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TIMEOUT AS A PUNISHING STIMULUS IN CONTINUOUS AND INTERMITTENT SCHEDULES[1]

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The effectiveness of a brief period of isolation (timeout) in the control of disruptive behavior emitted by a retarded child in a preschool classroom setting was examined. Timeout was shown to be an effective punishing stimulus, and its control of the child's disruptive behavior was investigated under four schedules of intermittent timeout. The results suggest that as a larger percentage of responses were punished, a greater decrease in the frequency of that response occurred. This inverse relationship between the percentage of responses punished and the frequency of the response did not appear to be linear, but rather a non-linear function. This function suggests that some schedules of intermittent punishment may be as effective as continuous punishment, at least in the case of the continued suppression of a response that has already been reduced to a low frequency.

Timeout from positive reinforcement is the response-contingent application of a relatively brief extinction period, usually with a concomitant discriminative stimulus. Many parameters of timeout procedures have been examined within laboratory settings. Several of the findings suggest that timeout can function as a punishing stimulus (Ferster, 1958; Ferster and Appel, 1961; Holz, Azrin, and Ayllon, 1968; Kramer and Rilling, 1969; Kaufman and Baron, 1968; Miller and Zimmerman, 1966; Nigro, 1966; Zimmerman and Baydan, 1963; Zimmerman and Ferster, 1963).

Timeout has also been used extensively to modify disruptive and undesirable behaviors in children: thumbsucking (Baer, 1962); throwing of eyeglasses (Wolf, Risley, and Mees, 1964); tantrums, shouting, and hitting in a home setting (Hawkins, Peterson, Schweid, and Bijou, 1966); crying, temper tantrums, and inappropriate vocalizations in speech training (Risley and Wolf, 1967); misbehavior in delinquents during recreation periods (Tyler and Brown, 1967); incorrect responses in speech training (Sloane, Johnston, and Harris, 1968); non-compliance to parental requests (Wahler, 1969*a;* Zeilberger, Sampen, and Sloane, 1968); aggression and yelling (Bostow and Bailey, 1969); verbal jargon during speech training (McReynolds, 1969); home and school disruptive responses (Wahler, 1969*b*); and inappropriate behaviors at meal time (Barton, Guess, Garcia, and Baer, 1970).

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Most of these early studies employing timeout techniques involved relatively long periods of timeout (*i.e.,* isolation from the "positive reinforcement area"). For example, Hamilton, Stephens, and Allen (1967) removed severely retarded children from their play area for 30 min to 2 hr contingent upon each aggressive or destructive behavior. Tyler and Brown (1967) employed a 15-min isolation period to control the rate of disruptive behavior in delinquents. More recently, however, several investigations have shown relatively short periods of timeout to be effective in controlling rates of disruptive behavior. Zeilberger *et al.* (1968) demonstrated the control of oppositional and aggressive behavior by a 4.5-yr-old boy through the use of contingent isolation in a bedroom. The average duration of the timeout isolation was approximately 3 min (this average excludes the first session of treatment during which there was an extended timeout of nearly 19 min). Bostow and Bailey (1969) employed a timeout technique with an elderly wheelchair patient who continuously yelled demands at the staff. During treatment conditions, the patient was placed on the floor for approximately 2 min after each yell response. In a second investigation, Bostow and Bailey (1969) treated a 7-yr-old retarded boy who showed high rates of severe aggressive behavior. Two minutes of isolation followed each incident of aggressive behavior under treatment conditions.

A brief period of timeout was similarly employed in Experiment I of the present study. Experiment I was designed to (1) evaluate the effectiveness of this brief period of timeout in the management of disruptive behavior of a preschool child and to (2) determine the necessity of timeout being presented in a contingent relationship with the disruptive behavior.

Experiment II examined the use of intermittent schedules of timeout in the management of disruptive behavior. Previous laboratory research concerning schedules of intermittent punishment typically has found an inverse relationship between the probability of punishment and the resultant rate of response (Intermittent shock: Azrin, Holz, and Hake, 1963; Estes, 1944; Filby and Appel, 1966; McMillan, 1967. Intermittent timeout: McMillan, 1967; Thomas, 1968; Zimmerman and Baydan, 1963; Zimmerman and Ferster, 1963). For example, Azrin *et al.* (1963), using various values of fixed-ratio schedules, found that a higher overall rate of response was maintained under the larger fixed-ratio punishment schedules (*e.g.,* FR 1000, FR 500) than under the smaller fixed-ratio punishment schedules (*e.g.,* FR 100, FR 1). Similarly, in an applied setting involving the training of two retarded children on a picture-naming task, Kircher, Pear, and Martin (1971) found that an FR 1 schedule of shock was more effective than either an FR 2 or FR 4 schedule in reducing inappropriate responding. Thus, it appears that smaller ratio schedules are more effective in reducing the rate of response than larger ones.

