Psychological Reports, 1979, 44, 1151-1154.

OBSERVATIONAL LEARNING OF A DISCRIMINATIVE SHUTTLEBOX AVOIDANCE BY RATS[1]

EZIO SANAVIO AND UGO SAVARDI

Istituto di Psicologia dell'Università di Padova, Padova, Italy

Summary.—The study of observational learning of discriminative avoidance response in shuttlebox has methodological advantages over the usual appetitive responses. Three groups of 10 Wistar rats each received avoidance training after observation of a trained model, after observation of a naive model, after adaptation to procedure and no model. The first group performed better than the naive-model group both for frequency and latency of responses. The hypothesis that this learning occurs through observation of the model's behavior explains these results. However, observing the behavior to be learned does not facilitate acquisition of the avoidance response compared with rats learning after adaptation and no model.

Experiments on observational learning by animals using aversive stimuli are few relative to the number of experiments in which alimentary reinforcers are used. Such lack of interest may be due to the difficulties connected to alarm pheromones produced under fear or stress. In fact, an avoidance response offers the methodological advantage that in the observation phase no reinforcer is physically detectable, especially if the model is adequately trained.

Observation of the demonstrator's trials facilitates learning of avoidance in a shuttlebox by rhesus monkeys (8), cats (4) and house mice (6). Rats trained to imitate leaders in T-maze situations, with food incentive, failed to generalize to a shock-avoidance training situation and showed acquisition of avoidance responses which did not differ significantly from that of controls who had not had prior imitation training (9). The influence of observation on the acquisition of passive avoidances by rats was noted in a semi-naturalistic study using an unusual aversive stimulus, i.e., a lighted candle (5). In acquisition of Sidman avoidance, rats receiving paired training did not acquire the lever-press even after a block of individual training sessions. Even when rats which were efficiently avoiding under individual training conditions were paired, avoidance was severely disrupted (1). Unfortunately no physical separation was provided to eliminate behaviors which might interfere with responding. Del Russo (3) compared 5 learning conditions of discriminated avoidance by Long Evans rats, i.e., two experimental groups observed trained or learning demonstrators and three control groups were, respectively, a stimulus control group (CS and no model), a response control group (model and no CS), and a naive control group (no CS and no model). The experimental groups learned better than the controls; no differences were observed among the three other groups.

[1]Requests for reprints should be sent to: Ezio Sanavio, Istituto di Psicologia, piazza Capitaniato, 35100 Padova, Italy.

The present experiment examined observational learning of a conditioned avoidance response to an auditory stimulus in a two-way shuttlebox. We compared learning after two observational conditions, i.e., trained vs naive models. Second, learning after both observational conditions was compared to learning without any observation of a conspecific but with similar familiarization with the apparatus and the procedure. Noticeably, in our experiment, rats were reared and housed in groups with their models to assure social compatibility and, in the observation phases, to reduce 'distraction' and aggression reactions elicited by visual exposure of a male conspecific which might have hindered the learning of the avoidance response.

METHOD

The subjects were 30 male albino rats of the Wistar strain of about 90 days. The animals were housed in groups with their models 15 days before the experiment. Two models were trained to the criterion of over 95% avoidances for each session. Two naive models were not trained but exposed to apparatus and CS with no shock.

The apparatus was a standard two-way shuttlebox with a fixed barrier 7 cm. high, over which the rats had to jump. A small observation box sat in one side of the shuttlebox, next to the barrier area and separated from it by Plexiglas.

The warning stimulus was a 1500-Hz, 100-db tone lasting 6 sec. and followed by a 0.1mA electric shock. The animal could interrupt the tone and avoid the shock by jumping over the barrier during the warning period. If no response occurred after 6 sec. the rat received a 20-sec. shock, which he could escape by jumping over the barrier.

Three groups of subjects were constituted. The first group was paired with trained models and could observe the avoidance response to be learned, i.e., a rat jumping over the barrier whenever the tone was presented. A second group was paired with naive models and could see a quiet rat showing no particular response during trials. A third group was not paired with any model but was simply exposed to the empty shuttlebox and could hear the tone for the duration as given the other subjects.

Subjects were trained in 55-min. sessions for six consecutive days. During Day 1 and 2 the subjects remained in the observation box exposed to their assigned condition. On four successive days each session included a 20-min. observation phase, after which the subject was placed in the shuttlebox and given 35 trials. On each trial number and latency of responses were automatically registered.

RESULTS

We subjected both number of avoidances and response latencies of the groups in the last session to separate analyses of variance. The analysis of the number of avoidances was significant ($F_{2,27} = 4.60$, $p < 0.05$). Means were 28.63 for the naive model group, 30.87 for the trained model group and 31.60 for the no model group. Newman-Keuls *post hoc* comparisons showed both trained vs naive model groups ($p < 0.05$) and no-model vs naive model groups ($p < 0.05$) to be different. Analysis of variance of response latency was also significant ($F_{2,27} = 10.99$, $p < 0.001$). Means were, respectively, 206.62, 174.12, 137.40 for the naive, trained and no-model groups. Newman-Keuls showed differences between trained vs naive model groups ($p < 0.05$), non-model vs trained-model groups ($p < 0.05$) and non-model vs naive-model groups ($p < 0.01$).

