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Manipulation of Abusive Behavior with Time-Out and Shock

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Introduction

Withdrawing positive reinforcement and preventing the opportunities to receive such reinforcement are commonly employed methods of punishment for behavior judged to be undesirable in our society. Prison sentences, dismissal from school or employment, social rejection, withheld allowance, loss of a driver's license are but a few examples. A significant trend apparent in recent psychological literature is the increasing amount of attention to punishment and such aversive methods of behavioral control. It is only in the last decade that the aversive properties of the removal of positive reinforcement (as opposed to the traditional studies using more direct physical measures) have been studied in depth.

A complete discussion of punishment and its effects on behavior is, of course, beyond the scope of this paper. The most widely investigated area of punishment is that dealing with shock and its effects on animal subjects. However, no matter how much the behavior in a natural environment seems to be maintained or suppressed by aversive events, little of this behavior seems to be influenced by corporal punishment as exemplified by electric shock. Although many of the complex, controlling events within an environmental setting seem quite similar to shock in some of their effects, they differ in others. The topic of this paper is a comparison of the effects of shock with one of these

aversive events--namely, time-out from positive reinforcement.

There is no single set of operations which adequately defines time-out (TO) from positive reinforcement. One essential feature, however, is that it is a period of time in which positive reinforcement is no longer available. Anyone with a basic background in the field of psychology today would recognize that such a broad definition could subsume many diverse experimental operations. One procedure might utilize S^{Δ} (S delta) periods during which time a stimulus is usually associated with the extinction of active responding. Many studies employing TO as an aversive event use pigeons as subjects and establish TO with a black-out period during which time all the house lights are turned off. A third procedure might establish a TO by the withdrawal of an opportunity to respond. This arrangement, most often used in monkey and rat studies, is usually accomplished by the use of retractable manipulanda. In two studies to be cited later TOs were established by physical isolation and the masking of cartoons. In experiments using human subjects a TO is an interruption of an ongoing activity, with the method of interruption and the type of activity being varied. There has not been sufficient work done in the area of human research to warrant any generalization about the procedure.

A review of recent literature confirms the fact that TO exhibits many of the characteristics of an aversive event. Holz and Azrin (1963), using four adult pigeons, did a comprehensive comparison of five aversive events: stimulus change, satiation, physical restraint, punishment and extinction. Their graphic synopsis is included on the next page.

Procedure	Immediate Effect	Enduring	Complete Suppression	Irreversible Effects
Stimulus Change	Yes	No	No	No
Satiation	Yes	Yes	No	No
Physical Restraint	Yes	Yes	Yes	No
Punishment	Yes	Yes	Yes	Yes
Extinction	No	Yes	No	No

If time-out were included in such a list, its characteristics and effects would most likely match those of extinction and would least resemble punishment (shock). One of the distinctive differences between TO and shock is the gradualness with which TO produces a suppression of behavior as compared to the immediate effects of punishment by mild shock (Azrin, 1959) and aversive noise (Holz & Azrin, 1963). Although Holz and Azrin conclude from their study that punishment appears to be the most effective method of eliminating responses, this does not mean that TO is not an aversive event. On the contrary, TO has proven to be a somewhat effective means of controlling an organism's behavior.

Holz, Azrin and Ayllon (1963) conducted an experiment to assess the effectiveness of TO as a punishing event to eliminate

undesirable behavior. Using four male psychotic patients as subjects, the experimenters reinforced bar-pressing with cigarettes on a variable-interval (VI) schedule and then punished every tenth response with a TO of 30 sec. Two of the four subjects showed a decrease in response rate upon introduction of the TO contingency. The other two subjects showed no change until another alternative response was made available (one which continued to produce cigarettes but no TO). The authors concluded that TO is a relatively weak punisher when it is made contingent upon a response which is simultaneously delivering a positive reinforcer. Although TO was only mildly aversive, it is worthwhile to note that complete suppression occurred when the subjects were punished and provided with alternative means of responding. These results seem to support the idea that undesirable behavior can be eliminated more quickly by punishment in conjunction with providing or teaching an alternative unpunished response.

