A serial conditioned reinforcement effect in a multiple-chain schedule in a squirrel monkey¹

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Abstract

A squirrel monkey was run on a multiple schedule whose individual components were chain FI VI and chain FI FR. Chain FI VI repeated four times, then chain FI FR repeated four times, and then the entire sequence recycled. Response rates in the FI links increased with successive repetitions of ch FI VI and decreased with successive repetitions of ch FI FR, while rates in the VI and FR links remained relatively constant.

Problem

In a two-link chained schedule, responding in the first link is reinforced by a conditioned reinforcer, viz., the appearance of the stimulus marking the second link; while responding in the second link is reinforced with food. Brady and Thach (1960) used a variation of chaining in which two chains occurred in alternation. With the schedule in the first link of both chains the same, differences in response rates in the first links indicated the relative conditioned reinforcing value of the stimuli associated with the two different food schedules of the second links. The present study extended the Brady-Thach design by presenting two chains first in single alternation (i. e., ABAB, or SA), then in double alternation (i. e., AABBB, or DA) and then in quadruple alternation (i. e., AAAABBBB, or QA). Inasmuch as the QA data extend the findings of the DA and SA experiments at the same time that they confirm the earlier data, only the QA results of one monkey that completed the experiments are given.

Method

The S was an adult male squirrel monkey whose initial ad lib. weight was about 900 gm. It was maintained at 80% of ad lib. weight during experiments but was allowed to free-feed for several weeks between experiments. The S shared an extensive experimental history with three other monkeys who sickened and were discarded before the QA experiment began. S's history included about 6 mos. on a multiple FR VI schedule, and then about 2 yr. on ch FI VI and ch FI FR occurring first in SA, then in DA, and then in QA sequence. S was run in a Lehigh 1417 squirrel monkey conditioning chamber that contained two pigeon keys, to the left and right of the food cup, and a lever directly below each key. Water was always available, and white masking noise was fed in continuously. A fluorescent houselight provided illumination during experimental sessions. The food reinforcers were 45 mg Noyes sucrose pellets. The QA sequence repeated to a total of 4 complete sequences daily. The FI link of ch FI VI was marked by an orange light on the right key and a dark left key. The VI 1-min. link of that chain was

marked by a green light on the left key, and a dark right key. The FI link of ch FI FR was marked by a yellow light on the right key, and the FR 10 link of that chain was marked by a white light on the left key. The S had to press the right (lighted) key during FI links, and the lever below the left (lighted) key during VI and FR links. Each occurrence of a food link lasted 1 min., but the duration of the FI was varied as follows: FI 1 min.-14 days; 1.5 min.-14 days; 2 min.-25 days; 1.5 min.-35 days; 1 min.-15 days; 0.5 min.-8 days. The data were averaged for the last 5 days at each FI value, or for the last 5 days of each replication for the FI values that were run twice.

Results

The lower half of Fig. 1 shows a typical performance during one complete QA sequence, with the FI = 2 min. Cumulative response records corresponding to individual links have been separated. Although the mean response rate in the FI links of ch FI VI was lower than in the FI links of ch FI FR, there was a progressive increase in responding from the first to the fourth successive FI of ch FI VI, and a progressive decrease in responding from the first to the fourth successive FI of ch FI FR. The upper half of Fig. 1 summarizes this serial effect for the whole experiment. Responses in all orange FI links were summed for the last 5 days at each FI value. Then the per cent of total "orange" responses that occurred in the first, second, third, and fourth serial position of the sequence was computed. Similar calculations were done for "yellow," "green," and "white" responses. As the figure shows, responding increased progressively during successive occurrences of orange FI links, and decreased progressively during successive occurrences of yellow FI links (except at FI 2). Corresponding food links followed suit: Responding in green links increased *very slightly* from the first to the fourth serial position, and responding in white links decreased *very slightly* from the fifth to the eighth serial position within each completion of the sequence. (As the FI length increased from 0.5 to 2 min., mean response rates rose from 5 to 9 responses per min. in orange links, from 18 to 24 in the corresponding green links, from 15 to 23 in yellow links, and from 45 to 73 in the corresponding white links.)

Discussion

The marked serial effect within successive appearances of like-colored FI links indicates that they were not functionally identical. Apparently, the green light that reinforced FI responding in ch FI VI became progressively more reinforcing with each successive

RESPONSES IN LIKE COMPONENTS OF THE CHAINS AS A FUNCTION OF SERIAL POSITION OF EACH CHAIN WITHIN THE SEQUENCE

Fig. 1. The serial position effect over all FI values (upper half); typical performance during one complete QA sequence, at FI = 2 min. (lower half).

appearance, while the white stimulus that reinforced FI responding in ch FI FR became progressively less reinforcing. One way to account for this finding is by the impending approach of the preferred (FR) or non-preferred (VI) food schedule. Each completion of ch FI VI brought S closer to the preferred food schedule, while each completion of ch FI FR brought S closer to the non-preferred food schedule. The difficulties with this explanation are that it grants behavioral control to events in the future, and it requires S to remember exactly how far it was from the next appearance of the preferred or non-preferred food schedule.

Another way to account for the serial effect is by the preceding events. Response rates rose in FI links that followed VI links, and fell in FI links that followed FR links. Perhaps cumulative exposure to the non-preferred food schedule produced a cumulative emotional excitement that revealed itself in a higher response rate in the next FI link, and cumulative exposure to the preferred food schedule produced a cumulative emotional quiescence that revealed itself in a lower response rate in the next FI link. The difficulties with this explanation are that the emotions are inferred entirely from the data they must explain, and the effects of the emotions appear primarily in the FI links and hardly at

all during the food links that presumably generated them. In defense of the account, it might be characteristic of emotions that their effects on operant behavior appear more clearly when other sources of control are relatively weak. Thus, the conditioned reinforcers in the chains must be supposed to have exerted weaker control over responding than the primary reinforcers, and so behavior in the first links of the chains might have been more susceptible to other influences.

References

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Note

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