THE INFLUENCE OF SUCCESSFUL AND UNSUCCESSFUL SOCIAL EXPERIENCES ON DOMINANT-SUBORDINATE BEHAVIOR OF THE RAT

By

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CHAPTER I

INTRODUCTION

One of the most striking features observed among animals possessing even rudimentary social organization is the existence of dominant-subordinate behavioral patterns among the individual members of the group. Such behavioral patterns provide the basis for what has been commonly known as the dominance hierarchy or the status hierarchy.

Over the years a number of studies have been devoted to the investigation of such hierarchies in a wide variety of species, ranging from fish (Noble & Borne, 1938) to humans (Harvey, 1953). The findings of the studies which have been conducted in this area have revealed considerable variation among the different species in regard to the development and structure of these hierarchies (Collias, 1950). For this reason, only those studies dealing specifically with the rat have been included in the review of the literature.

Review of the Literature

Of the investigations which have been undertaken in the study of the rat, only a very small number have been concerned with the nature of dominant-subordinate behavior. Even further limitations are placed on the information available in this area by the fact that several of these studies have not been specifically concerned with the underlying factors of dominant-subordinate behavior, but have simply involved

attempts to demonstrate the existence of a dominance hierarchy among rats.

For the sake of convenience, the studies which have been conducted in this area may be divided into two categories: (1) those dealing with the influence of heredity on dominant-subordinate behavior, and (2) those dealing with the effects of social experience on dominant-subordinate behavior. It is this latter category which has received the greatest amount of attention.

Heredity

Hall and Klein (1942) conducted a study involving a comparison of a "fearless" strain of albino rats with a "timid" strain. One method of comparison which was used was a thirst-competition situation. In this situation those animals of the fearless strain were found to be significantly more dominant, as determined by aggressive actions of one animal toward another, than were those of the timid strain.

Uyeno (1960) undertook a study to investigate the relationship between dominant-subordinate behavior in parents and dominant-subordinate behavior in offspring. Using a food-competition situation, he found that those animals which had been previously identified as dominant in competition for food tended to produce offspring who were dominant in similar situations.

Barnett (1963), in an open-field comparison of wild rats and laboratory rats, found a considerable difference between the dominant-subordinate behavior of the two species. The assertion of dominance through fighting was much less frequent and of a less severe nature among laboratory rats than among wild rats. Also, the dominant-

subordinate relationships observed among laboratory rats were not as rigid as were those observed among wild rats.

Social Experience

The most comprehensive body of information concerning the nature of dominant-subordinate behavioral patterns found in the rat has come from qualitative observations made upon experimental social colonies (Barnett, 1963). Although these observations have centered primarily upon the Common or Brown Rat, R. norvegius, rather than the laboratory rat, these accounts nevertheless represent a basic source of information concerning the social behavior of all species of rats.

On the basis of his observations, Barnett (1963) concluded that dominance hierarchies do not exist within the rat colony. Yet, he stated that stable dominant-subordinate relationships may be observed among the male members of the colony.[1] He distinguished between three types of males in the rat colony: alphas, which have attained dominant positions and have no fear of the other members of the colony; betas, which have been defeated by alphas and have adapted themselves to inferior positions within the colony; and omegas, which have been unable to adapt to defeat, exhibit a general adaptation syndrone, and

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[1]The definition of a dominance hierarchy used by Barnett (1963) is based on a rank ordering in which one animal holds the top position and all other animals hold subordinate positions. The distinction between a dominance hierarchy, as defined by Barnett, and the stable dominant-subordinate relationships described above is, for the purpose of this study, primarily definitional rather than practical in nature. Hierarchies of the latter type are observed among a number of species and are in part a function of the size of the group (Ardrey, 1966). Barnett (1963, p. 92) also notes that among small rat colonies one animal may hold a position superior to all other members of the colony.

eventually die. Although he attributed the development of these relationships to individual experiences, or more specifically, to the results of fighting, these experiences have little significance when they occur below the adult level. He did not observe stable dominant-subordinate relationships among colonies composed of animals which have been raised together prior to sexual maturity.

Seward (1945) attempted to establish stable dominant-subordinate relationships among groups of all-male and groups of all-female albino rats by pairing them in a combative situation. The combative situation consisted of placing two adult animals, which had been raised in isolation, together in a small cage. Using groups of six animals, each animal was paired with every other animal in his group six times, and allowed to fight until a judgment could be made regarding which animal was dominant. However, no stable dominant-subordinate relationships developed.

