

## ***Experimental manipulation of autistic behaviors and generalization into the home***

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In a study reported by Wolf, Risley and Mees (1964<sup>1</sup>) describing the procedures used to instate normal behaviors in an institutionalized autistic child, we collected no systematic data in two important areas—the establishment of speech, and the training of the parents to work with their own child. In recent work we have explicitly investigated these two areas. I will report here on one of the subsequent children with whom we have worked, using operant conditioning procedures.

This is a six-year-old autistic child, who exhibited bizarre mannerisms and echolalia, and was withdrawn and inactive with no appropriate verbal behavior. The child lived at home and was brought to the Developmental Psychology Laboratory at the University of Washington in a state of mild food deprivation each weekday by his mother.

### **SPEECH TRAINING**

Using bites of ice cream as a reinforcer, appropriate mimicking, then naming of pictures, and then appropriate phrases and sentences were established in these daily sessions. In the first session the subject was reinforced for imitating the word "ice cream." The experimenter said the word several times a minute. Since the child would occasionally echo novel sounds, within the first minute he repeated "ice cream." The experimenter then said "very good" and gave him a bite of ice cream. The mimicking of this word occurred at a low, stable rate throughout the session (from start to point a in Figure 1). However, the pairing of the words "very good" with the reinforcer

served to establish a high rate of the subject saying "very good, very good" (Figure 1). This paradigm of increasing the probability that the subject will produce a sound, simply by pairing that sound with reinforcement, perhaps is functional in maintaining the subject's echolalia.

In the next session, beginning at point a in Figure 1, a picture of a train was introduced and the word "train" was repeated by the experimenter. The subject mimicked this novel word once and was reinforced. After a long delay during which the subject began repeating "ice cream, ice cream" and tantruming, he again mimicked "train." After this, the rate of mimicking the word rapidly increased.

At point b in Figure 1, three other words (flower, car, and airplane) were introduced. The subject mimicked each word appropriately the first time it was presented and at each further presentation. Thus, in slightly more than an hour we had established the general behavior class of appropriate mimicking.

From point b to point c in Figure 1, pictures of a train, flower, car, and airplane were held out one at a time, and the subject was required to look at each picture before the experimenter said the name. The subject quickly began attending to the pictures, which indicated that the experimenter's saying the word (which was discriminative for the subject to mimic it and be reinforced) had become a reinforcer.

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<sup>1</sup> Pages 187–193 of this volume.

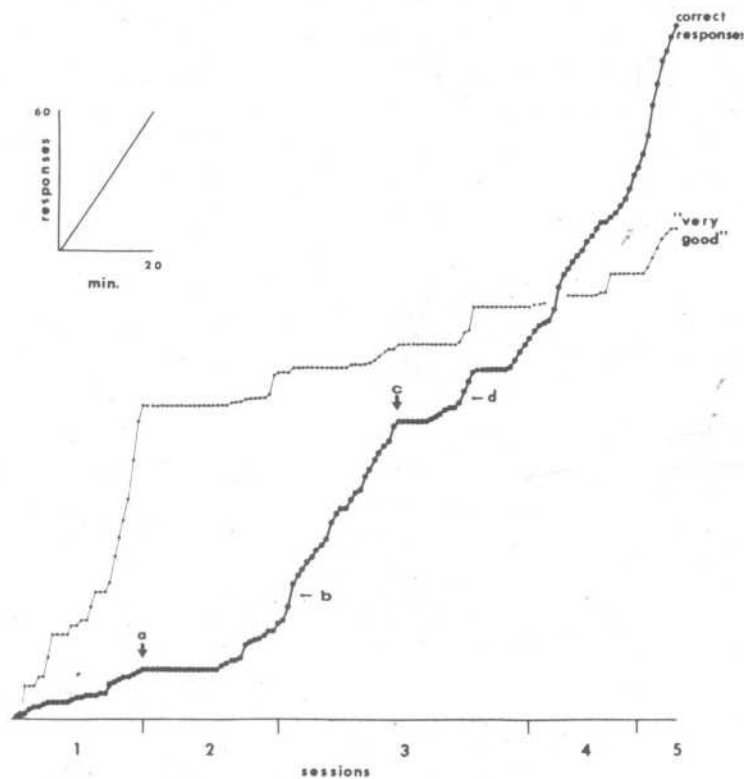
Just before point c in Figure 1 the experimenter began delaying naming the picture, requiring a longer period of attending by the subject. This was to increase the probability that the subject would name the picture instead of mimicking the experimenter. At point c the subject began to tantrum during an especially long delay. The experimenter merely sat quietly holding the picture toward the subject. The tantrum gradually subsided, and the subject again attended to the picture—and promptly named it. After this he named the picture with increasing speed with each presentation.

