AUTO-SHAPING IN BOBWHITE QUAIL¹

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Bobwhite quail were given extended auto-shaping, a procedure in which response-key illumination or color change is paired with response-independent food presentations. Continuation of the auto-shaping procedure yielded increased responding across sessions, although responses were never instrumental in producing food. The quail were shifted directly from the auto-shaping procedure to a variable-interval 60-sec schedule of reinforcement. All three birds were approaching stable response rates by the fifth session on the variable-interval schedule.

Brown and Jenkins (1968) found that when response-key illumination or color change was paired repeatedly with response-independent food presentations, it came to elicit a key peck in pigeons. They termed this procedure *auto-shaping*. For over 90% of their pigeons, key pecks were auto-shaped within 160 trials. Sidman and Fletcher (1968) reported auto-shaping also to be effective in eliciting a key press with monkeys. In both studies, training was limited to two sessions and, generally, once the first response occurred it was immediately reinforced. Therefore, there is little information concerning the effects of continuing the auto-shaping procedure across sessions. Furthermore, the possibility of shifting directly from the auto-shaping procedure to a higher schedule of reinforcement has not been attempted.

Shaping the key peck in bobwhite quail has proved difficult (Cloor and Melvin, 1968), and it was felt that auto-shaping might solve this technical problem. Furthermore, the comparative generality of auto-shaping would be extended if it proved successful in quail.

METHOD

Subjects

Experimentally naive, adult bobwhite quail (*Colinus virginianus*) were purchased locally. There were two females and one male in the

main study and two males and one female in the supplementary study. Subjects were housed in individual cages, maintained on Purina Game Bird Chow, and allowed free access to water. Throughout the experiment, subjects were maintained at 70 to 80% of their free-feeding weight.

Apparatus

The wooden experimental chamber had a white-interior, except for the unpainted aluminum response panel. The chamber was 30.5-cm long, 28-cm deep and 29-cm high. A translucent response key, 3.2 cm in diameter, was centered in the response panel 15 cm above the hardware cloth floor. A Gerbrands Pigeon Grain Dispenser was mounted directly under the response key. The grain dispenser aperture was rounded at the top and measured 4.5 cm by 4.5 cm with the lower edge 5 cm from the floor. The response key could be transilluminated by either of two 7-w, 115-v key lights, green and red. A white 7-w, 115-v houselight illuminated the interior of the chamber. Food presentations consisted of a 4-sec access to Purina Game Bird Chow. During food presentation, the houselight and key light were turned off and the feed dispenser was illuminated by a white, 7-w, 115-v light. A 10-cm by 10-cm one-way vision screen was approximately centered on the wall adjacent to the response panel. An exhaust fan provided ventilation and masking noise for the sound-attenuated chamber, which was located in an air-conditioned room. Standard electromechanical scheduling and recording equipment was located in an adjacent room. Data were recorded on counters and a cumulative recorder.

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Procedure

Each quail was placed into the chamber for 24 hr with the grain dispenser illuminated and filled to the bottom of the dispenser aperture with Purina Game Bird Chow. Twenty-four hours after removal from the chamber, each quail was again placed into the chamber and given 10-sec food presentations every 20 sec until it ate five times consecutively. During magazine training the response key was not illuminated.

The quail were then given 40 auto-shaping trials per day for 18 days. The intersession interval was approximately 23 hr. A trial consisted of a change in the color of the response-key illumination (red to green) 4 sec before a 4-sec food presentation. That is, the key was continuously illuminated, except during food presentations, and its color changed to green 4 sec before food was presented. This 4-sec period after color change is referred to as the "trial stimulus". Key pecks had no effect on the sequence of events. The intertrial interval (ITI) was varied between 45, 55, 65, and 75 sec, averaging 1 min in length.

A variable-interval 60-sec schedule of reinforcement (VI 60-sec), *i.e.*, response-contingent food presentation in which food was available after the lapse of a variable-interval averaging 60 sec, was introduced after the eighteenth day of auto-shaping. The key color was green, the trial-stimulus color, during VI training. The quail were given one 30-min session per day for five days.

RESULTS

Each quail emitted its first response during the trial-stimulus presentation. Each bird responded within 120 trials. Key pecks during the trial-stimulus presentation increased as a function of sessions during auto-shaping (Fig. 1). Figure 2 shows that intertrial responding initially increased and then gradually decreased across sessions. The number of intertrial responses seldom exceeded the number of responses during the trial stimulus, although the ITI was 15 times longer than the trial-stimulus interval.

Figure 3 shows sample data from the first four VI sessions of quail BW-4G, the quail with the lowest response rate during auto-shaping and the highest response rate on VI 60-sec. This bird's low response rate during

Fig. 1. Acquisition of an auto-shaped key peck of three quail.

auto-shaping appeared to be due to a competing superstitious response (jumping). All three quail began to stabilize on the VI 60-sec schedule by Session 5.

In the supplementary study, three quail were given an auto-shaping procedure in which the trial-stimulus key color and the intertrial key color were reversed every five sessions. Responses were not instrumental in producing food. All birds pecked the key during the trial stimulus within 40 trials. Two quail had very low response rates, thus rendering their reversal data inconclusive. The third subject showed a temporary decrease in response rate after reversals. These decrements became progressively smaller across reversals. There was no indication of trial-stimulus color

Fig. 2. Number of intertrial key pecks of three quail across 18 sessions of auto-shaping.

Fig. 3. Cumulative response records of one quail's first four sessions on a variable-interval 60-sec schedule of reinforcement, after direct transfer from auto-shaping, and records of three quail on the fifth session after transfer to the VI 60-sec schedule.. Pips on the records indicate reinforcements.

preference. Reversals were discontinued and a key-peck contingent food-presentation delay was initiated. This delay decreased response rate but all subjects continued to peck. Due to the low response rates of two quail, again the data were equivocal.

DISCUSSION

The results indicate that the auto-shaping procedure is effective in producing and maintaining a key peck response in bobwhite quail. Continuation of the auto-shaping procedure resulted in a general increase in responding, followed by an increase in discriminated responding. That is, responding to the trial stimulus increased across sessions while intertrial responding decreased, after an initial increase in both (Fig. 1 and 2). The responding gained from 18 sessions of the auto-shaping procedure was adequate for direct transfer to a VI 60-sec schedule of reinforcement (Fig. 3).

The one to three sessions (40 to 120 trials) required to shape the bobwhite's key peck with auto-shaping is a vast improvement over the five to 23 sessions of standard shaping reported by Cloar and Melvin (1968). Furthermore, the response rates of the two bobwhites on VI 60-sec shown in Cloar and Melvin's study appear to be more dissimilar than the response rates of the present bobwhites (Fig. 3). Melvin and Cloar (1967) also reported large rate differences between bobwhites on VI 1-min and 2-min schedules. This extended auto-shaping procedure, coupled with direct transfer to

VI 60-sec, appears to reduce intersubject response-rate variability, but further investigation is needed.

Auto-shaping procedure differs from the typical classical conditioning procedure in that the stimulus object (the key) can be approached and responded on or against, *i.e.*, the trial stimulus is accessible. If the conditioned stimulus were to be made accessible in classical conditioning, direction as well as other characteristics of the conditioned response might be altered, at least with appetitive unconditioned responses. Also, responding initiated and maintained with the auto-shaping procedure may follow the general principles of classical conditioning, even though the auto-shaped response is dissimilar from the consummatory response in various ways, including response direction.

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