Reports

Constitutional and Environmental Interactions in Rearing of Four Breeds of Dogs

The initial intention of the present study was to determine the relative effects of "indulgent" and "disciplinary" modes of rearing in dogs, with particular emphasis on how each method affects the obedience of the animal at maturity. The work derived from the extensive observations of children made by D. M. Levy (*1*), who has shown that overindulgent rearing may lead to psychopathy, a syndrome which involves an abnormal inability to inhibit one's impulses. The study described in this report was an attempt to deal experimentally with Levy's concept. As will be seen, the results are of interest aside from their reflection on this initial hypothesis.

Eight litters of four pups each were used. These included two litters each of Shetland sheep dogs, basenjis, wire-haired fox terriers, and beagles. Following weaning at 3 weeks of age, each litter of four was divided into two pairs equated as closely as possible on the basis of sex, weight, activity, vocalizations, maturation of eyes and ears, and reactivity to a startling stimulus. Each member of one pair was thereafter indulged, and each member of the other pair was disciplined, during two daily 15-minute periods from their third to their eighth week of age.

Indulgence consisted of encouraging a pup in any activity it initiated, such as play, aggression, and climbing on the supine handler. These pups were never punished. By contrast, the disciplined pups were at first restrained in the experimenter's lap and were later taught to sit, to stay, and to come upon command. When still older they were trained to follow on a leash. The pups were handled and tested individually by a single experimenter throughout the study. They lived in pairs in isolation boxes the remainder of the time, where members of indulged and disciplined pairs received identical treatment. The results were as follows.

At 8 weeks of age each pup was subjected to the following test: Each time a pup ate meat from a bowl placed in the center of a room, he was punished with a swat on the rump and a shout of "no!" After three minutes the experimenter left the room and, observing through a one-way glass, recorded the time that elapsed before the pup again ate. The results over 8 days of testing are summarized in Fig. 1. Basenjis tended to eat soon after the experimenter left, the method of rearing having no statistically significant effect. Shetland sheep dogs tended to refuse the food over the entire 8 days of testing. Again, the fashion of rearing had no significant effect. Beagles and wire-haired fox terriers, however, differentiated into two significantly disparate groups, depending on the condition of rearing. The Friedman nonparametric analysis of variance (*2*) indicates that the indulged pups took significantly longer to return to the food than did the disciplined pups ($p = 0.001$). Thus, as measured in this test, essentially the same differences in treatment had a decisive effect upon only two breeds.

Can characteristics of the breeds explain the differences in performance on this test? It was clear that, during training, beagles and wire-haired terriers were strongly oriented to the experimenter and sought contact with him continuously. Basenjis, by contrast, were interested in all phases of the environment and often ignored the experimenter in favor of inanimate objects. Shetland sheep dogs showed yet another pattern; all became fearful of physical contact with the experimenter and tended to maintain distance from him. We see, then, that the two breeds that were highly attracted to the experimenter differentiated as a result of the mode of rearing, whereas the breeds that exhibited aloofness (basenjis) and excessive timidity (Shetland sheep dogs) did not. Apparently it was the strong (constitutional) attraction in interaction with indulgent treatment that enhanced the effectiveness of later punishment. It should be noted that basenjis and Shetland sheep dogs were not entirely unaffected by the differential treatment. The scores of *all* indulged animals were significantly different from those of their disciplined counterparts on five of ten tests administered. In general, these tests indicated that the indulged pups were more active, more vocal, less timid (although more easily inhibited with punishment) than the disciplined pups.

A test of individual reactions to veterinary treatment based on vocalizations and the degree of activity during routine injections indicates that indulged pups were more vocal and active than disciplined pups in their protest ($p = 0.02$, Mann-Whitney) and that basenjis were more vocal and active than the other three breeds ($p = 0.01$, Friedman analysis of variance). It has been found at our laboratory that basenjis generally gain higher scores on this test than other breeds; hence these data suggest that similar behavior may be due in one instance to constitution (as in the basenjis) and in other instances to the conditions of rearing.

