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SOME DETERMINANTS OF THE REINFORCING AND PUNISHING EFFECTS OF TIMEOUT[1]

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Some determinants of the reinforcing and punishing properties of timeout were investigated in two experiments. Experiment I began as an attempt to reduce the frequency of tantrums in a 6-yr-old autistic girl by using timeout. Unexpectedly, the result was a substantial increase in the frequency of tantrums. Using a reversal design, subsequent manipulations showed that the opportunity to engage in self-stimulatory behavior during the timeout period was largely responsible for the increase in tantrums. Experiment II was initiated following the failure of timeout to reduce the spitting and self-injurious behavior of a 16-yr-old retarded boy. Using a multiple-baseline design, the nature of the timein environment was shown to be an important determinant of the effects of timeout. When the timein environment was "enriched", timeout was effective as a punisher. A conception of timeout in terms of the relative reinforcing properties of timein and timeout and their clinical implications are discussed.

DESCRIPTORS: timeout, escape, reinforcer, punishment, self-stimulatory behavior, self-injurious behavior, tantrums, timein, retardates, autistic children

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One of the strengths of an operant analysis of behavior is its insistence on a functional analysis of stimulus events. For example, stimuli are classified as reinforcers or punishers, not because of inherent properties but rather as a result of their effects on the behavior they follow. It is entirely consistent with this analysis that a given stimulus may function as a reinforcer under some conditions and a punisher in others. For example, electric shock has been shown to punish the rat's bar press and the pigeon's key peck (Azrin and Holz, 1966), but also to reinforce the key pressing and chain pulling of squirrel monkeys (Morse and Kelleher, 1970). Similarly, food presentation has been shown to have both reinforcing (*e.g., Journal of the Experimental Analysis of Behavior,* 1958-) and punishing (Herrnstein and Loveland, 1972; Premack, 1962, 1965; Smith and Clark, 1972) effects.

Similar results have rarely been demonstrated in applied settings. Certain stimuli, such as food and social attention, are typically found to be reinforcers across a wide variety of settings and responses. Although there may have been many cases in which such events have not functioned as reinforcers, there are few reported instances of typically reinforcing stimuli having punishing effects. A notable exception is a study by Herbert, Pinkston, Hayden, Sajwaj, Pinkston, Cordua, and Jackson (1973), which fortuitously discovered some paradoxical effects of parental attention. Herbert *et al.* (1973) attempted to reduce inappropriate behaviors in deviant children by instructing parents in a differential attention procedure. The unexpected result was an increase in the rate of misbehavior for four of the

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six children. Contrary to what is normally expected, parental attention punished appropriate behavior. As the authors note, these results emphasize the hypothetical nature of subject generality, and suggest the need carefully to evaluate the functional relationships between behavior and the environment in each individual case.

This lesson is particularly relevant to the use of timeout from reinforcement, which is perhaps the most widely used punishment procedure generated by operant researchers. The data demonstrating its punishing effect are voluminous (Birnbrauer, Wolf, Kidder, and Tague, 1965; Burchard and Barrera, 1972; Clark, Rowbury, Baer, and Baer, 1973; Hamilton, Stephens, and Allen, 1967; Leitenberg, 1965; Wahler, Winkel, Peterson, and Morrison, 1965; White, Nielson, and Johnson, 1972; Wolf, Risley, and Mees, 1964; for a review see MacDonough and Forehand, 1973). On the other hand, a growing body of literature suggests that timeout can have a variety of effects. The animal literature contains several reports of timeout functioning as a reinforcer (Azrin, 1961; Appel, 1963; Redd, Sidman, and Fletcher, 1974; Thompson, 1964; Zimmerman and Ferster, 1964). There is also evidence from applied research that timeout may have either no effect (Risley, 1968) or a reinforcing effect (Steeves, Martin, and Pear, 1970; Note 1). Results such as these emphasize the need to investigate the parameters that influence the effects of timeout.

EXPERIMENT I

This experiment began as an attempt to eliminate tantrums in a 6-yr-old autistic girl. During sessions on color-discrimination training, the teacher would pick up the reinforcers (candy) and leave the room for 10 sec whenever a tantrum occurred. Contrary to expectations, the timeout reinforced rather than punished tantrums. Sessions 1 to 24 in Figure 1 show a reversal design illustrating the reinforcing effect of timeout on tantrums.

