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RESEARCH ON THE DIFFERENCE BETWEEN GENERALIZATION AND MAINTENANCE IN EXTRA-THERAPY RESPONDING[1]

ROBERT L. KOEGEL AND ARNOLD RINCOVER

UNIVERSITY OF CALIFORNIA, SANTA BARBARA AND
UNIVERSITY OF NORTH CAROLINA, GREENSBORO

Many authors have reported that the development of programs for producing durable extra-therapy responding lags behind the development of programs for producing initial behavior change. In Experiment I, responding was recorded continuously in both the therapy and extra-therapy settings. The results showed that one child did not generalize to the extra-therapy setting, but that other children did. However, for the children who generalized, extra-therapy responding was not maintained. Therefore, in Experiment II two variables affecting the durability of extra-therapy responding were assessed and found to be influential: (a) the use of partial reinforcement schedules in the original treatment environment; and (b) the presence of noncontingent reinforcers in the extra-therapy environment. The results suggest that there are two distinct parameters of extra-therapy responding: generalization and maintenance. A technology for producing durable extra-therapy responding is discussed in terms of different treatment procedures required for different deficits in extra-therapy responding.

DESCRIPTORS: generalization, maintenance, durability of treatment gains, extra-therapy responding, parameters, noncontingent reinforcement, partial reinforcement, stimulus control, reinforcement schedules, autistic children

To develop a successful treatment program, one must be concerned with at least three major results: first, the initial acquisition of a behavioral change; second, the generalization of that change to settings outside of treatment, and third, the maintenance of change over time in settings outside treatment (Baer, Wolf, and Risley, 1968; Bandura, 1969, 1976). Applied behavioral research has generally focused on producing a behavioral change in the treatment setting, with little attention given to studying the generalization and maintenance of the change.

There has been increasing concern with the importance of both generalization and maintenance of behavioral changes (Atthowe, 1973; Barrish, Saunders, and Wolf, 1969; Kazdin, 1973*a, b;* Kazdin and Bootzin, 1972; MacPherson, Candee, and Holman, 1974; O'Leary and Drabman, 1971; Walker and Buckley, 1972). However, as Kazdin and Bootzin (1972) and O'Leary and Drabman (1971) point out, there have been few direct attempts systematically to investigate variables that influence these changes. Exceptions to this are studies in which extra-therapy settings are programmed by training parents (Lovaas, Koegel, Simmons, and Long, 1973; Patterson and Brodsky, 1966), teachers (Wahler, 1969), peers (Patterson and Anderson, 1964), or by multiple therapists (Stokes, Baer, and Jackson, 1974). Thus, it seems that generalization and maintenance do not occur naturally (without special intervention).

In a previous experiment (Rincover and Koegel, 1975), we suggested that a difficulty in the study of extra-therapy responding may lie in the

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separation of generalization and maintenance data. In most studies, the initial behavioral change is acquired in the therapy setting, and then posttreatment responding is usually assessed both in another setting (reflecting generalization) and over a period of time or trials (reflecting maintenance). The problem arises when no improvement is observed in the posttreatment environment, which is usually the case. In this instance, one does not know whether the behavior change did not generalize, or whether it did generalize but was not maintained in the extra-therapy setting. If the behavior change occurs outside the therapy setting, then generalization has occurred. At that point, other variables (*e.g.,* the occurrence or absence of reinforcement) in that setting may influence the maintenance of extra-therapy responding. To assess this possibility, we decided to begin our research in a controlled laboratory setting, approximating the conditions that might occur in a typical clinic. This analogue approach was used in an attempt to isolate variables that might be manipulated in various clinical settings.

EXPERIMENT I

This experiment was concerned with separating the measurement of generalization and maintenance. The assessment began at the beginning of the treatment intervention, before generalization and maintenance data could become confounded. By concurrently recording the children's behavior in both the treatment environment and in an extra-therapy environment, we were able to assess whether or not generalization would occur. Then, if any generalization was observed, continued recording in both settings made it possible to assess the maintenance of the behavior change in the extra-therapy environment. In short, the major questions being asked were: (1) would the children's responding generalize to the extra-therapy environment; and (2) if generalization occurred, would correct responding in the extra-therapy setting be maintained over time?

METHOD

Subjects

Three male autistic children, none of whom had participated in our previous research on generalization, was each diagnosed by agencies not associated with this project. Each child was severely psychotic and resided in an institution during this study. All of the children were either mute or echolalic, displaying no appropriate contextual speech. Each child engaged in a great deal of self-stimulatory behavior and was minimally responsive to instruction. All three children were untestable on the Stanford-Binet IQ test. Their IQ scores were estimated to be less than 10. On the Vineland Social Maturity Scale, all three children were placed below the 2-yr level; chronological ages were 7.5, 9.0, and 11.0 yr.

