves for the other groups must be attributed to variability differences because the significance tests did not demonstrate a difference between their means. Accordingly, the significantly higher mean goal response time of group E-3 from groups C-1 and C-2 during phase II, might conceivably be due to variability differences between these same groups during phase I.

Figure III indicates a similar situation in the case of group E-1. However, this group did manifest a difference in mean performance from groups E-2 and C-3 during the first set of five trials. This result must be considered in evaluating the rapid extinction of group E-1 during phase II.

TABLE 9

T VALUES BETWEEN TWO-GROUP COMPARISONS ON MEASURE G FOR SETS 1, 4, 5, 6, 7, AND 8

Set 1

Group	E-1	C-2	E-2	C-3	E-3
C-1	18	27	20	22	24
E-1		18	16*	16*	20
C-2			20	24	24
E-2				26	21
C-3					21

Set 5

Group	C-2	E-2	C-3	E-3
C-1	26	22	21	22
C-2		23	27	21
E-2			22	27
C-3				16*

Set 4

Group	E-1	C-2	E-2	C-3	E-3
C-1	18	22	22	22	23
E-1		17*	18	15**	23
C-2			25	26	18
E-2				25	19
C-3					15**

Set 6

Group	C-2	E-2	C-3	E-3
C-1	28	24	26	17*
C-2		24	27	18
E-2			24	20
C-3				15*

Set 7

Group	C-2	E-2	C-3	E-3
C-1	27	27	25	17*
C-2		25	27	19
E-2			20	19
C-3				15*

Set 8

Group	C-2	E-2	C-3	E-3
C-1	28	27	21	21
C-2		27	23	23
E-2			19	23
C-3				17*

* A T value this small or smaller would be expected by chance less than five percent of the time.

** A T value this small or smaller would be expected by chance less than one percent of the time.

Only one significant H value was found in the individual analyses for trials 15, 16, and 17. This was found in measure R on trial 16. These means are graphed in Figure V. A two-group difference analysis for trial 16 is shown in Table 10. Group C-1 had significantly longer running times than all other groups except E-3 on this trial. The large difference between group E-3 and all others apparent on trial 16 in Figure I must be attributed to variability differences.

The number of trials for each subject to massed extinction in phase IIIis listed in Table 11 with the medians for each group indicated. The remaining animal in group E-1 met the phase III extinction criterion on the first trial in this phase.

Figure V. Running Time Curves(R) for Trials 15, 16, and 17

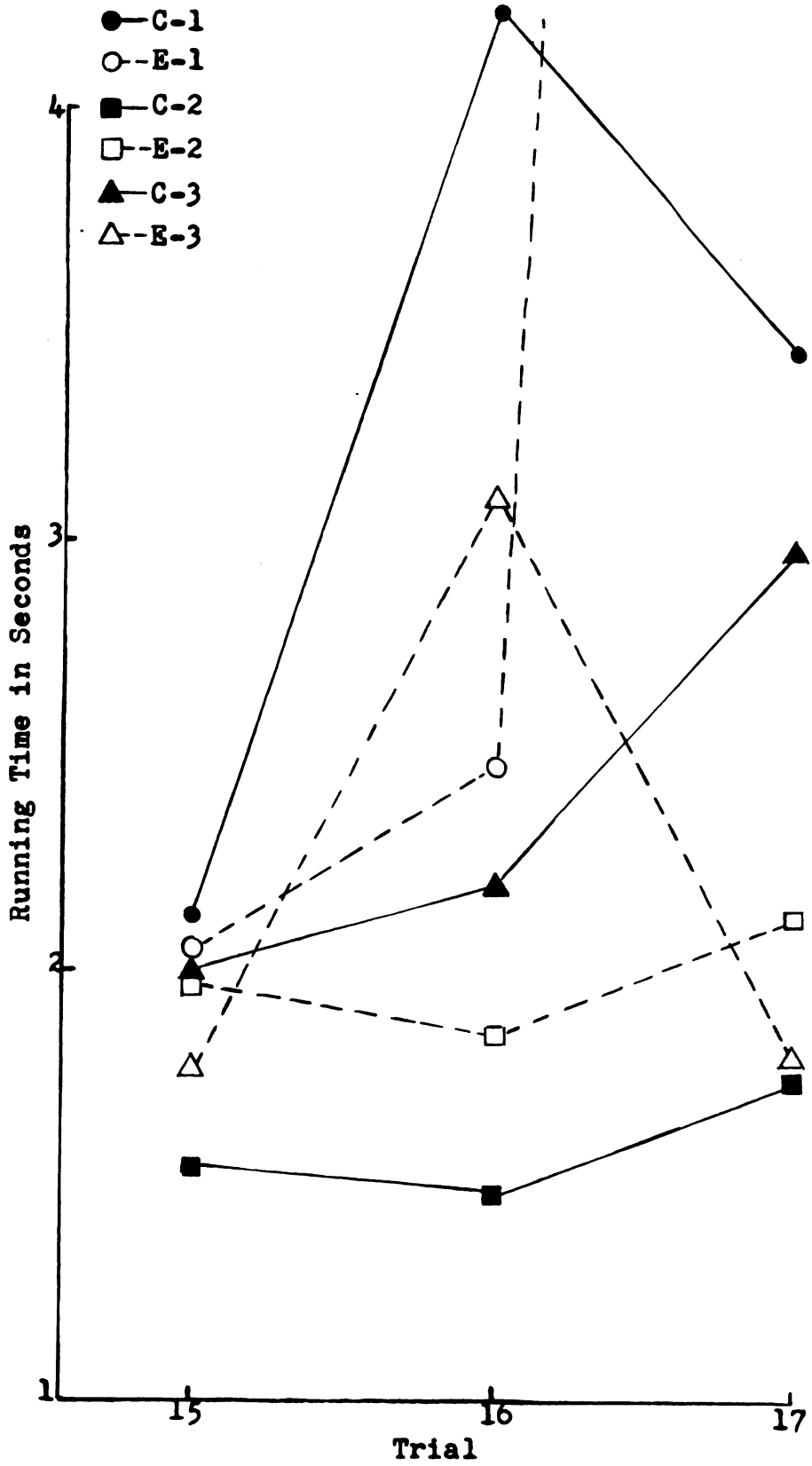


TABLE 10

T VALUES BETWEEN TWO-GROUP COMPARISONS ON MEASURE R ON TRIAL 16

Group	E-1	C-2	E-2	C-3	E-3
C-1	17*	15**	15**	17*	20
E-1		18	23	26	23
C-2			24	21	23
E-2				25	26
C-3					26

* A T value this small or smaller would be expected by chance less than five percent of the time.

** A T value this small or smaller would be expected by chance less than one percent of the time.

TABLE 11

NUMBER OF TRIALS TO MASSED EXTINCTION

Group C-1	C-2	E-2	C-3	E-3
7	7	2	3	4
2	10/	10	10/	5*
1	10/	1	3	1
3*	10/*	6*	9*	10/
4	10/	8	10	10

* median values

IV. DISCUSSION OF RESULTS

The results permit only tentative conclusions. The number of subjects was too small, in view of the extreme variability obtained in the time data, to allow a more powerful statistical analysis of the data. A more appropriate analysis would be a two-way analysis of covariance with the covariance correction made for body weight. Such an analysis would require a much larger amount of data with several successive constant conversions of the time measures.

There is a general indication in these present data that extinction of the various responses was more a function of change in tube diameter than of the removal of reward. This is indicated in the rapid extinction of group E-1 and by the significantly higher goal response times of group E-3 during phase II. These were the groups that had no reward and were changed to different diameter running tubes during phase II. Group E-2, which had no reward but ran in the same diameter tube during phase II, showed no evidence of extinction. However, we must consider the possibility that the result in group E-1 and E-3 might have been due to the apparent variability difference between these two groups and the remaining groups on goal response time during phase I.

The extinction of the E-1 group might be attributed to a significant change in the responses necessary to enter and negogiate a smaller tube. The C-1 group which was also changed to the smaller tube, but continued to be rewarded, had

significantly higher running response times than some groups at the trial where the change in tubes took place. This group also showed significantly higher response latency times than some groups during the first trial series of phase II. However, this significant difference is suspect for reasons indicated earlier. These tendencies were not apparent in the E-1 group even though both the E-1 and C-1 groups had been treated in an identical fashion to this point in the experiment.

The relatively greater decrement in response for group C-1 was also indicated in the phase III data. This group appeared to extinguish under the massed trials of phase III faster than all other remaining groups even though some of these latter subjects had experienced 25 non-rewarded trials previous to phase III.

The responses observed in this experiment were extremely stable once they were initiated. Undoubtedly, the wide spacing of trials contributed to this stability. However, the fact remains that when there were no other changes in experimental conditions concurrent with the removal of reward, there was no evidence of extinction after 25 spaced non-rewarded trials when the response had been acquired under only 15 rewarded trials.

It had been hoped that there would be an increase in the various time measures for the groups changed to the larger diameter tube. This was only tentatively indicated with

group E-3 on the goal response measure and group C-3 manifested no comparable increase. In no case during phase II did a subject reverse his direction in the large diameter tube even though this was a physical possibility for some subjects.

