

*CONDITIONED AND UNCONDITIONED AGGRESSION
IN PIGEONS*

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A stable pattern of aggression has been established by reinforcing one food-deprived Carneau pigeon with grain when it attacked another. The aggressor and the satiated aggressor were in an observation cage containing a grain dispenser. We first reinforced approach to the other bird, then by successive approximation pecking it in the region of the head, and finally pecking which made contact with the head or neck. The stance of the aggressor, the direction of its approach to the aggressor, and the vigor, location, and frequency of its pecks entered into the contingencies of reinforcement. Successive frames from motion pictures show that the pigeon attacked with closed eyes and open beak, just as in pecking a standard wall key. The feathers on the aggressor's neck occasionally fluffed (pennerection) before an attack (Skinner, 1959) though reinforcement was never specifically contingent on this behavior. Fluffing was most common when the aggressor tended to return the attack or to ward it off vigorously. Some aggressors did not fluff.

When the aggressor returned the attack, fighting occurred in the stereotyped pattern characteristic of pigeons (Levi, 1959, Smith and Hosking, 1955). The birds clasped beaks, wrestled, and flapped violently around the cage, often cooing loudly. The behavior could easily be identified by its form, speed, and vigor. While fighting in this way, the aggressor would not respond to the grain dispenser, even though free of the other bird's grasp.

Aggression was brought under the control of an exteroceptive stimulus, the color of the general illumination in the cage. Attacks were reinforced in blue light and not reinforced in green light. The aggressor came to attack predominantly in the blue light, infrequently in the green. Usually the unreinforced attacks in green light consisted of abortive, incomplete pecks: the eyes did not close, the beak re-

mained shut, and no contact was made with the other bird. Occasionally, the unconditioned fighting pattern appeared in green, though not preceded by the reinforced form of attack. The frequency of all forms of attack decreased in green light, but some birds ceased completely only after long periods of non-reinforcement. Immediately upon the reappearance of the blue light, the aggressor approached and attacked.

With several other pairs of birds, aggressive repertoires were simultaneously established under the control of different colors of illumination. An apparatus with two operanda, a bar and a treadle, allowed the experimenter to reinforce either bird with grain (Reynolds and Skinner, 1962). In blue light, an attack by Pigeon A was reinforced with a buzzer, in the presence of which depression of the treadle (previously conditioned in A) was reinforced with grain. In green light, an attack by Pigeon B was reinforced with the buzzer in the presence of which displacement of the bar (previously conditioned in B) was reinforced with grain. During occasional periods of white light, neither bird's attacks were reinforced. Aggression could then be controlled simply by changing the color of the illumination: in blue light A attacked, in green light B attacked, and in white light neither A nor B attacked. Any "dominance hierarchy" was generated by the conditions of the experiment and could be arbitrarily controlled by the color of the light.

One pair of birds occasionally engaged in violent unconditioned fighting in white light, though this became less and less frequent. To eliminate it, each bird was reinforced when it approached a far corner of the cage away from the other bird. A "boxing match" could then be arranged. In blue or green light, the birds fought, returning to their corners in white light between rounds.

One further point deserves mention. Two birds, trained to displace the bar with their breasts, changed to two other topographies. When movement of the bar was reinforced with grain (but before reinforcement was made contingent on aggressive behavior) these two pigeons began to peck the bar rather than push it with their breasts. The change suggests induction from a characteristic response to the food used as reinforcer. The Brelands (1962) report what may be a similar case in which a pig changed to rooting tokens rather than depositing them to obtain food. Later, when aggressive behavior was reinforced, the birds began to shake the bar with their beaks. It is possible that this shows induction from the unconditioned fighting pattern which often accompanied or followed conditioned aggression.

Although our procedure appears to shape and maintain aggression through food reinforcement under conditions similar to those which generate a non-social response such as pecking a key, the result may be complicated by aggressive behavior from other sources, generated by the mere presence of another bird. A fairly standard unconditioned pattern of attack appears to be characteristic of pigeons, as part of an inherited endowment. Moreover, comparable contingencies of reinforcement may have existed in the earlier environment of our subjects, as with a limited supply of food aggressive behavior may be differentially reinforced.

A third relevant condition may be the periods of extinction during intermittent reinforcement, as aggressive behavior is often observed to accompany extinction. However,

conditioned and unconditioned aggression have different topographies. The aggression shaped by the experimenter does not take on the characteristics of the instinctive pattern. It simply brings the bird into a situation which may release unconditioned fighting.

Though instinctive tendencies to fight may complicate the demonstration of conditioned aggression, it is also possible that an influence may be felt in the other direction. Natural instinctive fighting may have been made more common because aggressive behavior was reinforced or because reinforced aggressive patterns in one pigeon serve to release instinctive fighting in the other. The experiment seems to show that aggressive patterns can be shaped and maintained by reinforcement, and that the frequency of both conditioned and unconditioned patterns may be controlled by presenting or withholding reinforcement. The possible interactions between conditioned and unconditioned aggression could be explored with modifications of the present technique.

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