Observation and shaping learning: A comparison using Long Evans rats¹

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The acquisition of a lever-press response was compared between groups of hooded rats who learned through observation or shaping. The trials-to-criterion data revealed that the observation and shaping techniques did not differ from each other, but that they were superior to the control procedures. Analysis of total number of lever presses demonstrated that the observation technique was superior to the shaping technique and that the shaping technique was superior to the controls. These results are contrary to recent reports, presumably because the present investigation employed a series of procedures to optimize the visual process.

There has been a recent increase of interest in the study of learning through observation in subhuman species, especially as it compares to the more standard technique of learning through shaping. In two recent studies, Corson (1967) and Powell (1968) compared observational learning with shaping learning in rats. They each trained a shaped group to press a lever in an operant-conditioning chamber by the method of successive approximation and an observational group by placing Ss in the conditioning chamber with a previously trained S. Corson reported that the observational group required significantly fewer trials to reach criterion than did the shaped group, while Powell's "replication" experiment reported contradictory results.

As Powell, Saunders, & Thompson (1968) pointed out, both the Corson and Powell experiments were confounded by the fact that the observational groups, by being placed in the same compartment with a well trained S, had the opportunity to do more than observe. Specifically, the observational group had the opportunity to become magazine trained. In order to control for this factor, Powell et al trained an observational group by placing the Ss behind a clear Plexiglas partition through which a well trained model could be observed. Powell et al reported that the observational group required significantly more trials to reach criterion than did the shaped group. However, Powell and Powell et al used albino rats as Ss which are notorious for their poor vision. The inferior visual acuity of albino rats was reported more than 35 years ago by Lashley (1930). Greenhut

(1954) found that albino animals were poorer than hooded animals in determining depth in a perceptual-discrimination experiment. Recently Davidson & Walk (1969) compared hooded and albino rats in a visual-cliff experiment and found the albinos significantly inferior to the hooded animals.

The purpose of the present investigation was to compare observational with shaping learning in a situation which would optimize the visual process. Consequently, hooded rats were used as Ss and several apparatus modifications, developed during a pilot study, were implemented.

SUBJECTS

The Ss in this experiment were 26 naive Long-Evans male rats, approximately 90 days of age, weighing 190-225 g.

APPARATUS

A standard operant-conditioning chamber was modified in the following manner: (a) the lever was moved to a position immediately over and 3 in. above the food receptacle; (b) a clear Plexiglas partition was placed inside the chamber at a slight diagonal so that the lever and food receptacle were almost touching the partition (the compartment which housed the lever and food receptacle was called the operational side); (c) the outside transparent walls of the chamber were covered with a translucent paper so that external visual stimuli were kept to a minimum; and (d) the chamber was maintained in an air-conditioned, soundproof room. The above mentioned modifications were introduced to optimize the probability that the S in the nonoperational side of the chamber could visually observe a model in the operational side press the lever and eat the food.

PROCEDURE

All 26 Ss were kept on a 23-h food-deprivation schedule and allowed free access to water in their home cages. Two Ss were randomly selected to serve as models and were shaped to lever press until they reached a criterion of 75 presses in 7½ min. The remaining 24 Ss were randomly assigned to four groups of six Ss each. These Ss were trained for 7½ min and tested for 7½ min once a day, for 6 days. The groups differed only in the kind of training they received: "Group Shape" was placed in the operational side of the chamber and shaped to lever press according to the method of successive approximation; "Group Observe"

previously trained models press for food reinforcement on a CRF schedule; "Group Empty" was placed in the nonoperational side of the chamber and allowed to observe an empty operational compartment to control for adaptation to the situation; "Group Nothing" was kept in its home cage during the training period. Immediately following training, all Ss were placed alone in the operational side of the chamber for the test period. The apparatus was set to deliver food reinforcement on a CRF schedule.

RESULTS

Two dependent variables based on performance during the test periods were separately analyzed. The first dependent variable was the number of trials (test sessions) to reach the criterion of 50 lever presses in a 7½-min period. If the S failed to reach the criterion during the experiment he was given a score of 6. The mean number of trials to criterion by group were: Group Observe, 2.7; Group Shape, 3.2; Group Empty, 4.3; and Group Nothing, 4.8. A Kruskal-Wallis analysis of variance demonstrated a significant difference between the groups [$H(3) = 13.2, p < .01$]. However, a series of Mann-Whitney U tests showed that both Group Observe and Group Shape required significantly fewer trials to reach criterion than either of the two control groups but did not significantly differ from each other ($ps = .05$ or less).

The second dependent variable was the total number of lever presses. This measure was used because it was felt to be a more sensitive and complete measure of the Ss' behavior. The data for each of the four groups on each of the 6 days are shown in

Fig. 1. Total number of lever presses on each of the six test sessions for each of the four groups.