As a result of this unsuccessful treatment, we attempted to isolate the reinforcing aspects of this timeout procedure. In particular, we noted that the child spent virtually every timeout period engaging in self-stimulatory behavior. This seemed to satisfy the conditions described by Premack (1962, 1965) for a reinforcing effect to occur: the opportunity to engage in a high-probability behavior, self-stimulation, was being made contingent on a lower-probability behavior, tantrums. The following experiment investigated whether the opportunity to engage in self-stimulation during timeout could have been responsible for the increase in tantrums.

METHOD

Subject

Laurie was a student in an experimental classroom for autistic children (Koegel and Rincover, 1974; Rincover and Koegel, 1976). She was originally brought to our attention by her teacher, who reported that Laurie engaged in tantrums during class. Although tantrums did not occur at a high frequency each day, they did occur consistently across days. Laurie's repertoire of appropriate behavior was extremely limited. Time-sampling observations (alternating 10-sec intervals of observation and recording for 1 hr per day) during free time, in the classroom, and on the playground, revealed 0% social behavior, 0% appropriate play, and 100% self-stimulatory behavior. Her verbal behavior consisted entirely of delayed echolalia. Receptive language skills were limited to attending when the teacher said "Look at me", and imitating simple gross motor behaviors when instructed to "Do this". Laurie was found to be "untestable" on the Stanford-Binet IQ test.

Setting

All sessions were conducted in a 1.7-m by 3.0-m soundproof classroom with an adjoining observation room connected by a one-way mirror. Sessions were conducted once per day, five days per week, for 15 min. At the beginning of each session, Laurie was seated at a 0.6-m high table across from the teacher. The task was a previously learned response, "Touch the card",