A test of the level of activity, in which the pups were observed from a hidden vantage point for 10 minutes, was administered. The testing area was 10 by 20 ft and was demarcated into eight squares of 5 by 5 ft each. In this setting,

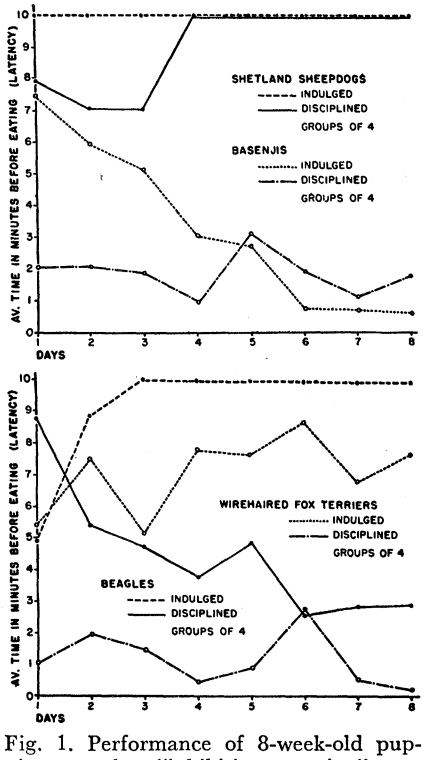

Fig. 1. Performance of 8-week-old puppies on the "inhibition-to-eating" test (see text for details of procedure).

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disciplined Shetland sheep dogs showed significantly less activity than any other animals ($p = 0.001$, Friedman analysis of variance). In another test the experimenter sat silently in a room for 10 minutes and recorded the amount of time the pups spent in contact with him. In this test the *indulged* Shetland sheep dogs differed significantly from all other dogs in that they rarely approached the experimenter ($p = 0.001$, Friedman analysis of variance). From these results it is clear that a specific test for a specific breed may facilitate expression of the effects of early rearing.

The conditions of rearing were continued over a second period, when the pups were 11 to 15 weeks of age, and all tests were readministered, with essentially the same results.

In the follow-up observations and tests, the indulged beagles, in contrast to all other animals, underwent dramatic changes, in time, although all animals were maintained under standard conditions. On a weekly test in which the time taken to catch each animal was recorded, these animals became exceedingly shy and wary of being caught when approached by various human beings, including the experimenter ($p = 0.05$, t test). Thus, it appears that changes in the behavior of certain animals may occur that are seemingly independent of the current environment and belatedly dependent, instead, upon the mediation of past experiences.

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References and Note

1. D. M. Levy, *Maternal Overprotection*. (Columbia Univ. Press, New York, 1943).
2. S. Siegel, *Non-parametric Statistics*. (McGraw-Hill, New York, 1956).

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New Test for Tranquilizers

The clinical success of the tranquilizing drugs has yet to be matched by a comprehensive experimental account of their behavioral effects. However, there has been impressive progress in certain areas. For example, a number of studies have dealt with the effects of tranquilizers on the behavior of experimental animals in the presence of stimuli associated with punishment ("anxiety" or "fear" situations) (*1, 2*). Tranquilizers have also impaired animal performance in discrimination tasks (*3*). The present report describes a somewhat different approach to "tranquilization." The findings suggest an aspect that is not associated with punishment or "fear reduction" and that is expressed in improved rather than impaired performance. Pigeons have served as subjects in this work.

