RELATIONSHIP BETWEEN INTENSIVE EXPLORATORY DRIVE AND THE CONTRAFREELOADING PHENOMENON

JOHN SALVATORE LIBRETTO

RELATIONSHIP BETWEEN INTENSIVE EXPLORATORY DRIVE AND THE CONTRAFREELOADING PHENOMENON

An Abstract

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

John Salvatore Libretto

August 1975

ABSTRACT

Twenty-seven rats served as subjects in an investigation of the relationship between intense exploratory behavior and the contrafree-loading phenomenon. Initially the animals were randomly placed into three rearing conditions; control (normal) environment, an enriched environment, and a deprived environment. Following 51 rearing days, all subjects were placed in a "choice" situation (i.e., barpress vs. freefood) after being exposed to both barpressing and freefood for nine training days. It was hypothesized that the Enriched Group would barpress less in the choice situation due to a decrease in exploratory drive behavior. The results, though not significant, indicated that the Deprived Group barpressed more than the other two groups and that the Enriched Environment Group, in fact, barpressed the least.

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August 1975

To the Graduate Council:

I am submitting herewith a Thesis written by John Salvatore Libretto entitled "Relationship Between Intensive Exploratory Drive and the Contrafreeload Phenomenon." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Stephen F. Davis

Major Professor

We have read this thesis and recommend its acceptance:

Garland E. Blair

Minor Professor
or
Second Committee Member

Peter Ulricetos

Third Committee Member

Accepted for the Council:

Wayne E. Stamper

Dean of the Graduate School

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CHAPTER I

INTRODUCTION

Results of several studies (e.g., Carder and Berkowitz, 1970; Jensen, 1963) have indicated that some animals prefer to work for food, whereas others have a preference for "freeloading." Work is defined as the situation in which some specific response must be executed in order to obtain reward. On the other hand, freeloading is that situation in which reward is not contingent on any specific response. Several different hypotheses have been advanced to explain the freeloading phenomenon. One explanation concerns the control and modification of the environment. Singh and Query (1971) investigated preference for work over freeloading in children. White and Indian children were tested in a choice situation where marbles could be obtained freely or by barpressing. The results showed that the children preferred to obtain reward by working. The authors state that the motivation for working comes from wanting to control and modify the environment; therefore, children prefer to engage in activities which permit them to produce dramatic effects by their actions and movements. So, given a choice, an organism will engage in a behavior which is directed toward obtaining a reward, but which is also directed toward interaction with and control of the surrounding environment.

A second hypothesis that has been advocated is that of intrinsic appeal. An operant has intrinsic appeal for a species if members of that species show a preference for obtaining food by using that operant as opposed to using a less effortful operant or a better established operant that would lead to an equal or a greater amount of food per unit of time. Jensen (1963) found that the act of pressing a bar is itself rewarding for rats. A total of 200 rats were used in the study. First, they were given free food in the operant chamber. Next, they barpressed for food. There were six groups of rats, each group receiving a different number of rewarded presses, from 40 to 1280. Finally, a choice situation (i.e., free food vs. barpressing) was presented in the operant chamber. The results showed that the typical rat preferred barpressing for food to freeloading from the free food dish at some point prior to satiation. Only 1 in 200 ate 100 per cent of the pellets from the free food cup. Of all subjects, 44 per cent earned more than half of all food pellets eaten during the choice period by barpressing. Jensen (1963) mentions that this could be predicted from Hullian theory in terms of competing habits. The habit of seeing food in a cup and eating it might be said to compete with the habit of seeing the bar and pressing it. This position was supported by the fact that the mean percentage of pellets earned by barpressing during the choice period was an increasing function of the number of rewarded presses made prior to the choice period (i.e., 40, 80, 1280). This fact will be considered again later.

A replication of the Jensen (1963) study was done by Knutson and Carlson (1973) using both food and water as reinforcers. The results of their study showed that all subjects continued to barpress for food and water where both reinforcers were also freely available. Thus, operant behavior was maintained whether the reinforcer was food or water.

Carder and Berkowitz (1970) also reported that rats given a choice between free food or earned food showed a preference for response-produced pellets. The subjects were six rats. It was found that when two responses were needed to produce a food pellet, five of the six rats continued to earn most of the pellets they ate. However, when the work requirement was increased to ten responses, preference for the response-produced food weakened. Thus, the study showed that when work demands are not too high, rats prefer earned to free food.