At point d the picture of the airplane was reintroduced. The subject immediately said "car." The experimenter said "No, airplane." The subject mimicked "airplane" and correctly named the picture on the next presentation. The other two pictures were then reintroduced and the subject correctly named each after a single prompting. After this he correctly

named the four pictures when each was presented. Thus, in an additional hour, the general behavior class of naming objects was established.

After a high rate of naming the four pictures had been established, the procedures were altered to experimentally isolate the function of the contingent delivery of the ice cream. At the first arrow in Figure 2 the ice cream was given randomly, which resulted in only an occasional bite immediately following naming one of the pictures. At the second arrow the ice cream was again given only contingent upon naming the pictures. Throughout these reversals, the experimenter continued to say "very good" contingent upon naming the pictures.

The random delivery of ice cream resulted in an immediate decrease in the rate of naming from 7.5 to 3.1 responses per minute. As the random reinforcement procedure continued, the rate gradually declined further to



**Figure 1.** A cumulative record of S1's initial acquisition of appropriate verbal behavior. The heavy line represents correct imitations or naming. The fine line represents S1's frequency of repeating the verbal reinforcer. From the start to point a, S1 was reinforced for mimicking 'ice cream.' At point a, a picture of a train was introduced and S1 was reinforced for mimicking 'train.' At point b, 3 other pictures were introduced and S1 was reinforced for mimicking the names of each. At point c, S1 was reinforced for naming rather than mimicking one of the pictures. At point d, the other 3 pictures were again introduced and S1 was reinforced for correctly naming each.

1.9 responses per minute. When the contingent delivery of ice cream was resumed, the rate rapidly increased to 9.8 responses per minute. This reversal demonstrates that the contingent delivery of the ice cream, rather than other variables in the situation, served to maintain the naming behavior. After this reversal, more complex phrases and sentences were established in the experimental sessions.

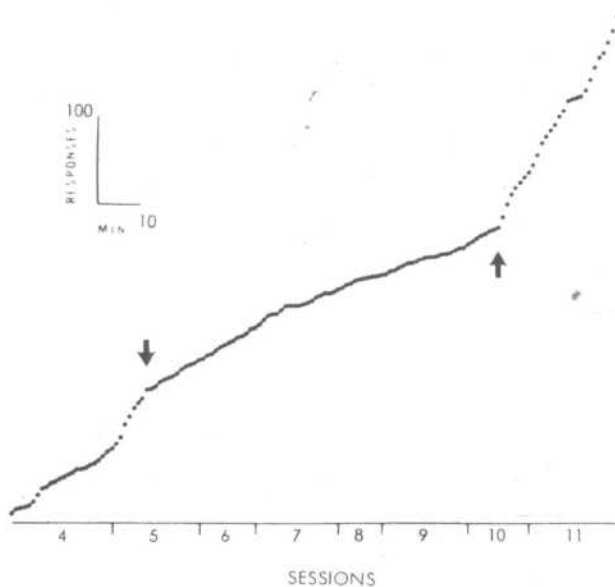
After appropriate mimicking had been established in the experimental sessions, mimicking could be used to instigate appropriate verbal behavior in other situations. For example, opening the doors to and from the experimental room was used to reinforce the comment, "out (or in) the door." The experimenter would say "out the door," the subject would mimic this, and the door would be opened. After several trials on succeeding days, the experimenter began fading out his verbal prompt, only saying "out the—," and the subject continued to say "out the door." This fading progressed until the experimenter would only put his hand on the doorknob and look at the subject, and the subject would say "out the door." The experimenter then faded in the question "Where are you going?" first by mumbling it softly as they approached