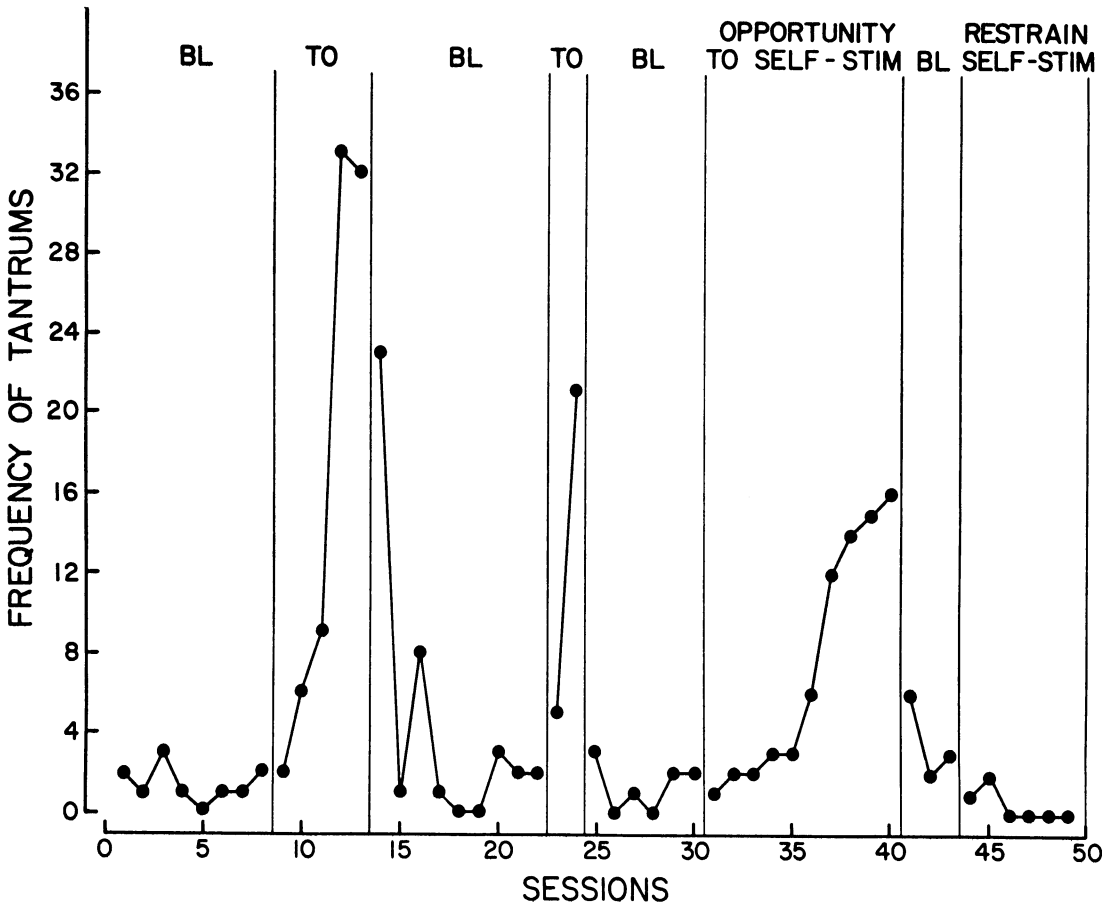

Fig. 1. Frequency of tantrums during each session in Experiment I. BL—baseline conditions without experimental intervention. TO—timeout contingent on a tantrum. Opportunity to self-stim—10-sec opportunity to engage in self-stimulatory behavior contingent on a tantrum. Restraint self-stim—10-sec restraint of self-stimulatory behavior contingent on a tantrum.

in order to minimize any negative reinforcement occurring from removal of the task during timeout (Carr, Newsom, and Binkoff, 1976). Trials were presented every 30 sec, and self-stimulatory behavior was restrained at the start of each trial. Correct responses were reinforced with candy and praise, and incorrect responses were ignored.

Procedures

The following procedures were designed to assess whether the opportunity to engage in self-stimulation would serve as a reinforcer for tantrums and, conversely, whether the restraint of self-stimulation would serve to punish tantrums.

Baseline. During baseline sessions, there were no scheduled contingencies on tantrums.

Opportunity to engage in self-stimulation. When a tantrum occurred, the teacher restrained the movement of certain body parts (*i.e.,* shoulders, knees) that were *not* used to engage in self-stimulation. This restraint consisted of the teacher physically holding the body part motionless for 10 sec. During this time, Laurie was free to engage in self-stimulatory behavior.

Restraint of self-stimulation. In this condition, the teacher restrained self-stimulatory behavior for 10 sec whenever a tantrum was observed. This was accomplished by physically restraining the parts of Laurie's body that were used in self-stimulation (*e.g.,* finger-waving was re-

strained by holding her hands and fingers immobile in her lap).

Recording and reliability procedures. Laurie's tantrum behavior was intense and easily observable. Tantrums consisted of screaming, kicking, hitting the table or the teacher, throwing the stimulus materials on the floor, and abruptly leaving the table. Her tantrums generally consisted of several of these behaviors, although the occurrence of any one was sufficient for a tantrum to be recorded. During each session, the frequency of tantrums was recorded independently by the teacher (in the classroom) and by one of two experimentally naive observers seated in the observation room. Each person recorded both the topography and time of occurrence of each tantrum on precoded data sheets, which were divided into 5-sec intervals. An agreement was defined as both observers recording an instance of tantrum behavior in the same 5-sec interval. A disagreement was defined as only one observer recording a tantrum in a given interval. Per cent agreement over all intervals was calculated by dividing the total number of agreements by the total number of agreements plus disagreements in each session. Per cent agreement was also computed separately for occurrences and nonoccurrences of tantrums.

The observers also recorded whether or not self-stimulatory behavior occurred during timeout intervals. Self-stimulation was defined as the occurrence of any of the following stereotyped, repetitive, motor behaviors: hand flapping, rocking, finger manipulations, and muscle tensing. During each timeout, the observers recorded a "Yes" or "No", corresponding to whether or not self-stimulatory behavior occurred during that interval. An agreement was defined as both observers recording a "Yes" or "No" during an interval. A total of 10 reliability measures was obtained for self-stimulatory behavior, with at least two reliability sessions in each of the four conditions.

