

INSTRUCTIONAL CONTROL OF HUMAN OPERANT RESPONDING DURING EXTINCTION FOLLOWING FIXED-RATIO CONDITIONING¹

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When given pre-conditioning instructions correctly indicating the maximum number of reinforcements obtainable, subjects made few responses during extinction following FR 10 conditioning. More extinction responses occurred when the maximum-reinforcement instructions suggested that reinforcements were obtainable during extinction. The highest rates of responding during extinction were produced by subjects who had no maximum-reinforcement instructions.

Humans maintain high rates of operant responding during extinction following positive reinforcement (Weiner, 1964; Baron, Kaufman, and Stauber, 1969). But relatively few studies have attempted to isolate and manipulate factors that control extinction responding with humans. Working with children, Bijou (1958) and Thompson, Heistad, and Palermo (1963) showed that extinction responding following fixed-interval (FI) and fixed-ratio (FR) conditioning, respectively, can be reduced by providing subjects with fewer reinforcements during conditioning. Weiner (1964) demonstrated that the extinction responding of adult humans following FI reinforcement can be suppressed with response cost (response-produced reinforcement penalties). Baron *et al.* (1969) replicated this response-cost finding and, in addition, showed that responding during FI reinforcement and extinction tends to decline (1) when subjects are given instructions describing the contingencies of reinforcement, and (2) when there is reinforcement feedback (the totalling of reinforcements on a counter) during FI reinforcement.

The present study attempted to ascertain whether human operant responding during extinction following FR reinforcement could be controlled by differential instructions concerning the maximum number of reinforcements that subjects could obtain. Such maximum-reinforcement instructions provided

subjects with information concerning the discontinuation of reinforcement during extinction.

METHOD

Subjects

Fifteen male and female humans, ages 18 to 28 yr, served.

Procedure

Each subject sat alone in an experimental room facing a microswitch button and a five-digit counter. Their task was to earn pennies on the counter by pressing the microswitch button. An effective button-press required a force of about 20 gm (0.196 N) through a distance of 0.4 in. (1 cm).

Subjects were divided into three groups of five each. The three groups differed only in terms of the instructions they received at the beginning of the experiment.

Group 1 was instructed as follows:

"You can earn pennies on the counter with this button. You will be in here for approximately 3 hours. At the end of this time, I will pay you the amount of pennies you have earned on this counter.

"At no time can you leave this room. Just stay in your seat and I will let you out when the experiment is over. 700 pennies is the most you can earn."

Groups 2 and 3 received identical instructions except for the last sentence. Group 2 was told that "999 pennies is the most you can

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earn." Group 3 was told nothing about the number of pennies they could earn.

All three groups began the experiment with five zeros showing on the counter and were conditioned initially on a fixed-ratio 10 (FR 10) schedule, where every tenth button-press added a penny on the counter. After 700 pennies had been earned on the counter under FR 10, a 2-hr extinction period was scheduled during which no reinforcements were provided.

Transistorized digital equipment (Weiner, 1963) was used to schedule the experimental contingencies. Responses were recorded on Gerbrands cumulative recorders and electro-mechanical counters.

RESULTS

Table 1 summarizes the performances obtained from individual subjects in each of the three instruction groups under FR 10 and extinction. The total time required to earn 700 reinforcements and the response rates emitted under FR 10 were fairly comparable

for the different instruction groups. For all subjects, response rates during each of the four successive 30-min extinction periods were less than their respective response rates under FR 10. Extinction responding, either within or between instruction groups, was not related to the sex of the subjects, to the total time spent by subjects under FR 10, to the overall average response rates during FR 10, or to the average response rates during the last 15 min of FR 10. Group 1 (700-maximum-reinforcement instructions) had the lowest response rates during extinction. Two subjects (696, 697) in Group 1 did not respond at all during extinction. The other three subjects in Group 1 made some responses, primarily in the first half-hour of extinction. Group 2 (999-maximum-reinforcement instructions) had higher extinction response rates than Group 1. The highest response rates during extinction were obtained from Group 3 (no maximum-reinforcement instructions).

Cumulative response records of final FR 10 performances and of responding during the first half-hour of extinction are presented in

Table 1

Summary of performances under FR 10 and Extinction. The subjects in Group 1 were told that 700 reinforcements (pennies) was the maximum they could obtain. The subjects in Group 2 were told that 999 reinforcements was maximum. The subjects in Group 3 were not given any maximum reinforcement instructions. For all groups, extinction was scheduled after 700 reinforcements were obtained under FR 10. The entries under the Total Time column under FR 10 show the total amount of time (in minutes) required by each subject to earn 700 reinforcements.

Subj No	Sex of Subj	FR 10			Extinction			
		Total Time	Av Resp/Min (overall)	Av Resp/Min (last 15 min)	Av Resp/Min during Successive Half-Hours			
Group 1								
693	M	70	100	266	3	1	0	0
694	M	18	388	429	14	1	0	0
695	F	24	291	286	18	0	0	0
696	M	24	291	333	0	0	0	0
697	F	25	280	283	0	0	0	0
Group 2								
698	F	23	304	333	20	12	12	12
699	M	29	241	250	17	4	7	10
700	F	24	291	316	84	14	6	6
701	M	23	304	348	18	20	15	4
702	F	26	269	260	24	17	0	4
Group 3								
703	F	23	304	320	112	52	193	215
704	M	18	388	376	100	93	122	118
705	F	28	249	266	130	116	132	100
706	F	47	162	313	26	16	17	15
707	M	24	291	280	86	26	14	12