When a child was brought to our laboratory, a therapist first selected a new behavior to teach him, and training was conducted on the new target behavior. Simultaneously, the child's responding to a new adult in an extra-therapy setting was assessed throughout the course of training. The procedures for selecting target behaviors, training, and assessing extra-therapy responding are described below.

Selecting target behaviors. One target behavior was selected for each child. The behaviors selected consisted of: (a) nonverbal imitation, where the child would learn to imitate a behavior of the therapist (*e.g.,* raising arm) in response to the verbal instruction, "Do this"; and (b) touching a body part in response to a verbal instruction "Touch your (nose, shoulder, *etc.*)". A particular task was selected for each child by recording the child's responding during each of these tasks, and selecting the first one where responding was consistently incorrect (*i.e.,* no correct responses in the first 20 trials). For example, a child would be seated in the treatment room and told to "Do this", whereupon the therapist might touch his own head. If the child failed to respond correctly, no reinforcer was given. The therapist's command and appropriate model

were repeated until either the child responded correctly on one trial or failed to respond correctly on 20 consecutive trials. If the child consistently responded incorrectly, that behavior was selected for treatment. If the child responded correctly on any trial, a reinforcer was provided. However, if a correct response occurred, the therapist would not use that task in the experiment.

During the experiment, a 40-min session was conducted once per day, two days per week, until the child acquired the appropriate behavior. Each session consisted of two kinds of trials, training trials and extra-therapy trials.

Training trials. The child was seated at a table across from the therapist in a 2.5-m by 2.5-m treatment room. The therapist started treatment by prompting the child to perform the correct behavior upon verbal command. Prompts initially consisted of the teacher taking the child's hand and physically guiding him through the topography of the behavior. For example, if the teacher was training shoulder-touching behavior, he would first say, "Touch your shoulder", and then place the child's hand on his shoulder and reward him with a piece of candy. The teacher then gradually began to delay and reduce the intensity of the prompt in order to transfer control of correct responding from the prompt to the verbal stimulus. Food and social praise were given for all correct responses, whether prompted or nonprompted. Incorrect responses were ignored.

Throughout each 40-min session, blocks of 10 training trials were alternated with blocks of 10 trials in the extra-therapy environment.

Extra-therapy trials. To conduct the extra-therapy trials, the therapist took the child outside the treatment room, where an unfamiliar adult approached the child and led him outside of the building. Each of the three children had different therapists and different unfamiliar adults for the extra-therapy measures. However, the same adults participated in all sessions for a given child. Outside, the child was placed facing the unfamiliar adult, standing on the lawn surrounded by trees. The adult then presented the same verbal instruction (and modelling where appropriate) as the original therapist. No other interaction took place between the child and the adult.

Ten trials were conducted and the child's responses were recorded as correct or incorrect for each trial. No reinforcers were given in the extra-therapy setting, in order to make these trials analogous to the environment to which a child typically returns after a therapy session. After 10 trials, the stranger led the child back into the hallway, and the therapist returned him to the therapy setting for additional training. Blocks of 10 training trials were alternated with blocks of 10 extra-therapy trials until the following criteria were met: (1) the child acquired the target behavior (*i.e.*, 100% correct responding in at least two consecutive blocks of trials) in the therapy setting, and (2) the child's responding stabilized in the extra-therapy setting.

Recording and reliability. To assess whether the recording of the child's responses was reliable during training and extra-therapy sessions, reliability measures were obtained for the child's correct and incorrect responses in both settings. The unfamiliar adult and a naive observer watched the training sessions through a one-way mirror. The therapist and both observers recorded the child's response on every trial. Each response was recorded as correct, prompted, or incorrect. Reliability between observers was measured by the number of agreements divided by the number of agreements plus disagreements per session. During extra-therapy trials in the outside setting, the original therapist and the naive observer independently recorded the child's responses. These observers recorded data from an adjacent building and could not be seen by the child. Reliability between observers was measured in the same way as during treatment. Reliability measures were obtained for each session. The average reliability was 99.4% for correct responses and 99.8% for incorrect responses (a range of 97% to 100% for individual sessions).