Fig. 1. A 6 by 4 analysis of variance revealed a significant group effect [$F(3,20) = 5.75$, $p < .01$], a significant trials effect [$F(5,100) = 45.20$, $p < .01$], and a borderline Group by Trial interaction effect [$F(15,100) = 2.01$, $.10 > p > .05$]. A Duncan's range test was then computed to make specific group comparisons on total number of lever presses. It was found that Group Observe was superior to all other groups, Group Shape was superior to the two control groups, and the two control groups did not differ significantly from each other.

DISCUSSION

The principal findings of the present investigation are: (a) using total trials to criterion, the observational technique produces performance rates equal to that produced by the shaping technique, and (b) using total number of lever presses, the observational technique produces significantly better performance than the shaping technique. These results are contrary to those of Powell et al, presumably because the present investigation optimized the visual process by using hooded rats along with several apparatus modifications. Also, it should be noted that the present data exhibit markedly smaller mean and variability measures than do the data of Powell et al, again presumably due to the S and apparatus differences between the two studies.

The findings of the present investigation have potential implications for research in experimental methodology and theories of learning. First, regarding experimental methodology, observational learning may be used as an efficient method for training operant behavior without the time demands and manpower associated with shaping techniques. Second, regarding theories of learning, observational learning involves changes in performance without the involvement of a direct overt response or the occurrence of direct reinforcement. This

phenomenon may pose problems for traditional S-R reinforcement theories of learning, but it is not necessarily incompatible with such an approach (Gewirtz & Stingl, 1968).

Finally, two qualifying notes should be made. First, the performance increments in "Group Observe" may have been due to the interaction of the observation during the training phase with the direct experience during the testing phase. The study of "pure" observational learning, independent of direct experience, remains to be done. Second, the results of any study which attempts to compare observational learning with shaping learning will depend, at least in part, on the skill of the E who does the shaping.

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NOTES

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Two-way shuttle avoidance in wild and domesticated mice¹

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Two-way shuttle avoidance was studied in albino mice and wild beach mice. A compound light-sound preaversive stimulus was employed. The albino mice more quickly reached a criterion of 90% avoidance than the wild mice, with the

difference between groups significant at the .05 level. All four albino mice and four of five wild mice met the avoidance criterion. The wild mice showed much greater day-to-day variability in avoidance than the albino mice.

The generality which can be ascribed to data obtained from domesticated laboratory

species has been questioned a number of times (Beach, 1950; Richter, 1959; Bitterman, 1960; Lockard, 1968). Lockard contends that the albino rat is the product of an environment in which the normal contingencies of survival do not obtain, and is, therefore, an unnatural species. While the major object of criticism has been the albino rat, the same objections would apply to other inbred domesticated laboratory species.

Several recent experiments have compared escape and avoidance learning in wild and domesticated species. Powell & Morris (1968) employed operant-conditioning procedures to study escape, unsignaled and signaled avoidance in wild cotton rats (*Sigmodon hispidus*) and albino rats. They found that cotton rats initiated responding at lower shock intensities, but the albino rats displayed more effective asymptotic responding in all of the situations studied. Powell & Peck (in press) compared running-wheel activity and unsignaled lever-press avoidance in Mongolian gerbils (*Meriones unguiculatus*) and albino rats. They also studied two-way shuttle avoidance in gerbils and albino mice. Rates of acquisition and asymptotic performance were quite similar in the different species. The gerbils ran at much higher rates than the rats. Boice, Denny, & Thomas (1967) found no difference between mild Norway rats and albino rats in the acquisition of shuttle avoidance. The duration of the experiment (80 trials) and the curves presented indicated that asymptotic responding was not achieved.

The purpose of the present experiment was to provide additional comparative information on a wild and a domesticated species which are closely related on a phylogenetic basis. Albino mice (*Mus musculus*) and beach mice (*Peromyscus polionotus*), the two species studied, are both members of the order Rodentia and the suborder Myomorpha. The domesticated albino mouse has been developed from the common house mouse, which is a member of the family Muridae (old world rats and mice). The beach mouse belongs to the family Cricetidae (new world rats and mice).

METHOD

Four adult male albino mice, Balb/c strain, and five adult male beach mice, all experimentally naive, served as Ss. The wild mice were first-generation offspring of field-caught *Peromyscus*. All animals had free access to water and Purina lab chow throughout the experiment.

A rectangular shuttlebox was employed which was constructed of 3/16-in. Plexiglas. The four sides of the box were covered by heavy tape, so that light was admitted only through the top. The box was 17 x 4 x 4 in. Compartments, 4 x 4 x 4 in., could be formed at either end of the shuttlebox by