the door and then increasing the volume on succeeding trials. If the subject mimicked the question, the experimenter would repeat the question at a lower volume and follow it with a prompt for the appropriate response: "Where are you going? Out —" This would usually generate the appropriate response "Out the door." The prompt "Out —" was then faded until the subject would respond to the closed door and the question "Where are you going?" with the statement "Out the door."

This same procedure was used to establish appropriate answers to the question "Where are you going?" in each of the steps of going to and from the experimental room: "Up the stairs. In the door. Down the hall. In the room. Out the door. Down the hall. Out the door. Down the stairs. In the car." In each case, the reinforcer was simply being allowed to proceed out the door, down the hall, etc.

This technique of giving a prompt for the subject to imitate and then fading out the prompt was used to establish appropriate responses to many other questions such as:

"What's your name?" "My name is (name)."  
 "What do you want?" "I want some ice cream."  
 "Hello, (name)." "Hello, Mr. Risley."



**Figure 2.** A cumulative record showing the effects of delivering the food reinforcement non-contingent on naming pictures. At the first arrow the food reinforcers were randomly presented. At the second arrow the food reinforcers were again made contingent upon correctly naming pictures. Each dot represents a 1 min. period.

Since new responses were established more quickly to each new question, the subject apparently began to discriminate the subtle stimuli of inflection and volume as cues for which phrases to mimic.

#### PARENT TRAINING

The mother had periodically observed these sessions from behind a one-way screen. After the child was brought to the point where the imitative paradigm was effective in establishing new verbal behavior, the mother was trained to take over the job of rehabilitating her child.

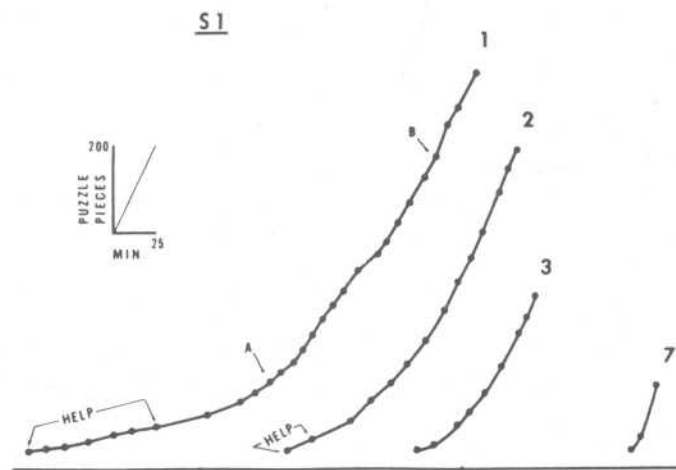
First she was given the relatively easy task of teaching the child to put puzzles together. A series of large plywood puzzles each with four or five isolated figures were used. Sessions were held in the home in the late afternoon, with bites of ice cream as the reinforcer. The mother was instructed on the general procedure and coached by the experimenter during the first session. After this the experimenter would observe occasional sessions. The mother recorded the number of puzzle pieces completed and total time of each session.