To summarize, it was tentatively indicated that the change in tube size, which constituted a change in stimulus conditions and required a modification of the acquired response, was a more important factor in extinction than was the removal of reward. This conclusion is limited to this specific experimental situation in which a very circumscribed set of responses were possible and under conditions of widely spaced acquisition and extinction trials. This conclusion is consistent with the expectancies of the interference viewpoint which, at least theoretically, does not regard the reward as an any more significant part of the experimental situation than other stimulus aspects. A possible interpretation would be that a response, acquired under as limited stimulus and performance conditions as in the present study, might require more than the stimulus change of removal of reward in order to extinguish. That is, food removal was too insignificant a stimulus difference between phases I and II to be readily discriminable. Also, the rate of extinction was further increased by change to a smaller diameter tube. There is an indication that this tube may have elicited a different set of responses than the larger acquisition tube.

V. SUMMARY

The subjects were thirty experimentally naive albino rats. The apparatus was a glass tube straightway placed in an enclosure that provided constant luminance without gradients within the tubes and end boxes. Different diameter glass tubes were interchangeable in the apparatus.

Subjects under food deprivation were trained to run a medium diameter tube to a food reward with trials spaced every 24 hours for 15 days. One group of subjects was subsequently run in the apparatus every 24 hours for 25 days with no reward present. One subgroup of these subjects was run through the same glass tube and others changed to a larger diameter tube or to a smaller diameter tube. Other subjects continued running to reward to provide controls in a balanced design. The same deprivation level was maintained. Subsequently, the responses of all subjects were extinguished with massed non-rewarded trials.

The experiment was designed to test the possibility that a unique apparatus and procedure might provide a better framework in which to evaluate the implications of an interference theory of extinction. The apparatus was designed to provide a straightway running response that involved a far more limited set of responses than a conventional straight alley The extinction trials were much wider spaced than in conventional procedures.

The data in the present study suggested the tentative conclusion that removal of reward in this situation was a far less important factor in producing experimental extinction than other changes in the stimulus situation which required a modification in the performance of an acquired response.

BIBLIOGRAPHY

1. Adelman, H. M. and Maatsch, J. L. Resistance to Extinction as a Function of the Type of Response Elicted by Frustration. Journal of Experimental Psychology. 50(1955), pp. 61-65.

2. Behan, R. A. oral communication, 1953.

3. Denny, M. R. and Adelman, H. M. Elicitation Theory: I An Analysis of Two Typical Learning Situations. Psychological Review. 62(1955), pp. 290-296.

4. Denny, M. R. and Adelman, H. M. Elicitation Theory: II The Formal Theory and its Application to Instrumental Escape and Avoidance Conditioning. unpublished manuscript.

5. Guthrie, E. R. The Psychology of Learning. New York: Harper, 1935.

6. Gwinn, Gordon F. Resistance to Extinction of Learned Fear-Drives. Journal of Experimental Psychology. 42 (1951), pp. 6-12.

7. Hull, C. L., Principles of Behavior. New York: D. Appleton Century, 1943.

8. Kruskal, W. H., and Wallis, W. A. Use of Ranks in One-Criterion Variance Analysis. Journal of the American Statistical Association. 47(1952), pp. 583-621.

9. Liberman, Alvin M. The Effect of Differential Extinction on Spontaneous Recovery. Journal of Experimental Psychology. 38(1948), pp. 722-733.

10. McClelland, David C., and McGown, D. R. The Effect of Variable Food Reinforcement on the Strength of a Secondary Reward. Journal of Comparative and Physiological Psychology. 46(1953), pp. 80-86.

11. Maatsch, J. L. Reinforcement and Extinction Phenomena. The Psychological Review. 61(1954), pp. 111-118.

12. Maatsch, J. L., Adelman, H. M., and Denny, M. R. Effort and Resistance to Extinction of the Bar-Pressing Response. The Journal of Comparative and Physiological Psychology. 47(1954), pp. 47-50.

13. Pavlov, I. P. Conditioned Reflexes (Translated by G. V. Anrep. London: Oxford University Press, 1927.

14. Rohrer, John H. Experimental Extinction as a Function of the Distribution of Extinction Trials and Response Strength. Journal of Experimental Psychology. 37 (1947), pp. 473-493.

15. Sheffield, V. F. Extinction as a Function of Partial Reinforcement and Distribution of Practice. Journal of Experimental Psychology. 39(1949), pp. 511-526.

16. Sheffield, V. F. Resistance to Extinction as a Function of the Distribution of Extinction Trials. Journal of Experimental Psychology. 40(1950), pp. 305-313.

17. Spence, K. W. Theoretical Interpretations of Learning. in: Handbook of Experimental Psychology. Edited by S. S. Stevens. New York: John Wiley and Sons, Inc., 1951, pp. 690-729.

18. Stanley, W. C. Extinction as a Function of the Spacing of Extinction Trials. Journal of Experimental Psychology. 43(1952), pp. 249-260.

19. Teichner, W. H. Experimental Extinction as a Function of the Intertrial Intervals during Conditioning and Extinction. Journal of Experimental Psychology. 44 (1952), pp. 170-177.

20. Weinstock, S. Resistance to Extinction of a Running Response following Partial Reinforcement under Widely Spaced Trials. The Journal of Comparative and Experimental Psychology. 47(1954), pp. 318-322.

21. Wells, R. H. Resistance to Extinction as a Function of the Number of Blocks of Fixed Ratio Reinforcement. Unpublished M. A. Thesis. Michigan State College, 1952, 32 pages.

22. White, C. The Use of Ranks in a Test of Significance for Comparing Two Treatments. Biometrics. 8(1952), pp. 33-41.

23. Wilson, W., Weiss, E. J., and Amsel, A. Two Tests of the Sheffield Hypothesis Concerning Resistance to Extinction, and Distribution of Practice. Journal of Experimental Psychology. 50(1955), pp. 51-60.

APPENDIX

EXPERIMENTAL DATA

Subject 1. Age- 225 days. Initial weight - 380 grams.
Running Direction - right to left. Phase II tube - 72 mm.
Phase II - rewarded. Section 1.

Trial no.	Weight (grams)	L	R (seconds)	G	Trial no.	L	R (seconds)	G
1	320	30.2	5.0	1.9	41	9.3	1.2	1.1
2	315	18.2	2.7	.4	42	6.5	1.1	1.0
3	310	20.9	2.2	5.4	43	5.3	1.2	.9
4	305	10.5	1.9	3.7	44	2.7	1.2	.9
5	310	6.4	1.4	3.6	45	4.2	1.0	.9
6	310	12.6	1.2	20.0	46	5.4	1.0	.9
7	305	8.8	1.8	25.1	47	1.5	1.0	.9
8	310	14.6	2.6	4.9	48	13.5	1.1	1.0
9	315	9.0	1.7	3.1	49	3.0	1.3	.9
10	315	7.2	1.3	2.3	50	23.3	1.3	4.8
11	310	30.0	1.9	2.2				
12	315	11.8	1.3	2.8				
13	310	20.8	.9	2.1				
14	315	16.7	1.7	5.8				
15	315	8.6	1.1	1.9				
16	315	3.3	1.0	1.5				
17	320	10.9	1.2	1.7				
18	320	5.6	1.8	1.5				
19	320	9.1	.9	4.5				
20	320	20.9	1.3	1.8				
21	320	55.0	2.2	3.4				
22	320	59.8	2.1	1.4				
23	305	9.6	1.1	1.1				
24	320	10.3	1.4	1.5				
25	320	5.1	1.8	1.5				
26	320	4.9	1.5	1.1				
27	320	8.2	1.5	1.7				
28	320	8.1	1.6	1.2				
29	320	7.4	1.2	1.4				
30	325	3.9	1.3	2.1				
31	320	9.4	1.1	1.3				
32	315	8.0	1.1	2.2				
33	300	2.1	1.4	1.4				
34	330	6.4	1.4	1.4				
35	325	1.8	1.6	1.4				
36	325	3.1	1.5	1.4				
37	315	2.7	1.6	1.9				
38	320	1.8	1.7	1.5				
39	320	1.8	2.2	1.8				
40	320	3.2	2.4	1.2				

Subject 2. Age - 225 days. Initial weight - 435 grams
Running direction - right to left. Phase II tube-62 mm.
Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	365	51.5	7.7	97.9
2	365	88.1	10.2	1.1
3	360	25.1	11.0	14.4
4	350	162.2	11.9	15.0
5	355	160.0	10.4	13.7
6	345	24.1	8.1	21.9
7	350	33.0	3.9	14.0
8	345	19.8	3.4	3.9
9	345	20.9	1.4	4.6
10	355	7.1	2.0	17.1
11	345	9.2	3.5	7.3
12	350	42.6	4.0	6.3
13	350	14.4	3.2	9.7
14	350	7.0	2.7	9.1
15	345	7.1	2.3	10.9
16	345	25.4	2.1	4.0
17	345	41.5	7.1	9.0
18	355	181.4	5.5	17.9
19	350	130.4	7.6	7.4
20	345	300.0		
21	350	224.2	16.9	101.9
22	345	300.0		
23	355	300.0		

