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PROXIMITY OF REINFORCEMENT AND THE PROTESTANT ETHIC EFFECT

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PROXIMITY OF REINFORCEMENT AND THE PROTESTANT ETHIC EFFECT

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Twelve food-deprived male rats were trained to barpress for food pellets in one of three operant chambers. The chambers were of standard size, double in length, or triple in length. After training, a food cup full of pellets was placed in the corner opposite the operant bar, and the eating behavior of the rats in this choice situation was observed. The dependent measure was the percentage of the total amount of food consumed that had been obtained by barpressing. Individual comparisons between the mean percentage of food earned over the four test sessions revealed that those rats in the longest chamber barpressed for a significantly greater amount of the food consumed than did those in the shorter boxes. Results are discussed in terms of the discriminability of the two food cups and the large individual differences. An approach for future research to follow is suggested.

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I wish to express my appreciation to the psychology faculty who have provided me with learning experiences I shall build upon forever. I offer my deepest thanks to the members of my committee, Drs. Metze, Craig, and Shiek, for their help and support throughout this thesis and during my education at Western. In particular, I thank Dr. Metze for all his patience and guidance.

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Literature Review

It has been found that rats will continue to leverpress for food pellets even in the presence of a food cup filled with pellets which do not have to be "earned" (e.g., Jensen, 1963; Tarte & Snyder, 1972). In certain situations rats will even press for a majority of the food pellets they consume (e.g., Jensen, 1963; Tarte & Snyder, 1972). This phenomenon has been called contrafreeloading (Taylor, 1972) or, more poetically, it has been labeled the Protestant Ethic Effect (PEE) Singh, 1972).

Research Supporting the PEE

The basic paradigm used in PEE research is exemplified by Jensen's (1963) study. Using a Skinner box, Jensen trained 200 male albino rats to barpress for 45mg Noyes pellets. The rats were given varying amounts of training, ranging from 40 barpresses (after magazine training) to 1,280 barpresses. Immediately after the last training barpress, a food cup filled with pellets was placed in the operant chamber in the corner opposite the operant cup. Jensen found that with increasing amounts of training, there was a greater tendency for the rats to exhibit the PEE (i.e., to barpress for more than fifty percent of the total food consumed). Researchers have since investigated a wide variety of independent variables in similar choice situations.

Deprivation level. Tarte and Snyder (1972) found that the deprivation level does influence barpressing in the choice situation.

Twenty-eight female albino rats were divided into seven groups and were trained to barpress in an operant chamber. They were then deprived either 0, 12, 24, 36, 48, 72, or 96 hours. Following deprivation, they were placed in an operant chamber in which another food cup filled with 300 pellets had been placed. This choice session lasted for one hour. Tarte and Snyder found that in such a situation, when rats are deprived twenty-four hours or more, they do exhibit the PEE. The group mean percentages of pellets earned by barpressing ranged from 71 to 93.5 for those higher deprivation level groups.

Reinforcement schedule. Another variable which has been found to affect the PEE is the schedule of reinforcement used. In a study by Tarte and Vernon (1974), the reinforcement schedule was gradually increased from a continuous reinforcement ratio (FR1) to a fixed ratio of 21 (FR21), using seven different intermediate schedules. Tarte and Vernon found that the mean percentages of pellets earned by the nine male albino rats declined from 64.5% at FR1 linearly to 10.9% at FR21.

Singh (1970) examined the effects of three different reinforcement schedules on the barpressing of rats. Under a continuous schedule, all ten rats showed a preference for barpressing for food. Seventy-five to ninety-four percent of the food consumed was obtained by barpressing. The fixed ratio reinforcement schedule was then increased to three and again increased to eleven. Under both conditions, the rats still preferred to work for their food. Mean percentages earned when the work schedule was FR11 ranged from sixty-seven to seventy-six percent.