During the initial sessions the mother expressed concern that the stated goal of the

child putting all the pieces in the puzzle (without assistance) for each bite of ice cream, was an impossible one. She commented that the only way she was getting him to do *anything* was by continuously prompting and assisting him. Therefore, after the sixth session she was instructed to stop all urging and assistance and to do nothing except to reinforce each successful fitting of a puzzle piece. The rate then began to increase. At the first arrow in Figure 3, the mother was instructed to reinforce every other response. When the rate had increased markedly with this fixed-ratio 2 schedule, the mother was instructed to lean out the schedule still more. At the second arrow the final schedule, of a reinforcer only contingent upon assembling the complete puzzle, was begun.

The next puzzle (number 2 in Figure 3) was started with this reinforcement schedule. The mother assisted the child only for the first few pieces and then stopped on her own initiative. The rate steadily increased from session to session.

The third puzzle (number 3 in Figure 3) was introduced with no assistance as were the fourth, fifth, sixth, and seventh puzzles. By the seventh puzzle (number 7 in Figure 3) the child's behavior showed almost no decrement



**Figure 3.** Cumulative records of successive improvement in S1's rate of assembling a series of puzzles in sessions at home. Each number indicates the ordinal position of each puzzle in the series. Each dot indicates the end of a daily session. The periods labeled 'help' indicate where S1's mother assisted in placing the puzzle pieces. At A an FR2 schedule of reinforcement was begun. Reinforcement frequency was gradually decreased until, at point B and on all subsequent puzzles, a reinforcer was given only contingent upon completing a puzzle (FR or 5).

when a new puzzle was introduced, and a new puzzle could be assembled nearly as fast as an old one. At about this time the child also began fitting puzzles together by himself during play.

Through this experience the mother learned to rely on the reinforcer, rather than urging or prompting, to increase the child's behavior. She learned that the procedure was effective in establishing general classes of behavior in addition to those specific behaviors which were reinforced. And she learned that the effects of the procedures would generalize to new tasks and new situations.

The mother was then given a series of pictures, and, using the same procedures as had been used in the experimental sessions, she began teaching the child to recognize and name pictures. She would introduce new pictures when he was consistently naming all the pictures used during that session. A picture was considered learned when the child correctly named it the first time it was presented, three days in a row. Then it would be retired until ten subsequent pictures had been learned, at which time it would be re-presented to test for recall. Initially, two sessions a day were run with separate pictures for each session. With one set of pictures the reinforcer was praise ("That's right. Very good.") and a bite of ice cream. Only praise was used with the other set.

While praise alone was an effective reinforcer (dashed line in Figure 4), praise plus ice cream resulted in a 50 per cent greater rate of learn-

ing (solid line in Figure 4). However, words learned under both conditions were equally well recalled (bar graph in Figure 4).

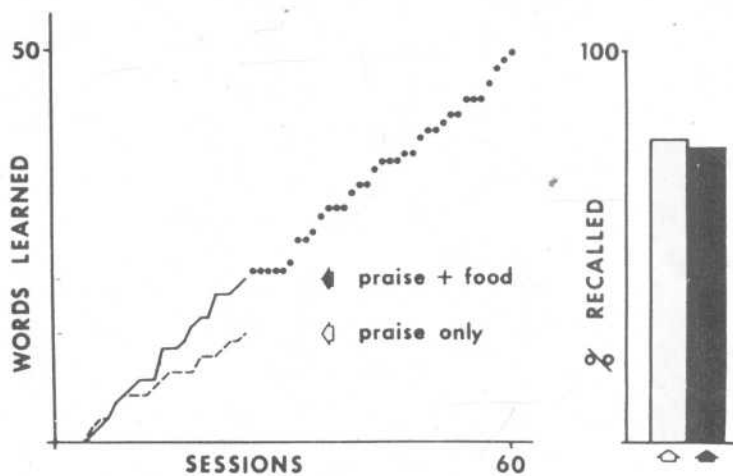
After this evaluation was made, only the sessions with ice cream were continued. The child learned approximately one new word per session with this reinforcer (dotted line in Figure 4).