Although intermittent schedules of punishment may not be most effective, they may prove useful in maintaining an acceptable low rate of inappropriate behavior in educational settings. The less frequent application of punishment procedures (*e.g.,* timeout) in such settings is particularly desirable because removal of the child from the setting interrupts and reduces the time available to teach him the academic skills for which the educational setting exists. The purpose, then, of the second experiment was to determine the effectiveness of a variety of schedules of intermittent timeout in the control of the rate of disruptive behavior emitted by a child in a special preschool classroom.

EXPERIMENT I

The first step in the investigation of timeout as a punishing stimulus was accomplished by simultaneously measuring three categories of disruptive behavior in a retarded preschool child. Initial observations were made of the rates of each of the disruptive behaviors under a condition in which the teachers attempted to ignore

all disruptive behavior. Timeout was then made contingent upon one category of disruptive behavior. Later, timeout was made contingent upon the other two categories. Thus, the experimental design was a multiple baseline across categories of disruptive behavior (Baer, Wolf, and Risley, 1968).

Subject

Bertha, the subject, was 8 yr old at the start of the study. Although small for her age, Bertha was larger than most of her preschool peers. Previously, she had been diagnosed as mongoloid. Bertha displayed a large number of behaviors that were considered severely disruptive and/or dangerous to the other preschool children.

Setting

Experiment I was conducted in a special preschool classroom for problem children in the Child Development Laboratories at the University of Kansas. Bertha was one of four children enrolled in the special program. The three other children ranged in age from 4 to 6 yr. They attended the preschool each afternoon, Monday through Thursday, for about 2.5 hr. Each child received special training with regard to discipline problems, task completion, imitation, discrimination skills, cooperation, and compliance with instructions. To accomplish these training goals, most indoor and outdoor play activities were contingent upon completing work with educational materials. Bertha was also involved in two individual research projects, which required that she be taken to another setting for approximately 20 min each afternoon.

The preschool staff consisted of two teachers and four observers (one observer for each child). The observers recorded child behaviors for approximately 1.5 hr of the 2.5-hr preschool day. They did not record child behaviors during snack time, outdoor play, or when the children were taken for individual research projects.

A 6-by-8 ft room adjacent to the preschool room was used as a timeout booth. Timeout consisted of a minimum of 3 min of isolation in the booth, with the door closed. There were no furnishings in the booth, the floor was carpeted, and the ceiling light was always on, unless Bertha shut it off during the timeout period. Bertha could not open the door from inside the booth. It was not possible to observe her visually while she was in the booth, but crying, kicking at the door, and screaming were monitored by her observer listening at the door.

Behaviors and Recording

Based upon discussions with the preschool teachers and the observer, as well as anecdotal observations, a list of disruptive behaviors was set up with a tentative definition specified for each behavior. After a few days of recording these behaviors, the observer noted some additional disruptive behaviors, which were added to the list. Some definitions were also revised to be more inclusive or exclusive. When the final code of disruptive behavior was developed, an estimate of interobserver reliability was obtained and the recording of baseline data was begun.

For the purpose of recording, the disruptive and aggressive behaviors were grouped into three categories:

I Chokes and Armwraps
II Other Attacks Toward People
III Attacks Toward Materials

The category of Chokes and Armwraps included two behaviors. A choke response was defined as placement of one or both hands around the neck of another child in a "stranglehold" fashion. An armwrap involved a "bear-hug" around a child's neck, shoulder, or body trunk, typically performed from behind.

During the baseline condition, both the choke and armwrap were frequently components of a chain of responses in which Bertha eventually threw the victim to the floor and then pounced on him. (The behaviors of throwing and pouncing were recorded in the second category, Other Attacks Toward People.) Oc-

casionally, the choke response was maintained throughout such a sequence or resumed once the child was on the floor.

In addition to the two behaviors mentioned above, throwing and pouncing, the category of Other Attacks Toward People included the following behaviors when these involved contact with another person: hitting, kicking, pushing, pinching, pulling on another person's clothing, and pulling another person's hair.

The category of Attacks Toward Materials included tearing and breaking things, sweeping things off shelves, throwing things forcefully about the classroom, stamping on materials, and tipping over furniture.

The disruptive behaviors included in the categories of Chokes and Armwraps and Attacks Toward People were scored as such, whether they were directed toward another child, a teacher, or an observer. Bertha always directed Chokes and Armwraps toward other children.