Results and Discussion

Reliability estimates for tantrums and self-stimulation were consistently above 88% and 98% respectively. Reliability for tantrums, computed separately for occurrences and nonoccurrences, averaged 91% (range: 88% to 100%) and 98% (range 92% to 100%), respectively.[3] Reliability for occurrences of self-stimulation averaged 99% (range: 89% to 100%).[4]

Sessions 25 to 49 in Figure 1 show the effects of manipulating the opportunity to engage in self-stimulatory behavior contingent on tantrums. During baseline, the frequency of tantrums ranged from zero to three per session. When self-stimulatory behavior was then allowed contingent on tantrums, the frequency steadily increased to a high of 16 in Session 40. In addition, observation during the 10-sec timeout periods indicated that self-stimulatory behavior occurred in 100% of the intervals. After a return to baseline, self-stimulation was then restrained contingent on tantrum behavior. Tantrums quickly declined and stabilized at zero, with no tantrums observed in the last four sessions of treatment. In short, these data show that tantrums increased when they produced the opportunity for self-stimulation, and tantrums were eliminated when they produced the restraint of self-stimulation. These results suggest that the opportunity to engage in self-stimulatory behavior was a reinforcer for tantrums in the timeout procedure.

Based on the present findings, teachers and parents using timeout might well be advised to monitor each child's behavior during timeout periods, to determine whether the child engages in preferred behavior during isolation. If isolation, or behaviors that generally occur in isolation, can at times be reinforcing, then timeout may have unexpected and undesirable effects.

[3]When fewer than five occurrences were observed in a particular session, subsequent sessions were used to compute reliability until a minimum of five occurrences had been recorded.

[4]Reliability for nonoccurrences could not be measured separately, as self-stimulatory behavior occurred in virtually every interval of observation.

EXPERIMENT II

Experiment II began as an attempt to eliminate the spitting and self-injurious behavior of a severely retarded child. These behaviors were first recorded during baseline sessions in which the subject was given a two-choice color discrimination task every 30 sec. A timeout contingency was then introduced at different times for self-injurious behavior and spitting. Timeout consisted of a 90-sec period during which the experimenter took the reinforcers[5] and moved to a corner of the classroom facing away from the subject.

The effects of this timeout procedure on self-injurious behavior and spitting are shown in Figure 2. Clearly, timeout was ineffective as a punisher and, in fact, may have been serving as a negative reinforcer for the problem behaviors. Possibly, the generally impoverished conditions of the timein setting may have been responsible for the ineffectiveness of the timeout procedure. Experiment II was designed to assess whether enriching the timein setting would facilitate a punishing effect of the timeout procedure.

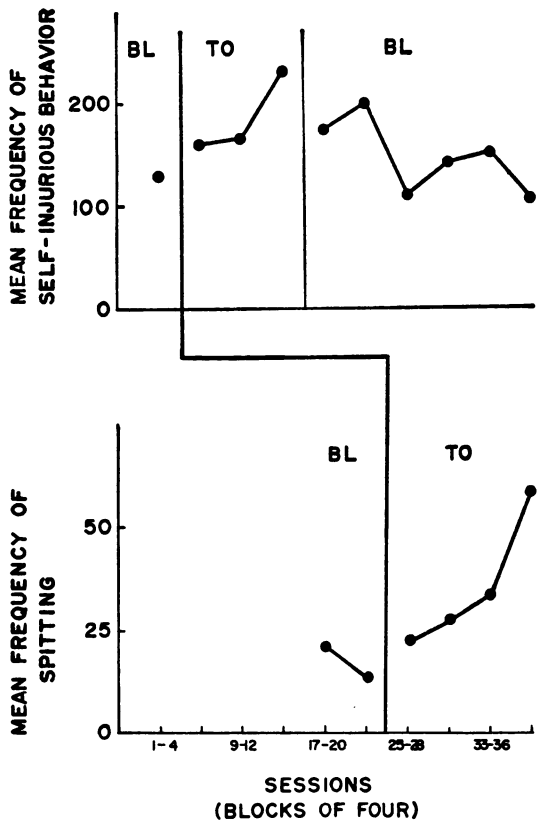

Fig. 2. Mean frequency of self-injurious behavior and spitting behavior during the baseline (BL) and timeout (TO) conditions. Each point represents an average of four sessions.