Pretraining. Using a design very similar to that used by Jensen (1963), Tarte and Snyder (1973) conducted a series of experimental studies on the PEE. They found that when the subjects (six female

albino rats) were given twenty-five barpresses before the introduction of the free food, the mean percentages of pellets earned were 72.1% on day one and 70.4% on day two. Tarte and Snyder then varied the number of presses made before the free food was introduced--0, 25, or 50 barpresses were made. There were no significant differences between these groups, and all subjects showed a preference for working. Experiment three, utilized eight albino rats in a PEE choice situation. In this study. however, they were given ten PEE choice sessions. The mean percentages of food earned ranged from sixty percent to eighty-six percent. There were no significant differences in the mean percentages over the ten test days. Thus, according to Tarte and Snyder, the amount of pretraining does not influence the amount of PEE exhibits, and the PEE response is a fairly stable one.

Type of reinforcer. The PEE has also been demonstrated in situations using reinforcers other than food pellets. Carder (1972) reported that food-deprived rats working for a 10% sucrose solution would indeed work for a large percentage of the sucrose they consumed. The subjects, eight Sprague-Dawley rats, earned a mean of 84% of the total reinforcer consumed in a PEE choice situation.

Tarte, Townsend, Vernon, and Rovner (1974) also looked at the type of reinforcer used and its influence on barpressing in the presence of a free reinforcer. The subjects were on either food or water deprivation. Under each deprivation condition, one of the following reinforcers was used: food, water, sucrose, or saccharin. In all, there were five deprivation-reward combinations. A water-food combination was not used, and the researchers were unable to train food-deprived rats to press for either water or saccharin. Of these five combinations, Tarte et al. did

find that food-deprived rats exhibited the PEE when food was used as a reinforcer. They also found, as did Carder (1972), that food-deprived rats would barpress (work) for a majority of sucrose solution consumed. Furthermore, Tarte et al. found that water-deprived rats would also exhibit the PEE when working for water. Thus, in four of the five combinations in which barpressing was established, the percentage of reinforcer earned in the choice situation was over fifty percent of the total amount consumed.

Other Subjects. The PEE has also been observed in other organisms besides rats. Neuringer (1969) demonstrated that pigeons would peck a key for a large percentage of the food they consumed in a choice situation. The subjects in Singh's (1970) study, Experiment IV, were five- and six-year-old children. Singh designed a two-compartment apparatus in which a child could either press a lever on one side or could choose the "free side" and be delivered marbles automatically. Singh found that the mean percentages of pellets that were earned were 63% and 69% for the girls and 70% for the boys.

Other Apparati and Experimental Designs. Although the operant chamber has been the most common apparatus, others have been used. For example, Singh (1970), mentioned above, utilized two-compartment apparati in his studies. The apparatus for rats allowed them to leverpress for pellets on one side or to receive pellets automatically (with no leverpressing) on the other side. He first adjusted the "free side" to deliver pellets at the rat's average working rate, as established during training. On the "work side," pellets could be earned by barpressing on various reinforcement schedules. As mentioned previously (see the section on Reinforcement Schedules), Singh found a very strong

propensity towards working for food, despite increased reinforcement schedules. Singh then adjusted the "free" side so that pellets were delivered 12.5%, 25%, or 50% faster than the average working rate for each rat. Pellets on the work side could be earned on the continuous reinforcement schedule. When the free side delivered food only 12.5 and 25 percent faster than the rat typically earned it, rats still showed a preference for earned food, with sixty-five to seventy-six percent of the pellets consumed being pellets that were earned. However, when the rats could obtain pellets 50% faster on the free side than their average working rate, the subjects began to prefer food on the free side. In this situation the mean percentages of pellets obtained by barpressing were 24, 61, 29, and 40 respectively, for the four test days.