Another study testing the punishing effects of TO was conducted by Baer (1962) with nursery-school children. He was able to suppress thumbsucking by interrupting cartoons when the child had his thumb in his mouth. When the TO contingency was withdrawn, the thumbsucking reverted to the pre-punishment level.

Matching-to-sample is another familiar technique used in the study of how TO affects behavior which produces it. In most experiments a pigeon pecks a center key to produce a sample stimulus, usually of a praticular color. After a fixed period of time, the center key light is turned off and two other keys are

lighted. If the bird pecks at the key of the same color as the center key which had previously been lighted, he is reinforced with food on some predetermined schedule. If the subject responds incorrectly, he produces a TO period and the center key is lighted again following the TO.

Some of the major variables which have been the subject of investigation in such matching-to-sample studies are duration of TO, schedule of TO, and schedule of reinforcement for correct matching responses. Ferster and Appel (1961) conducted an experiment to analyze the first and last of those three parameters. They found that when every correct response was continuously, rather than intermittently, reinforced, TOs following incorrect responses had little effect on matching accuracy. The data showed that when correct matching responses were reinforced on a VI three min. schedule, matching accuracy improved as TO increased from one to sixty sec. A TO duration as great as two min. disrupted both correct and incorrect responding.

Zimmerman and Ferster (1963) reported similar findings with different TO durations. With TO durations of 10 sec. or one min. the matching accuracy increased as the frequency of TOs increased. However, with longer TO durations like 10 min. or extremely short durations of one sec., the accuracy decreased. In addition, this study showed that matching accuracy decreased as the number of incorrect responses necessary to produce a TO was increased. The fixed ratio (FR) schedules employed were FR 2, FR 4, FR 6, FR 12, FR 25, and FR 50.

Several studies not directly concerned with TO duration

have noted the effects of varying the TO period. Miller and Zimmerman (1966) while investigating the effects of a pre-TO stimulus on matching-to-sample in humans also varied the TO duration and noted the consequences. The authors found that as the duration of TO increased from one to four minutes, there was a decrease in the number of incorrect responses. Thomas (1965) while studying avoidance in pigeons, found that a five min. TO period maintained a higher avoidance rate than did a long duration of 15 min. Basically, what all the studies have found is that increasing TO duration usually increases matching accuracy, but beyond a certain point the longer durations disrupt matching accuracy.

In general, matching-to-sample experiments play an important role in evaluating the punishing effects of a TO period. Although there are procedural differences in the experiments, it is worth noting that all of the studies provide substantial evidence that TO does act as an aversive stimulus. Few studies in other areas offer such clear cut evidence of the effect of a TO period.

An important consideration when evaluating the aversive effects of TO is whether or not a subject will learn to avoid TOs. Ferster (1958) used chimpanzees as his subjects. Two levers were made available to the subjects; responses on the right hand lever were reinforced on a VI three min. schedule and a continuous avoidance schedule was programmed on the left lever. If the subjects emitted no avoidance response, a TO of three min. occurred every 45 sec. However, if the subject did respond on the left hand lever, the TO was postponed for a fixed duration of

time (the durations being one, two, five and 10 min.). Ferster found that as the duration decreased there was an increase in the rate of avoidance. Morse and Herrnstein (1956) obtained the same results in a similar study using pigeons as subjects.

Thomas (1964) has noted an interesting finding from his avoidance experiments. As the interval between reinforcement was changed from nine min. to one min. there was a decrease in the number of TOs avoided. This would seem to be unexpected since the subjects would lose more reinforcements in such a situation. However, Thomas' results apparently would support a view that when the frequency of reinforcement is high, subjects tolerate more TOs from reinforcement.

Mechner and Ray (1959) used rats to demonstrate an avoidance of TOs from a fixed interval (FI) 15 sec. schedule of reinforcement. In order to avoid a two min. TO, the subjects had to refrain from pausing longer than three sec. between lever presses. As soon as this contingency was removed, inter-response times became longer.