Separate 3 (groups) × 4 (sessions) analyses of variance were done on number of avoidances and response latency. Both analyses indicate that subjects were learning during sessions ($F_{3,81} = 82.32$, $p < 0.001$ and $F_{3,81} = 15.62$, $p < 0.001$). An interaction of group × session was also present for latencies ($F_{6,81} = 13.56$, $p < 0.001$). No other main effect was significant.

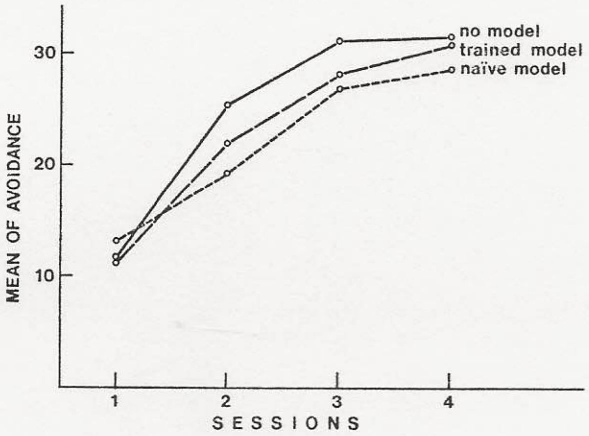

FIG. 1. Means of avoidance responses of groups on the four sessions

We then compared subjects' order obtained on the basis of both avoidances and latencies to the order derived from the performances in an open-field test we carried out 15 days before the experiment. We calculated the two Spearman's coefficients of rank calculation which were 0.082 for avoidances and 0.048 for latencies.

DISCUSSION

The primary finding of this experiment was that a significant effect was obtained as a function of observation of a trained vs a naive model, after a period of observational sessions. Rats observing trained models learned significantly better than rats observing naive models. Observational learning seems to offer a parsimonious explanation of this result. In fact, the experimental procedure used does not allow explanations in terms of social facilitation (10) since the models were removed immediately after the demonstration periods and were absent during test sessions, or local enhancement since the activity of models did not concentrate on any specific feature of the apparatus.

Second, observing a non-responding model clearly inhibits learning of an avoidance response. In fact, both trained and non-model groups learned better than the naive-model group. Otherwise, observing the precise behavior to be learned failed to facilitate acquisition in comparison with learning without any observational experience, if similar familiarization with apparatus and procedure was provided. On this point, our results contrast with those of Del Russo (3) and confirm the failure reported in the transfer of imitation from appetitive to shock-avoidance situations (9). However, rats in our work were exposed to models after a 2-wk. period of social familiarization. It is legitimate to argue that the observation of the mere presence of such a companion in the apparatus may have a reassuring influence and produce a decrement in drive which persists after removal of model. This agrees with observations that the mere presence of a conspecific diminishes the fear responses of rats (2, 7).

REFERENCES

1. CUNNINGHAM, W. L., & ROBERTS, A. E. Acquisition and maintenance of Sidman avoidance with paired rat subjects. *Animal Learning and Behavior*, 1973, 1, 44-48.
2. DAVITZ, J. R., & MASON, D. J. Socially facilitated reduction of a fear response in rats. *Journal of Comparative and Physiological Psychology*, 1955, 48, 149-151.
3. DEL RUSSO, J. E. Observational learning of discriminative avoidance in hooded rats. *Animal Learning and Behavior*, 1975, 3, 76-80.
4. JOHN, E. R., CHESLER, P., BARTLETT, F., & VICTOR, I. Observational learning in cats. *Science*, 1968, 159, 1489-1491.
5. LORE, R., BLANC, A., & SUEDFELD, P. Empathic learning of a passive avoidance response in *domisticatus rattus norvegicus*. *Animal Behavior*, 1971, 19, 112-114.
6. MANUSIA, M., & PASQUALI, A. Tentativi di ricerca di nuove forme di apprendimento osservazionale e di facilitazione sociale nel topo domestico. *Istituto Lombardo (Rend Sc.)*, 1969, 103B, 129-143.
7. MORRISON, B. J., & HILL, W. F. Socially facilitated reduction of the fear response in rats raised in groups or in isolation. *Journal of Comparative and Physiological Psychology*, 1967, 63, 71-76.
8. PRESLEY, W., & RIOPELLE, A. J. Observational learning of an avoidance response. *Journal of Genetic Psychology*, 1959, 95, 251-254.
9. SOLOMON, R. L., & COLES, M. R. A case of failure of generalization of imitation across drives and across situations. *Journal of Abnormal and Social Psychology*, 1954, 49, 7-13.
10. ZAJONC, R. Social facilitation. *Science*, 1965, 149, 269-274.

Accepted May 30, 1979.