AVOIDANCE CONDITIONING IN THE CHIMPANZEE¹

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Recent experiments have shown that operant-conditioning techniques developed with other species offer sensitive means of examining complex behavioral processes in higher primates. With the chimpanzee, operant methods have been applied to the investigation of chaining and behavioral interaction (Ferster, 1958, 1959), conditioned reinforcement (Kelleher, 1956, 1957a, 1957b, 1958b), complex discrimination (Kelleher, 1958c), and attention (Kelleher, 1958a).

In relatively unrestricted environments, the behavior of the chimpanzee is characterized by a complex repertoire of discriminated responses, and is ordinarily markedly sensitive to social reinforcements. Perhaps because of an assumed correlation between phylogenetic status and susceptibility to behavioral pathology (Nissen, 1951), punishment and avoidance procedures have apparently not been systematically used in behavioral studies of the chimpanzee. This report describes an application of operant procedures to the study of avoidance behavior in this species.

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Fig. 1. Subject seated in restraining chair, showing panel and lever.

The method of avoidance conditioning developed by Sidman (1953a, 1953b) was used. This method involves the delivery of brief shocks at pre-determined intervals, each avoidance response postponing the next shock due. Thus, the temporal properties of avoidance behavior in individual subjects can be recorded continuously, and the problems of control over behavior during intertrial intervals, which attend the use of procedures involving discrete trials, are eliminated.

Subjects were restrained in a seat constructed of 0.5-inch aluminum rods on an aluminum frame (Fig. 1). A web harness consisting of a chest strap with two attached shoulder straps secured the animal's torso to the seat frame between the shoulder blades, while an adjustable metal plate around its waist prevented the animal from reaching its feet. Shock electrodes were copper inserts in the soles of tennis shoes mounted beneath the metal plate on insulators. The manipulandum was a lever protruding 3 inches from a panel mounted on the sliding waist plate in front of the subject. The lever consisted of a 0.25-inch aluminum rod with a ball on its end and a micro-switch mounted near the pivot. A 1-inch downward excursion operated the microswitch, the lever coming against a stop after 1 inch overtravel. Shocks were 60-cycles-per-second AC at 20 milliamperes and 0.5 second long.

Six experimentally naive, male chimpanzees 3 to 4 years old and weighing 30 to 50 pounds were conditioned by the Sidman procedure. Subjects were adapted to the restraining chair for daily sessions of 1 to 2 hours until "emotional" and escape reactions occasioned by restraint had subsided. This required a period of 5 to 10 days. Chairs were then placed in a ventilated training cubicle, and an avoidance schedule (RS equal to 20 seconds, SS equal to 3 seconds) was placed in effect for three to five 20-minute periods per day. Avoidance periods were separated by at least 20 minutes. Considerable individual variation occurred in the number of such sessions required to produce an appreciable avoidance rate; from 2 to 10 days were required before several intervals of 1 minute or more without shock appeared within a single 20-minute session. When this occurred, session durations were extended to 2 hours.

Figure 2 contains sample records showing the development of avoidance behavior under this procedure. These data are typical and reveal a pattern characteristic of acquisition under the Sidman procedure in other species. Initially, each shock, or shocks, occasions a short burst of rapid responding, which is quickly followed by a pause and another shock. Grad-

Fig. 2. Sample cumulative records showing the development of avoidance behavior in a single subject. Data from the first through fifth sessions (A through E) starting with the first 20-minute period during which appreciable avoidance responses occurred.

ual increases in the length of bursts together with the development of bursts initiated by brief pauses then led to high avoidance rates and low shock rates. Finally, the emergence of efficient spacing of responses produces a somewhat lower, stable avoidance rate with very infrequent shocks.

Extended avoidance training under this procedure does not appear to have marked effects on behavior outside the experimental situation. The principal effect noted has been a temporary decrease in tractability to handling in connection with restraint. This develops after a number of shocks have been received, and may persist for 10 days or more. The effect appears to be specific to the routine connected with the initiation of avoidance training, however, and disappears gradually as the animal gains control over the experimental environment.

The data presented here suggests that avoidance reactions are developed and maintained in the chimpanzee in fundamentally the same manner as in other species. The use of operant-conditioning methods in

this connection would seem to provide rigorous techniques for assessing the effects of punishment and negative reinforcement upon complex behavioral processes in higher primates, and for examining the possible roles of avoidance contingencies in the development of behavioral pathology.

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