Using kindergarten age children as subjects, Baer (1960) investigated the subjects' ability to learn to avoid having cartoons shut off. His experiment differed from the above studies in that each response postponed a TO in a cumulative manner. If a TO was two sec. and the subject made 25 responses in succession, the cartoon was not interrupted for 50 sec. from the first response. Baer failed to maintain avoidance in this group. In addition to the difference already noted, a possible explanation might be the lack of response contingent reinforcement since the subjects were not required to make a response to start the

cartoon. Also these subjects had seen the cartoons several times and the TO may not have been punishing.

There is another side to the issue of the effectiveness of TO periods. Up to this point, the studies cited have demonstrated that TO was at least mildly aversive. However, several studies have demonstrated that organisms will at times escape from positive reinforcement into a TO period. Essentially the same procedure is used in all the studies. Two response keys or levers are available to the subject. Responses on one key are reinforced on a FR schedule. The first response on the other key initiates a TO period and the second response on that key reinstates the FR schedule on the opposite key. Azrin (1961) and Appel (1963) both showed that as the number of responses required for reinforcement increased, the number of self imposed TOs also increased. Azrin, using values from FR 60 to FR 200, found that pigeons spent close to 50% of the session in TO. Appel found that at FR 240 30% of the session was spent in TO. Thompson (1964) obtained similar results using rats and water reinforcement. He noted that a rat will press a bar three times in succession in order to produce a 30 sec. TO from high FR schedules. More TOs were produced as the FR requirement increased, and, conversely, fewer TOs were produced when the requirement was lowered.

Zimmerman and Ferster (1964) found that a pigeon will impose more TOs on himself the greater the difference in stimulus conditions during TO as compared to when an FR schedule is in effect. This seems congruent with Appel's (1963) conclusion that it is the change of stimulus conditions that is reinforcing.

However, Azrin (1961) noted no difference between TOs introducing an increase in illumination. The issue is still not settled. The prevalent view, nevertheless, is that the response leading to a TO is an escape response which terminates the particular aversive conditions associated with the study.

Although it can be said that TO satisfies the requirements of an aversive event, the results are by no means definitive. The experimental evidence presents a complex picture of the aversive properties of TO from positive reinforcement. Most of the results indicate that under certain experimental conditions TO can be employed to (1) punish the behavior which produces it, and (2) maintain the behavior which results in its postponement.

A study by Wolf, Risley and Mees (1964) provides substantial evidence of the effectiveness of TO in eliminating temper tantrums and self-abusive behavior in an autistic boy. Few studies, such as the above, have utilized TO as a punisher for undesirable behavior. Most of the research in TO and shock has been done under the tight experimental conditions of the laboratory. The present study is an attempt to further evaluate the punishing effects of TO and shock on human behavior and to ascertain the extent to which TO periods can be used to control socially undesirable behavior.

Subject

The subject (S) was a seven year old girl who had resided at Fort Custer State Home in Augusta, Michigan, since February,

1966. Tests indicated that S's I.Q. was in the mid 30's indicating severe mental retardation. Motor difficulties of a non-specific nature were present in addition to retardation. S could not walk without support and could not feed herself at the time of her admission to the State Home. S was on a self-feeding program; however, her progress was hampered by the fact that she threw plates, utensils, etc. when placed before her and left unguarded. Intelligence scales suggest that her verbal skills were near the age of one and one-half years with much of her speech being in the form of mimicry and profanity.

The basic behavioral problem with which this research was concerned was S's slapping behavior which occurred whenever anyone was within slapping distance. This sort of anti-social pattern of responding presented many problems to her parents, peers, and ward attendants.

Apparatus

The experimental sessions were conducted in an isolated 7' x 10' room located at the back of the ward in which S was living. The room was equipped with a small couch, a wooden chair and a round table. Additional apparatus used during the sessions included a stop watch, Fruit Loops, and a pink plastic telephone. The latter part of the experiment was conducted with a shock apparatus powered by two Burgess Y-20 D.C. (30 volt) batteries. The current was inverted by means of two transistors and stepped up by a transformer which yielded a maximum of 400

volts. The A.C. current delivered to S was about 1.2 milliamps.