Another unique apparatus used in PEE research was designed by Stephens, Metze, and Craig (1975) to test various theoretical explanations of the PEE. Using a round activity chamber, they placed a bar and/or a food cup around the edge in each of the four quadrants. In one quadrant was an operant bar; in quadrant two, an operant bar and filled food cup; in a third quadrant only a bar was present; and the fourth quadrant contained a filled food cup only. Stephens et al. found a high preference for barpressing. The percentages of pellets that were earned ranged from 41.6% to 92.4%. Of the eight rats, seven received more than fifty percent of the pellets they consumed by barpressing for them. Because of the design, Stephens et al. were able to conclude that secondary reinforcers such as motor activity and auditory feedback that are components of any barpressing situation were not the main determinants of the PEE response.

Another apparatus in which the PEE has been demonstrated is the runway. Stolz and Lott (1964) trained male Wistar rats to run down a straight-alley runway for a pellet of food. They then placed a pile of these pellets in the middle of the alley. They found that rats would indeed run over the pile in order to obtain the one pellet in the goal box, thus "working" for food in the presence of "free" food.

Leung, Jensen, and Tapley (1968) also used a straight-alley runway; however, they inserted the free food cup in the start box rather than in the alley itself. The results of this study indicated that the PEE may operate differently in a runway as opposed to an operant chamber. The variables under investigation were the number of trials before the choice situation (75 or 285) and the reinforcement schedule (100%, 50%, or alternating five rewarded five non-rewarded trials). The dependent measure was the number of free pellets eaten before the rat performed the operant response. The number of trials run prior to the introduction of the free food was the only variable which was found to significantly affect the results. Leung et al. found that the rats with the greater amount of training did more freeloading. This is in direct contrast to Jensen (1963), who had noted that in a Skinner box more training resulted in less freeloading and more barpressing during the choice situation, and to Tarte and Snyder (1973) who found that the amount of pretraining did not influence the amount of barpressing.

Further investigating these conflicting results from the different apparati, Jensen, Leung, and Hess (1970) gave 140 male Sprague-Dawley rats 0, 40, or 285 continuously-rewarded responses during training in either a Skinner box or a runway. The time between the introduction of the free food (of which the rats were forced to eat at least two pellets)

and the making of the first operant response was the dependent measure. Jensen et al. found that the group given 285 training responses freeloaded faster in the runway than the group with no training. However, in the Skinner box, the subjects who had 285 training responses took less time than the no training group to make the first barpress. Thus, although the PEE is found in both runway and operant chamber, the processes involved may not be identical.

In reviewing the literature, there seems to be no doubt that the PEE does exist; that is, under certain conditions organisms will work for a majority of the reinforcers working. This has been demonstrated under a variety of conditions and is fairly well established. However, not all researchers have found a preference for working in a choice situation. Although all researchers have found some barpressing, many studies have reported a predominance of freeloading.

Research Support Freeloading

Under conditions similar to those in Jensen's (1963) study, Taylor (1972) found that only three of the twenty-five rats preferred to barpress for food when free food was introduced into the operant chamber. The preference for free food increased over the sessions such that by the fifteenth session there was a very definite preference for free food. The same variables which have been discussed in the preceeding sections of this paper as affecting the PEE have also been found to have no effect on the PEE or have opposite effects. Thus, studies using the same variables as those used by researchers finding the PEE have often reported a predominance of freeloading in their subjects.

Deprivation level. Tarte and Snyder (1972) found that with 0 or 12 hours of deprivation, rats preferred to freeload. These two groups

earned only 29.5% and 25%, respectively, of the food they ate. Although with 24 hours of deprivation or more, Tarte and Snyder found a predominance of barpressing, it is interesting to note these exceptions. Further exceptions to the PEE were noted by Heacock, Smith, and Thurber (1974), who found that deprivation level had no effect on the PEE at all. The deprivation levels used in this study were 0, 24, 48, or 72 hours and no significant changes in barpressing were found with the rats preferring to freeload. Finally, Morgan (1974), using a two-compartment apparatus similar to Singh, also found that the deprivation level did not increase barpressing. The rats in Morgan's study all preferred the "free" side.