Subject 3. Age - 220 days. Initial Weight - 455 grams
Running direction - left to right. Phase II tube - 72 mm.
Phase II - rewarded. Section 1.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G	Trial no.	L (seconds)	R (seconds)	G
1	385	13.4	74.8	6.6	41	8.2	2.2	1.6
2	385	149.9	229.4	1.8	42	5.0	1.7	1.5
3	375	300.0	27.8	12.9	43	1.6	1.8	3.8
4	375	78.1	13.8	5.7	44	1.7	3.8	3.5
5	375	30.7	9.7	6.0	45	1.6	1.4	5.2
6	365	17.8	2.5	3.9	46	2.3	1.8	1.2
7	365	7.1	1.3	3.1	47	5.4	2.1	2.2
8	365	8.7	2.4	3.7	48	1.3	2.0	1.5
9	365	7.4	2.4	7.0	49	1.7	2.0	1.6
10	365	13.1	2.1	8.4	50	3.8	2.2	3.5
11	370	5.0	2.1	6.6				
12	365	5.6	2.5	6.7				
13	360	12.9	2.1	6.3				
14	365	4.4	2.3	2.5				
15	365	1.7	1.9	3.6				
16	365	2.6	2.6	2.7				
17	365	14.1	2.2	4.8				
18	365	18.3	3.1	5.3				
19	370	12.8	2.2	2.9				
20	365	8.4	2.1	3.0				
21	365	8.9	2.7	4.0				
22	365	8.3	2.1	3.4				
23	365	6.7	3.0	4.6				
24	365	5.7	1.9	3.1				
25	365	40.8	25.6	9.5				
26	370	43.8	3.2	4.0				
27	365	15.7	2.1	22.6				
28	370	7.2	2.5	3.4				
29	370	11.5	1.9	5.2				
30	370	9.9	2.3	2.7				
31	370	9.6	1.7	2.7				
32	365	2.7	2.5	3.0				
33	340	2.8	3.4	2.4				
34	375	4.8	2.6	5.7				
35	365	4.6	3.8	2.6				
36	370	17.9	2.0	4.9				
37	355	4.1	2.2	2.1				
38	365	1.6	2.2	1.6				
39	365	11.9	3.3	3.4				
40	365	4.8	2.9	2.0				

Subject 4. Age - 220 days. Initial Weight - 440 grams
Running direction - right to left. Phase II tube - 82mm.
Phase II - rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	365	29.6	11.4	97.8
2	360	131.8	87.1	4.5
3	355	300.0	9.4	3.6
4	360	135.1	12.7	7.9
5	350	69.0	2.8	4.1
6	350	21.6	2.8	5.0
7	345	13.0	4.9	4.2
8	355	63.3	6.1	8.0
9	350	7.8	1.4	3.6
10	350	4.6	2.6	3.2
11	355	6.3	2.1	3.8
12	350	2.1	2.4	2.0
13	350	1.5	2.4	2.6
14	355	3.6	2.4	3.2
15	360	1.6	2.2	2.3
16	355	2.4	1.0	4.8
17	350	19.0	6.5	9.4
18	355	4.0	2.4	2.2
19	355	3.3	2.8	3.0
20	355	2.6	2.5	1.4
21	355	1.9	2.2	1.5
22	355	1.3	1.8	1.8
23	355	1.8	2.1	1.9
24	355	1.2	1.7	1.4
25	355	2.2	2.2	2.4
26	355	6.9	2.1	5.2
27	360	1.3	1.7	3.0
28	355	1.4	2.0	2.2
29	355	6.7	6.5	10.2
30	360	2.6	2.2	1.6
31	355	9.4	5.1	7.3
32	350	1.2	2.0	1.8
33	325	3.5	1.8	1.3
34	370	3.0	3.2	2.4
35	360	2.1	4.0	2.3
36	360	1.3	2.6	1.2
37	350	3.8	1.8	1.6
38	350	1.0	1.5	2.5
39	355	1.2	1.9	1.9
40	360	1.0	2.4	2.4
41		4.1	3.6	1.4
42		3.6	2.2	1.9
43		2.6	2.1	1.1
44		3.8	3.5	5.1
45		1.5	1.8	1.1
46		1.0	5.0	1.3
47		5.1	4.4	1.2
48		19.4	1.2	1.2
49		14.3	13.5	6.9
50		60.0		

Subject 5. Age 220 days. Initial Weight - 420 grams. Running direction - left to right. Phase II tube - 82 mm. Phase II - rewarded. Section I.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	360	37.6	104.8	1.8	41	2.0	2.0	2.1
2	355	147.1	33.4	3.7	42	1.4	1.2	1.0
3	350	81.1	3.3	3.5	43	1.9	1.3	1.0
4	345	40.6	7.2	3.6	44	5.6	1.3	.8
5	340	6.2	2.1	5.7	45	1.3	1.4	4.5
6	335	6.0	2.0	2.2	46	1.0	1.5	1.1
7	330	1.8	1.8	1.8	47	1.3	1.5	3.1
8	335	7.4	1.8	4.5	48	2.2	1.5	3.4
9	330	2.0	1.9	3.6	49	2.4	1.6	3.6
10	335	4.3	2.0	3.1	50	1.0	2.9	1.2
11	335	4.2	1.8	2.3				
12	335	1.8	1.5	1.9				
13	325	4.9	2.0	1.7				
14	325	1.9	1.9	2.9				
15	340	.9	1.8	1.2				
16	325	5.3	2.2	3.5				
17	335	2.9	1.7	3.2				
18	340	1.9	1.9	2.2				
19	330	1.4	1.8	1.0				
20	340	1.7	1.4	1.4				
21	340	.8	1.5	2.4				
22	335	1.0	1.5	1.3				
23	330	3.8	1.3	3.4				
24	330	1.4	1.4	1.5				
25	325	1.5	1.9	1.9				
26	335	1.4	2.6	1.7				
27	335	2.3	1.7	3.7				
28	335	2.8	1.6	2.7				
29	330	1.1	1.7	2.4				
30	340	1.8	1.3	4.9				
31	335	1.4	1.3	3.1				
32	340	2.5	1.8	2.0				
33	310	1.4	1.5	1.5				
34	340	1.2	1.3	1.7				
35	340	1.9	1.7	1.9				
36	340	3.5	1.6	1.5				
37	340	6.1	1.7	1.2				
38	335	1.5	1.2	5.1				
39	335	2.5	2.6	1.9				
40	340	2.3	1.5	1.7				

Subject 6. Age - 220 days. Initial weight - 360 grams
Running direction - left to right. Phase II tube - 62 mm.
Phase II - rewarded. Section I.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	305	12.9	6.2	4.0	41	49.9	1.9	1.7
2	300	10.3	7.9	3.2	42	26.6	1.8	1.2
3	305	18.8	5.1	4.9	43	3.4	1.3	1.2
4	300	5.2	2.7	2.3	44	1.5	1.4	1.0
5	300	5.9	2.1	1.9	45	2.6	1.5	.8
6	300	9.1	2.4	7.4	46	1.1	1.2	1.2
7	300	2.7	2.3	4.7	47	60.0		
8	295	2.6	2.2	4.6				
9	295	3.5	1.9	5.6				
10	305	5.8	1.6	4.3				
11	310	2.2	1.8	2.6				
12	305	2.1	2.0	2.4				
13	290	2.2	1.4	9.4				
14	305	4.0	2.1	5.0				
15	300	1.2	1.6	2.4				
16	300	9.5	5.1	5.7				
17	300	10.4	5.0	2.1				
18	310	11.4	3.1	2.8				
19	305	5.0	2.9	3.1				
20	300	2.5	2.5	1.9				
21	300	3.0	3.5	3.4				
22	305	5.7	2.2	1.8				
23	310	13.7	2.1	2.4				
24	305	6.9	2.5	1.2				
25	305	3.7	2.2	3.0				
26	310	3.3	2.6	3.6				
27	305	7.3	1.6	1.3				
28	305	2.1	1.7	1.2				
29	305	2.7	2.3	3.2				
30	305	2.3	1.4	1.3				
31	305	2.6	1.6	1.5				
32	305	1.6	2.1	2.1				
33	290	3.1	1.7	1.3				
34	310	1.3	1.5	1.2				
35	310	5.4	1.9	1.3				
36	310	1.5	2.8	1.4				
37	310	1.2	1.7	1.4				
38	305	4.1	1.8	2.8				
39	310	1.0	2.5	1.6				
40	310	2.5	2.0	5.5				

Subject 7. Age - 195 days. Initial weight- 415 grams
Running direction - right to left. Phase II tube - 82 mm.
Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	355	14.9	17.6	10.8	41	10.1	7.0	13.0
2	350	51.1	37.2	3.0	42	4.9	1.6	3.2
3	345	78.1	14.6	5.1	43	1.1	3.1	5.2
4	345	135.3	18.1	4.1	44	2.0	1.8	4.4
5	340	123.3	46.3	5.6	45	4.6	3.0	5.0
6	340	32.9	29.4	11.5	46	3.9	7.5	9.2
7	340	76.1	6.2	8.7	47	15.8	7.1	10.4
8	335	90.5	4.2	10.1	48	7.4	30.7	7.9
9	335	77.1	3.4	6.0	49	20.1	11.0	8.7
10	340	17.6	13.4	65.5	50	60.0		
11	335	16.8	4.3	4.6				
12	335	8.3	2.6	3.4				
13	335	6.4	3.3	5.2				
14	335	5.0	2.1	3.6				
15	330	4.7	2.1	2.2				
16	330	5.9	8.5	5.8				
17	330	6.4	3.9	2.7				
18	335	10.1	4.3	8.0				
19	335	7.6	4.5	10.5				
20	330	2.8	2.4	9.8				
21	335	2.6	2.1	5.6				
22	330	3.5	1.2	2.7				
23	330	4.4	2.3	7.5				
24	330	1.4	3.6	5.1				
25	330	3.8	3.6	14.2				
26	335	7.9	5.4	16.5				
27	335	2.0	4.2	28.5				
28	335	2.2	4.3	13.6				
29	335	4.7	4.7	4.7				
30	335	1.6	2.7	5.6				
31	330	5.4	3.2	6.1				
32	335	1.9	2.5	5.3				
33	310	1.8	2.1	6.3				
34	340	2.1	5.7	8.6				
35	335	2.8	2.6	2.8				
36	335	1.3	1.9	2.8				
37	330	2.1	2.6	6.5				
38	330	2.9	3.1	19.1				
39	335	.9	3.7	2.3				
40	335	6.9	7.7	26.0				