Procedure

Two days were devoted to observation of S as she interacted with others in the ward setting. Observation was scheduled from 8:00 to 9:00 and 10:00 to 12:00 in the morning and 4:00 to 6:00 in the evening. This schedule allowed the experimenter (E) to note behavioral occurrences at meal times and while S was free to interact with the other children during play. A baseline rate of slapping behavior was measured on the next two days during four 15 min. periods: one in the morning and one in the afternoon on each of the successive days. Baseline, defined as the frequency of slapping behavior emitted in a five min. period, was established on the ward with S sitting on E's lap. Subsequent sessions were conducted in an isolated room on the ward and lasted one hour. During the first session E sat next to S on the couch and by successive approximation E moved S to E's lap after the first 25 min. of the session. S was reinforced with Fruit Loops for no slapping responses and/or any incompatible responses, such as folding her hands, etc. After two min. of no slapping responses, S was given 60 sec. access to a pink plastic telephone. With a stop watch E was able to record latency from the time E was within slapping distance until S did in fact slap E. When S did emit such a response, E slapped S on the wrist and walked outside the room (with Fruit Loops and the toy) for a 90 sec. TO period. After the 90 sec. had elapsed, E returned

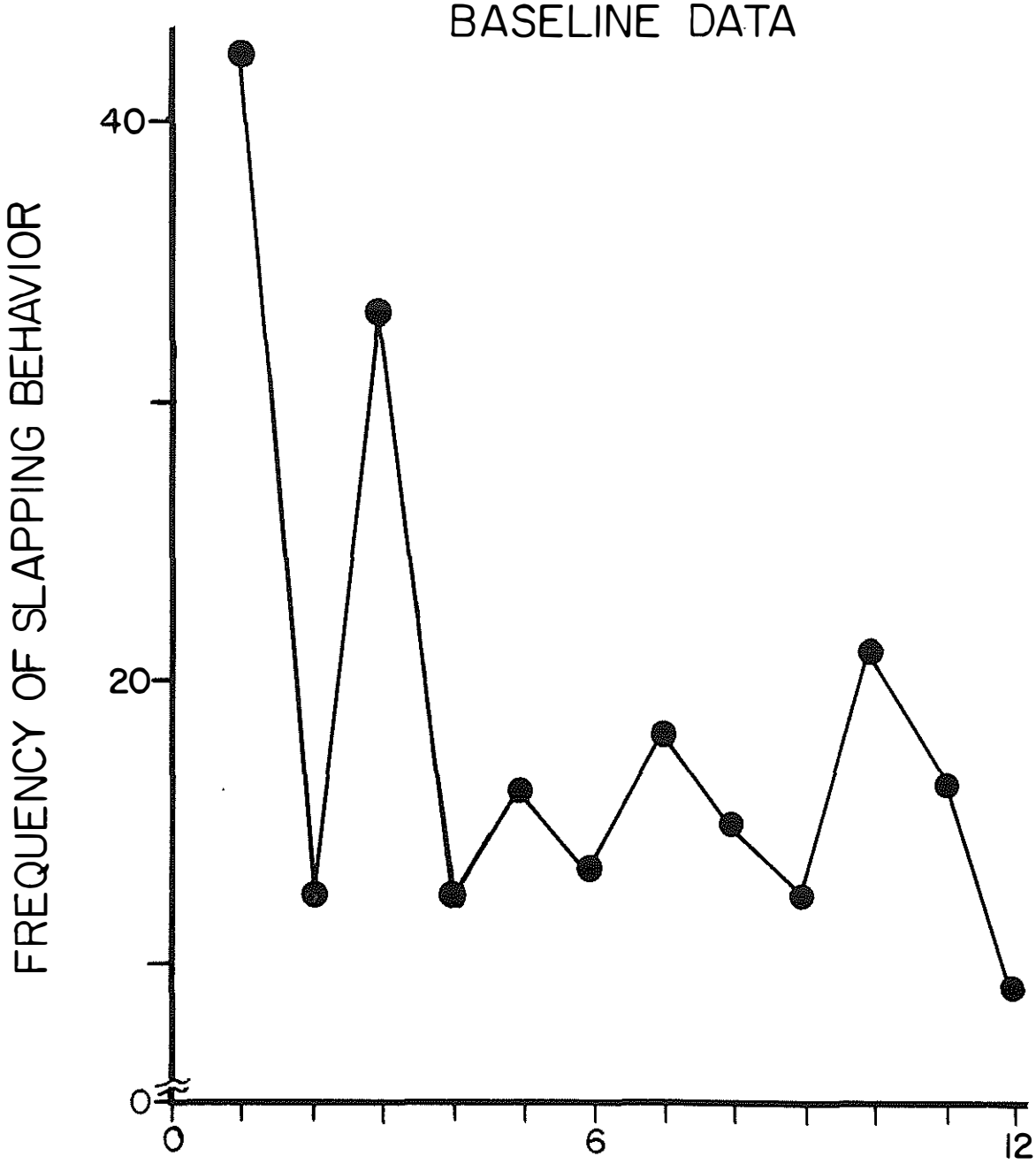
to the room and the session was resumed with S on E's lap. On the ninth session the procedure was changed so that instead of E leaving the room for a TO period S was placed in a chair facing the corner for a 90 sec. TO. During the tenth session the TO procedure was supplemented with meal contingencies. At this time E fed S in the experimental room, the receiving of food being contingent upon there being no slapping behavior emitted for 5 sec. In a final attempt to suppress the undesirable behavior S was shocked via electrodes attached to her left leg for any slapping responses emitted while sitting on E's lap. Before the shock contingency was introduced, a 10 min. baseline was taken.