The observer carried a clipboard that held a stopwatch and recording sheets, which were divided into 10-sec intervals. The observer ran the stopwatch continuously and marked the occurrence or non-occurrence of disruptive behaviors for each consecutive 10-sec interval observed. A given category of disruptive behavior could be scored only once in a given 10-sec interval. A category was scored as having occurred if one or more behaviors of that category were emitted during the 10-sec interval. Since a given category of disruptive behavior could be scored only once in an interval, the highest possible rate of response for any one category was 360 intervals of disruptive behavior per hour.

In addition to rates of individual categories of disruptive behavior, a measure was also calculated for Total Disruptive Behavior, defined as the number of intervals per hour containing one or more categories of disruptive behavior. The maximum rate was again 360 intervals per hour. In calculating the rate per hour for a given category, the number of intervals of that category observed was divided by the observed time in hours. The rate of Total Disruptive Behavior per hour was obtained by dividing the number of intervals containing one or more categories of disruptive behavior by the observed time in hours. To obtain this observed time in hours, the number of intervals observed, excluding intervals of timeout, was divided by 360.

Conditions and Procedures

Baseline. Under the baseline condition, the teachers were instructed to ignore all disruptive behaviors and to attend to the subject when she was not engaged in disruptive behavior. Due to the severity of some of the behaviors, such as choking, the teachers occasionally had to intervene to stop Bertha from hurting another child. Whenever such intervention was necessary, the teachers would matter-of-factly separate the children and would try to engage Bertha in other activities after she was quiet.

Timeout of Chokes and Armwraps. After nine days under the baseline condition, the timeout was introduced contingent on the occurrence of the behaviors of one disruptive category. Whenever the observer saw Bertha emit a behavior from the category of Chokes and Armwraps, the observer signalled the closest teacher by saying the teacher's name softly or tapping her on the arm or shoulder. One or two teachers then placed Bertha in the timeout booth and closed the door. She was released after 3 min, provided the observer did not hear any crying, yelling, or banging on the door during the last 15 sec of the period. If any of these sounds were heard, Bertha was released after the first 15-sec period in which none occurred (a changeover delay procedure). The observer signalled a teacher when Bertha was to be released. The teacher opened the door and matter-of-factly escorted her to an activity in the preschool.

This condition, in which timeout was contingent on behaviors of the category of Chokes and Armwraps, was in effect for eight days. Due to the severity of some Other Attacks Toward People and an extreme increase in the rate of Attacks Toward Materials which occurred under this condition, the teachers re-

quested that timeout next be placed on the behaviors of all three categories.

Timeout of all disruptive behavior. During the next 10 days, each disruptive behavior seen by the observer was followed by timeout. The timeout procedures employed were identical to those described above.

Interobserver Reliability

At least once under each condition of the study, a second observer also observed Bertha. The two observers' recording sheets were then compared interval by interval, with only those intervals in which one or both observers had scored the occurrence of a disruptive behavior considered in calculating reliabilities. These calculations yielded occurrence reliability estimates. These were calculated separately for each of the three categories and also for Total Disruptive Behavior, by dividing the number of intervals of agreement that the behavior occurred by the number of intervals of agreement plus intervals of disagreement; the result was then multiplied by 100.

Table 1

Occurrence reliability estimates for each measure of disruptive behavior employed under each condition of Experiment I.

	Response Categories			
Conditions	*Chokes and Armwraps*	*Other Attacks Toward People*	*Attacks Toward Materials*	*Total Disruptive Behavior*
Baseline (no timeouts)	89%	68%	82%	84%
Timeout on Chokes and Armwraps	100%	85%	82%	86%
Timeout on all disruptive behavior	*	100%	100%	100%

*No Chokes and Armwraps were scored by either observer while taking reliability measures under this condition.

Table 1 presents the reliability estimates as percentages for each measure of disruptive behavior employed under the conditions of Experiment I.

Results and Discussion

Figure 1 shows the number of 10-sec intervals per hour containing Chokes and Armwraps, Other Attacks Toward People, and Attacks Toward Materials for each day of the study. These rates were calculated excluding intervals of time spent in the timeout booth.

The baseline condition (Days 1 to 9) yielded rates of approximately 13, 15, and 3 intervals per hour, respectively, for the three categories of

