Effects of extinction on magnitude of aggression in humans

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Six male undergraduates could earn 4c for every 200 knob pulls. In addition, they could avoid or escape an aversive tone by pressing a button with a force of 1.5 lbs (nonaggressive response) or by punching a padded cushion with at least 20 lbs of force (aggressive response). Punches of 25 lbs or more were also recorded, permitting the magnitude of aggression to be measured. Higher rates and magnitudes of aggression occurred when knob pulling was not rewarded (extinction) than when it was rewarded (reinforcement).

Certain reinforcement schedules may cause aggression in man and other animals. Intermittent schedules of reinforcement, which include periods of nonreinforcement for responding, elicit aggression in pigeons (Knutson, 1970) and squirrel monkeys (Hutchinson et al, 1968). Extinction schedules have also been observed to cause aggression (Azrin et al, 1966; Davis & Donenfeld, 1967). Studies of extinction-induced aggression in humans have been rare, however. One study found that emotional outbursts occurred when infants were placed on extinction (Rheingold et al, 1959). Ethical considerations which prohibit experiments in which human Ss physically aggress against each other have tended to hinder efforts to measure physical aggression in adult Ss. However, a setting recently developed by Kelly & Hake (1970) to study extinction-induced aggression in humans appears to have solved this problem by employing an inanimate target object. In this study, a S, seated before a panel, could earn money by pulling a knob. In addition, an aversive tone which was programmed to sound every 60 sec could be avoided or escaped by either pressing a button with a force of 1.5 lbs (nonaggressive response) or by punching a padded cushion with a force of at least 20 lbs (aggressive response). It was found that the rate of punching was higher under conditions of extinction (i.e., when knob pulling was no longer rewarded) than during reinforcement.

The present study extended Kelly and Hake's research by investigating the effects of extinction on intensity of aggression. A setting similar to Kelly and Hake's was used, with the major difference being that high-magnitude (25 lbs or more) cushion responses to the Sonalert Signal were distinguished from cushion responses of lesser magnitude (20-24 lbs).

SUBJECTS

Six male undergraduates participated in the study. Ss attended from 6 to 11 90-min sessions, depending on the length of their initial baseline period. All Ss received both reinforcement and extinction conditions.

Before the start of the experiment, each S signed a consent form stating that participation in the experiment entailed no physical risk or substantial stress and that they were free to withdraw at any time.

APPARATUS

The apparatus, mounted on a table in a 12 x 14 ft laboratory room, consisted of a large panel containing a Lindsley knob, three stimulus lights, an add-subtract counter, and a button. The lights signaled when a knob-pulling ratio had been completed. The counter showed S's earnings. After completion of the knob-pulling task, counts registered if the button below the counter was pressed.

To the right of the panel was an 8-in.-sq chassis box with an 8-in.-diam padded cushion projecting from the top and a button mounted on the front. Beneath the table was mounted a 2,800-Hz 80-dB constant tone Sonalert Signal programmed to sound every 60 sec.

PROCEDURE

The experiment began when the indicator lights on the S's panel were turned on. The lights remained on until 200 pulls had been completed, after which they went out. If the button beneath the counter was pressed, four counts registered on the counter. After the counts registered, the lights went on again and the S could begin pulling the knob.

In addition, Ss were instructed that they could avoid or escape the Sonalert Signal by pressing either the button on the chassis box (which required a force of 1.5 lbs to operate) or by hitting the padded cushion (which required a force of at least 20 lbs).

CONDITIONS

A S was initially placed in a condition of reinforcement where, after every completed knob-pulling ratio, 4c registered on the add-subtract counter. This condition was maintained for two or more 90-min sessions until five consecutive 30-min segments had been completed in which the number of punches for any one segment differed by fewer than five from the number in any of the other four segments. These five 30-min segments constituted the baseline. If a baseline was obtained in the middle of a session, the condition continued in effect for the full 90 min.

"Extinction" was introduced in the next session. In this condition, reinforcement was discontinued after the S completed the first five knob-pulling ratios and earned 20c. Now when the S pulled the knob 200 times and pressed the button beneath the counter, there was a pause of 2 sec before the three panel stimulus lights went on again. No counter advance occurred.

After the first extinction session, S received a reinforcement-extinction-reinforcement sequence of sessions.

RESULTS

The Ss could respond to the Sonalert Signal by punching the padded cushion (aggressive response) or by pressing the microswitch just below it (nonaggressive response). In Fig. 1, which presents rates of aggression for each S, there is a tendency for higher rates of punching to occur during sessions of extinction than during reinforcement. In addition, this figure indicates that variation in high-magnitude punches (25 lbs or more) rather than variation in low-magnitude punches (20-24 lbs) largely accounts for differences in aggression between the two conditions. Thus, with the exception of S 5, all of the Ss made more high-magnitude than low-magnitude punches during both sessions of extinction. This is in spite of the fact that a punch of 20 lbs was sufficient to turn off or avoid the Sonalert Signal. Rates of low-magnitude punches, in contrast, tended to be constant across conditions or, in some cases, slightly less during extinction than during reinforcement. With regard to this last point, three of the Ss (S 2, S 3, and S 6) issued more low-magnitude punches during conditions of reinforcement than during extinction. Only S 4 and S 5 showed increases in both levels of punching magnitude during either session of extinction. The majority of Ss showed increases in only high-magnitude aggression with the onset of extinction.