In both of the above studies, prechoice training (free-food cup vs. pressing the bar) involved a massed and reinforced responding procedure without any intervening free food consumption. Thus, again referring to Hullian theory, one may speculate that the habit of responding for food may have been stronger than the habit of freeloading during the choice situation. Tarte and Snyder (1973) investigated this problem by giving their subjects equal prechoice training. Two of the experiments reported there involved equal prechoice training and employed six rats and eight rats, respectively. It was found that the rats did not prefer to earn food pellets by barpressing when they had spent equal amounts of time, equally distributed, between barpressing for food pellets and freely eating identical pellets. According to their first three experiments and other previous studies, Tarte and Snyder (1973) state that the great preference for obtaining rewards by barpressing relative to taking free food, when presented with a choice situation, has been found only when animals made large numbers of reinforced barpresses (i.e., 1200) prior to the choice situation and with no intervening free food eating in the operant chamber.

In two experiments, Carder (1972) compared rats preference for earned vs. free liquid as reinforcers. In experiment one, Carder found that rats preferred to barpress and drink sucrose rather than to drink without barpressing. Carder furthered his results in a second experiment where he tested eight rats that had demonstrated a preference for earned sucrose in experiment one. The rats were exposed to varied concentrations of quinine in the sucrose in both earned and free situations. The results were as Carder expected; the sucrose solution with high quinine content produced a preference for free solution. Carder's discussion indicated that possibly rats barpress for food in the presence of free food because reinforcement that is satisfying produces behavioral energy that must be discharged. He goes on to say that leverpressing is one way to discharge this energy, and in this way, the energy is discharged without reducing the amount of reinforcement obtained.

In a study by Neuringer (1969), two pigeons pecked a response disk to gain access to grain rewards. Also, two rats barpressed for food. The subjects were neither trained nor deprived, yet they learned and maintained an operant response in the presence of free food. Thus, instrumental acts may occur in the absence of deprivation or of threat to life. Animals will explore, play, make novel responses, etc., for their intrinsic appeal. Hence, the act of producing food can serve as its own motivation and its own reward and is done for its own sake. This is confirmed in an article by Tarte, Vernon, and Townsend (1973) to be considered subsequently.

A third explanation for preferring earned food to free food is the possible consideration of the stimuli that accompany work as secondary reinforcers. For example, Wallace, Osborne, Norborg, and Fantino (1973) found that pigeons would peck a disk for food when the act resulted in turning off a houselight, turning on the light over the food cup, and producing a clicking sound. When these changes accompanied eating from the free food dish, the pigeons preferred to freeload. Thus, it appears that responding is maintained by stimulus change accompanying food. In this context, stimulus change may be a conditioned reinforcer due to its temporal pairing with food; hence, instrumental responses are controlled by their associated consequences.

In a study by Alferink, Crossman, and Cheney (1973), two pigeons were trained to keypeck for food on a fixed ratio 300 (FR300) schedule (i.e., they were given a food pellet for every three hundredth response they made). Then a food-hopper light was introduced. When the food-hopper light was presented contingent upon the fixed ratio schedule, keypecking occurred. If no light was presented, no keypecking took place. Therefore, responding in the presence of free food was a function of the conditioned reinforcing properties of the hopper light. Tarte and Snyder (1973) also suggest some possible secondary reinforcements associated with rats pressing a bar for food pellets, e.g., motor activity at the bar and auditory and visual feedback from the pellet dropping into the dish.

A further possible explanation of the earned-food vs. free-food phenomenon may be found in the investigation of self-reinforcement patterns. Mahoney and Bandura (1972) studied this pattern using pigeons trained to reward their own performances. The pigeons ate from a freely available food source only after pecking a disk. The phenomenon is that the organism is presented the food in advance and rewards himself only after an appropriate behavior. The authors found that by gradually increasing the requisite work output, an animal can be trained to self-impose progressively higher performances for each self-reward. Possibly, this occurs because feedback from pecking responses are by themselves reinforcing, and the pecking responses persist because they are self-reinforced.