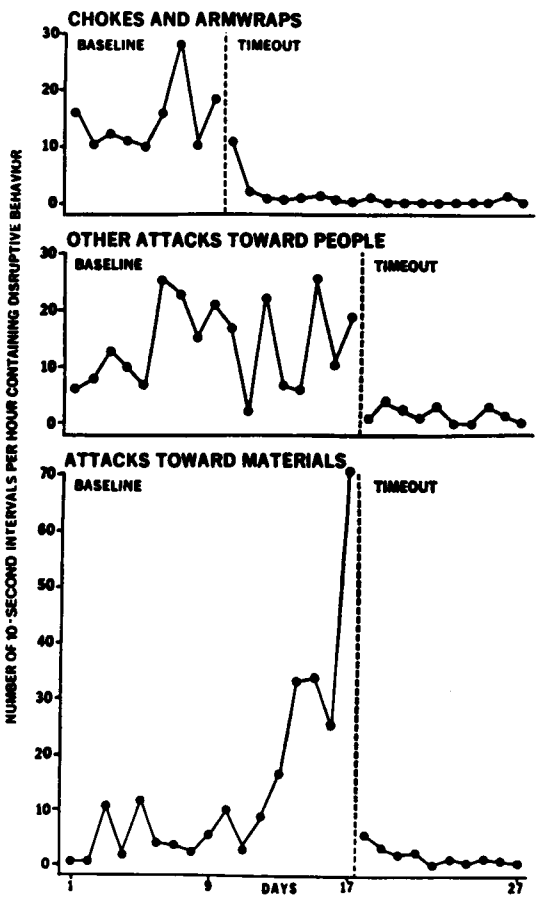

Fig. 1. Rate per hour for each of the three categories of disruptive behavior measured in Experiment I. The three categories of disruptive behavior were (1) Chokes and Armwraps, (2) Other Attacks Toward People, and (3) Attacks Toward Materials.

disruptive behavior. As can be seen in Figure 1, the rate of Chokes and Armwraps decreased almost immediately when timeout was made contingent on behaviors of this category (Days 10 to 17). The average rate of Chokes and Armwraps decreased from 13 per hour under the baseline condition to an average of less than one per hour when timeouts were administered. Under this condition, the rate of Other Attacks Toward People remained unchanged from the previous condition. The rate of Attacks Toward Materials, however, increased to a high of 71 intervals per hour.

When timeout was made contingent on behaviors of all three categories (Days 18 to 27), the rates of Other Attacks Toward People and Attacks Toward Materials were immediately reduced to a near-zero level. The rate of Chokes and Armwraps also remained low under this condition.

The results shown in Figure 1 provide evidence that timeout was functional in decreasing the rate of disruptive behavior. The rate of Chokes and Armwraps decreased when timeouts were contingent on that category of disruptive behavior. However, the rates of the other two categories did not decrease when timeout was contingent on Chokes and Armwraps. In addition, the rate of the behaviors included in the second two categories decreased only when timeout was contingent on them.

According to Azrin and Holz (1966), the definition of punishment is "a reduction of the future probability of a specific response as a result of the immediate delivery of a stimulus for that response" (p. 381). Thus, to demonstrate that the timeout employed was a punisher, it is necessary to show not only the decreased rate of the timed-out behavior, but also the immediate application of the timeout to those behaviors.

During the condition when Chokes and Armwraps produced timeout (Days 10 to 17), 100% of the intervals of Chokes and Armwraps were followed by timeout within 1 min. In contrast, only 6% of the intervals of Other Attacks Toward People and 2% of the intervals of Attacks Toward Materials were emitted during the minute before placement in the timeout booth (Days 10 to 17). Thus, timeouts delivered contingent upon Chokes and Armwraps were simultaneously appearing in a non-contingent relationship to the behaviors of the other two categories, but only Chokes and Armwraps decreased, suggesting that the contingency was essential to the decrease. This suggestion is strengthened further by the fact that the decrease of the other two categories under the final condition (Days 18 to 27) was accomplished with 100% of the intervals of disruptive behavior being followed within 1 min by timeout.

One final feature of the data should be noted. The increased rate of Attacks Toward Materials, which occurred when timeout was contingent on Chokes and Armwraps, may have resulted because Attacks Toward Materials were discriminated as not having any timeout consequence, yet providing an alternative response to gain attention from peers and teachers. The fact that the rate of Other Attacks Toward People did not increase under this condition was perhaps due to generalization of the timeout contingency applied to the Chokes and Armwraps category, which included two forms of people attacks. These conclusions are only speculative, since no experimental evaluation was employed to analyze this aspect of the effect. However, a similar result was evident in the Barton *et al.* (1970) study in which timeout was applied sequentially to a variety of inappropriate mealtime behaviors of retarded children. Eating could be accomplished by means of one to four types of behavior, each defined to be mutually exclusive of the other. The styles of eating (fingers, messy utensil, neat utensil, and pigging) were simultaneously measured. When timeout was contingent on eating with fingers, the frequency of this behavior decreased. Concomitantly, the frequency of messy eating with utensils increased. When timeout was also contingent on messy eating with utensils, the frequency of this behavior was decreased and the

frequency of eating neatly with utensils increased. The frequency of eating neatly with utensils was increased further when timeout was also contingent on the remaining inappropriate style of eating (pigging).