Grant & Chance (1958), in a study in which a qualitative method of assessing dominance and subordination was used, investigated group size as a factor influencing dominant-subordinate behavior among all-male and all-female groups. Following weaning, animals were divided into groups composed of 2, 3, 4, 5, and 6 animals each, and were observed for a period of nine weeks. When assessed during the first three weeks, rank-order hierarchies were found to have developed among the groups containing 2, 3, 4, and 5 animals. Over the nine-week period, the hierarchies for the 3, 4, and 5 member groups became more stable, but the hierarchies for the two-member groups broke down. Similar hierarchies were observed among both the male and female groups; however, those for the female groups tended to be less rigid.

Seitz (1954), in an effort to determine the influence of litter size on dominant-subordinate behavior, raised new-born rats under conditions in which litter size had been adjusted to 12 and 6. At the age of three weeks, these animals were placed in separate living cages and remained isolated until the age of 15 months at which time they met in a food competition situation. The findings of this study revealed that those animals which had been raised in large litters tended to be significantly more dominant in competition for food than were those animals which had been raised in small litters.

Rosen (1961), in a study similar to that of Seitz's, used a thirst-competition situation to compare animals which had been partially raised in pairs to those which had been raised in isolation. Twenty male albino rats were weaned at the age of 21 days and divided into two groups of ten animals each. One group was then housed in pairs, and the members of the other group were placed in separate cages. At the age of 42 days, those animals which had been paired were also placed in separate cages, and no further contact took place between the animals until they met in the test situation at the age of 82 days. On the basis of Seitz's findings, it was predicted that those animals which had been raised in pairs would be more dominant than would those which had been raised in isolation. Yet, no significant difference in the dominant-subordinate behavior of the two groups was found. It should be noted, however, that there were considerable differences in the methods used in these two studies.

Candland & Bloomquist (1965), in an interspecies comparison of the reliability of dominance orders, used as one of their species the rat. Ten male albino rats were raised together, from weaning to the

age of 80 days, and were forced to compete for food once each day. Each animal was then matched against every other animal two times in a food-competition situation. The results of the competition failed to reveal the existence of a reliable dominance hierarchy.

Summary and Conclusions

As revealed by the review of the literature, information regarding the nature of dominant-subordinate behavior of the rat is limited. In addition, the studies which have been concerned with this behavior have yielded conflicting results. Although much of this inconsistency may have been due to differences in the criterion used for determining dominance and subordination, these differences have only complicated the assimilation of the information which has been obtained.

From the information available, two rather broad generalizations may be drawn: (1) Innate differences in dominant-subordinate behavior have been found in rats (Barnett, 1963; Hall & Klein, 1942; Uyeno, 1960). (2) Social experiences may have a significant influence on the development of dominant-subordinate behavior (Barnett, 1963; Grant & Chance, 1958; Seitz, 1954). Beyond this point generalizations have to be drawn with care.

Questions regarding factors influencing dominant-subordinate behavior, such as aggressiveness and submissiveness, the significance of specific types of social experiences, the influence of age and sex, the importance of the size of the group in which social experiences occur, and the stability of dominant-subordinate behavior, can be answered only hesitantly and with the qualification that the information available is limited. For questions of a more complex nature, there

are no answers, with or without qualification.

Even though much of the dominant-subordinate behavior of the rat may be seen as consisting of genetically determined behavioral patterns, the role of experience and its influences on these behavioral patterns cannot be dismissed lightly. Among the major questions to be answered in regard to the dominant-subordinate behavior of the rat are those dealing with the influence of experience on the development of this behavior. It is one such question which provided the basis for the design of this study.

CHAPTER II

STATEMENT OF THE PROBLEM

Many of the studies which have dealt with the effects of social experiences on the dominant-subordinate behavior of the rat have assumed that the underlying basis of this behavior is to be found in social interactions stemming from conflict situations, or more precisely, encounters in which two or more animals, responding in connection with each other's presence, are apparently competing for a common goal. This assumption implies that success and failure in social interactions have a differential effect on the development of dominant-subordinate behavior. Stated somewhat differently, it has been assumed that successful social encounters tend to produce dominant behavior, and unsuccessful social encounters tend to produce subordinate behavior. However, no attempt has been made to explore experimentally the implications of this assumption.

