

Frustration effects rather than Sr effects in children

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A light was paired with token rewards for experimental children, and was unpaired for control children. Extinction of a cranking response was accompanied by periodic presentation of the light. Contrary to Sr predictions, experimental Ss extinguished first. A frustration interpretation seems more appropriate.

Although several studies with human Ss have led their authors to the conclusion that secondary reinforcement effects (Sr effects) were demonstrated (see Myers & Myers, 1965, for some of these references), another list may be mentioned which led its authors to the conclusion that Sr effects were *not* demonstrated (e.g., Kass et al, 1964; Longstreth, 1960; Mitrano, 1939). Normally an investigator mentions one list or the other, but not both (unless the editor insists upon it), depending upon how his own results turned out. There is a third list, however, which is seldom mentioned in either type of study, even though the independent variable involves the same basic operation as employed in Sr studies. Reference is made here to a growing list of frustration studies with human Ss (e.g., Haner & Brown, 1955; Holton, 1961; Longstreth, 1965). In both Sr and frustration studies, the experimental condition involves pairing a cue with reward and then presenting it alone, while control conditions hold *exposure* to the stimuli constant, but omit the pairing. If the experimental condition leads to greater resistance to extinction, it is usually concluded that Sr effects were demonstrated; if the control conditions lead to greater resistance to extinction, it is often concluded that frustration effects were demonstrated.

Now clearly, both results cannot be presumed to follow from the same operation, since they are mutually contradictory. Perhaps, then, some of the results would not withstand a replication. Or it could be that subtle factors were operating which are usually overlooked in the typical published report. Of these two possibilities, the first has priority: there is little sense in looking for subtle factors which produce unreliable results. Thus a first step in understanding these apparently contradictory results is to make sure the difference is *real*, not just apparent. The present paper reports a study which parallels closely the procedures in a previous study which did not find Sr effects, but rather frustration effects (Longstreth, 1960).

Method

Ss were 40 kindergarten children from a public school who were randomly assigned to an experimental and control group, with the restriction that $N = 20$ per group.

The apparatus consisted of two main units, a crank token-reward machine and E's control box. The crank

machine was a wooden black box 23 in. high, 14 in. wide, and 6 in. deep, with a crank handle mounted on one side. An ejection slot, cut in the front face, delivered tokens (poker chips) as controlled by E. A blue 120-volt light bulb, also controlled by E, projected from the top of the crank machine at approximately S's eyelevel.

The control unit consisted basically of two selector switches and an impulse counter. One switch allowed E to select which turn of the crank handle would lead to ejection of a token, while the second switch determined which turn of the crank would momentarily activate the blue light. The counter automatically counted the number of turns made by each S.

Training consisted of cranking until 14 tokens were earned. Each token was placed in a slot on a 15-slot board, at the end of which was a prize S had selected. The number of cranks per token varied from 3 to 15 in units of 3, with a median of 8. The sequence was 6, 9, 3, 12, 6, 15, 9, 6, 6, 12, 15, 3, 12, 6. Thus all Ss cranked a total of 120 times prior to extinction.

Pairing of the blue light with token ejection constituted the independent variable. For experimental Ss, the light was automatically activated one crank prior to token ejection and terminated simultaneously one crank later. For control Ss the light was activated on the crank corresponding to one-third the number required for a token on that trial. Thus, if 9 cranks were required, the light was activated on the third crank and terminated on the fourth. The crucial difference between groups was that the light was paired with token ejection for experimental Ss but not for control Ss.

Extinction began with no interruption: the fifteenth token was simply not delivered. For both groups the light was automatically activated every ninth crank and terminated one crank later. The extinction criteria were either a cessation of cranking for more than 1 sec. or the third cessation of less than a second's duration. When one of these criteria was reached, the fifteenth token was ejected, S collected his prize, and was returned to his room.

During both training and extinction, E sat behind a curtain which shielded him from S's vision. Children seem to be quite sensitive to subtle cues from E regarding whether they should continue responding or stop, necessitating some such precaution.

Results

Table 1 presents the raw data: the number of cranks to extinction by each S. The mean for experimental Ss is 33.2, and for control Ss, 74.7. Both a *t*-test and a Chi Square test indicated this difference is significant at $p < .01$. It is clear that experimental Ss extinguished faster than control Ss.

Table 1. Number of responses to extinction

Subjects	Experimental Group		Control Group		
1	11	9	21	43	120
2	12	13	45	57	19
3	13	46	12	72	147
4	14	48	21	133	106
5	15	14	35	43	54
6	16	21	26	190	49
7	17	16	18	64	39
8	18	150	9	32	75
9	19	89	10	65	40
10	20	23	37	102	44

Any verbal responses during extinction that expressed the correct relationship between the light and token ejection were recorded. For instance, if S said, "The light turns on, but the chip doesn't come out," a note was entered on S's data sheet indicating the response. Of the 11 Ss who made such responses, 9 were in the experimental group, and 10 extinguished with fewer than the overall median number of cranks to extinction. Both of these relationships were significant as evaluated by Chi Square ($p < .05$).

Discussion

The present results closely parallel those of a previous study (Longstreth, 1960). In both studies, the experimental group was exposed to the pairing of a light with reward, while the control group was not. In extinction, the light was presented to both groups, but not the reward. In both studies, (a) experimental Ss verbalized their expectation of reward when the light was presented, and (b) extinguished faster. How are these results to be rationalized?

According to the notion of secondary reinforcement, the light should have become an Sr for experimental Ss, and hence should have strengthened preceding responses. Thus experimental Ss should have extinguished slower. Clearly, Sr predictions are not supported.

Turning to frustration theory, it would be assumed that the light would elicit anticipations of a token in experimental Ss, as was confirmed by verbal responses.

Such nonreinforced anticipations in extinction would lead to maximum frustration, which would produce aversive emotional responses. Such aversiveness could be reduced by avoiding the situation, and hence should lead to rapid extinction. Frustration theory, then, is strongly supported by the data.

It would appear that frustration effects can be reliably produced with human Ss. But presumably, so can Sr effects. What is the key to the difference? One possibility is that some studies which have been interpreted as supporting Sr predictions can be re-interpreted as supporting frustration theory. This would appear to be a particularly appropriate possibility for those studies which measure only a small part of extinction and find stronger or more rapid responses for Ss exposed to assumed secondary reinforcers. According to frustration theory, such results may be nothing more than a frustration effect. An additional prediction, of course, would be that such Ss would extinguish faster. Unfortunately, most studies reporting Sr effects have not measured resistance to extinction. Until more complete information is available, the present state of confusion is likely to continue.

References

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Note

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