Thus, the present results and the Barton *et al.* (1970) study suggest that the application of timeout to some behaviors may result in an increased frequency of other behaviors that provide alternative ways of obtaining available reinforcers (*e.g.,* peer attention in the present experiment and food in the Barton *et al.* (1970) study).

During the present experiment, a total of 59 timeouts were administered (Figure 1: Days 10 to 27). The minimum time in the booth was 3 min. Due to the changeover delay contingency requiring 15 sec of quiet before release, some of the timeouts were extended. The average time spent in the booth over the first 10 timeouts was 6.7 min (the changeover delay was contacted on five of these first 10 timeouts). During the last 10 timeouts in this experiment, the average time spent in the booth was 3.4 min (the changeover delay was contacted on only two of these last 10 timeouts). During the course of the experiment, the changeover delay was invoked on only 18 of the 59 timeout periods. There were only two lengthy timeout periods, one of 30.5 min (the fifth timeout) and one of 21.8 min (the thirty fifth timeout). On only four other occasions did Bertha remain in the booth beyond 5 min (6.5 min, 9.2 min, 9.0 min, 6.0 min).

EXPERIMENT II

The second experiment investigated the effects of intermittent schedules of timeout on the total rate of the disruptive behaviors manipulated in Experiment I. The intermittent scheduling used several ratio schedules of timeout, as well as a schedule involving the use of timeout contingent on high rates of disruptive behavior, *i.e.,* "differential punishment of high rates" (Ferster, 1958).

The choice for variable- rather than fixed-ratio schedules followed previous laboratory research by Azrin (1956). That research compared a variable-interval schedule with a fixed-ratio schedule of punishment and found the variable-interval schedule more effective. It may be that variable schedules in general are more effective than fixed schedules; on that possibility, a range of variable-ratio schedules was examined.

Subject and Setting

Bertha again served as the subject and the study was conducted immediately following Experiment I within the same setting.

Apparatus

The observer's clipboard was equipped with a stopwatch, a 2800-Hz tone generator[3], and a push-button, which activated the tone generator when depressed. Also attached to the clipboard was a "variable-ratio tally form". This form was used to determine which interval of disruptive behavior was to be followed by timeout. The observer also carried a second stopwatch, which was used in timing one of the schedules of intermittent timeout.

Behaviors and Recording

Although the same three categories of behaviors were scored during this study as were recorded during Experiment I, only the measure of Total Disruptive Behavior was used in data presentation. As previously described, Total Disruptive Behavior was the number of 10-sec intervals per hour containing one or more categories of disruptive behavior.

Conditions and Procedures

During this study, Bertha was exposed to four conditions, each involving a different schedule of intermittent timeout.

[3]A Sonalert electronic signal generator (SC628, 6-28VDC, 2800 Hz, manufactured by Mallory) was wired in series with three 9-V transistor batteries.

Variable-ratio schedules. The first condition of intermittent punishment involved a VR 4 schedule of timeout. Under this schedule, on the average, every fourth interval of disruptive behavior was followed by timeout.

The range of the terms of the VR 4 schedule was one to seven. Each term specified the number of intervals of disruptive behavior to occur before timeout. All terms (1, 2, 3, 4, 5, 6, 7) were scheduled in an unsystematic order across sessions of this condition. Figure 2 shows the variable-ratio tally form used by the observer to determine the behavior on which timeout was to be contingent. Each row on the tally form represents a term. The number of intervals of disruptive behavior in each term is equal to the number of blocks in each row. Each interval of disruptive behavior was scored on the regular sheets and also entered as a mark in one of the blocks on the variable-ratio tally form. The first interval of disruptive behavior to occur under this condition was entered in the upper left-hand corner of the tally form. The next interval of disruptive behavior was entered in the next block to the right. Since the first term of the tally form included three intervals of disruptive behavior, the third disruptive behavior to occur was immediately followed by a 2-sec tone, the interval was marked in the last block of that term on the tally form, and Bertha was placed in the timeout booth. Scoring was resumed upon her release. The next term on the tally form included only one interval of disruptive behavior. This behavior was marked on the tally form, and the child placed in timeout. This procedure was continued until each block on the tally form had been marked. The marks on the form were then erased, and the procedure continued, starting again with the first term on the tally form. Whenever a disruptive behavior occurred that was to be timed-out, the observer immediately sounded the tone for 2 sec. The tone continued to be sounded contingent upon each 10-sec interval containing disruptive behavior until the teacher closest to Bertha placed her in the timeout booth and closed the door. She was released after a minimum of 3 min in the booth, provided she had been quiet (*i.e.*, had not cried, screamed, or kicked at the door) during the last 15-sec period of the timeout. Otherwise, she was released after the first 15-sec period during which she was quiet.