Subject 8. Age - 190 days. Initial weight - 365 grams
Running direction - left to right. Phase II tube - 82 mm.
Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	305	16.2	6.7	2.9	41	1.2	2.0	4.3
2	300	19.9	5.3	1.6	42	1.4	4.1	21.7
3	305	6.3	4.9	3.3	43	1.6	5.7	23.7
4	300	5.9	2.2	4.1	44	4.3	3.3	60.0
5	295	5.5	2.0	5.4				
6	295	4.7	3.1	2.9				
7	285	1.9	1.3	2.1				
8	290	7.1	1.7	2.5				
9	290	2.5	2.2	3.3				
10	295	1.3	1.8	1.4				
11	290	4.2	1.2	2.7				
12	300	.7	1.1	2.3				
13	295	.8	1.0	1.2				
14	300	.9	1.2	1.8				
15	290	.6	1.1	1.7				
16	290	3.5	1.4	1.4				
17	295	.6	.3	2.5				
18	315	.7	1.1	16.2				
19	300	1.6	1.0	4.7				
20	295	.7	1.1	12.0				
21	295	8.1	.9	3.9				
22	295	.5	1.1	2.4				
23	295	1.1	1.0	1.4				
24	300	.7	1.0	15.0				
25	295	.9	.8	21.9				
26	300	4.5	2.4	7.3				
27	300	.7	4.4	13.2				
28	300	.7	1.3	28.3				
29	300	1.1	18.2	52.3				
30	300	1.0	2.2	15.5				
31	295	.9	2.6	15.9				
32	300	.9	2.0	47.1				
33	275	12.4	7.1	12.3				
34	305	1.4	1.8	3.8				
35	310	5.2	2.3	10.9				
36	300	5.8	1.5	2.4				
37	300	2.9	1.2	3.4				
38	295	.9	.9	1.7				
39	300	.7	1.0	1.8				
40	300	.7	2.0	12.1				

Subject 9. Age - 175 days. Initial weight - 400 grams
Running direction - left to right. Phase II tube - 72 mm.
Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	350	21.8	5.6	3.9	41	4.5	4.6	6.6
2	345	18.4	6.3	2.7	42	1.3	3.8	2.7
3	340	37.0	4.2	5.9	43	1.2	13.8	6.8
4	335	11.8	3.3	4.4	44	2.3	4.6	6.8
5	330	19.0	4.1	5.5	45	6.2	38.3	3.0
6	335	7.0	3.0	4.5	46	13.6	11.1	1.4
7	325	4.2	2.3	2.0	47	58.3	2.5	1.8
8	335	2.1	2.0	2.2	48	9.8	2.0	3.2
9	330	1.4	1.6	3.7	49	6.5	1.9	1.7
10	330	1.2	2.1	3.1	50	60.0		
11	335	4.6	2.6	3.8				
12	335	1.0	2.3	2.2				
13	330	3.1	3.4	8.4				
14	330	.7	2.8	6.1				
15	325	1.0	2.2	8.0				
16	320	1.3	2.6	6.0				
17	330	1.3	2.8	13.0				
18	335	19.3	6.3	10.5				
19	330	1.3	2.5	6.2				
20	330	9.3	3.5	6.2				
21	325	5.1	6.6	10.4				
22	325	2.5	3.1	11.9				
23	325	1.9	3.2	4.2				
24	325	1.2	3.2	12.2				
25	325	8.5	3.0	3.1				
26	330	7.9	9.1	6.5				
27	325	3.1	3.6	10.7				
28	330	4.4	6.4	5.9				
29	325	6.3	5.3	9.4				
30	330	3.5	4.8	8.9				
31	330	1.2	2.2	5.0				
32	320	6.3	2.8	7.6				
33	300	1.1	2.9	2.4				
34	335	3.4	1.2	5.6				
35	330	.8	3.6	2.9				
36	325	9.2	10.0	5.0				
37	325	5.5	3.2	2.7				
38	320	.9	1.9	1.3				
39	320	4.1	3.0	2.9				
40	325	5.5	3.4	3.0				

Subject 10. Age - 170 days. Initial weight - 390 grams. Running direction - left to right. Phase II tube - 62 mm. Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	325	52.5	5.6	4.0
2	320	5.8	5.2	1.1
3	320	21.6	5.0	4.1
4	315	1.5	1.8	6.1
5	315	6.6	2.4	2.7
6	315	3.1	1.8	3.6
7	310	4.2	1.7	2.5
8	305	6.8	1.3	1.8
9	305	.8	1.2	5.8
10	300	5.0	1.5	1.8
11	300	5.6	1.3	3.3
12	305	3.6	2.0	5.9
13	310	2.1	1.6	3.3
14	310	6.8	2.6	4.2
15	305	10.6	1.1	5.1
16	305	2.5	1.9	78.2
17	300	300.0		
18	305	52.1	27.5	7.1
19	300	300.0		
20	300	300.0		

Subject 11. Age - 125 days. Initial weight - 340 grams. Running direction - left to right. Phase II tube - 72 mm. Phase II - non-rewarded. Section 2.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	300	149.0	35.0	4.0	41	56.2	2.1	1.4
2	295	285.4	3.0	2.0	42	60.0		
3	285	32.6	3.0	1.5				
4	285	300.0	2.6	1.3				
5	290	249.3	3.3	2.4				
6	285	179.3	2.8	2.7				
7	285	300.0	1.6	1.7				
8	285	188.9	1.3	1.7				
9	285	101.6	1.4	1.5				
10	280	15.7	1.1	1.5				
11	280	99.0	1.0	1.9				
12	285	4.1	1.1	1.1				
13	280	18.0	1.6	1.2				
14	275	4.9	1.0	1.0				
15	275	14.2	1.1	1.0				
16	285	4.3	.9	.9				
17	280	2.4	1.1	1.3				
18	280	5.3	1.2	.9				
19	280	1.2	1.9	1.0				
20	275	3.4	1.6	2.8				
21	280	5.3	1.3	1.7				
22	280	1.3	1.3	1.9				
23	275	4.7	1.0	1.9				
24	270	7.7	1.3	1.3				
25	280	1.4	1.4	1.3				
26	265	2.1	1.3	1.1				
27	270	14.4	1.0	1.2				
28	270	4.3	1.2	.9				
29	275	1.6	1.7	1.2				
30	265	22.5	.9	1.1				
31	280	3.8	1.6	1.0				
32	265	41.2	.9	1.0				
33	275	25.2	1.5	1.2				
34	275	25.7	1.4	1.0				
35	280	2.1	1.7	1.2				
36	285	6.4	1.6	4.3				
37	280	17.5	1.9	1.7				
38	285	9.0	1.4	1.2				
39	285	21.8	2.4	2.5				
40	280	12.5	1.7	2.0				

Subject 12. Age - 240 days. Initial weight - 390 grams. Running direction - right to left. Phase II tube - 62 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	340	30.4	5.8	3.7	41	3.5	4.0	28.2
2	340	13.6	5.0	4.2	42	.7	2.6	8.1
3	330	4.4	3.1	6.0	43	3.8	2.3	21.7
4	340	7.9	4.3	6.4	44	60.0		
5	325	12.0	2.3	3.1				
6	330	4.5	2.0	3.2				
7	330	7.8	1.5	4.1				
8	330	3.6	1.5	2.6				
9	325	3.7	1.8	2.4				
10	335	4.5	1.6	2.9				
11	325	4.7	1.6	2.1				
12	325	5.8	1.3	2.0				
13	325	1.2	1.3	1.6				
14	320	6.5	1.2	2.7				
15	325	4.2	1.4	2.9				
16	325	4.5	2.9	3.4				
17	320	7.8	2.0	2.9				
18	320	32.8	1.9	4.5				
19	320	5.5	1.5	5.5				
20	320	1.4	1.7	6.4				
21	320	1.2	1.4	7.0				
22	320	.8	2.5	3.6				
23	315	1.2	2.2	2.8				
24	315	1.5	1.4	2.1				
25	320	4.6	1.6	2.7				
26	310	1.5	1.3	2.0				
27	310	.8	1.3	2.1				
28	310	.8	1.6	1.6				
29	315	.9	2.5	1.4				
30	310	.9	1.5	1.0				
31	315	.9	1.5	2.3				
32	310	3.0	1.9	2.2				
33	310	1.9	1.4	1.9				
34	315	.8	1.2	.8				
35	320	.8	1.2	1.0				
36	320	4.4	3.8	4.4				
37	315	2.3	2.0	2.1				
38	320	1.0	1.4	1.7				
39	320	1.4	2.3	2.1				
40	315	.7	1.5	2.2				

