

Transitory effects of experiential deprivation upon reversal learning in dogs¹

JOHN L. FULLER

THE JACKSON LABORATORY

Impairment of place learning of beagles reared under restriction during early life was greatly reduced in successive reversal series. Most isolation-reared dogs were eventually able to reverse responses after one or two errors. Problem-solving ability was not permanently impaired by restricted rearing.

The effects of experiential deprivation during early life upon problem-solving of adults have been reviewed by Hunt (1961). Experiments may be divided into two groups, those in which a specific sensory modality is restricted and effects are sought primarily within the same modality as with Riesen (1947), and those in which more general effects of sensorimotor restriction upon associative learning are of primary interest as with Thompson & Heron (1954). Learning deficits are commonly found in mammals reared under conditions of low stimulation, but the interpretation of the mechanism by which the effects are produced is not entirely clear. Conceivably the impairment could be based upon faulty organization of information-processing systems as appears to be the case in kittens with monocular visual deprivation (Wiesel & Hubel, 1963). Alternatively, the mechanism for processing information may be intact, but still malfunction because the organism is emotionally disturbed in the testing situation.

If the psychological deficiencies are the result of faulty perceptual organization occurring during critical periods of development, they should be resistant to any but highly specific ameliorative therapy. If they are simply a manifestation of emotional disturbance, they might disappear as learning trials were repeated in a benign environment.

Method

An experimental investigation of the persistence of learning deficits was conducted with 16 isolation-reared and six pet-reared beagles. The isolates were held in special cages from 3 to 15 weeks of age as described previously (Fuller, 1963). Pet-reared Ss lived and were fed in the same type of cage, but were allowed the run of the laboratory twice each day while an attendant was present. During this time they were treated as pets. Both groups were then observed during 20 arena tests of approximately 8 min. duration each. The experimenter gave extra handling to some of the isolates during this period, but since this treatment had no detectable effect upon the performance described in this paper, the isolates are considered as a single group. All dogs

were 23 to 26 weeks old at the beginning of training.

The test device was a modified Wisconsin General Test Apparatus which remained stationary during use. Dogs were pulled back from it between trials by a rope running over a pulley and attached to a harness. Between trials a curtain concealed the apparatus from the view of the S. Two food pans with sliding opaque covers were recessed in a low platform 6 in. above the floor. Ss were trained to push the slides and obtain a teaspoonful of commercial dog food. When a dog was performing well it was allowed five free-choices with both sides baited and open. Position response training was then begun with both sides baited and the preferred side locked. Correction was not allowed. Sixteen trials were given per day. The criterion for learning was nine consecutive correct trials within a day. The day following attainment of criterion a new series was started with the correct side reversed. Twelve series were completed.

Results and Discussion

The number of errors prior to attainment of criterion are shown for all Ss in Fig. 1. Pet-reared dogs made fewer errors on the average in all series. However, the difference was by far the greatest on series 2, the first reversal. Ranks of the two groups were compared by the two-tailed Mann-Whitney U-test. Pet-reared Ss made fewer total errors in the combined series ($p < .05$). The difference is largely attributable to series 2, 3, and 4, ($p < .05$). Differences on the first series and on the last five series combined were non-significant ($p > .10$).

The persistence of a mean difference favoring the pet-reared Ss was attributable to high error scores of a few isolates. If making more than five errors above the group mean is considered as a "poor series," we find that pet-reared Ss had an average of 0.83 poor series, all occurring in the first half of the experiment. Isolates had an average of 1.88 poor series. Four had zero, 7 had 1, 2 had 2, and 1 each had 4, 7, and 8 poor series. There is no obvious explanation for the consistently poor performance of three of the isolates, for after the first few series they responded readily and showed no overt fear. The two poorest performers came from one litter, but the genetic significance of this fact is conjectural since two other isolates from the same litter performed on a par with pet-reared Ss. It is noteworthy that an isolate made the fewest errors, and that a majority of both groups were meeting criterion with two errors or less by the end of the

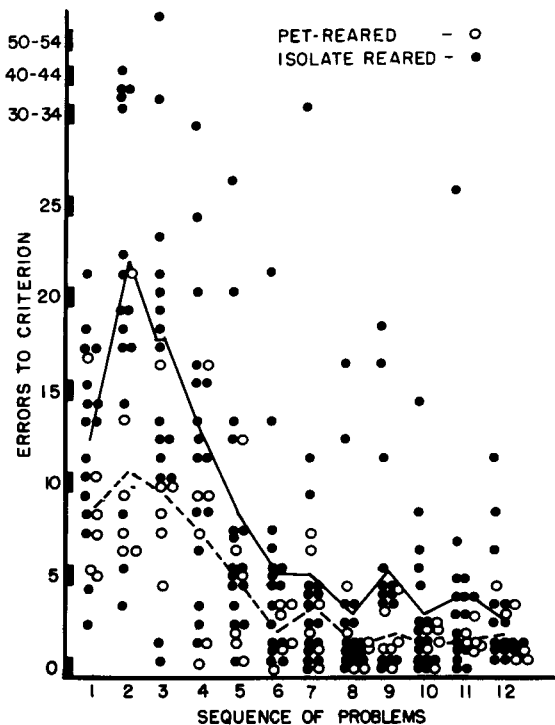


Fig. 1. The number of errors made prior to attainment of criterion for each S on a series of 12 place-learning problems. The correct position was reversed at each new series. The solid line is the mean for isolate-reared Ss; the dashed line is the mean for pet-reared Ss.

experiment. Thus, restricted rearing for 12 weeks following weaning does not prevent the formation of a reversal set.

The initial reversals appeared to disturb the isolates suggesting that they were particularly vulnerable to

sudden changes in reinforcement contingencies. In most isolates, however, the effect was transitory. The data are better explained by a hypothesis of inappropriate emotional arousal which disappears during repeated testing than by a hypothesis of faulty perceptual organization. Type of problem, manner of postisolation handling, length of isolation and species might be varied in other experiments to determine whether impermanence is a general feature of postisolation impairment of performance. It may be that functions which depend upon perception in a single sensory modality will prove more permanently vulnerable to experiential deprivation than are general capacities such as the acquisition of a reversal set. At the moment it is premature to regard a decrement in performance following experiential restriction as equivalent to a general depression of learning ability. Hunt's (1961) conclusion that intelligence is not fixed by genes may have as a counterpart that it is not fixed by early experience either.

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Note

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