METHOD

Subject

Mac was a 16-yr-old male diagnosed as Down's syndrome and classified as severely retarded; institution records listed his IQ as 16. His repertoire of appropriate behavior was extremely limited, consisting mainly of following simple commands such as "Sit down", "Come here", *etc.* He did not engage in any spontaneous social or appropriate play behavior. Mac's most troublesome inappropriate behaviors were spitting and self-injurious behavior. In a typical 30-min period we observed 10 to 30 instances of spitting and more than 100 instances of self-injurious behavior. Throughout the study, Mac was a resident of a state institution for the retarded.

Setting

The experiment was conducted in a 6- by 3-m room with an adjoining observation area connected by a one-way mirror. The room was divided approximately in half by a 1-m high barrier, creating two 3- by 1.5-m areas. One of these areas was heavily padded on all four sides and served as the classroom. The other area was used during timeout. Both Mac and the experimenter sat on a carpeted floor during the experiment.

Reliability and Recording Procedures

Two categories of Mac's behavior were recorded:

[5]Preliminary work in a free-operant situation demonstrated that food was a reinforcer, ensuring that this 90-sec period was in fact timeout from reinforcement (see Plummer and LeBlanc, 1976).

(1) *Self-injurious behavior.* Any repetitive making and breaking of contact between one part of the body and another was defined as self-injurious behavior. In virtually every instance this involved Mac hitting his face or head with either his foot, his hand, or some object held in his hand. Some of these contacts were quite forceful, producing bruises and scars on Mac's face, especially around his mouth.

(2) *Spitting.* Spitting was defined as blowing through the lips so as to make them vibrate. In many cases, this involved expulsion of saliva, but this was not necessary for spitting to be recorded.

Two undergraduate students, naive to the purposes of the experiment, alternately served as observers. An observer was seated behind a 10-button response panel connected to an Esterline Angus 20-pen event recorder located in another room. Self-injurious behavior and spitting were recorded throughout each session, including timeout periods. Reliability checks were conducted every seventh session. During reliability sessions, the observers were separated by a curtain to ensure independent observation and recording.

Reliability was measured separately for each target behavior. The observers were considered in agreement if they both recorded the same behavior within a 4-sec interval. Disagreements were those 4-sec intervals in which one observer scored the event and the other observer did not. Reliability was calculated by dividing total agreements in a session by total agreements plus disagreements and multiplying by 100.

Experimental design and procedures. Sessions were generally conducted five times per week for 30 min. Two variables were manipulated: (1) the timein environment was either enriched or impoverished; (2) the timeout was either contingent only on spitting or on both spitting and self-injurious behavior.

Impoverished timein. The impoverished timein was similar to treatment sessions we have observed in institutional (and other) settings. Every 30 sec the experimenter asked Mac to: "Put the green/red block in the green/red can", randomly alternating the color of the block on each trial. Prompting assured that a correct response would occur on virtually every trial. After reinforcing the correct response with food and praise, the experimenter gave Mac one of six toys (a rubber ball, a small block of foam rubber, a small plastic block, a simple plastic truck, and two dolls) and said: "Here Mac, would you like to play with this for awhile?" Following this invitation the experimenter did not interact with Mac until the next trial was signalled.

Enriched timein. The enriched timein involved the following additions to the impoverished timein setting. (1) New toys were introduced that provided a variety of sensory stimulation. Examples of some of the toys were a xylophone, music box, tambourine, toy piano, and a jack-in-the-box. In addition, recorded music played continuously. (2) Mac was continuously prompted to play with the new toys and was praised for doing so. The prompting typically involved both verbal encouragement and manually guiding one of Mac's hands. In short, there was a large increase in social interaction due to the continuous prompting and praise. In no instance did this prompting interfere with Mac's ability to engage in the target behaviors. Appropriate on-task behavior was reinforced with food every 30 sec as during the impoverished timein.

Timeout. The timeout procedure consisted of a 90-sec period during which the experimenter turned off the music, took the reinforcers (but not the toys[6]) and moved to the other side of the partition.

Design. The design of the experiment was a modified multiresponse baseline (Birnbrauer, Peterson, and Solnick, 1974). The combined use of timeout and enriched timein was first introduced for spitting behavior alone, and then (following a return to baseline) introduced for both

[6]Toy contact was recorded throughout Experiment 2. Interobserver agreement averaged 99% (range = 95% to 100%). Virtually no toy contact occurred during timeout in any of the sessions with this subject.

spitting and self-injurious behavior simultaneously. This permitted some assessment of the effects of enriched timein alone, as well as the combined effects of enriched timein and timeout.