Although support has been shown for animals preferring to work for food rather than consuming free food, other studies have come to different conclusions. For example, Taylor (1972) reported a study involving 25 rats. He trained the rats to press a bar for food pellets. After 1,000 pellets had been earned, he introduced a free-food dish for one day. Then the rats were put into the choice situation (free-food dish and bar). He found that there was a mild preference (over 50 per cent) for free food on the first day, but on subsequent days, there was a progressive increase in the preference for free food. The results showed that only three of the 25 rats actually preferred to work for food. Taylor tried to generalize his results by also using water as a reinforcer. Again, most of the rats preferred free water, contradicting the results of Knutson and Carlson (1973). So, although preference for work over freeloading is possible, it is a principle that lacks generality.

Hothersall, Huey, and Thatcher (1973) reported three experiments, two with eight rats and one with six rats. They trained the rats to press a bar for food on a continuous reinforcement schedule, i.e., a food pellet for every response, an FR2 schedule, i.e., a food pellet for every two responses, and an FR10 schedule, i.e., a food pellet for every 10 responses. The results showed that most of the rats preferred free food on all schedules. Of the 21 rats, six preferred earned food over free food. The preference for free food increased when more than one response was required to produce a food pellet. Thus, this study suggests the prematurity of the conclusion that rats have a generalized tendency to prefer earned to free food.

Atnip and Hothersall (1973) also reported a study using different schedules of reinforcement. They found that five of the seven rats basically showed a preference for free food under all conditions. The above two studies support the Taylor (1972) study showing the limitations of the contrafreeloading phenomenon.

Support is also given in an article by Koffer and Coulson (1971) which involved six cats. The results showed that in a choice situation, all of the free food was consumed by the cats on most of the occasions it was available before they would work for food. The authors speculate that these results which are contrary to many of those involving rats and pigeons may be species-linked. They assume that rats and pigeons usually eat food in small amounts, while cats, being predators, usually obtain a large amount of food at once.

Turning briefly to a different research area, numerous studies examining the effects of enriched or deprived living environments on brain anatomy and chemistry, have been reported recently. The relationship between this area and the free food research will be clarified presently. In an early study, Krech, Rosenzweig, and Bennett (1960) investigated the effects of varying the rat's environment and its effects upon changes in the biochemistry and morphology of the brain and the animal's problem solving ability. They found that rats reared in an enriched environment as compared to rats reared in an impoverished environment clearly were superior problem solvers. The results indicated that problem-solving ability correlated highly with the two indices of brain morphology and biochemistry.

Krech, Rosenzweig and Bennett (1961) demonstrated in a series of experiments that increasing the environmental complexity and training of an animal results in measurable changes in its brain chemistry. In an earlier study, Krech, Rosenzweig, and Bennett (1960) demonstrated that activity of the enzyme Cholinestrase (ChE) in the cerebral cortex is not fixed, that it is responsive to changes of Acetylcholine (ACh) concentration, decreased stimulation, increased stimulation and traumatic changes in remote parts of the brain.

An interesting study was conducted by Hebb and Williams (1946). They attempted to devise a method of rating animal intelligence. The method minimized variations of motivation (either of timidity or of eagerness for food) and based its score on an analysis of performance and time taken to complete a task. An essential feature of the test was the animal's familiarity with the testing situation, (including position of the goal or reward), and handling by experimenters. They also indicated that the use of a single feeding point and a unified testing situation would lead to further economies of time.

A study specifically designed to test the notion of novelty having an unusually large impact on subjects reared in a restricted environment was carried out by Konrad and Bagshaw (1970). The investigators reared one group of cats in an experience-restricted environment, while a second (control) group was reared normally. The restricted cats displayed marked passivity, inhibited normal exploratory behavior, and gave larger autonomic responses to brief-tone stimuli. The results suggest that experience-restricted rearing produces adult animals who are overwhelmed by the impact of varied stimuli.

An early investigation into the effects of environmental conditions on problem-solving abilities in rats was reported by Hymovitch (1952). In one of the studies reported, Hymovitch reared rats in a large box (complex environment) containing a number of playthings. Additionally, he reared rats in normal cages, which restricted the space in which the rats could move freely but allowed visual experience, and in stovepipe cages, which restricted the total experience of the animals. The results were consistent with previous studies: rats reared in a complex environment (free-environment) were significantly superior in problem-solving ability.