Results

Fig. 1 shows the frequency of slapping behavior emitted per five min. period. As indicated previously, this baseline data was collected in 15 min. periods in the morning and afternoon of two successive days. As can be seen, the highest rate was 42 slaps in the first five min. followed by a substantial decrease to 12 responses in the next five min. S's behavior was quite erratic with a mean of 18.5 slapping responses per five min. segment.

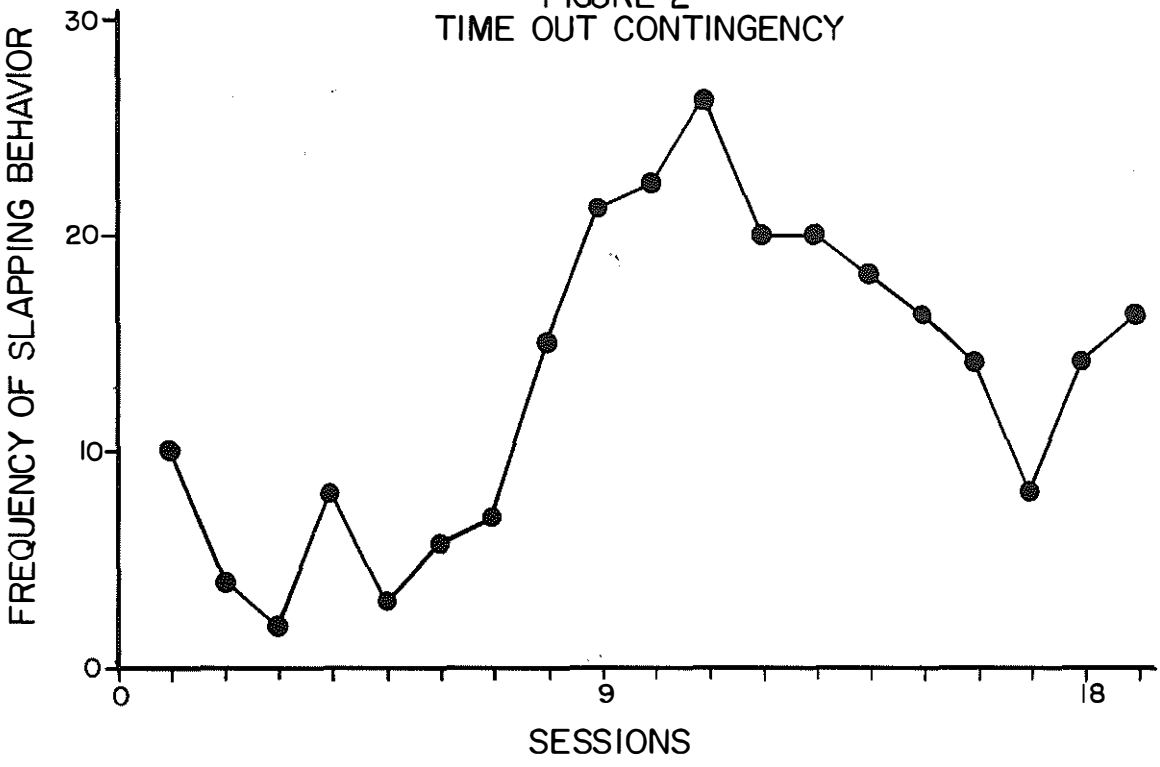
Fig. 2 is a noncumulative graph of the frequency of slapping behavior emitted during the 19 experimental sessions when the TO contingency was in effect. E started the first hourly session sitting next to S on the couch, but when one latency reached 18.5 min. E moved S to her lap. The responses increased with the