It was, therefore, the purpose of this study to investigate the the relationship between success and failure experienced in social interactions stemming from conflict situations. More specifically, this study involved an attempt to relate the effects of early successful social experiences to dominant behavior and the effects of early unsuccessful social experiences to subordinate behavior.

Hypotheses

Two hypotheses were put forth: (1) In competition for food, rats competing with rats 30 days younger than themselves will be more successful than will rats competing with rats 30 days older than themselves. (2) Early successful experiences in competition for food will result in later dominant behavior, and early unsuccessful experiences in competition for food will result in later subordinate behavior.

CHAPTER III

METHOD

Subjects

The Experimental Subjects (ESs) were 16 experimentally naive Rockland Farms male albino rats. These animals were purchased at the age of 28 days and were received at the age of 30 days. At the start of the investigation, the ESs were 60 days old.

Thirty-two additional Rockland Farms male albino rats were also used in the experiment. Sixteen of these animals were purchased at the age of 58 days and were received at the age of 60 days. These animals were designated as Social Group I (SG I), and they were 90 days old at the start of the investigation. The other 16 animals were purchased at the age of 23 days and were received at the age of 25 days. These animals were designated as Social Group II (SG II), and they were 30 days old at the start of the investigation. The animals in both of these groups were housed in the same facilities as the ESs.

Apparatus

The testing apparatus, or Dominance Test Box (DTB), was constructed of 3/4-inch plywood. The inside dimensions measured 36 inches X 4 inches X 5 inches. It was divided into four sections by three partitions. Two of the partitions were placed six inches from each end, and one partition was 18 inches from either end. The two smaller,

or end, areas served both as start-boxes and goal-boxes. A sliding- or guillotine-type door, placed flush against the outside of each of the end-box partitions, covered a 3-inch X 3-inch square opening in the partition. The middle partition was double-walled, and a sliding door between the two walls closed a 2 1/4-inch X 2 1/4-inch square opening in the partition. The three doors were so constructed that they only closed to within 3/8 of an inch of the floor.

The four sections of the DTB were covered with plywood-framed 1/2-inch hardware cloth lids which were hinged and held fast by 1 1/4-inch screendoor hooks. The floor of the DTB was covered with 1/2-inch hardware cloth which was held in place by 1/2-inch quarter-round molding. All wooden parts were painted a flat gray (see Figure 1).

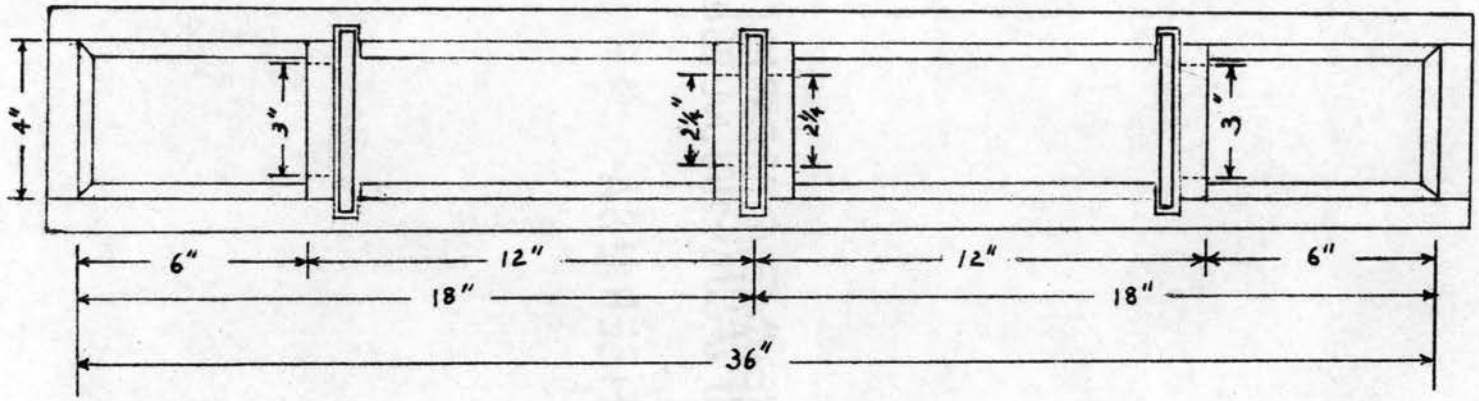
The DTB was placed on a table three feet above the floor of the experimental room. Illumination was provided by three 200-watt incandescent lamps inclosed in translucent shades.