Reinforcement Schedule. Atnip and Hothersall (1973) also found a preference for freeloading. Seven albino rats were trained on a continuous reinforcement schedule in an operant chamber. Free food was then introduced. Only two of the seven subjects earned more than fifty percent of the food they consumed. Furthermore, when Atnip and Hothersall increased the reinforcement ratio tc FR10, they found that none of the rats preferred to barpress.

In the study by Heacock et al. (1974) the schedule of reinforcement was also manipulated. Fixed ratios of one, five, and ten were used. Very little barpressing was exhibited. Over all schedules, the mean percentage of pellets earned was only 18.8%. In addition, unlike Singh's findings, the most demanding schedule resulted in significantly less food being earned.

Additional evidence for freeloading in apparati other than operant chambers comes from Morgan (1974) and Leung, Jensen, Tapley (1968). Morgan, whose apparatus was very similar to Singh, varied the

reinforcement schedule on the "work" side and found that all but one of the twelve subjects preferred to eat on the free food side, regardless of the reinforcement schedule. Leung et al. found that the reinforcement schedule had no effect on the PEE response in a runway.

Type of reinforcer. Taylor (1972) tested water-deprived animals in an operant chamber choice situation with water serving as the reinforcer. He found a very high preference for "free" water; none of the twenty-five subjects preferred to barpress. These findings are very similar to those reported by Carder (1972), who found that six water-deprived rats earned an average of 26% of their total water consumption. These findings are in direct opposition to the findings of Tarte, Townsend, Vernon, and Rovner (1974), who found that water-deprived rats would indeed work for water.

In addition, in food-deprived rats working for a sucrose solution, Carder found that as the level of quinine in the solution increased, the amount of freeloading also increased. Not all the findings of Tarte et al. were supportive of the PEE either. Water-deprived rats would not work for saccharin, earning only 24.1% of the saccharin consumed.

Other experimental designs. A study reported by McLaughlin, Kleinmann and Vaughn (1973) also provided little support for the PEE. Rather than train rats and then introduce the free food cup, they placed five male albinos in operant chambers which had both an operant bar and a filled free food cup available. After living in this chamber for seven to ten days, the free food was removed for twenty-four hours and then replaced. For the next three days, McLaughlin et al. found that there was a significant increase in the number of barpresses made. The free food was then removed for forty-eight hours. Once it had been

replaced and the choice situation was again present, the researchers found that the number of barpresses had increased over the original choice situation. The same procedure was repeated again for 72 hours, with three days of choice afterwards and again, the barpresses had increased over the original choice situation. McLaughlin, Kleinman, and Vaughn concluded by noting, however, that although the proportion of total rewards earned increased, in no case was a majority of the rewards earned. The researchers repeated this same design with four male albinos using water instead of food pellets and obtained similar results.

Statement of the Problem

The preceding review of the literature indicates that there are many inconsistencies in the results from PEE studies. Given almost identical situations, some researchers have found preference for barpressing and others have found preferences for freeloading. A variable which has been found to increase barpressing by some has been found by others to increase freeloading or to have no effect at all. Exactly what determines the PEE is not clear.

One hypothesis is that the rat is unable to clearly discriminate between the work and the free conditions. For example, much of the confusing data comes from studies which utilized an operant chamber. Operant chambers are relatively small, the free food cup and the operant cup are very close to each other, and thus, it may be that the rat may or may not (depending on other presently unknown factors) discriminate between the choice and the free food situations. Therefore, findings from studies using operant chambers are often conflicting. In other apparati, however, the two situations are clearly different. For example, the large apparati used by Singh (1970; 1972) and Stephens et al. (1975) were characterized by a greater distance between the two food cups than that found in an operant chamber. In terms of barpressing, these studies generally reported high amounts of the PEE.