Forgays and Forgays (1952) further investigated the Hymovitch (1952) study. Using the Hebb-Williams maze as a measuring device, the authors found that animals reared in an enriched environment performed significantly better than animals housed in standard laboratory cages. The free-environmental experience in early life reflected superior problem-solving ability in adult life. The presence of playthings benefited the animals, in that the animals reared in the free-environment with playthings were better problem solvers than any other group.

Bingham and Griffiths (1952) designed a study to determine if differential early environments would have any measurable effects on later behavior. The experimental subjects were reared in a specially designed room and given access for 30 days to tunnels, inclined planes, and swinging doors, while the control rats were reared in restricted environments of laboratory cages and "squeeze" boxes. The results indicated that rats reared in an enriched environment were superior in maze-learning ability as compared to animals reared in the "normal" or "squeeze" boxes. Interestingly, no differences in temperament or discriminatory behavior during adulthood could be traced to the variety of early environments.

Zimbardo and Montgomery (1957) also explored the effects of free-environment rearing upon exploratory behavior. The authors used 48 rats who were randomly assigned to either normal-rearing cages or to free-environment cages that allowed a wide range of sensory and proprioceptive stimulation. The results of the investigation indicated that the free-environment subjects explored less than the normally reared subjects. The main difference as explained by the authors was due to the high number of maze units traversed by the normal female rats. An interesting point of speculation was that perhaps subjects reared in a free-environment would be less likely to respond as intensely and indiscriminately to all cues in the environment. This in itself may reduce the chance that the subjects spend a prolonged time exploring and reexploring all parts of the testing environment. In other words, as the authors state, "for subjects with rich early experience, given a test situation will evoke less exploratory drive than it will for subjects with relatively limited experience."

A study further investigating the difference in exploratory behavior of rats reared in free and restricted environments was conducted by Woods, Fiske, and Rucklehaus (1961). The authors reared their subjects under free-and-restricted-environmental conditions. The animals were tested twice on the Hebb-Williams Maze. The conclusion was in agreement with Zimbardo and Montgomery's (1957) speculation, that restricted environmental rearing conditions serve to increase exploratory behavior. The authors further indicated that their results would not be such if restricted groups were suffering from a deficiency in intelligence or in maze-solving ability.

Combining these two apparently divergent lines of research, Tarte, et al. (1973) studied housing environments and the barpressing vs. free-loading phenomenon in rats. The animals were housed in four environmental conditions; stimulus-enriched, motor-enriched, stimulus-deprived, and control. They were then tested for their preference in a choice situation in which they could obtain food pellets by barpressing or from a free-food dish. The results were that the control animals barpressed for a higher percentage of food than any other group and that the stimulus-enriched and the stimulus-deprived groups both preferred to "freeload."

The present study was designed to increase the generality and reliability of the conclusions arrived at by Tarte, et al. (1973). In an attempt to reduce the possibility of chance significance and to increase the reliability of the Tarte, et al. (1973) data, a greater number of subjects was utilized. Additionally, the deprived-environment was made even more "deprived" via the use of powdered food. This was done to further reduce motor activity for those subjects. Another modification involved the enriched environment. Unlike the Tarte, et al. (1973) study, the enriched environment used in the present study was constructed to make it similar to the operant chamber in which testing was to take place. This change was instituted to decrease exploratory behavior in the enriched group. It might be hypothesized (see Zimbardo and Montgomery, 1957) that this similarity would decrease exploratory behavior in the test situation and result in a decrease in barpressing.

With the above modifications in mind, the present study was designed to partially replicate the Tarte, et al. (1973) study. However, contrary to the Tarte, et al. (1973) interpretation of the results of the Zimbardo and Montgomery (1957) and the Woods, et al. (1961) studies, in which Tarte et al. (1973) reported the results as indicating "that animals reared in enriched environments show increased exploratory behavior," this author feels that the results of the Zimbardo and Montgomery (1957), and Woods, et al. (1961) studies indicate that there was actually a decrease in the exploratory behavior shown by the animals reared in the enriched environment. Thus, based on this interpretation, animals reared in an enriched environment would tend to explore the testing environment less because they have already satiated the exploratory drive in the enriched environment. Consequently, they would barpress less in the presence of free-food due to decreased exploratory drive. Since the present study is designed to decrease the novel exploratory behavior in the enriched environment group, it is hypothesized that the enriched environment group would tend to barpress less, when placed in a choice situation of free-food vs. barpressing for food reward, than animals reared in a controlled or a deprived environment.