Two types of cages were used: (1) 8-inch X 9 1/2-inch X 7-inch individual cages, and (2) 17 1/2-inch X 14-inch X 9-inch group cages. The individual cages were racked four high and six across, and the group cages were racked four high and four across.

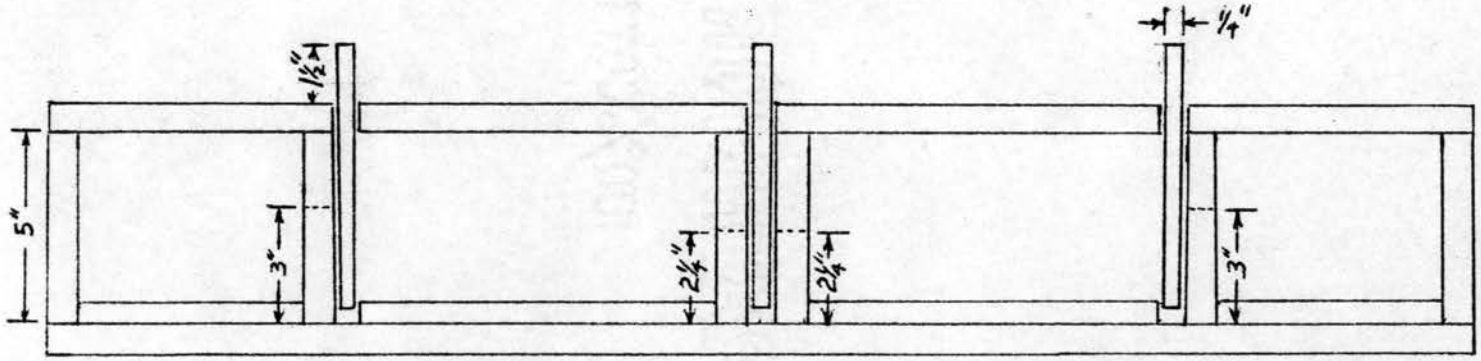
Procedure

The Ss were placed in individual cages where they remained for 30 days prior to the beginning of the experiment. The animals in SG I were also housed in individual cages for 30 days preceding the experiment. The animals in SG II were housed in individual cages for five days before being placed in the experimental situation.

The experiment was divided into three phases: a social phase,



Exposed Top View



Exposed Side View

Figure 1. Dominance Test Box

a training phase, and a testing phase.

Social phase. This phase began with the random assignment of each of the ESs to a group cage and the random pairing of the animals within each of the two social groups. Prior to the beginning of this phase three of the animals in SG I and one of the animals in SG II died of unknown causes. Therefore, the pairing of the animals in these two groups yielded six pairs in SG I and seven pairs in SG II. These pairs were then randomly assigned to the group cages. The two extra social animals, one from SG I and one from SG II and the three ESs which had not been assigned a pair of social animals remained housed in individual cages.

As the result of the assignment to the group cages, six 60-day-old ESs were each housed with two 90-day-old animals from SG I, and seven 60-day-old ESs were each housed with two 30-day-old animals from SG II. The six ESs which were housed with the animals from SG I were designated as Experimental Group I (EG I) and the seven ESs which were housed with the animals from SG II were designated as Experimental Group II (EG II). Collectively, these groups will be referred to as Experimental-Social Group I (E-SG I) and Experimental-Social Group II (E-SG II).

Water was provided at all times; however, the experimental-social groups were placed on a 12-hour feeding schedule. This feeding schedule was designed to induce social interaction among the members of each group within the experimental-social groups through competition for food. Due to the relatively younger age and smaller size of the ESs in E-SG I, this competition for food was predicted to provide the unsuccessful social encounters required by the hypothesis. Likewise, the

relatively older age and larger size of the ESs in E-SG II and this competition were predicted to provide the successful social encounters required by the hypothesis.

The procedure for feeding was as follows: One pellet of Purina Lab Chow was placed in each group cage, with precautions being taken not to favor any one animal, and the animals were allowed to compete for it for 15 minutes. At the end of this 15-minute period of competition, a sufficient amount of food was placed inside each cage to insure that each animal would have access to all the food it could eat within a one-hour period. At the end of one hour, all excess food was removed.