Subject 13. Age - 285 days. Initial weight - 360 grams. Running direction - right to left. Phase II tube - 62 mm. Phase II - non-rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	315	46.5	5.1	7.3	41	60.0		
2	320	10.7	3.6	5.8				
3	295	8.9	2.8	5.1				
4	300	5.0	3.3	7.7				
5	305	2.6	1.8	3.4				
6	295	2.5	2.4	14.1				
7	305	5.2	2.4	18.4				
8	305	2,4	2.0	36.5				
9	295	2.5	1.5	5.8				
10	300	5.1	1.5	13.5				
11	300	1.8	1.1	5.3				
12	295	1.0	1.6	5.3				
13	295	1.0	1.6	4.5				
14	295	.9	2.2	4.5				
15	290	1.3	1.5	6.2				
16	305	1.1	2.2	7.4				
17	290	1.3	1.5	9.0				
18	300	1.5	1.7	14.3				
19	295	1.2	1.8	10.3				
20	290	1.6	2.7	4.0				
21	295	2.1	6.4	6.1				
22	300	3.1	3.0	20.6				
23	290	6.7	2.9	10.6				
24	295	2.9	2.3	5.4				
25	295	104.8	3.3	8.2				
26	280	11.1	2.4	3.4				
27	285	8.3	2.2	4.9				
28	290	7.7	3.4	5.1				
29	285	14.5	6.2	7.1				
30	290	7.2	2.3	4.9				
31	290	104.4	6.1	9.1				
32	290	5.0	3.7	5.4				
33	295	300.0						
34	290	115.4	1.6	3.2				
35	295	126.7	3.3	11.0				
36	295	262.2	2.9	5.8				
37	300	31.7	3.9	6.6				
38	300	8.3	2.5	2.8				
39	300	4.9	3.2	7.4				
40	300	8.9	2.6	6.9				

Subject 14. Age - 235 days. Initial weight - 410 grams. Running direction - right to left. Phase II tube - 72 mm. Phase II - non-rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	365	10.7	3.8	1.7	41	5.4	2.7	3.2
2	360	19.7	1.9	1.4	42	3.9	2.1	10.8
3	350	19.3	2.2	7.4	43	.9	3.8	33.4
4	355	5.3	1.9	5.1	44	8.3	5.1	20.1
5	345	6.3	1.6	3.8	45	5.4	5.3	13.6
6	345	3.2	2.1	4.2	46	60.0		
7	350	12.5	3.0	4.2				
8	350	10.6	3.2	4.0				
9	340	5.7	2.1	2.4				
10	345	7.4	2.4	7.0				
11	340	2.8	3.1	5.6				
12	335	5.6	2.6	7.7				
13	340	2.8	2.3	4.0				
14	340	4.2	2.6	3.1				
15	340	5.3	2.3	3.6				
16	335	1.9	2.5	9.3				
17	330	3.7	3.2	10.8				
18	335	3.2	3.7	13.8				
19	335	1.8	3.6	5.0				
20	330	4.0	4.1	2.8				
21	335	22.2	4.0	13.5				
22	335	5.9	3.7	6.3				
23	330	2.8	2.6	4.1				
24	330	7.1	5.9	13.3				
25	330	6.0	3.1	7.8				
26	320	17.7	2.4	3.4				
27	320	4.2	2.5	4.8				
28	325	2.6	3.2	12.5				
29	325	68.7	3.8	3.0				
30	320	3.5	2.9	7.9				
31	330	3.6	5.4	8.0				
32	325	2.3	3.3	7.0				
33	330	4.5	3.3	3.5				
34	325	1.3	3.1	2.8				
35	330	1.9	4.0	4.1				
36	325	2.1	3.5	6.6				
37	335	4.6	4.8	5.9				
38	330	6.2	4.5	9.9				
39	340	3.5	3.5	5.9				
40	325	11.6	3.0	4.6				

Subject 15. Age - 235 days. Initial weight - 380 grams. Running direction - left to right. Phase II tube - 72 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)
1	335	44.2	96.3	8.6
2	340	58.7	15.9	3.5
3	325	63.2	7.2	2.6
4	320	27.7	6.0	6.5
5	320	60.0	5.0	4.5
6	315	24.2	2.5	4.8
7	325	18.3	2.6	6.7
8	310	29.0	1.9	10.1
9	310	8.1	2.2	7.9
10	310	14.5	2.0	4.7
11	310	15.4	2.1	3.5
12	305	7.5	2.2	4.2
13	305	3.8	3.7	9.7
14	305	5.0	2.9	2.4
15	305	2.6	2.4	2.3
16	305	5.4	2.3	2.6
17	300	4.8	2.6	2.9
18	305	2.6	2.2	2.2
19	300	5.1	2.0	2.6
20	300	2.2	4.6	7.5
21	305	5.6	1.4	2.9
22	310	1.0	2.4	3.4
23	300	2.4	1.7	1.9
24	305	.8	2.1	5.5
25	300	.8	2.2	2.9
26	295	.7	1.7	2.8
27	290	.8	2.2	5.2
28	295	.7	1.2	3.0
29	295	1.2	3.1	3.6
30	290	.9	1.7	1.3
31	300	1.2	2.3	2.1
32	300	2.9	2.0	1.7
33	305	1.0	2.1	1.2
34	300	.9	2.0	1.8
35	315	.9	1.9	1.2
36	310	.7	2.3	5.0
37	310	4.7	3.8	6.0
38	305	3.3	2.1	4.4
39	320	5.4	2.7	8.6
40	305	1.1	3.9	3.3
41		19.3	3.6	6.9
42		12.2	4.4	19.4
43		33.8	5.7	8.3
44		17.6	4.5	9.0
45		10.6	3.9	5.5
46		12.9	4.8	5.3
47		60.0		

Subject 16. Age 235 days. Initial weight - 415 grams. Running direction - right to left. Phase II tube - 72 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	360	10.5	5.7	2.6	41	4.0	6.7	12.5
2	360	18.6	1.5	1.4	42	2.5	3.8	9.0
3	350	3.1	1.8	4.1	43	1.3	4.7	11.1
4	355	14.3	2.0	2.7	44	1.0	3.5	18.0
5	345	8.1	1.9	1.7	45	50.9	5.5	9.9
6	345	31.8	1.9	1.7	46	2.0	3.8	2.1
7	350	25.3	2.6	8.6	47	1.3	1.7	3.5
8	350	25.4	2.5	3.4	48	3.8	1.4	2.5
9	345	10.1	1.5	4.4	49	.8	1.6	2.3
10	345	11.8	1.6	2.7	50	.7	1.4	12.5
11	345	2.4	2.0	4.5				
12	340	1.6	2.0	5.3				
13	340	3.1	2.3	1.8				
14	340	2.3	1.8	5.8				
15	340	2.0	1.8	5.4				
16	340	6.3	1.7	4.4				
17	330	3.9	2.1	10.2				
18	335	11.0	2.5	7.0				
19	335	3.4	2.2	4.1				
20	330	3.8	4.1	7.0				
21	335	3.4	2.3	17.5				
22	340	3.9	2.2	9.2				
23	330	2.5	2.3	6.4				
24	330	1.4	2.3	7.7				
25	330	2.6	2.3	8.9				
26	320	1.6	2.0	6.0				
27	320	2.1	2.1	8.4				
28	325	.9	1.8	5.4				
29	325	3.0	2.5	5.8				
30	325	2.7	2.9	5.7				
31	335	1.7	2.3	11.9				
32	325	1.3	3.4	5.4				
33	330	3.6	6.7	13.0				
34	325	1.2	1.8	6.4				
35	340	3.2	2.2	13.3				
36	340	2.4	3.1	8.4				
37	330	1.3	2.5	7.2				
38	330	2.8	3.3	8.0				
39	345	2.1	4.6	15.3				
40	330	1.2	3.2	5.2				

Subject 17. Age - 235 days. Initial weight - 410 grams. Running direction - left to right. Phase II tube - 82 mm. Phase II - non-rewarded. Section II

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	365	17.4	4.7	5.1	41	26.8	4.1	5.9
2	360	16.8	4.6	6.9	42	9.1	3.1	2.6
3	350	23.6	5.5	4.7	43	8.1	4.8	12.9
4	360	88.9	31.0	5.7	44	21.9	15.7	1.9
5	350	79.9	10.9	10.9	45	32.5	60.0	
6	345	60.5	4.4	13.2				
7	355	58.8	3.5	5.9				
8	340	17.6	2.1	2.2				
9	340	6.3	2.5	4.0				
10	340	8.3	2.7	2.2				
11	340	4.9	2.3	2.6				
12	340	5.0	2.2	1.8				
13	335	1.0	2.2	2.2				
14	340	1.0	2.2	1.7				
15	340	1.4	2.0	1.9				
16	340	3.1	2.2	2.3				
17	335	2.6	1.7	2.8				
18	335	1.5	3.5	13.8				
19	335	1.2	2.0	5.6				
20	330	2.7	1.7	6.2				
21	335	1.9	1.5	3.5				
22	330	.9	2.2	7.3				
23	335	6.8	2.2	5.0				
24	335	5.8	2.0	6.8				
25	330	1.9	56.0	.9				
26	320	1.8	3.7	6.6				
27	320	1.2	3.3	4.2				
28	320	16.5	2.7	5.1				
29	325	.8	2.7	4.5				
30	330	8.8	2.6	13.6				
31	340	3.5	3.4	3.4				
32	330	.9	3.1	10.6				
33	330	1.0	2.1	6.5				
34	325	5.5	2.4	1.6				
35	340	2.8	4.3	6.2				
36	340	.9	1.9	8.0				
37	340	.8	3.0	8.0				
38	340	.9	5.4	8.0				
39	340	8.5	4.5	4.2				
40	335	1.3	4.0	3.2				