FIGURE I
BASELINE DATA



Non-cumulative record of the frequency of slapping behavior per five minute segment. The graph represents a total of one hour of baseline data with a mean of 18.5 slapping responses per five minute segment.

FIGURE 2
TIME OUT CONTINGENCY



Non-cumulative record of the frequency of slapping behavior per experimental session. A total of 19 sessions was conducted. Sessions 1-10 were one hour in length and sessions 11-19 varied in length from 40-60 min. Meal contingencies and a change in TO procedure were initiated in session nine and continued through session 19.

average latency decreasing to 2.5 min. while S was seated on E's lap. The fewest responses (three) for all experimental sessions were emitted in session three. The latencies were 29.6 min. and 26.5 min. S had been unruly and abusive at breakfast on this particular morning and, consequently, E had put S back to bed without any breakfast. This was the only session in which the Fruit Loops appeared to have any reinforcing properties. S went home for the weekend after session five and it is worth noting the continuous increase in response rate following S's home visit. Because of the relative ineffectiveness of TO (S's latencies ranged from 10 sec. to three min.) in session eight, a procedural change was initiated in session nine. Not only were meal contingencies introduced, but the TO was a 90 sec. period during which S was placed in a chair facing a corner rather than it being a period during which E left the room. For the remaining 10 sessions S was fed in the experimental room with food contingent upon no slapping responses. Sessions 11-19 varied in length from 40-60 min. Session 11 was characterized by many slapping responses; the longest latency was 43 sec. and the shortest was 3 sec. The remaining sessions were similar in that S did not slap during the first five min. of the session and, consequently, received about half of her meal during that time. Latencies then dropped considerably and S continued to hit E, the spoon, or the plate.