In order to determine if the predicted success and failure in competition for food was occurring, the ESs were observed during the competition portion of the feeding schedule over a ten-day period. Five minutes after having placed a food pellet inside all of the group cages, the experimenter, beginning with Group Cage #1 and proceeding to Group Cage #2, #3, etc., noted each ES's success and failure. Success and failure were defined in terms of possession of the food pellet, with possession being considered a success and being given a score of one, and nonpossession being considered a failure and being given a score of zero. It required approximately five minutes to place the food inside each cage and five minutes to make the observations, and the cages were always observed in the same order.

These observations were made twice daily or at each feeding from the eleventh thru the twentieth day of the experiment. Thus, a total of 20 observations were made on each ES.

Later deaths[2] among the social animals in the experimental-social groups reduced the number of groups within E-SG II from seven to six and required the substitution of the extra social animals to maintain six groups within each experimental-social group. Eventually, as the result of further deaths, it was necessary to use two extra ESs in place of social animals. Therefore, one group in each experimental-social group was composed of a social animal, a substitute social animal (an extra ES), and an ES. Since the use of the extra ESs did not bias the experiment in favor of the hypothesis, these groups were retained.

Training phase. At the age of 80 days a series of training trials was begun with the ESs in the DTB. Each ES was given ten training trials per day over a ten-day period for a total of 100 trials.

At the beginning of this phase of the experiment the feeding schedule was changed to one feeding every 24 hours. Otherwise, the feeding schedule remained essentially the same with the 15-minute period of competition and 1 hour of free feeding being retained.

With the exception of the first day's series of training trials, which required approximately six hours to complete, all training trials were run under 21 to 23 hours of deprivation. These trials were given between 9:00 p.m. and 11:00 p.m. each day.

Immediately before beginning each day's series of trials, the ESs

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[2]Concern over these deaths prompted seeking the aid of the Veterinary Pathology Department at Oklahoma State University in an attempt to determine their cause and to take preventive measures for dealing with them. Since the remaining animals were treated to prevent further deaths, the result of the gross examinations and laboratory analyses, the symptomatology, and the method and procedure followed in treatment are given in Appendix A.

were removed from the group cages and placed in individual cages on a separate rack. The order in which the ESs received their first series of ten trials was randomly determined. The end-box which served as a start-box for the ESs' first trial was randomly varied, with six ESs starting from End Box A and six ESs starting from End Box B. Thereafter, the running order and the end-box from which the ESs began each series of 10 trials were reversed from day to day.

The following procedure was used in the running of the training trials: Each ES was carried to the training area in its individual cage. The ES was then placed in the predesignated end-box and the sliding door was lifted allowing it to move out of the end-box. As the ES approached each partition, the doors were lifted to allow it to move into the next section of the DTB. When the ES's explorations led it into the opposite end-box from which it had begun, it was rewarded with one pellet of P. J. Noyes Co. lab rat food (4.0 mm. X 3.3 mm; 45 mg.). This movement from one end-box to the other constituted one trial.

The ES then was removed from the end-box and placed in its cage for approximately 5 seconds. It was then picked up and returned to the end-box from which it had just been removed for the start of the second trial. Thus, the end-box which had served as a goal-box on the previous trial now became a start-box, and the end-box which served as a start-box on the previous trial became a goal-box.

After each ES had completed its ten trials it was returned to the individual cage rack where it remained until all of the daily training trials for all of the ESs had been completed. The ESs were then returned to their group cages and fed according to the normal feeding schedule.

Testing phase. The dominant-subordinate testing phase was carried out over a two-day period which began when the ESs were 90 days old and ended when they were 91 days old. On the day preceding the testing the ESs were weighed; and the ESs from EG I were marked with a red dye, and the ESs from EG II were marked with a blue dye to facilitate identification.

During the testing each ES from EG I was matched one time per day with each ES from EG II. Therefore, there were 36 test trials per day and a total of 72 trials for the two days of testing.

Each day's series of 36 trials was run in six blocks of six trials each to insure that each ES had received the same number of test trials as the ES against which he was matched. Thus, the pairing of ESs within each block of six trials was predetermined. However, the order in which the pairs within each block received their trials was randomly determined, and on the second day of testing, the order in which the blocks of trials had been run on the first day was reversed. Also, the end-box used by each experimental group as a start-box was alternately varied from block to block. Therefore, each experimental group ran six test trials from End Box A and six test trials from End Box B.