Subject 18. Age - 235 days. Initial weight - 375 grams. Running direction - left to right. Phase II tube - 62 mm. Phase II - non-rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	330	300.0	20.5	7.2
2	325	127.1	12.2	6.8
3	315	71.8	9.5	8.8
4	320	25.4	4.0	10.8
5	315	84.9	4.8	25.7
6	315	26.6	2.5	20.2
7	320	32.2	1.9	26.4
8	320	11.5	3.1	20.9
9	310	7.0	2.1	31.5
10	315	9.8	2.3	13.4
11	310	7.0	2.3	13.6
12	305	3.3	1.6	5.6
13	305	7.7	1.5	5.4
14	305	4.6	1.9	7.4
15	305	2.8	1.5	3.3
16	300	3.9	2.6	6.9
17	300	4.7	1.5	7.4
18	305	35.3	2.1	3.6
19	300	19.5	3.3	2.3
20	300	123.2	2.4	1.4
21	300	202.1	2.2	1.8
22	300	66.3	2.5	6.3
23	295	8.9	2.2	5.7
24	300	60.1	2.0	1.8
25	300	38.9	2.3	3.4
26	290	6.0	1.7	1.0
27	285	3.2	1.6	1.5
28	295	15.3	1.6	2.7
29	290	46.2	2.7	2.2
30	295	116.0	1.5	1.4
31	300	119.4	2.1	6.6
32	300	118.1	1.9	1.3
33	295	59.3	1.8	1.2
34	300	4.8	1.3	1.0
35	305	167.5	2.0	2.6
36	310	20.9	2.0	1.6
37	300	300.0		
38	305	300.0		

Subject 19. Age - 235 days. Initial weight - 350 grams. Running direction - left to right. Phase II tube - 82 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	315	8.8	4.3	1.8	41	12.0	10.6	2.8
2	315	21.7	10.2	1.5	42	51.8	3.5	4.1
3	300	61.1	4.2	4.5	43	60.0		
4	300	37.0	6.3	5.0				
5	305	35.4	3.1	3.1				
6	295	9.4	2.0	2.8				
7	305	21.4	2.6	2.2				
8	305	20.6	3.3	2.0				
9	290	18.4	2.0	2.7				
10	295	9.5	4.3	1.9				
11	295	5.4	2.0	2.5				
12	290	7.8	2.0	2.1				
13	290	6.0	1.6	2.1				
14	290	8.8	2.2	2.0				
15	290	2.9	2.3	2.3				
16	290	4.6	2.0	2.9				
17	285	8.5	2.3	2.1				
18	285	3.4	2.1	5.5				
19	285	2.9	2.2	3.3				
20	285	1.9	2.0	3.3				
21	290	4.7	1.8	1.9				
22	285	1.0	1.9	1.7				
23	285	2.2	1.3	2.8				
24	285	4.8	2.1	1.6				
25	285	2.4	1.8	3.4				
26	275	2.0	2.0	1.8				
27	275	3.7	1.7	1.4				
28	280	1.9	1.9	2.3				
29	280	2.0	2.4	1.9				
30	280	1.7	4.2	1.7				
31	285	2.8	3.4	2.6				
32	275	4.5	1.8	2.2				
33	285	4.3	2.6	6.6				
34	280	2.3	2.1	1.4				
35	285	4.8	2.7	1.1				
36	290	1.0	1.4	1.2				
37	280	1.6	1.9	2.1				
38	285	7.5	2.8	1.3				
39	290	3.2	2.6	1.6				
40	285	1.4	1.7	4.1				

Subject 20. Age - 145 days. Initial weight - 390 grams. Running direction - right to left. Phase II tube - 62 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	350	35.4	35.0	11.7	41	12.9	3.8	18.5
2	345	11.4	3.9	5.0	42	31.5	4.0	11.8
3	335	35.5	4.8	4.9	43	60.0		
4	335	22.2	9.6	5.2				
5	330	34.3	17.3	5.2				
6	330	75.5	6.5	7.4				
7	330	15.4	3.8	27.4				
8	330	44.2	3.3	8.6				
9	325	18.0	2.6	8.4				
10	325	10.3	2.1	5.7				
11	325	12.8	2.4	4.1				
12	320	7.8	2.1	3.6				
13	315	2.6	2.1	5.6				
14	320	11.4	3.8	2.6				
15	320	8.6	2.2	6.6				
16	325	18.6	3.0	5.8				
17	315	32.4	2.4	3.0				
18	320	45.1	2.4	7.7				
19	320	6.4	2.7	5.6				
20	315	4.6	2.8	4.1				
21	315	3.3	2.3	4.8				
22	315	9.2	8.7	5.0				
23	315	17.2	2.7	4.5				
24	320	17.3	3.7	3.8				
25	315	5.2	2.2	3.2				
26	305	7.6	1.9	3.5				
27	310	2.8	2.2	4.1				
28	310	5.6	2.1	2.9				
29	315	12.3	6.1	6.1				
30	305	1.3	3.1	7.1				
31	320	1.8	3.1	5.3				
32	310	1.6	2.2	5.0				
33	315	1.2	2.2	4.9				
34	315	.9	3.1	4.5				
35	315	8.9	2.5	4.5				
36	320	1.2	3.3	5.7				
37	315	1.2	4.3	4.1				
38	320	1.1	4.2	5.6				
39	325	1.8	3.0	10.4				
40	320	1.6	2.4	5.6				

Subject 21. Age - 175 days. Initial weight - 445 grams. Running direction - left to right. Phase II tube - 62 mm. Phase II - rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	380	300.0	54.6	1.4
2	380	300.0	3.3	8.6
3	380	300.0	3.9	2.3
4	375	243.2	9.2	3.4
5	375	300.0	10.0	2.5
6	375	75.6	3.9	2.3
7	370	109.8	3.2	2.2
8	370	74.1	3.7	1.9
9	365	26.7	2.6	1.6
10	365	49.7	3.4	2.6
11	360	12.0	2.7	1.6
12	355	9.8	2.4	1.4
13	355	17.7	2.8	1.6
14	360	7.6	2.4	1.4
15	355	8.1	1.8	2.0
16	350	22.6	5.5	1.8
17	355	34.4	3.2	2.4
18	355	30.9	3.9	1.7
19	350	36.9	2.3	1.5
20	355	7.3	2.8	1.8
21	350	9.7	3.1	1.8
22	355	10.2	3.1	4.9
23	350	6.8	3.2	1.9
24	350	8.8	3.0	2.5
25	355	8.2	3.6	3.3
26	355	9.3	4.0	3.8
27	350	9.8	3.9	4.7
28	355	12.2	3.4	2.3
29	345	4.4	3.3	2.2
30	350	7.8	3.7	2.7
31	355	2.6	5.4	14.6
32	350	2.4	3.9	4.6
33	355	3.3	3.0	2.1
34	350	1.7	2.4	1.5
35	350	3.2	3.1	1.6
36	355	7.0	5.3	3.8
37	350	2.0	2.4	2.5
38	350	3.9	3.0	2.5
39	355	8.0	3.6	4.3
40	360	2.9	3.2	3.4
41		11.9	3.2	1.7
42		60.0		

Subject 22. Age - 200 days. Initial weight - 340 grams. Running direction - right to left. Phase II tube - 72 mm. Phase II - rewarded. Section 3.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	285	20.3	41.3	2.2	41	4.7	2.0	4.8
2	295	34.6	3.7	8.9	42	1.9	1.8	8.9
3	290	156.4	2.5	3.1	43	1.9	1.4	6.0
4	290	9.2	1.4	3.2	44	1.3	2.1	3.2
5	290	12.0	1.3	2.1	45	6.6	3.0	6.3
6	290	8.5	1.6	1.4	46	6.2	3.2	20.0
7	285	6.5	1.6	2.3	47	27.5	2.2	7.5
8	285	9.8	1.7	2.3	48	54.2	4.2	10.2
9	280	4.3	1.2	2.1	49	30.8	3.5	4.9
10	285	7.8	1.7	3.1	50	4.7	4.9	4.5
11	285	9.3	1.5	1.7				
12	280	3.2	1.0	1.6				
13	280	2.8	1.6	1.9				
14	280	1.3	1.5	1.6				
15	275	1.4	1.3	1.1				
16	275	5.8	1.4	1.8				
17	270	1.3	1.6	1.8				
18	280	1.3	1.3	1.2				
19	275	.9	.7	1.1				
20	275	2.4	1.5	1.4				
21	275	1.2	1.3	1.9				
22	270	.7	.9	1.8				
23	270	.9	1.5	1.3				
24	275	1.0	1.2	2.1				
25	285	.8	2.2	6.6				
26	275	1.9	1.9	1.6				
27	270	1.1	1.5	1.9				
28	270	.8	1.1	1.7				
29	275	.7	1.0	3.0				
30	270	.8	2.0	1.6				
31	275	.6	1.8	2.0				
32	275	1.4	1.5	1.9				
33	275	.9	1.8	1.5				
34	270	.8	1.4	1.4				
35	265	.6	8.4	2.5				
36	255	41.3	2.0	3.3				
37	280	13.0	2.1	10.3				
38	285	10.5	2.6	3.8				
39	280	11.8	2.0	4.4				
40	280	3.9	2.0	2.4				