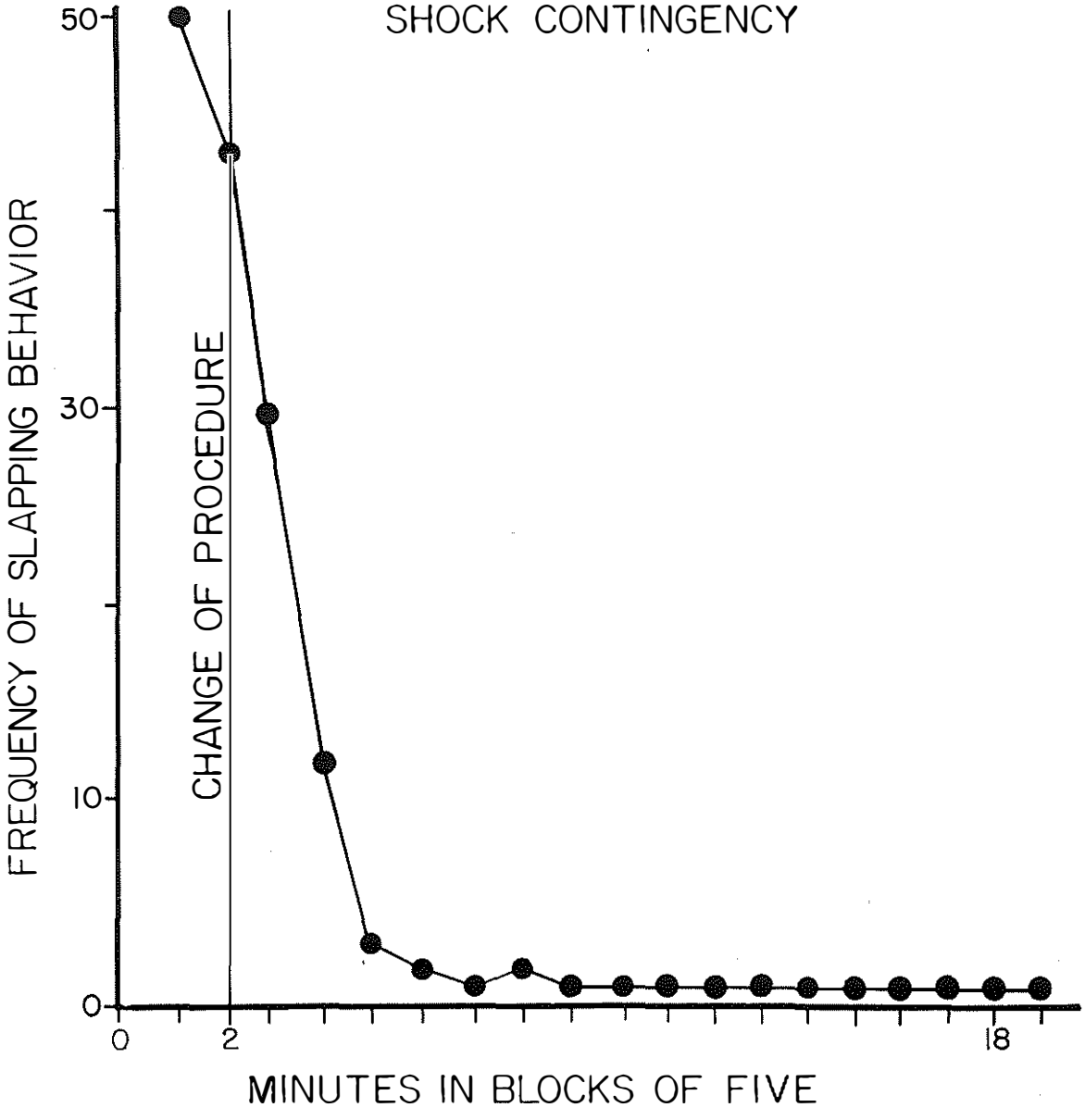
By session 19 it was quite evident that the TO procedure was not effective in eliminating S's slapping behavior. Therefore, a completely different procedure was introduced. Baseline data was again collected and graphed in the first two five min.

period of Fig. 3. The single line indicates a change of procedure--the introduction of shock. As evidenced by this graph, S's responses were typically quite high--50 responses in the first five min. and 43 responses in the second five min. However, the behavior dramatically decreased when S was shocked for any approximation to a slapping movement. S's response rate soon dropped to zero and remained at zero except for one five min. period in which S emitted only one response. Two additional experimental session of 30 min. each were conducted following this treatment, and during both sessions S's level of responding consistently remained at zero. The results given in Fig. 3 present rather conclusive evidence of the high degree of control over S's slapping behavior exercised by the shock contingency.