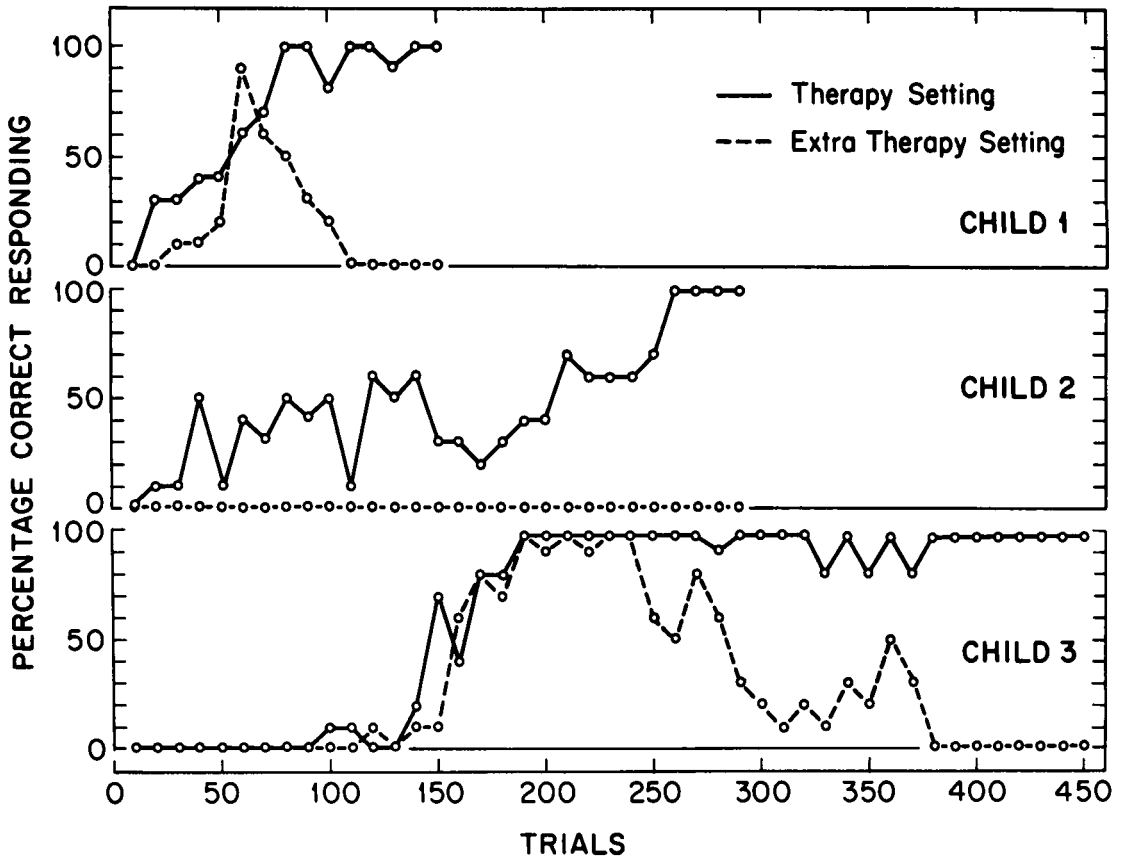

Fig. 1. Per cent correct responding measured concurrently in the therapy environment and the extra-therapy environment for each of the children in Experiment I.

Results

Figure 1 presents the results for each of the three children. The ordinate in each graph shows the per cent of correct responding and the abscissa shows blocks of 10 trials. The continuous line signifies responding in the therapy setting, and the dashed line represents responding in the extra-therapy environment.

All three children acquired the new behavior in the treatment room and correct responding was subsequently maintained at a high level in that setting. In addition, all three children showed 0% correct responding in the extra-therapy environment by the end of the experiment. There were, however, differences between the children. Child 1 and Child 3 initially responded in the extra-therapy environment, and then responding gradually decreased. For these two children, the behavior change acquired in the treatment setting generalized to the extra-therapy setting, but extra-therapy responding was not maintained. Child 2 *never* responded correctly in the extra-therapy setting. For this child, no generalization to the extra-therapy setting occurred. The upper portion of Table 1 presents a summary of the tasks, trials to criterion, and results for each child.

Discussion

The results of Experiment I suggest that there may be different kinds of deficits in extra-therapy responding. Specifically, Child 2 did not generalize to (*i.e.*, had no correct responses in) the extra-

Table 1

Description of task, trials to criterion during training, and performance in each generalization and maintenance condition for all children in both experiments.

