

# Conditioned suppression increases following training in pigeons<sup>1</sup>

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*It was found that in pigeons as in rats conditioned suppression is greater if measured two or seven days after CS-shock pairings than if measured immediately after training.*

In a recent study it was reported that in rats conditioned suppression of barpressing increases with time following the last pairing of the conditioned and unconditioned stimuli (McMichael, 1966). This increase in suppression, clinically known as "incubation of anxiety," is thought to account for apparently spontaneous increases in the severity of phobias in humans and was postulated to account in part for the rat's transient decrement in effective shock avoidance known as the Kamin effect (Kamin, 1957). Since an increase in fear has been shown in the rat and in humans (cf. Bindra & Cameron, 1953), the question naturally arises as to whether the phenomenon generalizes to a nonmammalian species such as the pigeon. This latter species is of particular importance in this regard since many studies of conditioned suppression have used the pigeon as a S.

The present study was done to determine whether conditioned suppression of the pigeons key-pecking behavior would be greater if measured days after the conditioned stimulus had been paired with shock than if measured immediately after training. A second purpose was to attempt to monitor the course of any changes in suppression in individual birds by repeatedly testing some Ss during the week following training.

## METHOD

### Subjects

The Ss were 30 female white Carneaux retired breeders which were maintained at 70% of their free-feeding weight.

### Apparatus

A standard two-key operant conditioning box was used with appropriate solid-state control and recording devices nearby. A white noise of approximately 80 db (re: .0002 dyne/cm<sup>2</sup>) masked extraneous sounds except during presentation of the CS which was a 1000 Hz tone of approximately the same intensity. The shock stimulus of 100 Vac through a 150,000 ohm resistor was delivered by means of two, twice-looped beaded chains wrapped around the base of Ss wings where a small area had been plucked of feathers for this purpose (Hoffman, 1960).

### Procedure

The Ss, which had previously been shaped, were trained to peck the right key which was white and then were put on a VI 1 min schedule for several days. In the course of this preliminary training all Ss received over 400 reinforcements consisting of 3-sec access to grain. The VI 1 schedule was in force for the remainder of the experiment.

Some days later adaptation trials were then begun to assure that the CS would not lead to any unconditioned suppression. Such a trial consisted of counting key-pecks for a 60-sec preCS period and then presenting the CS for 60 sec and counting responses. A suppression ratio was calculated by subtracting the number of responses during CS presentation from the number during the preCS period and then dividing by the number during the preCS period. A suppression ratio of zero indicates no suppression; one of one indicates complete suppression of responding (Hoffman & Fleshler, 1961).

Negative ratios, occasioned by an S responding faster in the presence of the CS, were assigned a ratio of zero to indicate that no suppression was present. Adaptation trials were continued at 5-min intervals until a suppression ratio of zero was achieved.

All birds were subjected to the same training conditions. A training trial differed from an adaptation trial only in that a 1-sec pulsating shock was presented as a US along with the CS at the end of the 60-sec CS period. Training trials were also spaced at 5-min intervals but the interval was not begun until a response was made after the shock. Training was continued until the first trial on which a suppression ratio of at least .2 was obtained. The .2 criterion was used in an attempt to equate training for all Ss and was purposely set low to permit observation of any subsequent increases.

In testing, the same trial procedure was followed except that the US was not presented at the end of a trial. The Ss were divided into three groups of 10 birds each. One group (5-min) was removed from the box, immediately returned, and the test trial was administered 5 min after the bird resumed pecking. The second group was tested two days later and the third seven days later. In addition, the Ss from the 5-min group of the first experiment were all repeatedly tested at intervals of 1 h, 4 h, one day, two days, and seven days.

## RESULTS AND DISCUSSION

Figure 1 shows that the groups tested two and seven days after original CS-US pairings had substantially higher mean suppression ratios than the group tested 5 min after training. An analysis of variance showed this effect to be significant beyond the .01 level. Thus it seems clear that the basic

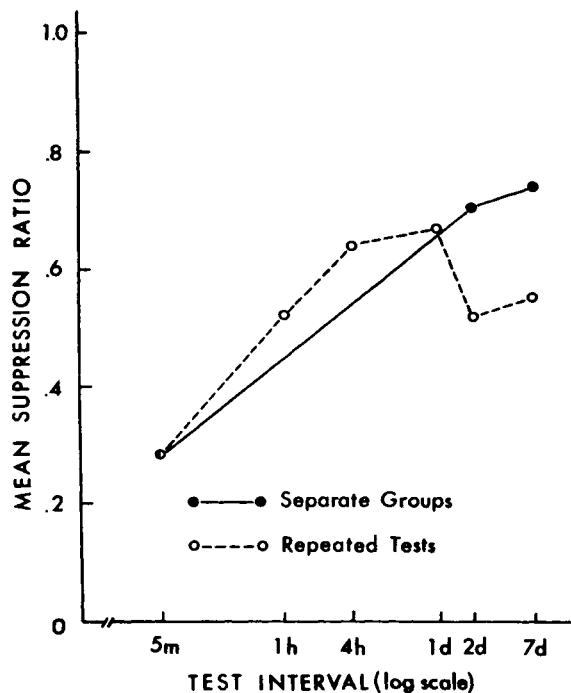


Fig. 1. Mean conditioned suppression ratio as a function of time elapsing between CS-US pairings and testing. Data from the testing of separate groups (solid line) and repeated testing of 5-min group (dotted line) are shown.

phenomenon of an increase in the suppressing effect of a conditioned aversive stimulus upon ongoing operant responses. "incubation of anxiety," occurs in the pigeon as well as in mammals.

Figure 1 also shows that when the Ss from the 5-min group were tested throughout the week following training there is some suggestion of an increase in conditioned suppression. However, this effect was not highly significant ( $.10 < p < .25$ ) presumably because test trials are, in effect, extinction trials and as such would not only mitigate any increase in suppression but would also be expected to contribute variability to the data. Therefore, it is only tentatively concluded that, since the immediate test showed the lowest mean suppression score, some "incubation" was taking place. No conclusions concerning time of maximum increase seems warranted from these data.

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#### NOTE

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