Subject 23. Age - 200 days. Initial weight - 415 grams. Running direction - right to left. Phase II tube - 62 mm. Phase II - rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	365	19.9	3.3	5.6	41	60.0		
2	365	32.9	3.0	4.6				
3	360	57.1	3.4	4.2				
4	360	85.9	55.8	4.9				
5	360	300.0	2.6	1.3				
6	355	300.0	2.5	2.4				
7	355	300.0	2.7	2.4				
8	355	300.0	2.1	1.2				
9	355	248.9	4.7	12.7				
10	355	271.4	4.1	2.7				
11	350	26.3	3.2	2.8				
12	350	14.1	3.3	6.0				
13	350	43.5	3.5	7.3				
14	350	5.2	3.1	8.1				
15	350	2.7	3.7	5.3				
16	350	23.6	4.6	4.6				
17	350	41.4	4.6	16.1				
18	345	26.8	3.1	9.8				
19	345	22.9	3.9	4.7				
20	345	9.1	3.5	8.9				
21	345	4.6	4.1	8.2				
22	340	10.9	3.4	6.5				
23	340	8.4	4.2	5.5				
24	340	28.6	3.5	5.6				
25	340	20.9	3.5	14.0				
26	345	13.1	3.6	6.0				
27	340	3.2	4.4	2.9				
28	335	6.6	3.4	4.0				
29	340	5.1	3.2	5.0				
30	340	8.0	3.4	2.7				
31	345	17.2	3.9	6.5				
32	340	12.3	3.6	3.5				
33	340	10.7	3.4	2.7				
34	340	117.0	41.9	6.8				
35	335	300.0						
36	340	191.6	19.1	6.3				
37	335	21.8	4.0	3.5				
38	340	49.9	3.3	6.1				
39	340	28.8	3.1	6.9				
40	340	27.3	4.7	3.7				

Subject 24. Age - 200 days. Initial weight - 475 grams. Running direction - right to left. Phase II tube - 72 mm. Phase II - non-rewarded. Section 3.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	410	155.3	44.4	2.5	41	3.3	2.6	5.5
2	410	300.0	3.9	2.3	42	1.7	2.1	3.9
3	405	300.0	3.8	1.7	43	4.4	2.4	5.8
4	400	209.9	29.2	6.1	44	1.2	2.8	4.0
5	395	300.0	6.7	3.2	45	.7	2.4	5.2
6	395	140.6	3.8	1.8	46	15.1	2.2	6.4
7	390	175.0	3.2	1.4	47	12.7	1.6	2.8
8	385	102.0	3.9	1.8	48	60.0		
9	385	54.0	3.6	5.5				
10	380	35.8	2.6	2.6				
11	375	10.8	2.6	1.7				
12	375	10.6	2.4	1.8				
13	370	5.6	2.2	2.0				
14	365	2.1	2.4	1.8				
15	365	1.2	2.4	2.4				
16	370	2.3	2.0	2.1				
17	375	10.6	2.0	2.5				
18	365	24.5	2.2	2.7				
19	360	13.2	3.0	3.7				
20	365	5.1	2.6	8.4				
21	360	2.4	3.5	4.6				
22	365	42.8	2.8	9.2				
23	365	6.9	2.0	4.6				
24	355	2.7	3.6	7.2				
25	365	7.6	3.2	6.7				
26	365	6.0	2.2	6.2				
27	365	6.1	1.8	8.1				
28	365	1.6	2.0	5.5				
29	365	5.4	1.7	6.9				
30	360	59.0	1.9	3.3				
31	365	6.7	1.6	2.7				
32	370	15.1	2.1	2.5				
33	370	3.8	2.2	2.3				
34	370	3.1	2.4	2.6				
35	365	9.2	2.4	6.1				
36	370	6.6	4.8	5.5				
37	370	10.0	3.8	3.0				
38	375	3.2	2.5	7.0				
39	370	133.3	2.5	5.1				
40	365	3.1	2.8	3.1				

Subject 25. Age - 200 days. Initial weight - 375 grams. Running direction - left to right. Phase II tube - 62 mm. Phase II - non-rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	320	46.0	4.0	2.5
2	320	31.5	18.9	7.1
3	315	111.1	300.0	22.5
4	315	69.5	57.2	29.1
5	315	230.5	300.0	76.8
6	315	192.0	126.7	47.2
7	310	194.0	12.8	22.4
8	310	44.6	7.5	40.0
9	310	15.5	4.6	14.5
10	305	14.3	5.0	8.8
11	300	8.6	4.0	7.0
12	300	12.6	3.4	6.6
13	295	2.9	3.6	6.0
14	295	3.0	3.7	5.3
15	300	2.7	3.7	5.4
16	295	2.8	3.6	5.0
17	290	1.9	4.9	9.8
18	300	9.8	4.0	46.6
19	295	2.5	4.8	14.0
20	295	9.7	7.4	9.0
21	295	116.4	4.9	10.8
22	295	76.0	5.0	17.2
23	295	2.4	4.9	22.4
24	295	5.2	3.5	14.7
25	300	5.4	7.1	9.9
26	300	4.3	5.3	16.1
27	295	4.1	3.6	13.8
28	295	3.7	4.1	6.0
29	295	66.2	4.1	4.2
30	290	61.5	2.7	4.2
31	305	99.0	3.8	22.1
32	295	78.7	3.9	9.3
33	300	3.3	3.7	27.9
34	300	12.3	4.6	21.5
35	300	20.0	7.0	32.2
36	295	12.3	7.2	76.0
37	295	60.8	7.8	64.7
38	295	300.0		
39	300	300.0		

Subject 26. Age - 185 days. Initial weight - 365 grams. Running direction - right to left. Phase II tube - 82 mm. Phase II - rewarded. Section 3.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	300	15.2	4.4	4.3	41	.9	1.9	6.9
2	305	13.9	88.8	1.7	42	1.2	3.0	5.4
3	305	300.0	85.5	1.1	43	.7	1.7	6.2
4	300	79.3	22.9	1.9	44	.8	2.3	10.1
5	300	42.6	2.5	4.4	45	13.5	2.0	4.0
6	300	19.5	2.3	2.0	46	5.3	5.0	5.7
7	300	22.8	1.8	1.9	47	2.9	2.1	7.7
8	300	20.6	2.7	3.5	48	1.9	3.4	6.1
9	290	9.0	1.7	2.1	49	60.0		
10	300	7.6	3.5	2.9				
11	300	12.1	2.0	2.6				
12	290	5.5	1.9	2.4				
13	295	2.4	1.6	2.3				
14	295	2.3	1.7	2.6				
15	295	2.3	2.1	2.0				
16	290	2.5	2.6	2.2				
17	300	3.4	2.3	9.0				
18	295	3.1	2.1	2.0				
19	290	2.2	1.3	2.7				
20	295	1.1	1.6	3.6				
21	285	6.6	1.6	3.0				
22	265	6.6	2.5	6.2				
23	300	2.0	1.8	2.7				
24	290	1.6	1.7	2.5				
25	295	4.6	1.8	3.2				
26	295	3.1	1.9	2.9				
27	295	5.8	2.7	3.8				
28	290	1.5	1.8	2.3				
29	290	1.5	1.8	2.1				
30	295	2.5	1.8	2.2				
31	295	2.0	1.8	1.8				
32	295	1.3	1.8	1.8				
33	295	1.0	1.5	1.8				
34	295	.6	1.7	1.3				
35	290	.6	1.6	1.1				
36	295	.9	2.1	1.5				
37	290	.8	1.3	1.2				
38	295	1.2	1.6	1.7				
39	295	2.0	2.0	4.8				
40	295	.8	1.8	1.2				

Subject 27. Age - 185 days. Initial weight - 395 grams. Running direction - right to left. Phase II tube - 82 mm. Phase II - non-rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	335	39.9	4.2	11.4	41	7.4	1.7	7.3
2	335	8.4	3.1	7.4	42	5.8	1.7	4.8
3	335	14.2	3.0	3.9	43	6.7	2.6	4.1
4	330	56.1	6.4	40.6	44	13.2	2.7	5.0
5	335	57.7	14.6	3.3	45	19.8	3.7	3.0
6	330	109.7	7.0	3.2	46	22.5	2.8	9.8
7	330	221.3	2.4	3.5	47	16.5	2.0	2.0
8	330	20.9	7.7	5.8	48	11.3	1.3	3.6
9	325	3.4	1.2	4.3	49	2.7	1.6	5.0
10	325	10.3	1.6	2.0	50	5.5	1.9	5.1
11	320	3.7	1.6	2.9				
12	315	4.9	1.5	3.0				
13	320	2.7	1.7	1.8				
14	315	3.2	1.2	1.9				
15	315	2.3	1.6	2.3				
16	320	3.5	1.6	1.8				
17	320	12.3	1.4	4.5				
18	315	1.6	1.6	2.3				
19	310	13.2	1.9	3.8				
20	310	40.5	1.3	17.6				
21	315	6.7	1.5	15.0				
22	310	39.0	2.7	4.8				
23	315	21.1	1.2	10.6				
24	305	3.3	1.5	6.5				
25	320	27.0	2.0	5.0				
26	315	6.9	1.7	2.4				
27	310	2.6	1.7	5.6				
28	320	19.0	5.1	2.2				
29	310	30.2	2.2	7.7				
30	310	13.8	2.5	3.8				
31	315	49.2	2.0	2.7				
32	315	4.4	1.7	3.1				
33	305	5.1	1.6	4.1				
34	320	3.4	3.6	3.8				
35	315	1.2	2.2	3.2				
36	310	1.2	2.0	3.0				
37	310	.7	1.7	1.5				
38	315	.6	3.0	3.4				
39	315	9.6	2.2	2.5				
40	320	8.5	1.2	2.1				