			Sequence of Conditions			
	Task	*Trials to Criterion*	*Figure 1 Generalization vs. Maintenance*	*Figure 2 Sched. Reinf.: Trials to Extinction*	*Figure 3 Trials to Extinction after each NCR*	*Figure 4 Trials to Extinction with NCR Every 20 Trials*
EXPERIMENT I						
Child 1	"Touch your ears."	90	Generalization, no maintenance			
Child 2	"Touch your shoulders."	270	No generalization			
Child 3	"Do this." (touch nose)	200	Generalization, no maintenance			
EXPERIMENT II						
Child 4	"Do this." (raise arm)	137		CRF: 20		
Child 5	"Clap your hands."	322		FR 2:60	60, 40, 50, 0, 40, 0	
Child 6	"Do this." (clap hands)	234		FR 2:100	100, 30, 50, 70, 60, 20, 20, 0	
	"Touch your nose."*	190		FR 5: Indefinite		
Child 7	"Right," "Left."	351		FR 5: Indefinite		
Child 8	"Do this." (touch nose)	61				450
Child 9	"Do this." (cross arms)	124				550

*For Child 6, training and testing with "Touch your nose" occurred after training and testing with "Do this" (clap hands).

therapy setting. The two remaining children did generalize, but responding was not maintained in the extra-therapy setting.

Perhaps the important point to be made by this experiment is that separate deficits in generalization or maintenance are measurable. In previous research in this area, authors have usually assessed generalization to extra-therapy settings after acquisition in the therapy setting. In this case, it is often impossible to know if deficits in extra-therapy responding are a problem of generalization or of maintenance. This is illustrated in Figure 1. After treatment, all three children showed 0% correct responding in the extra-therapy environment. However, this apparently similar end result actually reflected two different problems (one in generalization and one in maintenance). Without continuous measures during and after training, in both the therapy and the extra-therapy settings, it would have been impossible to detect or differentiate the different trends in responding found for these children.

The distinction between the generalization and the maintenance of behavior change becomes quite important if deficits in these areas have different treatment implications. The variables that influence generalization may be different from those that influence maintenance and, as a result, a problem of generalization may require quite different treatment procedures than a problem of maintenance.

In a previous study (Rincover and Koegel, 1975), we investigated the problem of generalization. Ten autistic children were taught a new behavior in one setting and their responding was recorded in an extra-therapy environment. Four of the children showed no generalization to the posttreatment setting. For these children, the problem of generalization turned out to be a problem of stimulus control. Specific changes in the stimulus settings were identified that resulted in the generalization of behavior change for each child. However, the other six children did generalize, with no intervention in the extra-therapy setting. The question raised at the end of that study was: when generalization is found, will extra-therapy responding be maintained over time? In Experiment I of the present study, it was found that extra-therapy responding was not maintained. For the two children who did generalize (Child 1 and Child 3), extra-therapy responding was found to extinguish after a relatively short period of time. Therefore, Experiment II was designed to assess variables that might influence the maintenance of extra-therapy responding.

EXPERIMENT II

The failure of extra-therapy responding to be maintained over time may be viewed, in some respects, as the child learning a discrimination between an environment where contingent reinforcers are given and one where few contingent reinforcers are given. Viewed in these terms, it is possible that manipulation of variables that reduce the discriminability of the reinforcement schedules in these environments would produce more durable responding in extra-therapy settings (Bandura, 1969). In this experiment, two variables were manipulated: (a) the schedule of reinforcement in the treatment environment, and (b) the presence of noncontingent reinforcers in the extra-therapy environment.

METHOD

Subjects

Six male children, all of whom had participated in previous research on generalization (Rincover and Koegel, 1975), had each showed generalized responding in the extra-therapy setting in that study. Although the children were working on different tasks and had different therapists, only a few months had elapsed, and it was anticipated that they would also show generalization in this study. As a result, these children seemed ideally suited for the study of the maintenance of extra-therapy responding.

Except for their previous participation in research, these children were very similar to the

children in Experiment I. Each had been diagnosed as autistic by agencies not associated with this project, and they all resided in an institution at the time of this study. All were either mute or echolalic, displaying no appropriate contextual speech. Each child engaged in a great deal of self-stimulatory behavior and was minimally responsive to instruction. Three children were untestable on the Stanford-Binet IQ test. The remaining three achieved IQ scores of 19, 27, and 35. On the Vineland Social Maturity Scale, five children were placed below the 3-yr level; the other child was placed at 3 yr, 10 months. The average chronological age was 10.2 (range 7.5 to 12.5 yr).

General Procedure

The selection of target behaviors was identical to that described in Experiment I. However, in Experiment II, we did not alternate the training and extra-therapy trials. Since we were concerned only with maintenance in this experiment, all extra-therapy trials took place *after* a child had completed training. The data in Figures 2, 3, and 4 refer only to these extra-therapy trials, and can be considered analogous to measures of the behavior of a child after discharge from a treatment program.