The present study investigated the possible effects of proximity of the free food cup to the bar/food cup. Specifically, it was

hypothesized that the farther the free food cup was from the operant cup (i.e., the more discriminable the two conditions) the more PEE would be exhibited. Chambers of varying lengths were constructed with the food cups always being on the endplates. Thus, the shorter the chamber the closer the two food cups. Using such apparati, it was hypothesized that the shortest chamber would yield the lowest preference for barpressing; the longest, the most PEE; and the middle chamber, a moderate amount. In other words, the relationship between proximity of food cups and amount of PEE would be linear.

Method

Subjects. Twelve male hooded rats from the Western Kentucky University colony were used in this study. These experimentally naive rats were approximately 60 days old at the start of the experiment. They were housed individually in standard laboratory cages.

Apparatus. The apparati consisted of three operant chambers placed in three separate rooms. One chamber (S) was a standard operant chamber, $9\frac{1}{4}$ inches long, 8 inches wide and $7\frac{1}{2}$ inches high. The only modification consisted of an additional food cup secured to the back wall in the corner opposite the bar/food cup. This free food cup was identical to the operant cup.

The second apparatus (M) consisted of two operant boxes placed end to end with both backs removed such that the apparatus resembled a standard operant chamber double in length. It measured $18\frac{1}{2}$ inches by 8 inches by $7\frac{1}{2}$ inches. At one end of the box was a regular bar and food cups and at the other end was the free food cup, also placed in the corner opposite the bar/food cup.

The third chamber (L) was three standard operant chamber lengths, measuring $27\frac{1}{2}$ inches by 8 inches by $7\frac{1}{2}$ inches. The two ends were identical to those used in the other two apparati. All three boxes had metal endplates, aluminum rod floors, and plexiglass sides and tops. The bars delivered .045g Noyes pellets on a continuous reinforcement schedule.

Design. The study utilized a groups by trials repeated measures design. Subjects were randomly assigned to one of the three chambers (S, M, and L), such that n=4 in each group, and each subject was given four test sessions in his respective chamber.

Procedure. On Day One, the rats were put on a $23\frac{1}{2}$ hour food deprivation schedule with water being available at all times. Thirty minutes a day the rats were fed Purina Rat Chow. This schedule was maintained during the entire experiment. On Days Five and Six, each animal was placed in his respective chamber and allowed to acquire the barpressing response. The three chambers were in three separate, quiet dark rooms.

Training to establish the barpressing response was given on Days Seven through Twenty. The rats were each given a fifteen minute session in their respective chamber with the bar active and with food pellets being delivered on a continuous schedule. Water was available at all times during the sessions. Drinking tubes were placed to the right of the bar (the food cup being on the left) and to the right of the free food cup. To control for any novel effect which the presentation of a new food cup might have upon the rats behavior, the free food cup was always present (though empty) during this training. After each session, the rats were placed back in their home cages and allowed thirty minutes access to Purina Rat Chow. Days Twenty-one through Twenty-four were testing days. The free food cup was filled with two hundred Noyes pellets and the bar was operative. Each rat was placed in his respective chamber for a fifteen minute choice session. Both the number of pellets earned through barpressing and the number of pellets eaten from the free food cup were counted. After each test session, the rats were given thirty minutes access to food in their home cages.

Results

The PEE measure was determined by dividing the number of food pellets earned by the total number of pellets consumed (both earned and freeloaded) and multiplying by 100%. This percentage of food earned was calculated for each subject for each test session (see Appendix for individual data).

The means of the three groups across the four test sessions are shown in Figure 1. It can be observed that the general pattern of responding was maintained over the four test sessions for all three groups. In addition, those in the longest box tended to barpress for a greater percentage of food than did those in the shorter boxes. Furthermore, as the brackets in Figure 1 denote, the individual differences in responding were quite large. In the regular operant box (group S), PEE scores ranged from 6.2% to 77.6%. And by the fourth test day, those rats in the longest box exhibited both extremes--0% and 100% earned.