Subject 28. Age - 140 days. Initial weight - 335 grams. Running direction - right to left. Phase II tube - 82 mm. Phase II - non-rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	275	1.1	2.5	1.4	41	60.0		
2	280	10.8	3.0	1.1				
3	285	300.0	30.7	1.2				
4	270	29.3	1.3	2.7				
5	275	182.9	1.3	3.1				
6	275	20.5	1.3	2.3				
7	275	15.0	2.1	1.8				
8	275	3.3	2.6	1.6				
9	275	23.6	4.2	1.5				
10	275	132.4	2.1	1.4				
11	275	7.5	2.0	1.9				
12	270	5.3	2.5	2.2				
13	270	6.9	1.6	2.9				
14	270	4.9	1.3	1.6				
15	270	2.1	1.6	3.0				
16	265	2.1	1.8	6.7				
17	270	12.6	1.7	6.2				
18	265	4.2	2.0	12.2				
19	245	2.2	2.4	13.4				
20	260	5.1	1.5	29.5				
21	265	2.9	1.8	38.2				
22	260	14.3	1.6	28.9				
23	265	4.7	2.5	28.4				
24	265	2.6	1.6	6.7				
25	265	4.1	2.6	8.7				
26	270	2.5	2.2	40.5				
27	260	9.6	2.5	17.6				
28	270	3.3	3.3	25.6				
29	260	2.7	2.8	24.6				
30	265	2.3	2.8	24.6				
31	265	3.3	2.5	20.7				
32	265	2.9	2.6	20.4				
33	270	1.6	1.7	6.9				
34	265	3.5	2.7	13.0				
35	265	3.5	3.7	13.8				
36	260	4.4	2.2	58.2				
37	265	27.0	5.0	51.0				
38	265	101.6	2.7	30.2				
39	270	237.5	3.5	9.7				
40	270	26.2	4.0	30.6				

Subject 29. Age - 140 days. Initial weight - 395 grams. Running direction - right to left. Phase II tube - 82 mm. Phase II - rewarded. Section 3.

Trial no.	Weight (grams)	L (seconds)	R (seconds)	G (seconds)	Trial no.	L (seconds)	R (seconds)	G (seconds)
1	310	5.0	4.4	5.2	41	1.9	2.3	11.2
2	315	20.9	3.1	3.4	42	.7	3.0	32.1
3	320	16.7	3.5	3.0	43	48.1	4.2	60.0
4	305	8.4	4.7	2.8				
5	305	9.1	3.9	3.0				
6	310	3.8	2.8	2.3				
7	305	5.8	2.4	4.7				
8	305	5.6	1.7	1.9				
9	300	7.5	1.7	9.5				
10	305	1.1	1.8	9.5				
11	305	9.3	1.9	2.4				
12	305	4.6	1.6	2.4				
13	300	.9	1.9	7.7				
14	300	2.0	1.8	2.3				
15	300	.7	1.7	1.5				
16	295	.9	3.2	2.0				
17	305	3.0	2.1	2.2				
18	305	.9	1.8	2.9				
19	300	.7	1.7	2.0				
20	310	.9	1.8	4.8				
21	310	.8	1.9	4.3				
22	315	.9	1.6	3.5				
23	305	.7	1.3	1.2				
24	300	.7	1.2	2.4				
25	310	.6	1.3	6.0				
26	305	.7	2.5	3.6				
27	300	.7	1.7	3.4				
28	305	.6	2.2	4.4				
29	310	1.5	1.6	4.0				
30	305	1.5	1.3	3.2				
31	315	2.4	2.1	2.7				
32	305	4.0	1.4	1.9				
33	310	.6	1.9	1.5				
34	305	.7	1.9	2.9				
35	295	.6	1.5	1.8				
36	305	.7	4.0	7.7				
37	305	.7	1.9	6.6				
38	310	.7	2.0	5.3				
39	310	.6	1.5	3.2				
40	310	8.5	2.6	4.1				

Subject 30. Age - 145 days. Initial weight - 515 grams. Running direction - left to right. Phase II tube - 72 mm. Phase II - non-rewarded. Section 3.

Trial no.	Weight (grams)	L	R	G	Trial no.	L	R	G
		(seconds)				(seconds)		
1	430	9.8	57.8	3.6	41	60.0		
2	415	138.9	6.8	1.9				
3	410	26.2	3.6	2.8				
4	405	9.8	4.1	1.9				
5	400	10.6	1.8	1.4				
6	400	3.1	2.1	2.0				
7	395	5.0	1.8	1.3				
8	390	3.6	2.1	1.4				
9	385	2.5	1.9	.9				
10	375	9.2	2.6	1.4				
11	370	3.2	2.2	1.1				
12	385	2.6	1.1	1.2				
13	380	4.3	1.7	1.2				
14	375	1.4	1.6	1.0				
15	375	1.2	1.9	1.0				
16	370	.9	1.2	.8				
17	380	5.0	1.5	1.2				
18	370	6.0	1.4	4.5				
19	365	1.6	1.8	1.3				
20	375	17.2	3.4	1.1				
21	370	11.2	1.4	2.5				
22	380	11.0	1.8	2.9				
23	380	6.3	1.5	1.4				
24	370	24.6	3.9	3.2				
25	380	12.9	3.0	4.0				
26	385	14.9	3.3	4.1				
27	370	7.9	1.4	1.8				
28	370	53.8	2.3	3.2				
29	370	52.3	1.7	1.9				
30	370	17.8	1.9	1.9				
31	370	55.3	1.8	2.5				
32	370	10.5	3.3	11.1				
33	380	3.2	1.7	2.2				
34	375	6.2	3.1	5.7				
35	375	2.7	2.9	4.5				
36	380	2.0	3.0	2.6				
37	380	16.3	1.7	1.9				
38	370	2.7	2.1	4.5				
39	375	257.8	4.2	2.8				
40	385	15.1	4.4	3.9				

Subject31. Age - 180 days. Initial weight - 405 grams. Running direction - right to left. Phase II tube - 72 mm. Phase II - non-rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	345	4.2	6.8	2.4
2	345	22.6	3.1	3.3
3	345	10.7	3.1	4.9
4	335	18.5	2.2	4.6
5	330	8.8	2.8	2.8
6	330	43.2	1.8	4.4
7	320	31.3	3.0	2.7
8	325	22.8	30.4	9.3
9	325	238.3	1.2	2.6
10	330	138.1	2.0	4.6
11	330	37.0	1.5	2.3
12	320	110.5	5.3	1.9
13	330	101.8	1.0	2.1
14	330	24.7	1.0	1.4
15	330	11.0	2.8	1.6
16	330	13.5	1.5	2.0
17	330	32.2	1.4	6.2
18	345	37.3	5.2	1.8
19	340	300.0		
20	330	254.5	2.0	4.1
21	335	300.0		
22	330	300.0		

(discarded)

Subject 32. Age - 280 days. Initial weight - 375 grams. Running direction - right to left. Phase II tube - 82 mm. Phase II - rewarded. Section 2.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	340	19.6	10.6	127.9
2	330	13.9	2.9	4.5
3	320	35.7	3.2	3.6
4	325	92.7	4.2	2.7
5	315	19.2	2.3	3.3
6	320	13.6	2.5	5.2
7	325	30.1	2.4	5.2
8	315	6.6	1.6	4.3
9	315	9.6	2.3	3.7
10	320	9.9	3.4	4.2
11	315	5.9	2.2	2.8
12	315	10.9	2.6	18.5
13	310	4.6	2.5	11.9
14	315	6.9	5.7	23.9
15	315	8.6	3.3	15.3
16	320	18.2	9.8	14.3
17	310	3.2	5.3	5.7
18	310	2.6	6.9	20.3
19	310	2.6	3.3	12.9
20	310	10.1	4.6	8.3
21	310	7.3	3.1	11.6
22	310	12.7	4.6	7.1
23	300	3.5	2.7	8.2
24		(died)		

(discarded)

Subject 33. Age - 330 days. Initial weight - 410 grams. Running direction - right to left. Phase II tube - 62 mm. Phase II rewarded. Section 1.

Trial no.	Weight (grams)	L	R	G
		(seconds)		
1	345	50.9	4.2	3.2
2	335	15.3	44.0	1.2
3	335	22.9	4.0	3.5
4	330	25.8	2.3	5.5
5	330	18.4	3.4	10.0
6	330	18.7	2.1	3.2
7	325	15.9	3.0	11.3
8	325	10.9	2.8	12.6
9	325	11.5	4.3	10.2
10	330	11.0	2.3	5.7
11	330	30.7	1.8	7.9
12	330	8.4	1.1	10.6
13	325	10.1	2.3	10.9
14	330	10.5	2.9	14.1
15	330	3.8	2.2	17.2
16	325	13.3	5.6	14.6
17	330	(Door was accident-		
ally dropped on subject.)				

(discarded)

Jul 25 '56
Sep 10 '56