A number of other trends can also be noted in Fig. 1. The first is that the effects of extinction on punching responses are not always reversible.

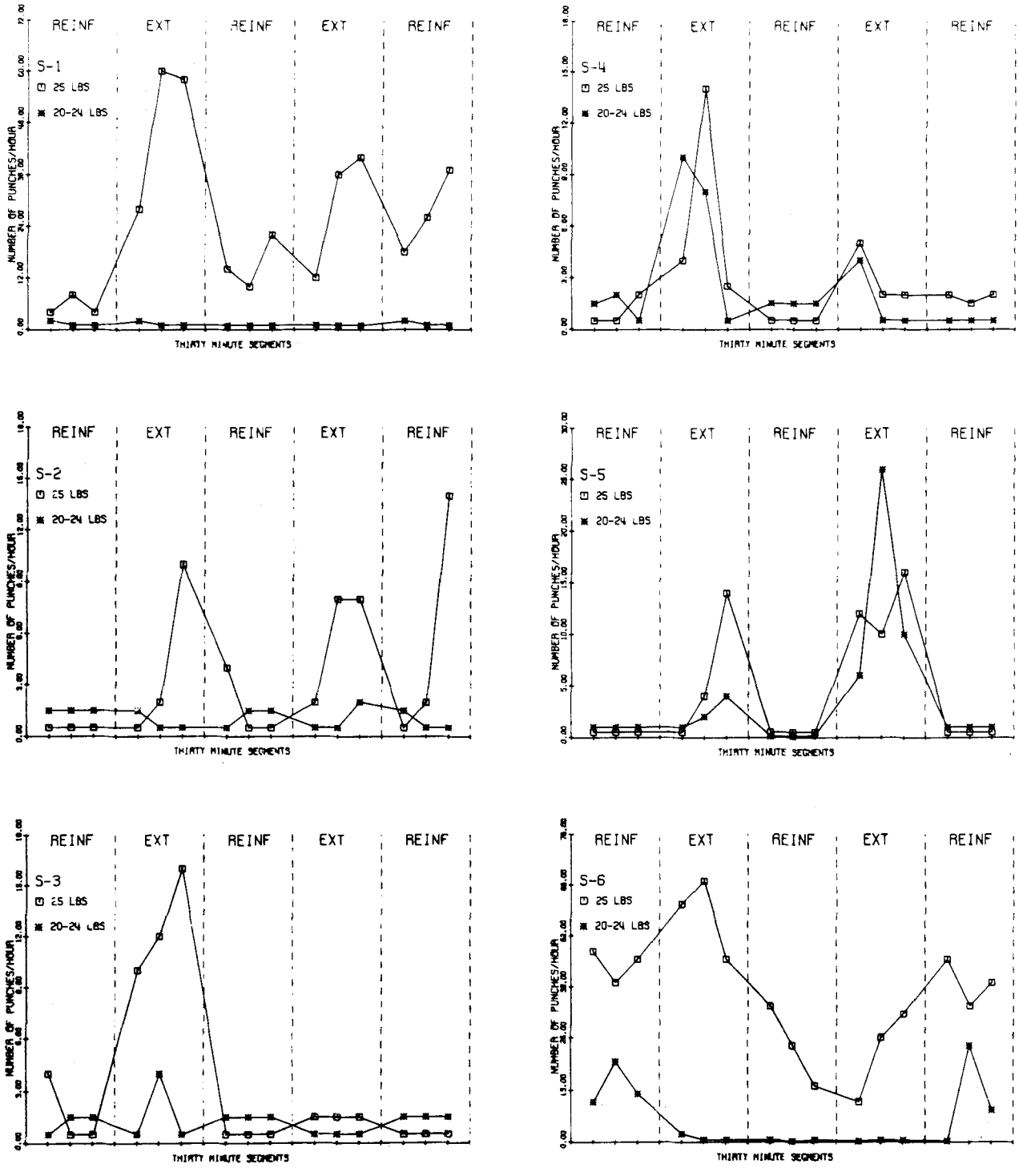

Fig. 1. Rates of punching during extinction and reinforcement conditions for six Ss. High-magnitude (25 lbs or more) and low-magnitude (20-24 lbs) punches have been plotted separately for each condition. The first reinforcement session in each figure represents a S's final baseline session.

There were two instances in which high rates of extinction-induced punching persisted into subsequent sessions of reinforcement. For example, S 1 showed relatively high rates of punching after each extinction session and failed to regain his initial baseline level of aggression. S 2, who was able to return to a baseline level after completing the first period of extinction, nevertheless demonstrated a dramatic increase in punching in the final session of reinforcement. Other studies have noted a similar persistence in aggression after a change from aversive stimulation to conditions of reinforcement (Hutchinson et al, 1968; Kelly & Hake, 1970).