CHAPTER II

METHOD

<u>Subjects</u>: Twenty-seven, naive, male albino rats purchased from the Holtzman Company, Madison, Wisconsin served as subjects. They were approximately 21 days old at the beginning of the experiment. On the day of arrival, the rats were randomly assigned to either one of two experimental groups or a control group. Each group contained nine animals and were labeled as follows: Enriched-Similar Environment (ES), Deprived Group (D), and Normal Rearing Condition Group (N).

<u>Apparatus</u>: The rearing environment for Group ES consisted of a wooden box (insides painted white) 183 cm. X 122 cm. X 30 cm. with 1.27 cm. hardware cloth nailed to a hinged top. One-third of the floor was also 1.27 cm. hardware cloth with the remaining two-thirds of the floor being .635 cm. plywood. Eight pieces of metal, shaped similar to the operant bar found in the testing chamber, were placed on the four walls of the box, 10.16 cm. from the floor. A sandpile approximately 15 cm. high covered a portion of the plywood floor. The novelty objects, distributed randomly throughout the environment, consisted of eight wooden blocks, five small plastic balls, five small plastic toys, three "tunnels" made of tin cans, a wire exercise wheel and a cube-shaped plastic "habittrail" with holes and steps approximately 15.24 cm. X 12.70 cm. X 7.62 cm. Three water bottles were attached to one side of the box and food was placed randomly in the environment.

The rearing environment for the Group D subjects was an adaptation of the standard Wahmann laboratory rat cage. A piece of plywood divided each cage in half, lengthwise, forming two side-by-side cubicles (18 X 9 X 24 cm.). Purina Laboratory Chow was ground up to restrict food manipulation and placed in empty baby food jars which along with a water bottle were wired to the front of each cubicle. Subjects in Group D were housed one to a cubicle. The control animals were reared two to a cage in standard (18 X 18 X 24 cm.) Wahmann laboratory cages.

All training and testing took place in a standard operant-conditioning chamber, 26.67 cm. X 23.8125 cm. X 26.035 cm., which was placed in a sound-attenuating, ventilated chamber. A Davis Scientific Instrument Pellet Dispenser, Model No. PO-104, located externally, was used to dispense 45-mg Noyes Precision pellets. Free food was made available during the training and testing days from a metal dish containing 250 45-mg. Noyes pellets secured to the right rear portion of the chamber.

Procedure: On Day 1 of the experiment, all subjects were assigned randomly to one of the three environments. The ES animals were frequently handled by the experimenters throughout the experiment. Once placed in their rearing cages, subjects in Groups N and D were never handled, except during the training and testing sessions. On Day 43, all subjects were color-coded on the tail for identification. On Day 46, seven days prior to testing, the animals were placed on a 23-hour food-deprivation schedule. The testing procedure essentially followed the design of Carder and Berkowitz (1970). On Days 52, 53, and 54, subjects were individually placed into the operant chamber and allowed access to the free-food dish for 30 minutes. The operant lever was removed these days. A total of 250 45-mg. Noyes Precision pellets were available to each subject via the free food cup on these days. On Days 55-60, the animals received barpress training for 30 minutes per day; free food was not available. Days 61 and 62 were "choice" or testing days. Free food was again available, and the subjects had a "choice" between obtaining pellets by barpressing or by freeloading. The number of pellets eaten "freely" and the number of pellets "earned" by barpressing was recorded.

During the 11 days of training and testing, the ES and the N subjects were placed in feeding cages after their experimental session and were allowed to eat ad-lib for an additional half-hour. The D animals were returned to their home cage, where they were allowed access to the powdered food for an additional one-half hour.

