PERFORMANCE OF TWO SPECIES OF QUAIL ON BASIC REINFORCEMENT SCHEDULES¹

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Two bobwhite quail (*Colinus virginianus*) and two Japanese quail (*Coturnix coturnix japonica*) were trained to peck a response key to obtain food. In general, performance on fixed ratio 20 and variable- and fixed-interval 60-sec schedules was comparable to the response patterns of other species under these schedules.

Few experimenters have studied quail behavior. Species-specific behavior and habituation in bobwhite quail were examined in two studies (Martin and Melvin, 1964; Melvin, Cloar, and Massingill, 1967), and several experiments have studied discrimination learning in this species (*e.g.*, Stettner, 1967). But published data concerning free-operant behavior seem to be nonexistent.

The Japanese or *Coturnix* quail has recently found a niche in the avian physiology laboratory (Padgett and Ivey, 1959). As with the bobwhite quail, few behavioral experiments have been reported. One such study investigated *Coturnix* behavior as a function of two schedules of reinforcement (Reese and Reese, 1962). While behavior on fixed-ratio (FR) schedules was typical, a fixed-interval (FI) 1-min schedule produced an unusually low rate of response, *i.e.*, 1.4 responses/min. They concluded that "with a little more training, these birds might be capable of fine temporal discriminations." (Reese and Reese, 1962, p. 269.)

The present study was designed to investigate the effects of FI, FR, and variable-interval (VI) schedules of reinforcement on the behavior of bobwhite and Japanese quail.

METHOD

Subjects

A male (J1) and a female (J2) Japanese quail (*Coturnix coturnix japonica*), and a

male (B5) and a female (B12) bobwhite quail (*Colinus virginianus*), all experimentally naive, were purchased locally. They were housed in individual cages, fed Purina Game Bird Chow, and allowed free access to water. Throughout the experiment, the quail were maintained at 70 to 80% of free-feeding weight.

Apparatus

The experimental chamber was wooden except for one end and one side, and was 21 in. long, 12 in. deep, and 12 in. high. A translucent key 1.25 in. in diameter was centered 4 in. above the hardware cloth floor at the front end, and illuminated by a 115-v ac, 7-w yellow bulb. An audible relay click accompanied each recorded response. Reinforcement was 4- to 5-sec access to Purina Game Bird Chow; during reinforcement, house and key lights were turned off and the feeder illuminated. The feeder, a Gerbrands Pigeon Grain Dispenser, also produced a sound at reinforcement delivery. The food magazine aperture was located in the adjacent wall to the right of the key. This 2¼ in. by 1¼ in. opening was ¾ in. from the front end and 1¼ in. above the floor. One-way vision material placed over the Plexiglas side and front end allowed the quail to see its reflection while responding. A single overhead 115-v ac, 7-w white bulb served as a houselight. An exhaust fan provided masking noise for the chamber which was placed in an air-conditioned, sound-attenuated room. Standard electromechanical programming and recording equipment was located in an adjacent room. Responses were recorded on counters and a cumulative recorder.

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Procedure

The birds were trained to peck the key and then given brief training on a continuous reinforcement schedule (CRF). Quail J1, B5, and B12 were then given a sequence used by Reese and Reese (1962), consisting of five reinforcements on CRF, five on FI 5-sec, five on FI 30-sec, and 25 on FI 60-sec. J1 then received 45 sessions of FI 60-sec, followed by five sessions of FR 20. After the initial sessions, B5 received two sessions of FI 30-sec, four sessions of FI 45-sec, 15 sessions of FI 60-sec, five sessions of FR 20, and 77 sessions of VI 60-sec. B12 was given the initial sequence followed by 30 sessions of FI 60-sec, then 70 sessions of VI 60-sec. Quail J2 was given one session each of CRF and FI 15-sec, then two sessions of FI 30-sec, followed by 72 sessions of FI 60-sec and then four sessions of FR 20. All quail received one session per day; sessions were 30, 45, or 60 min in length.

RESULTS AND DISCUSSION

The two *Coturnix* were easily trained to peck the key within one or two sessions. The bobwhite quail, however, were difficult to train, usually requiring 8 to 10 sessions. With 20 bobwhites, training to CRF has ranged from 5 to 23 days (both with the present apparatus and a smaller, conventional-type box). While the *Coturnix* quail trained readily, most bobwhites initially reacted violently to handling and were very wary of strange environments such as experimental chambers. Once trained, however, bobwhite quail performed well on the schedules of reinforcement.

Figure 1 presents cumulative records for two birds showing behavior during a sequence identical to that used by Reese and Reese (1962). Both J1 and B12 failed to show low rates of response. B5's record is somewhat more similar to the Reese and Reese data. Further training on FI 60-sec did not lead to "fine temporal discriminations" but rather to moderate to high rates of response for all four birds. In general, the FI records were positively accelerated (scalloped): within each interval, the rate of responding increased gradually. Representative cumulative records are shown in Fig. 2. The scallops were more pronounced for bobwhite quail. Both *Coturnix* quail showed a period of zero responding immediately after reinforcement (a post reinforcement pause), then a rapid shift into the terminal rate.

The FR data, however, are compatible with those shown by Reese and Reese. The effects of the FR 20 schedule are shown in Fig. 3. A marked postreinforcement pause was evident in all sessions for all birds. While similar results were found for the pigeon, they tended to occur with ratios higher than 60 (Ferster and Skinner, 1957). It is possible that the postreinforcement pauses were due to the quails' extensive training on the FI schedule; however, other factors, including species differences, might be involved.

Cumulative records showing performance on a VI 60-sec schedule are presented in Fig. 4. These bobwhite quail responded at a very stable rate throughout the session. Twelve other bobwhites have shown similar records on this schedule and on VI 2-min.

Bobwhite quail show a strong species-specific fear response to certain "sign stimuli"

Fig. 1. Cumulative response records for a Japanese and a bobwhite quail during a shift from CRF to FI 60-sec.

Fig. 2. Selected cumulative records of responses on an FI 60-sec reinforcement schedule for a Japanese and a bobwhite quail.

Fig. 3. Selected cumulative response records of FR 20 performance for three quail.

Fig. 4. Selected cumulative response records for two bobwhite quail on a VI 60-sec schedule.

(Martin and Melvin, 1964). Their performance on a VI schedule could be used as a baseline to provide a quantitative measure of this type of phenomenon. Research in progress indicates that such an "innate suppression" technique is feasible (Melvin and Cloar, 1967). Also, we agree with the Reeses' evaluation of the desirability of *Coturnix* quail as subjects for behavioral research.

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