The sequence of procedures is shown in the lower portion of Table 1. Initially, we investigated the effect of different schedules of reinforcement in the training setting on maintenance in the extra-therapy setting. Procedures for assessing the effects of noncontingent reinforcers on maintenance were not introduced until after the schedule effects were assessed. These procedures are described in detail below.

Assessment of scheduling effects. Since thinning the reinforcement schedule during treatment would make the treatment environment more similar to the extra-therapy environment (where no contingent reinforcement was given), several different schedules were assessed. After acquiring a behavior, each child was given additional trials on one of three randomly assigned schedules of reinforcement: either CRF, where every correct response was reinforced; FR 2, where every other correct response was reinforced; or FR 5 where every fifth correct response was reinforced. The procedure for thinning the schedule of reinforcement from CRF was as follows. After a child reached criterion (10 consecutive responses) on CRF, the teacher then reinforced every second correct response (FR 2). When the child reached criterion on FR 2 (10 consecutive correct responses), every third correct response was reinforced. This procedure continued until the teacher achieved the predetermined schedule of reinforcement (CRF, FR 2, FR 5) for that child. However, it is notable that one child (Child 6) received training with an FR 2 schedule on the first behavior, and, subsequently, an FR 5 schedule on the second behavior. The lower portion of Table 1 shows the target behaviors, schedules of reinforcement, and trials to criterion for each child.

After completing the training trials, a child was taken to the extra-therapy setting (described in Experiment I), where a stranger presented trials with the same instruction used in the treatment room. To assess the durability of responding, trials were conducted in the extra-therapy setting until correct responding either decreased to 0% or was maintained at 80% or above for at least 100 consecutive trials.

Assessment of the effect of noncontingent reinforcement in the extra-therapy environment. Another method of making the extra-therapy environment more similar to the treatment environment is to have reinforcers presented in the extra-therapy environment. This was accomplished in two ways (see Table 1). (1) After completing the above assessment of scheduling effects, two children (Child 5, Child 6) remained in the posttreatment environment, where noncontingent reinforcers were periodically presented. For these children, a noncontingent reinforcer was presented after extinction had occurred (*i.e.,* after 10 consecutive incorrect trials in the extra-therapy environment). Ten seconds after the last (incorrect) trial, the stranger reached into his pocket and presented the child

with a piece of candy. The purpose of this procedure was to determine whether the reinforcer had acquired discriminative stimulus properties (Ayllon and Azrin, 1966; Holz and Azrin, 1961; Holz and Azrin, 1962) and would serve to recover correct responding in subsequent trials. (2) Two other children (Child 8 and Child 9) were taught new behaviors, and then noncontingent reinforcers were presented after every 20 trials in the posttreatment environment. After 20 (40, 60, *etc.*) trials, the stranger waited 10 sec and then presented the child with a piece of candy. After the candy was consumed, additional trials were presented. The candy was presented whether the child's previous responding was correct, incorrect, or off-task. The purpose of this procedure was to determine if the use of noncontingent reinforcers would increase the durability of extra-therapy responding.

RESULTS

Reliability measures were obtained in exactly the same manner as in Experiment I. The average reliability for these sessions was 97.8% (range: 85% to 100%).

As noted above, all six children in Experiment II were selected because they were "generalizers" in a previous study. The present results show that all six children again generalized their behavior to an extra-therapy environment; however, the maintenance of extra-therapy responding was influenced by several variables.

Assessment of schedules of reinforcement. Figure 2 shows the effect of using different schedules of reinforcement in the therapy environment, on the maintenance of extra-therapy responding. Per cent correct responses are presented on the ordinate and blocks of 10 trials are presented on the abscissa. The data show that all four children initially generalized to (responded correctly in) the extra-therapy environment. However, when a CRF schedule was used (Child 4), extra-therapy responding extinguished within 20 trials. Furthermore, during

