Competitive conditioned reinforcement and efficient differential reinforcement of low rate performance[1]

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A fixed ratio schedule for conditioned reinforcement was superimposed on differential reinforcement of low rate schedules. For one S, the conditioned reinforcement schedule had no effect on DRL performance, given efficient performance on the DRL schedule. However, response rates increased and came under the control of the FR schedule when DRL performance was inefficient.

The results of a previous study indicate that response rates of birds on differential reinforcement of low rate schedules (DRL) rise when a competitive conditioned reinforcement contingency is superimposed on the DRL schedule. When every tenth response produces a brief presentation of a conditioned reinforcer, response rates increase and responding appears to come under the control of the conditioned reinforcement contingency (Randolph & Sewell, 1965).

However, the effects of the competitive conditioned reinforcement schedule appear to interact with the degree of control exerted by the DRL schedule (Randolph & Sewell, 1965). In pigeons, the degree of change in rate resulting from the fixed ratio for conditioned reinforcement schedule was inversely related to the efficiency of DRL performance. The more efficient birds, birds whose rates more closely approximated those specified by the DRL contingency, showed a smaller change in rate when the conditioned reinforcement schedule was introduced.

Very efficient DRL performance is rare in pigeons under ordinary procedures. The efficient performance of one pigeon therefore prompted a replication of the procedure for the purpose of investigating behavior at one extreme of efficiency.

Subject

The S was one adult male White Carneaux pigeon, maintained at approximately 80% of his free feeding weight throughout the course of the experiment. The bird had an extended history of exposure to DRL schedules.

Apparatus

The experimental chamber was a standard one key pigeon box similar in design to that described by Ferster & Skinner (1957). The experiment was programmed by relay equipment and the results were recorded automatically by counters and a cumulative recorder.

Procedure

The S was exposed to a DRL 21-sec schedule until a stable behavioral baseline was obtained. The chamber was illuminated by a houselight, and the response key was transilluminated by a yellow light. Each response with interresponse time of 21 sec or greater resulted in 4-sec access to grain. During reinforcement the houselight and key light were turned off and the food magazine light was turned on. Each session terminated upon the completion of 50 reinforcements or at the end of 2.5 h, whichever occurred first. Sessions were run daily, seven days a week.

During conditioned reinforcement probe sessions every n^{th} response on the key, regardless of interresponse time, produced a 0.5-sec illumination of the magazine light (but not food), during which the houselight and key light were turned off. For the S, three probes were made. For one session, the conditioned reinforcement schedule was introduced after the beginning of the session, and every 10th response occasioned the conditioned reinforcer (FR 10). For this session, 55 reinforcements were given in order to obtain greater exposure to the conditioned reinforcement. For the following two sessions the conditioned reinforcement schedule was in effect for the entire session, and the response requirement was lowered to FR 5 to increase density of conditioned reinforcements.

After the probes, the bird was exposed to a DRL 35-sec schedule until stability occurred. Except for the DRL requirement, all other experimental factors were held constant. The conditioned reinforcement probe was then introduced in two sessions.

Results

The bird exhibited a high degree of efficiency on the DRL 21-sec schedule. That is, response rates closely approximated the rate necessary for maximum

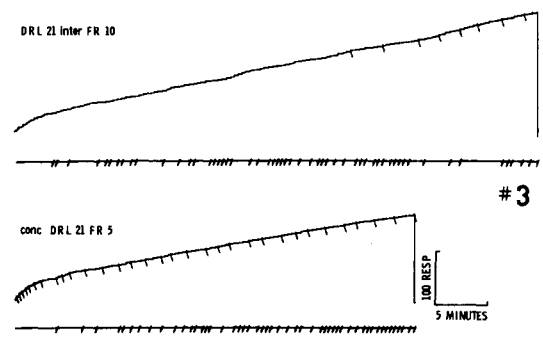

Fig. 1. Cumulative response records for the S on a DRL 21 schedule. Reinforcements are indicated by deflections of the event pen. Each response stepped the response pen. Deflections of the response pen indicate conditioned reinforcements.

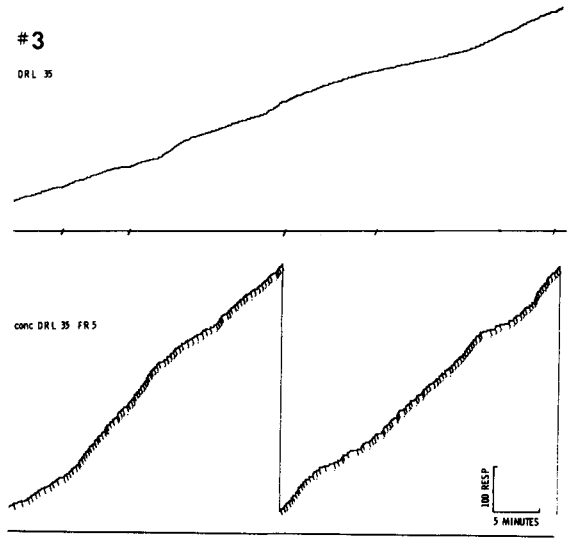

Fig. 2. Portions of cumulative response records for the bird on a DRL 35 schedule. Reinforcements are indicated by deflections of the event pen. Each response stepped the response pen. In the lower record a concurrent FR schedule for conditioned reinforcement was in effect. Conditioned reinforcements are indicated by deflections of the response pen.

frequency of reinforcement. As can be seen in Fig. 1, the introduction of the fixed ratio presentation of the magazine light did not result in an increase in response rates. The bird maintained low and efficient rates of responding, with no reduction in reinforcement frequency. The slight rise in rates at the beginning of each session was characteristic for this bird, and does not appear to be the result of the probe.

When the DRL 35-sec schedule was in effect, baseline response rates increased, performance was relatively inefficient, and frequency of reinforcement was lowered, by comparison with performance on DRL 21-sec. Baseline performance is shown in the upper portion of Fig. 2. The effect of the probe is shown in the lower portion of Fig. 2. Response rates increased to almost double the baseline rates and frequency of reinforcement dropped to zero.

Discussion

The results demonstrated, within the same bird, that when DRL efficiency and frequency of reinforcement are high, a competitive schedule for conditioned reinforcement will have little or no effect on DRL rates. But, when efficiency and frequency of reinforcement are low, the competitive schedule will cause a sharp rise in response rate, with responding seemingly under the control of the conditioned reinforcement schedule.

The present findings parallel the results of Randolph & Sewell (1965). The amount of rate change produced by the conditioned reinforcement probe is inversely related to the bird's efficiency of DRL performance. More specifically, the results demonstrate that with highly efficient performance, the conditioned reinforcement schedule will have no effect on response rate.

The present results suggest that the generality of the effects of the competitive schedule may be limited. When compared with pigeons, other species such as rats, cats, and monkeys show a much higher degree of efficiency of DRL performance (Reynolds, 1964). Unpublished findings by Sullins, Sewell, and Randolph indicate that a competitive conditioned reinforcement schedule does not increase rate of responding in rats.

The relatively efficient or inefficient performance was correlated with frequency of reinforcement. The failure of the conditioned reinforcement schedule to disrupt efficient DRL performance could have resulted from either the degree of control exerted on the organisms by the schedule, or from the dense frequency of reinforcement, or from a combination of both. Which, remains an empirical question.

References

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Note

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