An analysis of variance for repeated measures, groups x trials, was conducted (Edwards, 1972), and the analysis summary is given in Table 1. There were no significant effects. For the groups

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Insert Table 1 about here

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and trials main effects, $F(2,9) = 2.54$ and $F(3.27) = 1.57$, respectively, $p > .05$ for both. The interaction was also nonsignificant, with $F < 1$.

Closer examination of the data did reveal some interesting

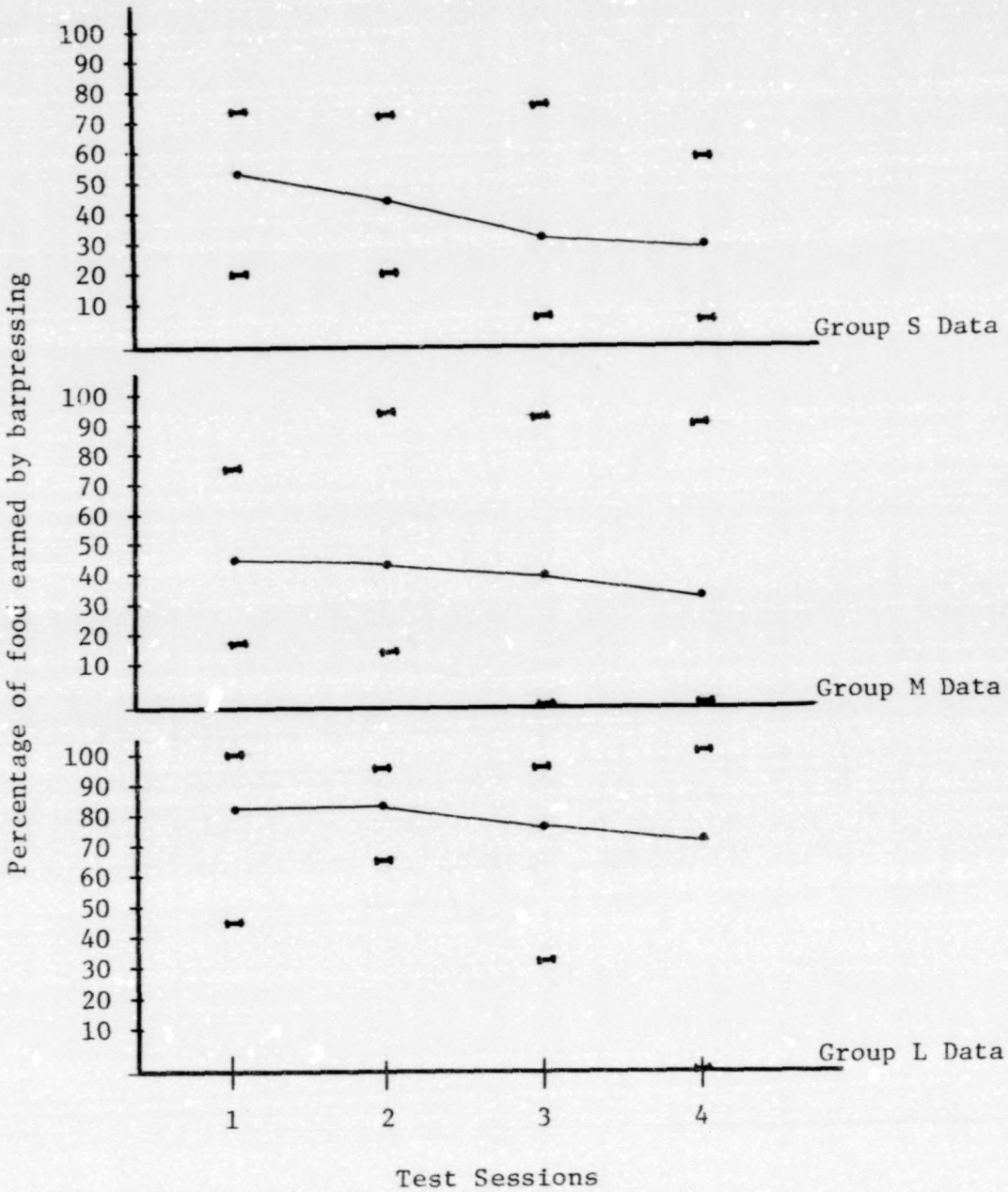

Figure 1. Group means over the four test sessions the ranges of responding denoted by brackets.