Since it required approximately one and one-half hours to run the 36 test trials each day, the test trials were run under 22 1/2 to 24 hours of deprivation. On the first day the trials were run between the hours of 10:30 p.m. and 12:00 p.m., and on the second day they were run between the hours of 11:30 p.m. and 1:00 a.m.

Thirty minutes prior to testing, the ESs were removed from the group cages and placed in the individual cages used during the training phase. Each ES was carried to the testing area in its individual cage.

At the testing area, the cages were so placed that neither animal could see the other.

The experimenter and an assistant, handling different animals, removed them from their individual cages and placed them in their predesignated start-boxes. The experimenter always worked from End Box A and his assistant always worked from End Box B, and as a result, the Ess from each experimental group were handled an equal number of times by the experimenter and the assistant.

After placing the ESs inside the end-boxes, the doors of the end-boxes were opened to allow the animals to proceed to the middle partition of the DTB. As soon as the ESs were out of the end-boxes, the sliding doors on these boxes were closed and one pellet of the previously mentioned reward food was placed inside each end-box.

When the ESs were, in the opinion of the experimenter, equally oriented toward the opening in the middle partition, the sliding door was removed, giving each animal access to the opening. The ES which first succeeded in passing through the opening was considered to be the dominant animal and was given a score of one, and the other ES was considered to be the subordinate animal and was given a score of zero.

After each ES had passed through the middle partition and was proceeding toward the opposite end-box from which he had started, the door of the middle partition was closed, and the doors to the end-boxes were opened. When the ESs had entered the opposite end-boxes from which they had begun, the doors were closed, and the ESs were allowed to consume the pellet of reward food before being returned to their individual cages. Upon completion of the daily series of 36 trials, the ESs were removed from their individual cages and returned to the

group cages where they were fed according to the previously described procedure.

CHAPTER IV

RESULTS

The observations of success and failure in competition for food revealed, as predicted, that the ESs in E-SG II were significantly more successful than the ESs in E-SG I. An Analysis of Variance based on percentage of successes yielded an F value significant beyond the .01 level (see Table I). The raw scores obtained on these observations may be seen in Appendix B.

TABLE I

ANALYSIS OF VARIANCE OF SUCCESS AND FAILURE IN COMPETITION FOR FOOD

Source	df	SS	MS	F	p
Total	11	8,722.917			
Treatment	1	4,602.083	4,602.083	11.168	$<.01$
Error	10	4,120.834	412.083		

Note: Based on the percentage of successes achieved by each ES over twenty feedings.

The dominance test trials revealed a group difference opposite that predicted by the hypothesis. The ESs from E-SG I obtained a dominance score higher than that of the ESs from E-SG II. Using an adjusted Chi Square for nonparametric data, this difference was found to be significant beyond the .005 level (see Table II). The individual

dominance test scores are presented in Appendix C.

TABLE II

CHI SQUARE ANALYSIS OF THE RESULTS OF THE DOMINANCE TEST TRIALS

	EG I	EG II
Score*	54	18
	$X^2 = 18.00$; df = 1; $p < .005$	

* Number of dominant trials

The weights of the ESs revealed considerable within-group variation; however, there was little between-group difference in weight. The total and mean weights of the experimental groups may be seen in Table III, and the weights of the individual animals may be seen in Appendix D.

TABLE III

WEIGHTS OF THE EXPERIMENTAL GROUPS

	EG I (N = 6)	EG II (N = 6)
Total	1903.00 gms.	1892.50 gms.
Mean	317.17 gms.	315.42 gms.
S.D.	55.23 gms.	61.51 gms.

Note: Weights taken at the age of 89 days.

CHAPTER V

DISCUSSION

As may be seen, the results of this experiment do not support the hypothesis that early successful social experiences tend to produce dominant behavior and early unsuccessful social experiences tend to produce subordinate behavior. However, these results do offer evidence that early social experiences in general, and early successful and unsuccessful social experiences in particular, are related to dominant-subordinate behavior of the rat. That this relationship should be opposite that predicted by the hypothesis certainly requires some explanation. Unfortunately, explanatory comments regarding the findings of this study must be of a theoretical nature, for specific research in the area of dominant-subordinate behavior of the rat is extremely limited.