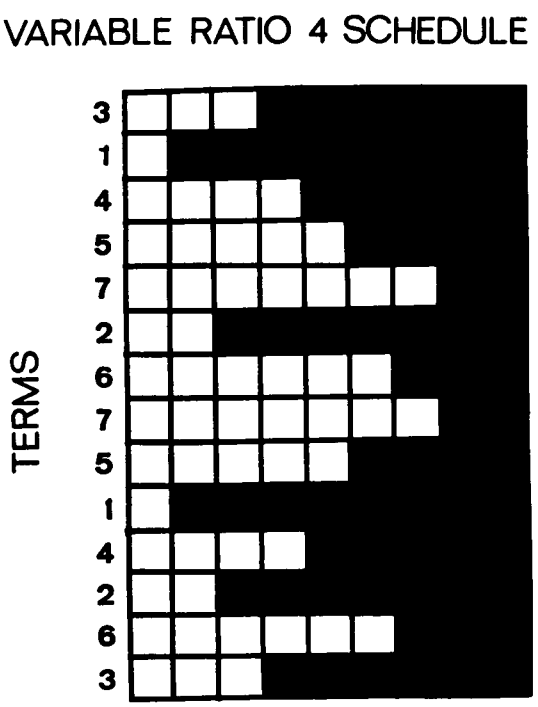

Fig. 2. A "variable-ratio tally form", which was carried by the observer during Experiment II. This type of form was used to determine which intervals of disruptive behavior were to be timed-out under the variable-ratio schedules of intermittent punishment (*e.g.*, the VR 4 schedule had a range of terms from 1 to 7 as shown on this form). Refer to text for further description.

Disruptive behaviors that occurred during intervals between the timed-out behavior and placement in the booth were scored as intervals of disruptive behavior. Thus, these intervals were included in the calculation of the rate of disruptive behavior; they were not entered, however, on the variable-ratio tally form.

After 11 days under the VR 4 schedule, another variable-ratio schedule condition was employed: a VR 8 schedule of timeout in which, on the average, every eighth interval of disruptive behavior was followed by timeout. The terms of the VR 8 schedule were 2, 4, 6, 8, 10,

12, 14. These terms occurred in a random order on the tally form. The procedures employed under this schedule were identical to those for the VR 4 schedule. The VR 8 schedule condition was evaluated over a 37-day period.

During the third intermittent punishment condition, a VR 3 schedule of timeout was applied. The terms of this schedule were 1, 2, 3, 4, 5. The VR 3 schedule was in effect over a 12-day period.

Differential punishment of high rate (DPH). The schedule of timeout in the fourth condition was designed to punish differentially closely spaced, high rates of disruptive behavior. During this condition, timeout was delivered contingent on any disruptive behavior that occurred within 10 min of the last recorded disruptive behavior. To implement this schedule, the observer started the second stopwatch when the first disruptive behavior occurred in a session. If a second disruptive behavior occurred within 10 min of the first, the observer sounded the tone generator and a teacher placed Bertha in the booth for a minimum of 3 min. (The 15-sec changeover delay was employed.) The stopwatch was reset and started again with the first interval of disruptive behavior following release from the timeout booth.

If a second disruptive behavior did not occur within 10 min of the first, the observer stopped the watch, reset it, and started it again with the occurrence of the next disruptive behavior. Any disruptive behavior that occurred within 10 min of the start of the watch was timed-out. The DPH schedule was in effect for 21 days.

Condition changes during Experiment II were based upon visual inspection of a graph representing daily rates of disruptive behavior, Figure 3. A criterion that no systematic trend be evident in rate over the last half of a condition was employed for the condition changes of this experiment.

Interobserver Reliability

Reliability estimates for Total Disruptive Behavior were obtained at least twice under each condition of the study and calculated in the same way as in Experiment I. The average reliability percentage for each condition was: VR 4 schedule condition, 100%; VR 8 schedule condition, 94%; VR 3 schedule condition, 100%; DPH schedule condition, 93%.

Results and Discussion

Figure 3 presents the daily rates of Total Disruptive Behavior obtained under each of the four schedules of intermittent timeout. The daily rates of disruptive behavior per hour are represented by the dots connected with solid lines. The mean rate of disruptive behavior for each of the four conditions (*i.e.*, schedules) is represented by the broken horizontal lines. As can be seen in Figure 3, the VR 4 schedule resulted in a mean rate of 5.6 intervals of disruptive behavior per hour. This rate increased to a mean of 13.7 per hour under the VR 8 schedule. A low mean rate (3.0 per hour) was again established when the VR 3 schedule was introduced. Similarly, a low rate (3.6 per hour) was maintained in the final condition, in which the DPH schedule was employed.