Discussion

It is difficult to assess the punishing effects of a TO procedure from this study. The first five session of Fig. 2 could be used as evidence to substantiate the relative effectiveness of TO; however, the remaining sessions suggest the ineffectiveness of the procedure. Perhaps, in this particular study there are procedural explanations. Because several seconds elapsed from the time S slapped E to the moment E left the room, TO was not contiguous with the slapping responses. The activity involved in E's leaving the room or even transferring S to the chair in the corner during the second procedure might have had unexpected reinforcing effects rather than aversive consequences. The point to be made is that within a clinical setting the situation

FIGURE 3
SHOCK CONTINGENCY



Non-cumulative record of the frequency of slapping behavior per five minute segment. The first ten minutes represent baseline data. The vertical line indicates a change of procedure at which time shock was introduced.

is so complex that it is probably impossible to achieve a pure TO from positive reinforcement with human subjects. The TO should be viewed as a component of a complex environmental stimulus pattern to which S is exposed at the time. The complexity of the situation is found not only in the TO procedure employed, but also in the subject's reaction to the situation. It is difficult to evaluate and control for all the necessary variables in such a situation.

Perhaps the novelty of the first sessions contributed to the aversiveness of the TO procedure. However, what was at first mildly punishing lost its aversive properties as S was repeatedly exposed to the same behavioral consequences. It is quite evident that the same TO procedure applied to S's behavior later facilitated the same behavior it had at first suppressed. In conclusion, the study exemplifies the fact that TO from positive reinforcement is one element of a complex stimulus environment, and does not exist apart from other stimulus elements which must be controlled in order for TO to be effective.

The presence of a rewarded alternative is another factor in the effectiveness of the application of a TO period (Holz, Azrin & Ayllon, 1963). In the first part of this experiment reinforcement was in the form of Fruit Loops and access to a toy. In the latter part of the experiment S was rewarded with meals. After the first four sessions, it was noted that neither the Fruit Loops nor the toy was a very powerful reinforcer since S often refused Fruit Loops and soon became disinterested in the toy. Perhaps the fact that the reinforcers did not exert continual control over the behavior contributed to the ineffectiveness of

the TO.

The schedule of positive reinforcement interrupted is another determinant in the effect of an aversive event (Ferster, 1958). With some intermittent schedules TO may become positively reinforcing instead of aversive (Azrin, 1961; Appel, 1963). Although there was no strict schedule of reinforcement imposed on S in the present study, this may very well have been a contributing factor. E's presence may have been aversive to S, whereas E's absence may have been reinforcing. During the first few sessions in which TO was effective, E could hear S crying during the TO periods. However, this ceased as the session progressed, and it may have been that E's absence had lost its punishing influence.

Individual differences and environmental conditions must be taken into consideration before the results of the application of the TO procedure can be accurately assessed. The past history of the individual and the complex environmental situation found in a State Home may be conducive to the development of persistent, maladaptive behavior patterns. It is difficult to account for the attendants' reactions to S and the other events on the ward in conjunction with S's anti-social behavior. The same is true of the home situation. S always was most uncooperative and abusive following her return from home visits. One can not deny the fact that the environment will and does exert a decisive influence upon the behavior of the subject.

The dramatic influence of shock in suppressing undesirable behavior is in accord with other studies (Holz & Azrin, 1963; Azrin, 1959). There were immediate effects with the shock contingency; however, because E had to leave the State Home, no follow

up study could be conducted to test the long term effects. It is doubtful whether S's level of responding is still at zero. If the rate of slapping behavior has increased, the administration of contingent or non-contingent shock should bring it down to zero again.

Since TO periods such as social rejection, job dismissal, physical isolation, etc. are among the widely practiced techniques of naturally-occurring behavioral control, the experimental investigation of TO is especially relevant. Because there is no previous experimental data evaluating the effects of TO procedures in the treatment of mentally retarded, this study may not be representative of the findings of future studies. The extensive use of aversive control requires re-evaluation, and, perhaps, it may be found that alternative procedures will provide more effective means of maintaining desirable behavior.

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