Results

Reliability for self-injurious and spitting behavior averaged 99% (range = 95% to 100%) and 99% (range = 98% to 100%), respectively.

The frequency of self-injurious behavior and spitting per session is shown in Figure 3. In general, the results show that under enriched timein conditions, the timeout became an effective punisher. During the first impoverished condition (Sessions 1 to 7), Mac averaged 92 instances of self-injurious behavior. When the enriched timein was first introduced, with timeout contingent only on spitting, the frequency of spitting declined from 25 in Session 8 to zero in Session 15. When the impoverished timein was then re-instated (Sessions 16 to 33), spitting remained at a low rate for 12 sessions and then increased, ranging from 18 to 75 during the last six sessions. The re-introduction of the enriched timein (Sessions 34 to 45) again resulted in a decrease in spitting to a mean of three per session. Spitting remained at a low rate when the impoverished timein was again re-instated.

The results for self-injurious behavior are similar to those found for spitting. Before the enriched timein and timeout were introduced together, self-injurious behavior occurred at a high rate, ranging from a mean of 101 to 157. When the enriched timein was introduced with timeout contingent on self-injurious behavior (Session 34), self-injurious behavior declined to near-zero frequency, averaging 11 occurrences over the next 12 sessons. Re-instatement of impoverished timein conditions did not alter the low rate of self-injurious behavior. It is notable that when the timein was first enriched (Sessions 8 to 15), with timeout contingent only on spitting, self-injurious behavior averaged 107 occurrences, increasing from four in Session 8 to 272 in Session 15. This suggests that neither enrichment of the timein setting *per se* nor the differential reinforcement of play could account for the reduction in self-injurious behavior.

Discussion

This experiment demonstrated that the effectiveness of timeout was influenced by characteristics of the timein setting. When the timein setting was "impoverished", the timeout was ineffective as a punisher and, in fact, seemed to serve as a negative reinforcer. When the timein setting was "enriched", the same timeout procedure functioned effectively as a punisher. This finding was replicable across target behaviors: when the enriched timein was first introduced, with timeout contingent on spitting, only spitting declined; when the enriched timein was re-introduced with timeout contingent on self-injurious behavior and spitting, both target behaviors declined.

Certain ambiguities in the results should, however, be noted. First, we did not assess the effects of individual components of the enrichment package. The relative contribution of social interaction, sensory stimulation from the toys and music, remains unclear. Second, no adequate explanation can be given for the failure to reverse the effects of adding the enriched timein (Sessions 46 to 51). Although spitting and self-injurious behavior may have returned to pre-enrichment levels given sufficient sessions, this remains speculative.

GENERAL DISCUSSION

These experiments show that timeout can have both reinforcing and punishing effects. More importantly, the results suggest certain variables that to some extent determine the effects of timeout. Characteristics of the timeout (Experiment I) and timein (Experiment II) settings were each manipulated to produce either punishing or reinforcing effects of timeout. Experiment I suggested that the nature of the behaviors permitted during timeout influences its effectiveness. Experiment II demonstrated