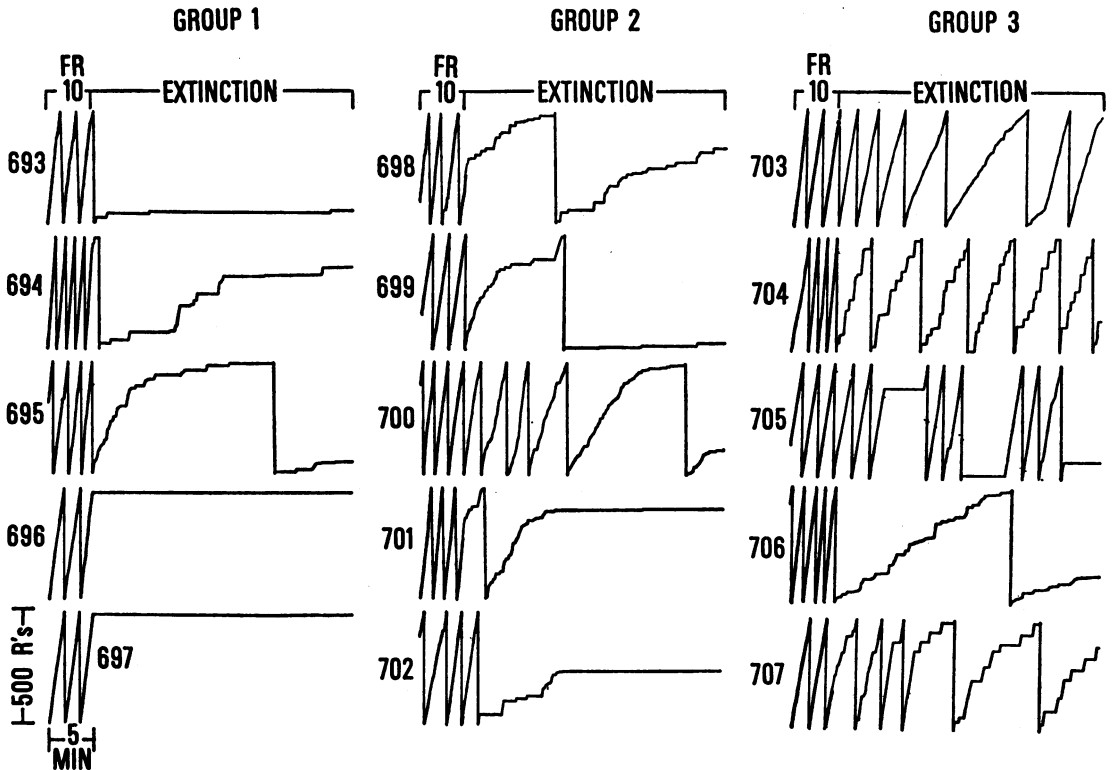


Fig. 1. Final (last 5 min) FR 10 performances and initial (first 30 min) extinction performances. Vertical marks on the records under FR 10 indicate the occurrence of one-penny reinforcements. Other details as in Table 1.

Fig. 1. The differential extinction responding for Groups 1 to 3 shown in Table 1 was discernible almost immediately after the onset of extinction. Also notice that all three of the subjects in Group 1 who made some responses during extinction (693, 694, 695), all five subjects in Group 2, and two of the five subjects in Group 3 (706, 707) exhibited progressive decrements in responding during the first half-hour of extinction. There were some subjects in each of the three groups (e.g., 695, 701, 706) who had virtually stopped responding by the end of the first half-hour of extinction. As shown in Table 1, however, only subjects in Group 1 continued consistently either to decrease their responding or refrain from responding entirely during the final three half-hour periods of extinction.

DISCUSSION

The present data are in line with the growing evidence (e.g., Ayllon and Azrin, 1964; Kaufman, Baron, and Kapp, 1966; Lippman and Meyer, 1967) that instructions can exert

powerful control over human operant behavior. Extinction performances following FR 10 conditioning were shown to be a function of instructions concerning the maximum number of reinforcements obtainable, and hence indirectly about whether reinforcements were available during extinction. Relatively high response rates occurred when subjects were not informed about whether or not reinforcements could be obtained during extinction. High-rate extinction performances have been obtained previously following FI schedules when subjects had no instructions about the availability of reinforcements (Weiner, 1964).

Very little responding occurred during extinction when subjects had information that reinforcements could not be obtained. The fact that three of the subjects with such information responded at all during extinction was surprising. This is not the first time, however, that instructions have failed to control behavior entirely (Ayllon and Azrin, 1964).

The present finding that responding during extinction tends to decline when subjects have information that reinforcements are not avail-

able is consistent with and extends previous findings that showed that classically conditioned autonomic responses (*e.g.*, Notterman, Schoenfeld, and Bersh, 1953; Wickens, Allen, and Hill, 1963) and motoric responses (*e.g.*, Lindley and Moyer, 1961) decline more rapidly during extinction when humans are instructed that reinforcements have been discontinued. It is also in line with the previously mentioned data of Baron *et al.* (1969) which showed that low response rates are produced by humans during both fixed-interval reinforcement and extinction when subjects are instructed about the contingencies of reinforcement.

In the present experiment, subjects given maximum-reinforcement instructions that suggested falsely that reinforcements could be obtained during extinction had higher extinction response rates than subjects with maximum-reinforcement instructions suggesting that reinforcements were not available during extinction. However, the subjects with false maximum-reinforcement instructions had markedly lower extinction rates than subjects given no maximum-reinforcement instructions. It appears that instructions about a reinforcement maximum may be sufficient to reduce responding during extinction irrespective of the accuracy of such instructions.

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