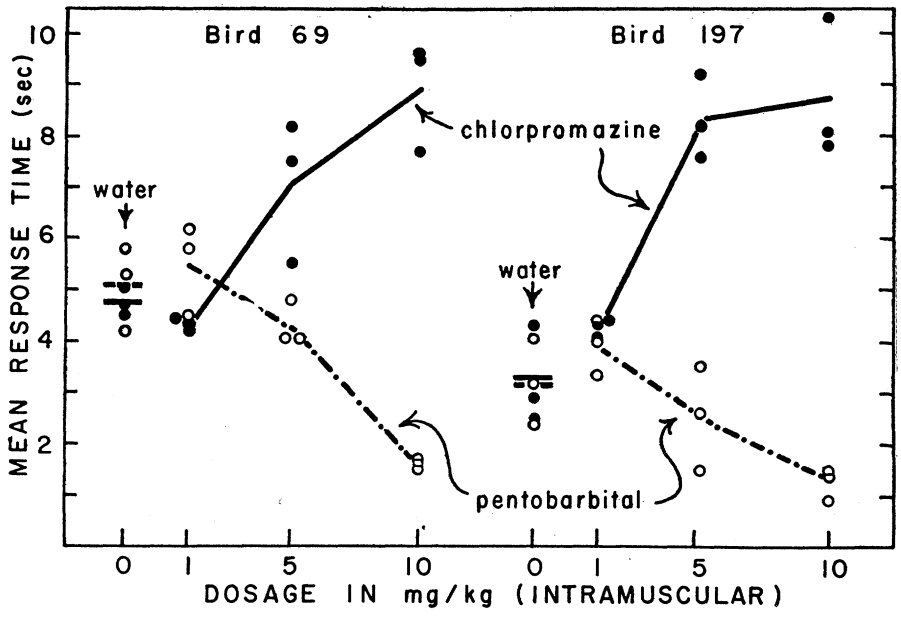

Fig. 1. Dose-response curves from two birds. Individual sessions appear as circles and dots; lines join the means of three sessions. The higher the curve, the longer, on the average, the bird stood still to gain food reinforcement.

The basic idea of the method may be stated simply. A pigeon is trained to stand still in a particular location. The longer it stands continuously in the designated spot, the more likely it is to receive food reinforcement. The bird's performance of this "standing response" is recorded as a function of drug dosage.

The method has been applied in a brief study as follows. The bird was placed in a closed, cubical chamber. A food magazine set in the front wall of the chamber operated automatically to present grain to the bird. Small photocells were located on one side wall and on the rear wall of the chamber. The cells were placed at about the height of the pigeon's head when it stood erect. Opposite the cells, in the front wall and in the other side wall, were small electric lamps. When the bird stood in a circumscribed area near the center of the chamber, its head cast a shadow over both photocells simultaneously. When the bird was in any other position, one or both cells received light from the lamp opposite. If the bird stood in the correct position and cut off light continuously from both cells for a sufficiently long period, it gained access to the food magazine for 5 seconds. A translucent disk on the front wall of the chamber glowed whenever the bird was in the right position. The length of time that the bird stood continuously in the correct position is defined as the "response time."

The hungry pigeon (weighing about 80 percent of the weight it attained when it was allowed to feed freely) was trained as follows. First it was allowed to become familiar with the food magazine, and then it was given food whenever it happened by chance to stand in the correct position for half a second or so. As in other instances of operant conditioning (*4*), the bird spent more and more time in the correct position, and the response time required to bring food was gradually increased.

Each experimental session lasted 2 hours. During this time, the bird received approximately 30 food reinforcements, averaging one every 4 minutes. This schedule was maintained by varying the response time required for reinforcement. With each reinforcement, the response time required to bring food the next time was increased by 2 seconds. Every 4 minutes the required response time was automatically reduced by 2 seconds, regardless of the bird's behavior. Thus, if the bird averaged more than one reinforcement in 4 minutes, it gradually increased the response time required, while if it averaged fewer reinforcements, the response time gradually decreased. No matter how "well" the pigeon performed (that is, how long, on the average, it stood continuously in the critical position), an equilibrium was reached such that the bird was reinforced about every 4 minutes. (Of course, if the bird had not performed the correct response at all it would not have been reinforced, but this situation did not arise in the experiment described in this report.) Counters totaled the number of response times that fell in each of ten intervals covering the range