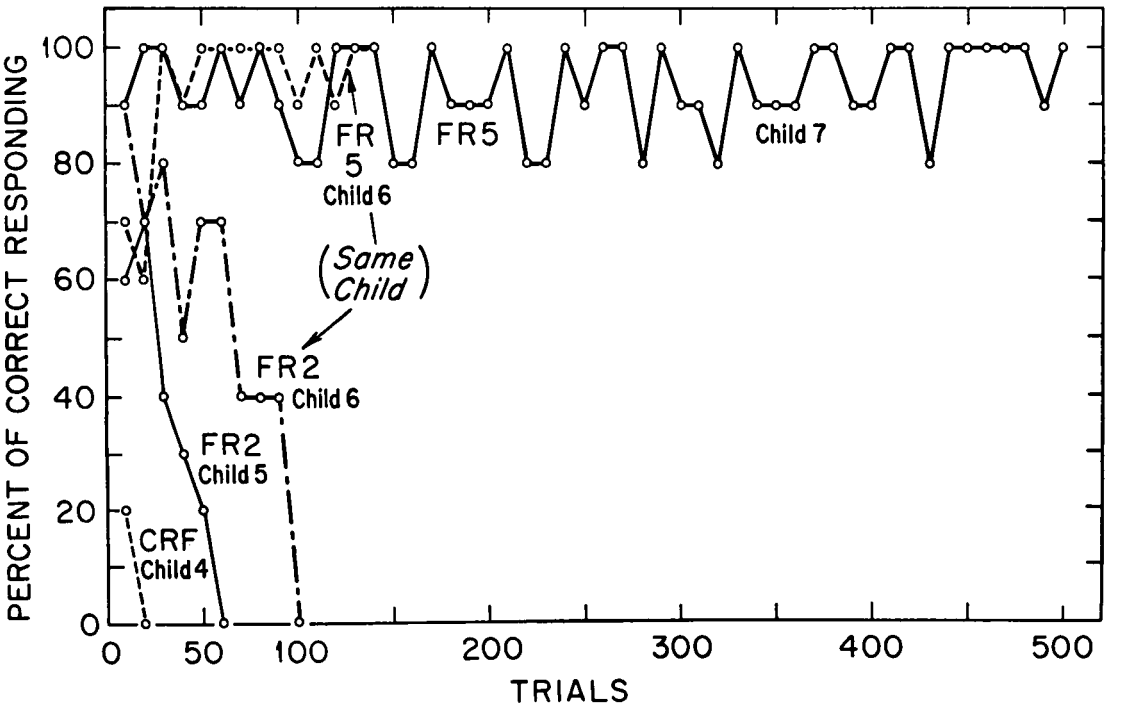

Fig. 2. Per cent correct responding in the posttherapy environment when different schedules of reinforcement (every response reinforced = CRF, alternate responses reinforced = FR 2, and every fifth response reinforced = FR 5) were used during the final stage before treatment was completed in the original therapy environment.

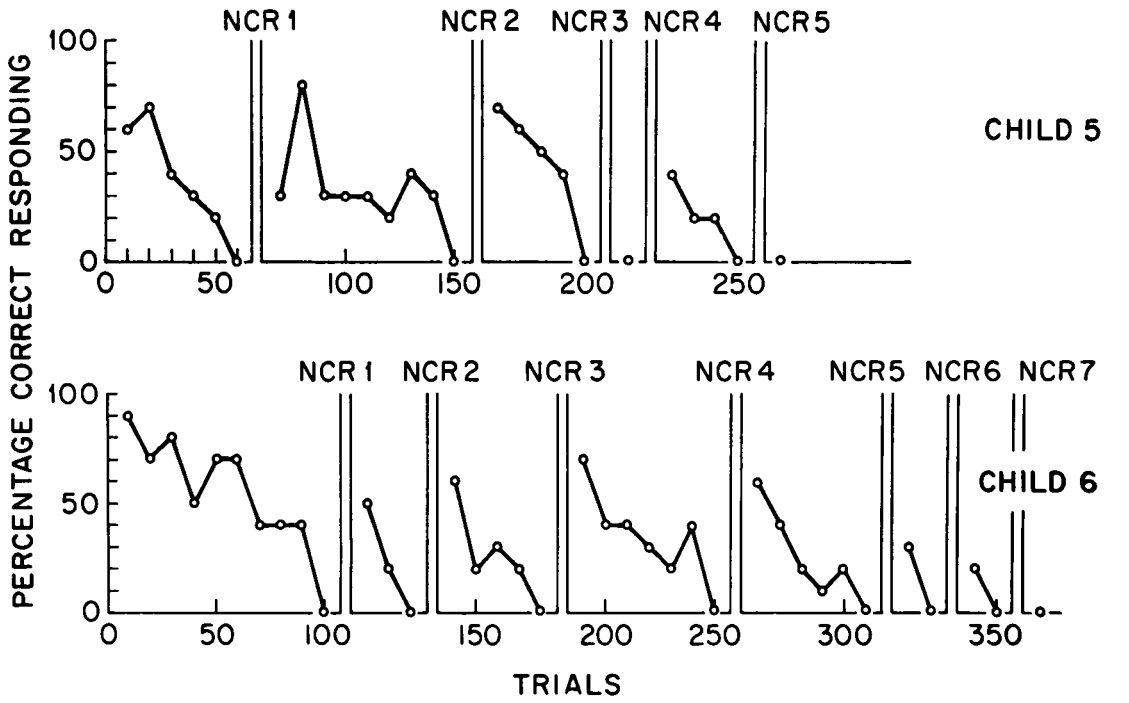

Fig. 3. Per cent correct responding in the posttherapy environment when noncontingent reinforcers (NCR's) were presented after extinction. Both children were on the same (FR 2) schedule of reinforcement in the original treatment environment.