Before undertaking an attempt to account for the findings of the study, it should be noted that in the feedings preceding the running of the dominance test trials the competition portion of the feeding schedule was maintained. Therefore, it would be expected that the ESs in E-SG II obtained the food pellet during the period of competition, and consequently, had access to more food for a longer period of time than did the ESs in E-SG I. It is not known as to what effects this probable difference would have on drive-level at 22 1/2 to 24 hours of deprivation.

Several approaches may be taken in attempting to account for the

findings of this study. Seitz (1954), in a study in which rats raised in large litters were matched against animals raised in small litters in a food competition situation, found that those animals from large litters were more successful in competing for food. The explanation for these findings was that the animals from large litters had had more experience at competing, and, as a result, were more skillful. Thus, we might see the dominance of the ESs in E-SG I resulting from their having been exposed to more competition, and, as a consequence, having learned to compete more effectively.

Another approach which might be taken would be to postulate a difference in aggressiveness between the two experimental groups. The underlying assumption of this approach would be that the dominance of the ESs in E-SG I resulted from heightened aggressiveness stemming from more rigorous social interaction. That the ESs in E-SG I were subjected to interaction of a more forceful nature is supported by the data collected on the competition for food and by observations of group activity at other times. However, it remains questionable as to whether such interaction results in increased aggressiveness. There is, at least, some evidence to the contrary. Seward (1946) has shown that fighting tends to decrease later aggressiveness in both winners and losers.

The third and final approach which will be offered takes a somewhat different slant in that it focuses on the subordination of the ESs in E-SG II rather than the dominance of the ESs in E-SG I. Subjective evaluations of the interaction occurring in competition for food revealed two rather distinct types. In E-SG I the ES either got the food pellet when it was first placed inside the cage and was then chased by

the social animal, or one of the social animals got the food pellet and the ES chased the social animal. In E-SG II the ES either obtained the food pellet when it was first presented and went to a corner to eat unmolested, or one of the social animals got the pellet and the ES then chased the social animal, often taking the pellet from the social animal. Therefore, the interaction to which the ESs in E-SG I were exposed was two-way, with the ES being both a pursuer and the pursued, and the interaction to which the ESs in E-SG II were exposed was primarily one-way, with the ES being a pursurer but not being pursued. As a consequence of this difference in type of social interaction, the subordination of the ESs in E-SG II may be viewed as the result of being unaccustomed to having another animal move forcibly against them.

Observations of the reactions of the ESs in the DTB seem to lend some support to this account. The typical reaction of the ESs in E-SG II was to stop either when the other ESs were seen to be also attempting to get through the opening in the middle partition or to back up when the other ESs actually pushed against them.

These reactions did not appear to be due to fear. The ESs in E-SG II were often observed to turn and examine the other animal before proceeding through the opening toward his own goal-box. On several occasions the ESs from E-SG I were observed to assume a full submissive posture of lying on their backs when being examined by the ESs from E-SG II. No such posture was observed on the part of the ESs in E-SG II.

In terms of this explanation, the subordination of the ESs in E-SG II may be characterized by what may be called, for a lack of more descriptive terminology, a "surprise reaction." Accepting such an

explanation, one must also accept the implications that such behavior might only be temporary.

Certainly, the information presented above by no means exhausts or represents an attempt to exhaust all possible explanations for the findings of this study. What has been attempted has been to present what is hoped to be, at least, general guidelines for further research.

CHAPTER VI

SUMMARY

This study represents an attempt to investigate the relationship between successful and unsuccessful social experiences and dominant-subordinate behavior in the rat. Two hypotheses were put forth: (1) In competition for food, rats competing with rats 30 days younger than themselves will be more successful than will rats competing with rats 30 days older than themselves. (2) Early successful experiences in competition for food will result in later dominant behavior, and early unsuccessful experiences in competition for food will result in later subordinate behavior.

Twelve 60-day-old male albino rats were placed under one of two living conditions. Six of these animals were each housed with two 90-day-old animals, and six were each housed with two 30-day-old animals. These groups were then placed on a feeding schedule involving a period of food competition.

Observations were made twice daily from the eleventh thru the twentieth day to determine each ES's success and failure in competition for food. And, at the age of 90 days, the ESs were matched against each other in a Dominance Test Box.