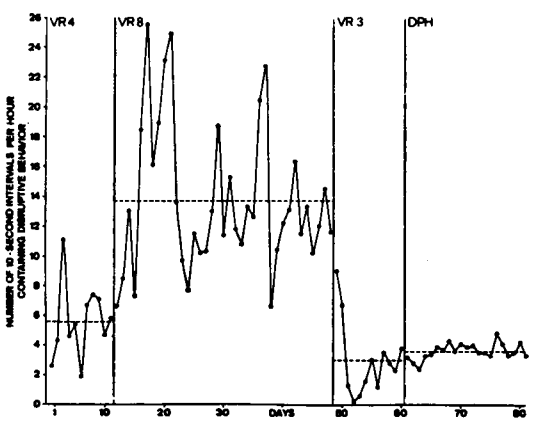

Fig. 3. Daily rates of Total Disruptive Behavior obtained under each of the four schedules of intermittent timeout employed during Experiment II. The four schedules (conditions) examined were VR 4, VR 8, VR 3, and differential punishment of high rates (DPH). The daily rates of disruptive behavior per hour are shown as dots connected with solid lines. The mean rate for each condition (schedule) is shown by the broken horizontal lines.

Although the variable-ratio schedules were arranged to be of the following values—VR 4, VR 8, VR 3—they were slightly discrepant. The values obtained by dividing the mean number of intervals of disruptive behavior that occurred under each condition by the number of timeouts administered under each condition were always slightly higher than that specified by the programming schedule (VR 4, 4.3 disruptive behaviors per timeout; VR 8, 8.2 disruptive behaviors per timeout; VR 3, 3.7 disruptive behaviors per timeout). This discrepancy was a function of those intervals of disruptive behavior that were scored while Bertha was enroute to the timeout booth. These intervals of disruptive behavior were not entered on the variable-ratio tally form; but they were included in the calculation of the total rate of disruptive behaviors. In terms of the number of disruptive behaviors per timeout, the DPH schedule was nearly equivalent to the VR 3 schedule (*i.e.*, 3.9 disruptive behaviors per timeout under DPH).

Figure 4 presents the relationship between the probability of a disruptive behavior being followed by timeout and the resultant rate of disruptive behavior per hour. The rate plotted at the 0.0 probability value was obtained from the baseline condition of Experiment I, when no disruptive behavior was followed by timeout. The rate plotted at the 1.0 probability value was obtained from the last condition in Experiment I, when an FR 1 schedule was in effect (every disruptive behavior was followed by timeout). The intermediate points, plotted from left to right, were obtained from the VR 8, VR 4, VR 3, and DPH schedule conditions, respectively. To make the six conditions comparable, despite the varying numbers of timeouts that were administered during the different conditions, the rates of response were calculated excluding those intervals and responses that occurred between the interval of disruptive behavior to be timed-out and the actual start of the timeout period.

The function shown in Figure 4 reveals that as the probability of a response being timed-out increased, the actual rate of that response de-

