Reinforcement and free feeding as antecedent conditions in a discrete trial discrimination

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In a discrete trial situation, a pigeon showed a discrimination only on trials following nonreinforcement. Probability of a response to either S+ or S- was high if the trial was preceded either by a reinforced response or by noncontingent reinforcement in the intertrial interval.

Jenkins (1965) noted that in discrete trial discrimination situations the probability of response on any given trial was related to the presence or absence of reinforcement on the previous trial. A response was more probable if the previous trial had involved a reinforced response to S+ than if the previous trial had involved presentation of the S-, with subsequent nonreinforcement of a response. The phenomenon was noted to be transient on easy discriminations, but more lasting in difficult discriminations. Jenkins suggested that the probability of response may have been a function of general responsiveness induced by reinforcement on the previous trial.

The present experiment sought to investigate the effect of the presentation of a reinforcement, independent of a response and unrelated to either stimulus, on the probability of response at the following stimulus presentation. It was hypothesized that presentation of the intertrial reinforcement would have a similar effect as presentation of response-contingent reinforcement on the previous trial, i.e., result in a general increase in the probability of response to either stimulus presented on the following trial.

METHOD

Subject

A six-year-old male Silver King pigeon with approximately 50 h experience with hue discrimination problems was maintained at 80% weight. Ad lib water was available in the home cage.

Apparatus

The top and three sides of the 18 x 19 x 14 in. pigeon chamber were made of Plexiglas. Two Gerbrands translucent pigeon keys were mounted on the metal front panel, 5 in. above and to either side of the feeder opening at the base of the panel. The stimuli were ¼-in. bands of white light projected onto the right key. A horizontal line was used as S+, and a line tilted 45 deg to the right was used as S-. The infrequent responses to the left key had no programmed effect. Illumination was provided by a house light mounted at the top of the panel. The chamber was draped with a dark cloth and located within a larger room into which white noise was delivered. Electromechanical programming equipment was located in an adjoining room.

Procedure

The S was run for six consecutive days. During the first three training days, stimuli were presented according to Jenkins' (1965) procedure whereby stimuli to appear on odd number trials are alternated between S+ and S-, while stimuli on even numbered trials are selected randomly. On each trial, the stimulus was presented for 5 sec or until a response occurred. Responses to S+ were reinforced with 3-sec access to grain. If the S responded to S+, or did not respond to S-, the next stimulus in the series was presented after a randomly chosen intertrial interval of either 10, 20, or 30 sec. Responses during the intertrial interval postponed the next stimulus presentation by 1 min. No data was collected for repeat trials.

The S was given 60 trials on Days 1 and 2 of training, and 30 trials on Day 3.

Test trials were first introduced on Day 4. A new sequence of stimulus presentations was generated, and 36 intertrial intervals were selected, so that they equally often fell between pairs of trials involving presentation of S+S-, S-S+, and S-S-. Intertrial intervals between two S+ trials were not selected. An intertrial reinforcement involved presentation of grain for 3 sec midway through each selected interval. Sixty trials were given on Days 4 and 5, and 30 trials on Day 6.

RESULTS

No differences were found between random and predetermined stimulus presentation trials, and the data from both will be considered collectively. The probability of response on nontest trials (not involving intertrial reinforcement) is shown in the upper portion of Table 1. When the data from all six days was pooled, Chi Square analyses showed that there was a higher probability of response to either stimulus on a given trial, if the stimulus on the preceding trial had been S+ ($\chi^2 = 14311$, $p < .001$). The probability of a response on a trial was not significantly affected by the stimulus presented on that trial ($\chi^2 = 2.26$, $p > .10$), when the stimulus on the preceding trial is ignored. When the preceding stimulus was S+, the difference was not significant ($\chi^2 = .029$, $p > .95$), but the stimulus did have an effect on trials preceded by S- ($\chi^2 = 10.95$, $p < .001$).

Data from test trials are presented in the lower portion of Table 1. Because of the presence of zeros in the cells of the 2 by 2 matrices, binomial tests of significance were used. In each of the three stimulus sequences (S+S-, S-S+, and S-S-), the probability of a response to the second stimulus was obtained by pooling data from test and nontest trials of Days 4, 5, and 6. This probability was then used in a binomial expansion to obtain the probability of the obtained results. Presenting the intertrial reinforcement resulted in a significant increase in the probability of response whenever the stimulus on the preceding trial was S- (for each, $p < .001$), but the presentation of the intertrial reinforcement had no significant effect following S+ since the probability of a response to S- following an S+ trial was very high without an intertrial reinforcement.

DISCUSSION

While it has long been known that the event of reinforcement or nonreinforcement can serve as a cue for further responding (Bullock & Smith, 1953), the data from this experiment showed that both response contingent, and response independent reinforcement increased the probability

Table 1
Probability of Response for Each Stimulus

	Stimulus Sequence	Day					
		1	2	3	4	5	6
Nontest trials	S+S+	.92	.80	.84	1.00	1.00	1.00
	S+S-	1.00	.87	.87	.87	1.00	.90
	S-S+	.50	.47	.62	.44	.60	.44
	S-S-	.50	.20	.17	.21	.10	.10
Test trials	S+S-				.77	1.00	1.00
	S-S+				1.00	1.00	1.00
	S-S-				1.00	1.00	1.00

of response on the following trial when the stimulus sequence was such that, even with correction trials, the antecedent events of reinforcement or nonreinforcement were not correlated with the occurrence of S+ or S- on the next trial. Jenkins (1965) found evidence for discrimination on trials following reinforcement, while the present study, using an experienced S, did not.

The effect of intertrial reinforcement in increasing the probability of a response on the following trial may be considered further evidence for nonassociative effects of antecedent reinforcement. If nonreinforcement is considered to reduce responsiveness, and thus increase the slope of the gradient (W. O. Jenkins et al, 1958), both a lowered level of responsiveness to either stimulus and enhanced discrimination between S- and S+ following nonreinforcement would be

expected. Both were obtained. Antecedent reinforcement of either sort increased responsiveness to the degree that the discrimination was not demonstrated on the following trial.

REFERENCES

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