A second trend in Fig. 1 is for rates of punching to be higher during the first session of extinction than during

the second session. This tendency is present in all Ss except for S 5. A similar finding has been reported in studies of extinction-induced aggression in nonhuman Ss (e.g., Azrin et al, 1966; Thompson & Bloom, 1966).

The Ss in this study showed considerable inter-S variability in rates of extinction-induced aggression. S 1 and S 6 had the highest rates, at times exceeding more than 60 punches/h during extinction. The other Ss, on the other hand, rarely made more than 18 punches/h. A closer examination of the data also found that a S's rate of aggression during the reinforcement condition was related to his rate of aggression during extinction. Thus, S 1 and S 2, in addition to emitting high rates of extinction-induced punching, showed high rates of aggression during baseline sessions and subsequent periods of reinforcement. Both of these Ss required seven sessions to reach an initial baseline. In contrast, the other Ss needed only from two to four baseline sessions. As Fig. 1 indicates, S 6 reached a steady state of 60 punches/h, which was much higher than the baselines of other Ss. Earlier in the baseline series, this S frequently reached rates as high as 90 punches/h. S 1 showed similar high rates of punching during the baseline series before attaining a near-zero baseline rate of aggression. This evidence suggests the existence of substantial individual differences in the predisposition to react aggressively in the face of frustration or other aversive stimulation. Thus, in the present study, Ss who were most apt to react aggressively to the fixed-ratio schedule they received during reinforcement were also likely to react the most aggressively to an extinction schedule.

Buttonpresses made in response to the Sonalert Signal were also examined. All of the Ss showed some decrease in the rate of this response during the extinction phase of the experiment. Decreases in this response tended to be associated with corresponding increases in punching responses. Thus, in extinction sessions, there was a statistically significant inverse relationship between rate of button responses and rate of punching ($r = -0.96$, $p < .001$). This negative correlation suggests that Ss simply switched their mode of response to the Sonalert Signal during conditions of extinction from buttonpresses to cushion responses. In contrast to these findings, Kelly and Hake's Ss tended to maintain constant rates of buttonpressing across conditions. Nor did there appear to be any relationship between rates of buttonpressing and punching.

DISCUSSION

The major finding of this study was the effect that extinction had on the intensity of aggression. During extinction, high-magnitude punches tended to increase, while the rate of low-magnitude punches declined. It should be noted that this study was unique in exploring magnitude of aggression. In studies with humans, this aspect of aggressive behavior has received considerably less research attention than has measurement of the rate of aggression (Patterson & Cobb, 1970). Since, in this study, changes in the magnitude of punching were often more dramatic than changes in the rate of punching, this variable in particular seems to merit inclusion in future research.

While many of the results from this study tended to replicate Kelly and Hake's findings, there were, however, important differences between the studies. A major difference was that Kelly and Hake's Ss, on the average, showed higher rates of aggression during extinction than Ss in the present study. For example, two of Kelly and Hake's seven Ss punched at a rate of 100 punches/h during extinction. The other Ss ranged from 20 to 60 punches/h. As you may recall, four of the six Ss in the present study averaged well below 20 punches/h. For the other two Ss, the highest rate was 68 punches/h. In addition, many of the cushion responses by Kelly and Hake's Ss were avoidance responses rather than escape responses. These avoidance punches tended to occur within the first fourth of the 200-response ratio requirement, i.e., shortly after the work requirement had been completed and payment had not been received. On the other hand, in the present study, practically all of the punches made by Ss during extinction were escape responses rather than avoidance responses.

A number of factors could explain the lower rates of aggression in this study. One explanation may be the availability in the present study of a number of alternative "escape" responses which competed with punching. For example, Ss could withdraw from the study. Explicit permission to quit at any time was given in the consent form signed by the Ss in this study. Though none of the Ss left the laboratory and failed to return before the end of an extinction session, more minor forms of withdrawal were in evidence. For example, Ss were observed walking around the laboratory and visiting adjacent rooms. Ss also pushed their chairs away from the apparatus, making it more difficult to strike the cushion. In contrast, Ss in the Kelly and Hake study had fewer forms of "escape" available. For example, it was more difficult for their Ss to get up and walk around or even to push their chairs away from the manipulanda because they were housed in small compartments.

Other differences between the two studies which should be mentioned are the age and class differences of the Ss. Kelly and Hake's Ss were adolescents and apparently came from lower-class backgrounds. On the other hand, Ss in this study were adults and came from middle-class backgrounds. "Fighting" and other forms of physical aggression make up a large part of adolescent social life. Studies also suggest that aggression is much more likely to be tolerated by members of the lower class than by middle-class individuals. Such behavior would be less acceptable and less commonplace among adults, especially those of the middle class. Also, Kelly and Hake's lower-class Ss may have suffered more from the loss of money during extinction than did the better-off Ss in this study.

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