Some effects of light flicker rate on the pigeon

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Four pigeons were trained to peck a key which was briefly illuminated every 0.64 sec., a fifth was trained to peck a dark key, and a sixth a constantly illuminated key. Two more were trained to peck a key successively illuminated with nine different rates of flicker, the time between light onsets for the nine different rates ranging from 0.22 sec. to 2.01 sec. When the birds were given generalization tests in extinction with these nine rates of flicker, they responded with key pecking rates proportional to the key flicker rates, except for two of the four trained at the median rate of flicker (onset every 0.64 sec.) and the bird trained to peck the dark key.

It is well known that stimulus characteristics such as intensity and frequency may be functionally related to respondent behavior without specific training. However, the role of such variables in controlling operant behavior is not clear (Hull, 1952; Blough, 1959; Henderson, 1957; Fox, 1964; Stebbins & Miller, 1964). In the current study, the effect of variations in the rate of a flickering key light on the rate of key pecking was investigated.

Subjects and Apparatus

Seven male white Carneaux pigeons and one male homing pigeon maintained throughout the experiment at 75% of their pre-experiment free-feeding weight were used. Nine different rates of flicker (S1-S9) varying only in interstimulus interval (0.22, 0.29, 0.33, 0.44, 0.64, 0.89, 1.01, 1.63, and 2.01 sec.) could be projected upon the response key in a standard experimental chamber. Experimental contingencies and recording were automatically controlled.

Procedures

Training sessions consisted of a series of 1 min. stimulus periods during which reinforcement (5 sec. access to grain) was available on a 2 min. VI schedule of reinforcement. During stimulus periods the house lights were off and the appropriate training stimulus was projected upon the key. Each stimulus period was separated from the next by a 2 sec. period during which the key was dark, the house lights were on, and responding was without consequence. For Birds 1-4 the training stimulus (S5) was the median rate of flicker (onset every 0.64 sec.), for Bird 5 the training stimulus was a constantly illuminated key, for Birds 6 and 7 all nine stimuli were successively presented in an irregular order during training, and for Bird 8 the training stimulus was a continually dark key. For Bird 7 the procedure was modified in early sessions to insure that he received the same number of reinforcements in the presence of each stimulus. Training sessions were continued for each bird until response rates appeared stable from session to session.

Fig. 1. Response rates during test sessions for four birds. The small arrows indicate the training stimulus.

Test sessions in extinction were given at the completion of training. During test sessions a different one of the nine stimuli was projected upon the key during each successive stimulus period. The order of presentations was irregular. Each test session was preceded by a brief period of reinforced responding under training conditions.

Results

Figure 1 shows the extinction gradients obtained from Birds 1, 2, 3, and 4. The curves from Birds 1 and 2 are fairly typical light flicker generalization gradients (Sloane, 1964), resembling gradients obtained from single animals for other stimulus dimensions. The curves from Birds 3 and 4 are not characteristic generalization gradients, the response rates being higher with high rates of flicker. Bird 3 does show a peak displaced towards S5 from the most rapid rate of flicker.

Extinction gradients for the remaining birds are presented in Fig. 2 and 3. After training with the constantly illuminated key Bird 5 responded most rapidly in the presence of faster rates of flicker. Conversely, after training with the dark key Bird 8

Fig. 2. Response rates during test sessions for two birds. The small arrows indicate the training stimulus.

Fig. 3. Response rates during test sessions for two birds.

responded most rapidly in the presence of the slower rates of flicker. Birds 6 and 7, after training with all nine rates of flicker, responded most rapidly in the presence of faster rates of flicker. This "preference" appeared from earliest training when reinforcement was available in the presence of all flicker rates; in Fig. 4 the rates for those birds in the presence of each stimulus during early sessions are presented.

Discussion

The reasons for this preferential responding are not clear. Further study in which the flicker was

Fig. 4. Response rates during early training sessions for two birds.

generated by interspersing varying length "on" periods with brief and constant "off" periods suggested that total key illumination was not important. Studies in which the key remained illuminated in the brief inter-stimulus periods, as well as before and after the session, indicated that inadvertent discrimination learning, based upon unreinforced responding in the presence of a dark key during the interstimulus periods, was also not a factor (cf. Logan, 1954).

References

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Note

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