those 20 trials, only two correct responses occurred. When an FR 2 schedule was used, extra-therapy responding was maintained over a longer period of time. Child 5 continued to respond for 50 trials, and made 22 correct responses. Child 6 responded for 90 trials, and made 55 correct responses. When an FR 5 schedule was used, extra-therapy responding was generally maintained at or above 80% correct, with no signs of extinction. Child 6 responded for 140 trials, made 130 correct responses. The sessions for Child 7 were continued for 500 trials, the child made 465 correct responses with no evidence of extinction. It is notable that these results occurred even when different schedules were used with the same child (Child 6).

In summary, Figure 2 shows that when generalization occurred to the extra-therapy setting, manipulation of schedules of reinforcement in the treatment setting had a predictable effect on the maintenance of this generalized responding. The thinner the schedule of reinforcement during treatment, the more extra-therapy responding.

Noncontingent Rewards (NCR). Figure 3 shows the results of giving a noncontingent reward after extinction (*i.e.,* 10 consecutive trials with no correct responses) in the extra-therapy setting. Looking at the upper graph (Child 5) first, one can see that responding originally extinguished within 60 trials in the extra-therapy setting. When a noncontingent reward was then presented, extra-therapy responding was recovered. Correct responding initially increased to a high of 80% (Trials 71 to 80), and then continued at a decreased rate until responding eventually extinguished after 90 trials. During this time, a total of 29 correct responses were observed. When a second noncontingent reward was then provided, extra-therapy responding was again recovered. Correct responding initially increased to 70%, and a total of 22 correct responses were observed over 50 trials. When a third noncontingent reward was presented, no

correct responses occurred during the following 10 trials (Trials 201 to 210). However, when a fourth noncontingent reward was given, a low rate of correct responding again occurred over the next 40 trials. The fifth, and final noncontingent reward did not produce any extra-therapy responding.

The results of using noncontingent rewards with Child 6 are similar. After the first noncontingent reward, correct responding increased to 50%, and then extinguished after a total of 30 trials. When a second noncontingent reward was provided, correct responding increased to 60%, and then gradually extinguished over a total of 50 trials. Extra-therapy responding was again recovered after a third noncontingent reward, initially increasing to 70% (Trials 181 to 190) and then continuing at a decreasing rate, for a total of 70 trials. A fourth noncontingent reward recovered a high rate of extra-therapy responding, which extinguished in 60 trials. Subsequent noncontingent rewards produced minimal responding until the seventh noncontingent reward, which produced no correct responses.

Figure 4 shows the results of presenting a noncontingent reward after every 20 trials in the extra-therapy setting. For all four children, an FR 2 schedule of reinforcement was used in the treatment room. However, only two children received the noncontingent reward after every 20 extra-therapy trials. Initially, all four children showed high rates of correct responding in the extra-therapy setting. In the first 10 trials, 90% correct responding was found for three children, and 60% for the fourth child. However, in succeeding trials, extra-therapy responding was more durable for the two children who received noncontingent rewards. The two children not receiving noncontingent rewards extinguished within 60 trials and 100 trials, respectively. The two children receiving noncontingent rewards continued to respond for 540 trials and 440 trials in the extra-therapy setting. In short, the use of noncontingent rewards in this condition increased the durability of extra-therapy responding substantially.

Discussion

This experiment assessed variables that influence the maintenance of extra-therapy responding. The results showed the following. First, the thinner the schedule of reinforcement used in the treatment setting, the greater the maintenance of treatment gains in extra-therapy settings. Second, the intermittent use of noncontingent reinforcers in the extra-therapy settings served to increase further the durability of treatment gain.