TABLE 1

Analysis of Variance Summary Table

Source of Variation	Sum of Squares	d.f.	Mean Square	F	P
Groups (G)	16,000.93	2	8,000.46	2.54	.13
S/G	28,309.41	9	3,145.49		
Trials (T)	1,572.18	3	524.06	1.57	.21
GT	441.01	6	73.50	1	--
TS/G	9.006.47	27	333.57		

relationships, however. Means, variances, and standard deviations of the three groups (collapsed over trials) may be seen in Table 2.

Insert Table 2 about here

Since the means of groups S and M were so similar (40.14 and 40.71, respectively), a comparison of group L with groups S and M together was conducted. Group L was found to be significantly different from the other two groups, $t(9) = 2.26$, $p = .05$.

TABLE 2

Means, Variances, and Standard Deviations
of the Three Treatment Groups

	Group S	Group M	Group L
Mean	40.14	40.71	79.15
Variance	644.87	1,107.29	869.77
Standard Deviation	25.39	33.28	29.49

Discussion

The hypothesis that those rats in the longest box would exhibit the most PEE; those in the shortest, the least; and those in the middle-sized box, a moderate amount was supported only in part. Specifically, the rats in the longest box did indeed earn a significantly larger percentage of the food they consumed than did the other two groups. However, the middle group's performance was almost identical to that of the group in the shortest box. Thus, the proximity of the "operant" cup to the "free food" cup does affect the amount of PEE, although the exact relationship cannot be determined from the present data. Despite this uncertainty, however, one might still question why the PEE is influenced at all by such a variable as reinforcement proximity.

It has been very difficult to develop broad theoretical explanations to account for the many conflicting results from PEE research. In spite of this, though, a variety of explanations have been offered: intrinsic appeal of barpressing (Jensen, 1963; Leung, Jensen & Tapley, 1968; and Jensen, Leung, & Hess, 1970) and competence motive (Singh, 1970; Stephens, Metze, & Craig, 1975), to name a couple. The explanation which seems most pertinent to this study, however, is one which considers the discriminability of the conditions in the PEE choice situations.

Tarte, Townsend, and Vernon (1973) hypothesized that ". . .barpressing in the presence of free rewards is related to the amount of

difference between the home environment and the testing situation" (p.70). They raised rats in one of four different environments and then tested them in the typical PEE choice situation. Tarte et al. found that those raised in standard laboratory cages, rather than those in a stimulus-enriched environment, exhibited the highest PEE. They hypothesized that the greater discrepancy between environments existed between the standard cage and the operant box, and hence, a greater PEE was observed. More recently, Taylor (1975) specifically investigated the influence of discriminability within the choice situation. His conclusion was that "the discriminability between the conditions of working and freeloading is a most important factor contributing to the continued responding in the presence of free rewards" (p. 108). It is interesting to note that Taylor concluded that the PEE was strongest under conditions of least discriminability, whereas Tarte et al. (1973) hypothesized that the PEE is strongest where there is the most discriminability.

In the present study it was those subjects in the longest box who exhibited the highest PEE. In this situation, the work and the free food cups were most clearly differentiated, whereas in the small box the free food cup was much nearer the bar and the two feeding situations could be easily confused. Thus, apparatus length affects the amount of PEE because it affects the discriminability of the conditions. And in the present study, the PEE is strongest when there is the most discriminability between the conditions. One avenue future research can take, then, is to examine the discriminability hypothesis in detail. The present study obviously taps only one dimension of discriminability, that of proximity. Other dimensions

which could be varied are the visual and auditory components. For example, visual cues may be the key factor in a rat's discrimination of the two conditions, and placing a flashing light at one food cup would facilitate discriminability and presumably influence barpressing. Similarly, different auditory cues could be used to increase or decrease discriminability (tones at one cup; clicking at both cups, etc.). All of these dimensions could be examined singly or multiply in an attempt to find an optimal discriminability level and its maximal effect on the PEE.