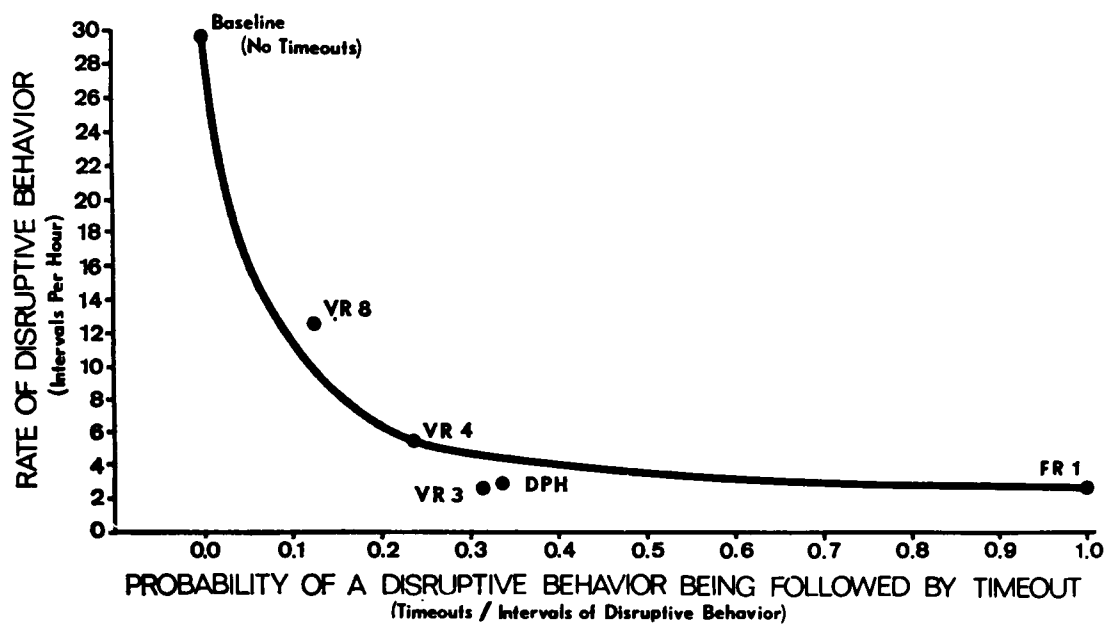

Fig. 4. Each plot represents the average rate of disruptive behavior per hour that occurred under each of the conditions of intermittent timeout under Experiment II and the baseline and fixed-ratio 1 schedule of Experiment I. The rate for each condition is plotted against the probability of a disruptive behavior being timed-out under each condition. The solid line represents a "best fit" through these points.

creased. The decreasing function is most evident in the range from the 0.0 probability value (baseline) to the 0.23 probability value (VR 4 schedule). As the probability of a response being timed-out increased beyond the 0.23 value, the rate did not appear to decrease further. From this function (based upon one determination at each of six probabilities), it appears that relatively low rates of disruptive behavior can be maintained by intermittent schedules of timeout that involve a probability of timeout of 0.23 or greater. In the present study, these probability levels were obtained from the VR 4, VR 3, DPH, and FR 1 schedule conditions.

GENERAL DISCUSSION

In Experiment I, a brief period of isolation (a 3-min timeout from positive reinforcement) effectively reduced the rate of a variety of disruptive behaviors displayed by a preschool child. This finding is consistent with findings reported by Bostow and Bailey (1969) and Zeilberger *et al.* (1968).

In the investigations by Bostow and Bailey, the exact contribution of timeout to the behavioral change is difficult to determine. With the application of timeout, these investigations concurrently employed a procedure of either reinforcing specific appropriate behaviors or periodically reinforcing any behaviors other than the target behavior (*e.g.,* DRO). Thus, the behavioral changes that occurred may have been partially or totally a function of the procedure of differential reinforcement. In the Zeilberger *et al.* (1968) study, however, parental attention following appropriate behavior remained constant across baseline and treatment conditions. Thus, it would appear that the decreased rate of oppositional and aggressive behaviors that occurred during the treatment conditions of the Zeilberger *et al.* study was, for the most part a function of the brief timeout periods employed.

For each of the two present experiments, the teachers were instructed to ignore disruptive behavior and maintain a constant frequency of teacher attention for appropriate behavior. Though no measure of teacher attention was taken, it is unlikely that the behavioral changes of Experiment I could be accounted for by changes in the frequency of teacher attention to appropriate behavior. If teachers provided a greater or lesser frequency of attention to appropriate behavior (*i.e.,* at times when no disruptive behavior was occurring), the resultant effect, if one occurred, would probably be to affect similarly the rate of all three categories of disruptive behavior, rather than selectively increase and decrease the rates of separate categories as occurred during the multiple baseline evaluation.

Nevertheless, the effectiveness of the brief timeouts employed in the above cited studies, could have been related, in part, to the availability of a relatively high frequency of reinforcement for an alternative response (Holz *et al.,* 1963).

Data from Experiment I also suggest that the brief timeout from positive reinforcement functioned as a punishing stimulus, in that a contingent relationship between the behavior and timeout appeared necessary for the decrease to occur. This conceptualization of timeout as a punishing stimulus is consistent with the findings of a number of laboratory investigations concerning timeout procedures (Ferster, 1958; Ferster and Appel, 1961; Holz *et al.,* 1963; Kaufman and Baron, 1968; Kramer and Rilling, 1969; Miller and Zimmerman, 1966; Nigro, 1966; Zimmerman and Baydan, 1963; Zimmerman and Ferster, 1963).

Experiment II examined the effects of intermittent scheduling of timeout, using the same subject as in Experiment I. The rate of total disruptive behavior was investigated under three variable schedules (VR 4, VR 8, VR 3) and one schedule designed to punish high rates of disruptive behavior (DPH). When the rates of response obtained under the four schedules of intermittent timeout were compared with the rates obtained under baseline and FR 1 conditions (Experiment I), it was concluded that

an inverse nonlinear relationship existed between the probability of a disruptive behavior being timed-out and the resultant rate of that behavior. This relationship (Figure 4) suggests that some schedules of intermittent timeout may be nearly as effective as a schedule in which every disruptive behavior is followed by timeout. If this finding proves to be reliable across subjects and settings, low variable-ratio schedules of timeout may provide practical and efficient ways to minimize the amount of disruptive behavior emitted by children, while having to remove them only occasionally for a brief period of time from the ongoing activities.

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