The results suggest that it may be possible, during treatment, to plan for behavior changes that are maintained indefinitely after treatment is terminated. The data suggest that this might be accomplished by reducing the discriminability of the reinforcement schedules used in the therapy and extra-therapy settings. If an extremely thin schedule of reinforcement is used in the therapy setting, it is possible that naturally occurring noncontingent reinforcers in extra-ther-

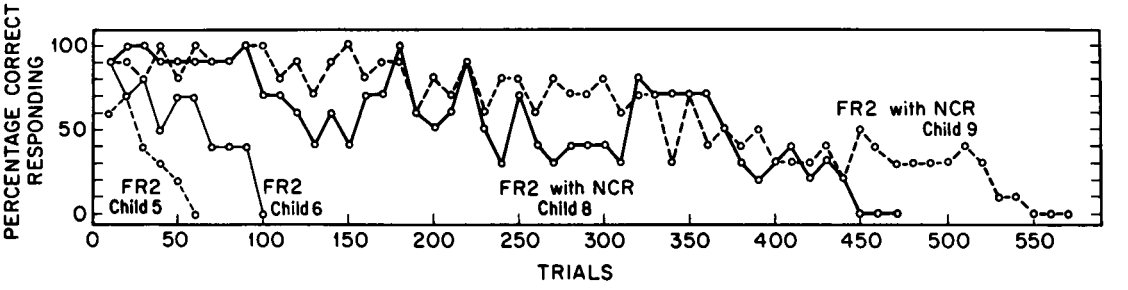

Fig. 4. Per cent correct responding in the posttherapy environment when no reinforcers were presented in the posttherapy setting, and when noncontingent reinforcers (NCR's) were presented after every 20 trials in the posttherapy setting. All four children were initially trained with an FR 2 schedule.

apy settings may serve to maintain the behavior indefinitely.

The development of maintenance procedures that can be used in the treatment setting would seem to be advantageous over maintenance programs that must be conducted in posttherapy settings. A host of possible problems arise when one has to intervene in extra-therapy settings (by training teachers, peers, parents, *etc.*) to produce maintenance. For example, what happens when, at a later time, the child acquires new peers, is placed in a different classroom with a new teacher, *etc.*? These changes are, of course, inevitable.

Previous research on "superstitious" behavior (Herrnstein, 1966; Morse and Skinner, 1957; Skinner, 1948) suggests that noncontingent reinforcement may produce extremely durable behavior change. In the present experiment, noncontingent reinforcers were manipulated and found to be successful in increasing the durability of behavior change. It is notable that the behavior found is quite similar to superstitious behavior described by Herrnstein (1966, p. 36, p. 46). In both cases, reinforcers were first delivered contingent on a predetermined response, and then reinforcers were delivered noncontingently.

GENERAL DISCUSSION

Experiment I presents two different kinds of deficits in extra-therapy responding. The data showing no correct responses in the extra-therapy setting were labelled a problem of generalization. The data showing initial correct responding in the extra-therapy setting, and then subsequent extinction, were labelled a deficit in maintenance. It was thought that this distinction would be important if a problem in generalization had different treatment implications than a problem of maintenance. Therefore, Experiment II investigated variables that may influence the maintenance of behavior change in extra-therapy settings.

The data showed that treatment gains were not very durable in extra-therapy settings under normal training conditions (*i.e.*, terminating the treatment immediately after acquisition of the correct response). For maintenance to occur, it had to be specifically programmed into the treatment procedures. Two procedures were assessed and found to be effective in increasing the maintenance of behavior changes. First, the thinner the schedule of reinforcement used in the treatment setting, the greater the durability of behavior change in extra-therapy settings. Second, the periodic use of noncontingent reinforcers in the extra-therapy settings served further to increase the durability of treatment gains. Both of these results were replicable within and across children.

The results suggest that deficits in generalization and maintenance in extra-therapy responding may have different treatment implications. A previous study (Rincover and Koegel, 1975) was designed to investigate the generalization of treatment gains in autistic children. In that study, the problem of generalization was found to be a problem of antecedent stimulus control. When the antecedent stimulus that was functional during training was identified and introduced into the extra-therapy setting, generalization occurred for each child. The present study focused on another parameter of extra-therapy responding: the maintenance of extra-therapy responding. Maintenance was found to be influenced by both reinforcement control (Figure 2) and the discriminative stimulus properties of reinforcement (Figures 3 and 4). When the discriminability of the treatment and extra-therapy schedules of reinforcement was reduced, the behavior changes were more durable in extra-therapy settings.

It should be noted that this study was conducted in a laboratory setting approximating clinical conditions. For example, in this study, only one or two behaviors were measured for each child, while there are always a variety of behaviors and reinforcement schedules occurring concurrently in the natural environment. The extent of the external validity of the present re-

sults, as with all laboratory analogue research, is an empirical question that awaits direct investigation in more complex settings.

The results, however, clearly imply that one should be cautious not to confound generalization data with maintenance data. Further, the results show that, in fact, these two types of extra-therapy responding are separable and measurable. Since the majority of literature in this area reports that generalization and maintenance of treatment gains are the exception rather than the rule, the independent assessment of generalization and maintenance may be an important step in the development of a "technology of behavioral persistence" (Atthowe, 1968).

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