Other aspects of the study should also be noted, particularly the many similarities between the present study and previous research. First, it was found that rats would indeed barpress for food in the presence of free food. Secondly, in many cases rats would barpress for a major percentage of the food they ate. A third similarity was that the levels of an external variable (in this case, apparatus length) were found to differentially affect the amount of barpressing seen.

As a fourth point the results of this study also indicated that the general pattern of responding was maintained over at least four sessions. Although some studies have suggested that there is a general decline in the barpressing response over testing days (Taylor, 1972, 1975), others have reported a fairly constant performance over trials, as was found in this study (Tarte & Snyder, 1972; Stephens, Metze, & Craig, 1975; and Davidson, 1971).

A fifth aspect of this study which seems typical of PEE research is the large amount of individual differences in responding found within the groups. These wide variations in the dependent variable have also been observed by other researchers. Tarte and Snyder (1972), for

example, reported that within the two groups which were deprived less than twenty-four hours, rats earned anywhere from zero to ninety-five percent of the food they consumed. Tarte, Townsend, and Vernon (1973) also observed the large individual differences in their study.

Conclusions about and generalizations from PEE experiments are extremely difficult to make when the variance in responding is so large. When two rats of the same breed are housed under the same conditions, fed the same food, trained in the same way, and subjected to the same treatment and when the difference between their performance can be as much as 100% -- then there is(are) some other factor(s) influencing these divergent behaviors. In such a situation, these other factors may well be organismic variables which the individual rat brings to the experimental condition and which influence his performance in an idiosyncratic manner. The large individual differences present in nearly every study lend credence to such a hypothesis.

Thus, there seem to be two major aspects of the PEE situation: external variables such as the discriminability of the two feeding situations and internal variables which rats bring to the PEE situation and on which individual rats differ. Consequently, an interactionist approach to the study of the PEE seems most appropriate. That is these organismic variables interact with the environment and it is from knowledge of these interactions that one can best predict behavior in a given situation. Possible organismic variables such as arousal level, activity patterns, aggressiveness, and rapidity of learning a response may well interact with the different situational variables such as the discriminability of the conditions, deprivation levels, and reinforcement schedules.

An interactionist approach for future research, then, may help clear up many of the "conflicts" in this area of research and would certainly be fruitful in suggesting and guiding future research. And with an interactionist approach, perhaps the research will change and Morgan's (1974) suggestion can be answered:

> Previous investigators have concentrated on cases where the preference for the work side is greater than fifty percent; but it seems more profitable to pose the question of why it is not zero, and what factors affect its magnitude (p. 365).

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APPENDIX

TABLE A

Individual PEE Scores *

	Subject	Day 1	Day 2	Day 3	Day 4
Group S	1	20.51	44.35	28.80	6.15
	2	73.91	71.81	77.64	60.25
	3	48.57	20.55	14.29	9.63
	4	68.35	44.85	6.58	45.96
Group M	1	17.17	13.04	55.45	23.01
	2	42.59	51.26	0.00	0.70
	3	75.97	94.23	93.33	90.48
	4	48.76	14.61	14.42	16.31
Group L	1	88.00	70.48	91.26	96.07
	2	92.97	96.00	93.62	98.62
	3	45.61	67.57	30.97	0.00
	4	100.00	97.69	97.55	100.00

$$*\text{PEE score} = \frac{\text{number of food pellets earned by barpressing}}{\text{total number of pellets consumed}} \times 100\%$$