CHAPTER III

RESULTS

Figure 1 shows graphically, the mean percentage of pellets obtained via barpressing during the two "choice" testing days. The numerical values of these percentage scores are also presented in Table 1. A repeated measures analysis of variance was performed on these percentage scores for the two choice days. The results of this analysis is presented in Table 2. As can be seen from this table, only the Environmental Rearing Conditions by Days interaction was significant. $F(2,24) = 3.44$, $p < .05$. This significant interaction was further investigated through the use of simple main effects analyses. The results of these analyses indicated that the significant interaction was attributed to a significant difference on the two choice days by Group N, $F(2,24) - 4.95$, $p < .05$. Thus, it can be seen from Figure 1 that the percentage of barpress responding on the part of Group N subjects decreased significantly from Day 10 to Day 11; while the other groups increased slightly, though not significantly.

In attempting to answer the basic question "do animals, disregarding rearing conditions, prefer to freeload", several Chi-square analyses were performed. Since previous literature offers no clue as to what expected frequency might be employed in this case, a purely chance (i.e., 50-50) model was adapted. Hence, it was expected that half of the animals would prefer to barpress and half expected to freeload. The results of these analyses indicated that no significant differences existed, i.e., one cannot say that animals significantly prefer to freeload or to barpress.

CHAPTER IV

DISCUSSION

The particular concern of the present study was to investigate further the barpressing vs. freeloading preference behavior of animals housed in a stimulus-deprived environment, an enriched environment, and a normal environment. It was hypothesized that animals reared in an enriched environment would tend to explore the testing environment less, thus, barpress less in the presence of free food.

The data shows, however, that a significant difference between the groups did not exist. Even though there is a lack of a significant difference, examination of Figure 1, shows that Group D did in fact barpress more than did the other two groups. These results are inconsistent with a previous study by Tarte, et al. (1973), which suggested that animals reared in a stimulus-enriched environment would tend to display increased exploratory drive behavior and consequently increased barpressing. However, on the other side of the coin, we find that the studies by Konrad and Bagshaw (1970), Woods et al. (1961), and Zimbardo and Montgomery (1957) suggest that novelty cues in the test situation are possibly related to the amount of exploratory behavior displayed by the animals. The above studies further suggest that the difference in the individual environments and the testing situations may, in fact, dictate the exploratory actions of the animal. It would appear that the restricted animals spent more time exploring the testing situation; thus, the behavior can be interpreted to mean that the deprived animals experienced the testing environment as more novel. More specifically, it can be predicted that the animals reared in a deprived environment would tend to display a greater amount of exploratory behavior and consequently a greater preference for barpressing. This would be expected because of the difference, novelty-wise, between the housing environment and the testing situation. Hence, as the present study suggests, animals reared in an enriched environment will not be as curious or display as much exploratory behavior, as restrictively-reared animals.