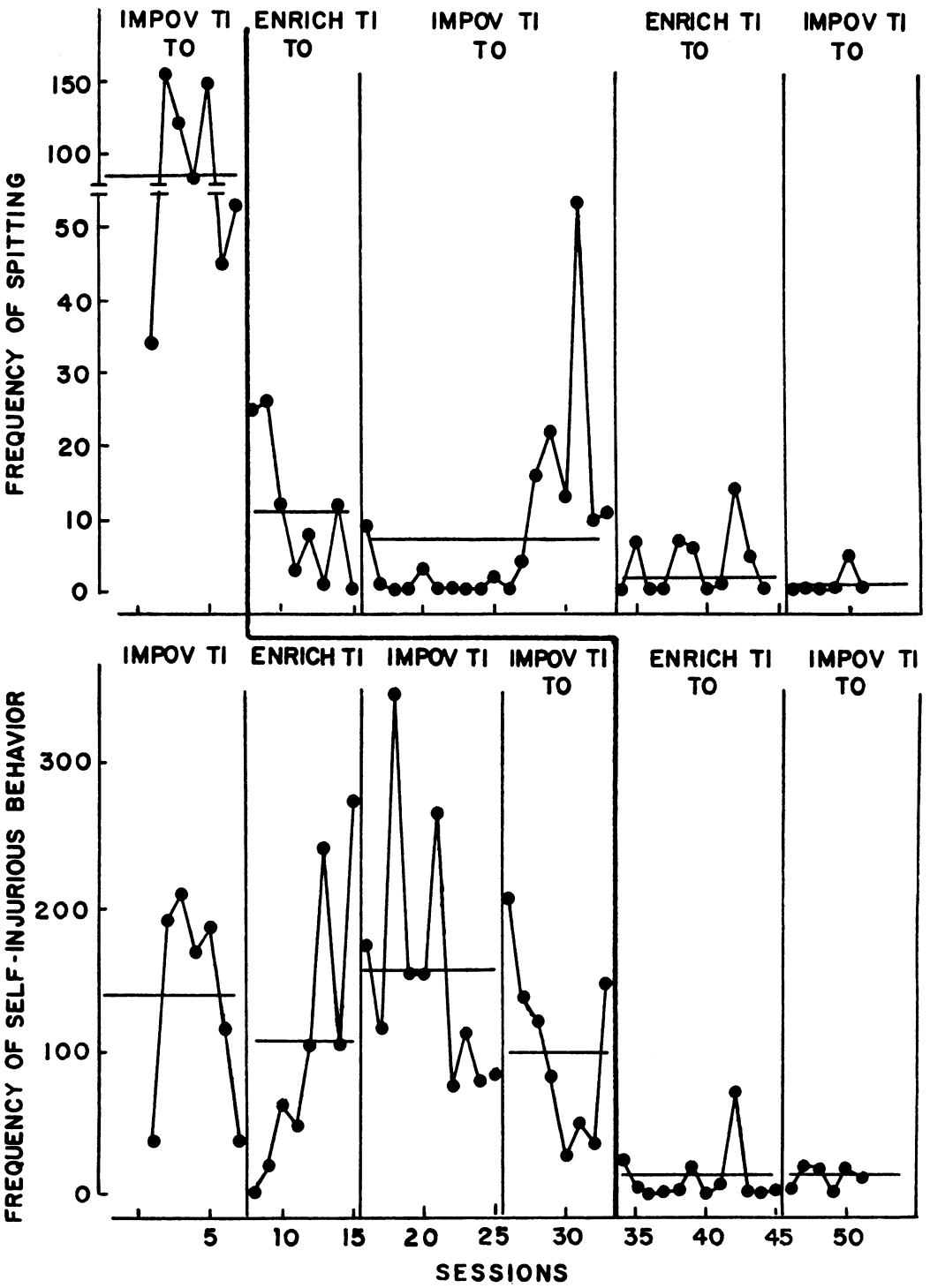

Fig. 3. Frequency of self-injurious behavior and spitting, with timeout from an enriched (Enrich T1) *versus* an impoverished (Impov T1) timein setting.

that the relative enrichment or impoverishment of the timein setting can have considerable influence on the effects of timeout.

Together, these results suggest viewing timeout as a relationship between two different settings. It has recently been emphasized (Baum, 1973; Smith, 1974) that the reinforcing or punishing effects of a stimulus are not simply a function of the situation that follows the response. Rather, the effects of the stimulus are determined by the relationship between the states preceding and following the behavior. A timeout procedure involves such a relationship, and its effects on behavior should be a function of both the preceding situation, timein, and the succeeding situation, timeout. The reinforcing or punishing properties of timeout should be described by the relative number and potency of reinforcers and punishers in each situation.

This view of timeout suggests that there can be no "standard" timeout procedure that will reliably reduce problem behavior. Alternatively, we are left with the task of monitoring the relative reinforcing properties of the timein and timeout settings for each child. Often we find that dreary institutional day rooms or highly demanding learning tasks constitute the "timein" setting (*cf.* Carr, Newsom, and Binkoff, 1976), while escape from these situations is "timeout". In practice, the present data suggest that enriching the timein environment may be a powerful tool in planning an effective (punishing) timeout procedure.

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