Observations of the food competition revealed that, as predicted, those ESs housed with younger animals were significantly more successful in competing for food than were the ESs housed with older animals.

The results of the dominance test revealed an inverse relationship to that predicted by the hypothesis with unsuccessful social experiences being related to dominance and successful social experiences being related to subordination.

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APPENDICES

APPENDIX A

DEATHS AMONG SOCIAL ANIMALS: ETIOLOGY, SYMPTOMATOLOGY, AND TREATMENT

Necropsies were performed on Social Animal I-8, age 98 days, and Social Animal II-9, age 39 days. The gross examinations and follow-up laboratory analyses revealed that death resulted from pathogenic pneumonia of streptococcic origins.

The first overt symptoms of the disorder appeared in the form of blood around the nostrils. This was followed, within a day or two, by congested breathing with a distinct "rasping" sound. These symptoms were accompanied by a general lowered level of activity and a loss of appetite. With the appearance of these overt symptoms the disorder was usually terminal.

All animals were treated with Purina Tylan Soluble, a tylasin tartrate, mixed one part (11.2 gms.) to five gallons of regular drinking water. The animals were kept on this medication from the 14th to the 24th day of the experiment.

Only two deaths occurred after treatment was begun. Both of these deaths were among the younger social animals, and one of these animals was showing overt symptoms of the disorder prior to treatment.

APPENDIX B

FOOD COMPETITION SCORES

	EG I						EG II					
Subjects	8	4	5	6	2	9	15	10	11	14	3	12
1.	0	0	0	1	0	0	0	0	1	1	1	0
2.	0	0	0	1	0	1	0	1	1	1	0	1
3.	0	1	0	1	0	0	0	1	0	1	1	0
4.	0	1	0	0	0	0	1	0	0	1	1	1
5.	0	0	0	1	1	0	1	1	0	1	1	0
6.	0	0	0	1	0	0	1	0	1	1	0	0
7.	0	0	1	1	1	0	0	1	1	1	1	0
8.	0	0	0	0	0	1	1	1	1	1	0	0
9.	0	0	0	1	1	0	0	0	1	1	1	0
10.	0	0	0	1	0	0	0	1	1	1	1	1
11.	1	0	1	0	0	0	1	0	0	1	0	1
12.	0	0	0	0	0	0	0	0	1	1	1	1
13.	0	0	0	1	1	0	1	0	1	1	1	0
14.	0	0	0	0	1	1	0	1	0	1	0	0
15.	0	0	0	0	0	0	0	1	1	1	1	1
16.	0	0	0	0	0	0	0	1	1	1	0	0
17.	0	1	0	0	1	0	0	1	0	1	1	1
18.	0	0	0	0	0	0	0	1	1	1	1	0
19.	0	1	0	1	0	0	1	1	1	1	1	0
20.	0	0	1	0	1	0	0	0	1	1	1	1
Totals	1	4	3	10	7	3	7	12	14	20	14	8

Observations

APPENDIX C

DOMINANCE SCORES

		EG I						EG II					
Subjects		8	4	5	6	2	9	15	10	11	14	3	12
Trials 1st Day	1.	1	0	1	1	1	1	0	1	0	0	0	0
	2.	1	0	1	1	1	0	1	0	1	0	0	0
	3.	1	0	1	1	1	1	0	0	0	0	0	1
	4.	0	1	1	1	1	0	0	0	1	0	0	1
	5.	1	1	1	1	1	0	0	0	0	0	0	1
	6.	1	1	1	1	1	0	0	0	0	1	0	0
Trials 2nd Day	7.	1	1	1	0	1	1	0	0	0	0	0	1
	8.	1	0	0	1	1	0	1	0	1	0	0	1
	9.	1	0	1	1	1	1	0	0	0	0	0	1
	10.	0	0	1	0	1	1	1	0	0	1	0	1
	11.	1	1	1	1	1	1	0	0	0	0	0	0
	12.	0	0	1	1	1	1	1	0	0	0	1	0
Totals		9	5	11	10	12	7	4	1	3	2	1	7

APPENDIX D

WEIGHTS OF ESs

EG I		EG II	
Subject	Weight (gms.)	Subject	Weight (gms.)
8	304.5	15	329.0
4	215.0	10	350.5
5	319.5	11	276.5
6	365.0	14	405.5
2	338.0	3	227.5
9	361.0	12	303.5

VITA

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Master of Science

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