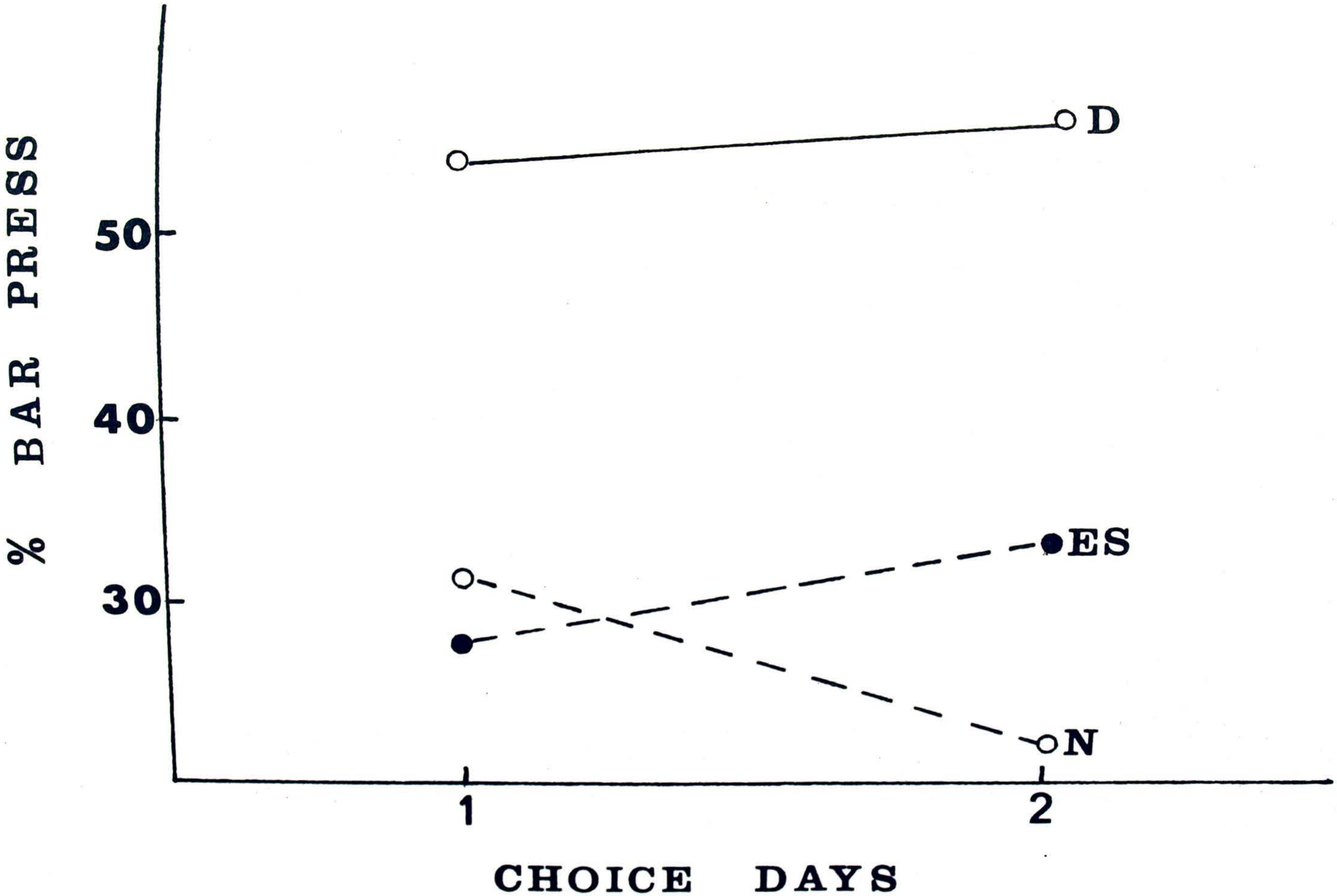
In the Tarte, et al. (1973) study, the authors state the assumption: "The fact that animals are normally housed in a way that generates high levels of barpressing in the presence of free rewards may be fortuitous in terms of the phenomenon." The present study indicates the reverse of this assumption (See figure 1) in that Group D displayed a greater preference for barpressing as opposed to freeloading.

Perhaps it is the degree of the deprivation that is the key to the heightened exploratory drive of the animals. The present study, in comparison to the Tarte, et al. (1973) study, further removed all possible manipulatory behavior by grinding up the food of Group D. However, this further restriction did not appear to inhibit the subjects to the extent of being completely unmotivated to explore the new environment (i.e., the testing situation).

It is apparent at this point that further investigation into the area of environmental control of the animal is needed. Further studies will need to take this variable into consideration, as well as the investigation of the actual preference of the animal before their environments have been manipulated.

APPENDIX A: FIGURES

Figure 1. - Mean Percentage Barpress Responding On Choice Days.


% BAR PRESS
50
40
30
D
ES
N
1
2
CHOICE DAYS

APPENDIX B: TABLES

Table 1. - Mean Percentage of Barpressing During Two Testing Days.

Group	N	Two Choice Days Per Cent Via Bar Day 10	 Per Cent Via Bar Day 11
Stimulus Deprived	9	53.33	55.11
Control	9	31.89	21.78
Stimulus Enriched	9	27.78	33.89

Table 2. - Summary of Mean Percentage of Barpressing Analysis of Variance.

Source	SS	df	MS	F
Between Subjects	48,208.00	26		
Environmental Rearing Condition (A)	7,947.00	2	3973.50	2.37
Subj. w. groups (error)	40,261.00	24	1677.54	
Within Subjects	2,878.00	27		
Choice Days (B)	6.00	1	6.00	.06
A X B	640.10	2	320.05	3.44*
B X Subj. w. groups (error)	2231.90	24	93.00	

*$p < .05$

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