In addition to simply expanding his naming vocabulary, this procedure was designed to establish the general skill of attending to small differences in printed matter which is a step in preparing him for academic materials.

Concurrent with these procedures, the parents had been recording instances of stereotyped chanting which had characterized much of the child's verbal behavior. The child would repeat a word over and over with increasing volume which would terminate in shrieks and crying. The parents could "turn off" this sequence at any point by simply attending to the child.

For example, the child, standing by the couch, would repeat "sit down, sit down," etc., which would terminate when the parents responded in any way ["Yes, (name)"; "O.K., sit down"; "You can sit down if you want to"; "Be quiet."].

Instead of reinforcing this behavior, the child was sent to his room contingent upon the shrieking and crying. This decreased the occurrences of the shrieking (solid line in Figure 5), but did not affect the rate of the stereotyped chanting (dotted line in Figure 5).



**Figure 4.** Records of the number of pictures learned and recalled in daily sessions at home under two reinforcement conditions. A picture was considered learned when S1 named it when it was first presented in three successive sessions. A picture was considered recalled when S1 named it when it was first re-presented after 10 subsequent pictures had been learned.

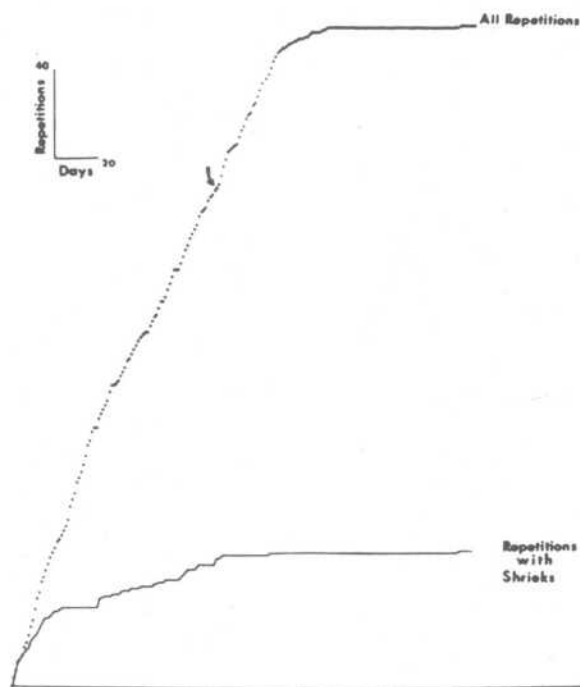
It was decided to change the form of these occurrences, rather than attempt to eliminate them, as there were elements of appropriate social behavior in these occurrences.

The parents were instructed to turn away from the child on these occasions. One parent (the father) would then call out the name of the other parent ("Mommy") and the child would mimic this, at which point the other parent (the mother) would reinforce the imitation by attending to the child and saying, "Yes, (name)?" The first parent would then say a complete sentence ("I want to sit down, please.") which the child would mimic. The other parent would again reinforce the imitation by responding accordingly, "Oh, you want to sit down. Well, you can sit down right here." On subsequent occasions the verbal prompts were faded out and the parents would withhold reinforcement by looking away until the child called their names and would wait while looking at the child until the complete sentence was emitted before responding to his request.

This procedure was begun at the arrow in Figure 5. The stereotyped chanting soon decreased to zero, as the child began to initiate more appropriate requests such as "Mommy, I want to sit down, please."

The explicitness and effectiveness of operant conditioning procedures enables parents to contribute significantly to the rehabilitation of their deviant children with only a minimum of training. Of the seven sets of parents with which we have attempted similar programs, all have been effective and all are now conducting the major part of the rehabilitation of their children.

It is apparent that the child's initial echolalic behavior was crucial to the rapid establishment of appropriate verbal behavior. Other work by the present authors and others (Sherman, 1964) indicates that it is much more difficult to establish a mimicking repertoire in a mute individual than to bring already present mimicking behavior under the control of appropriate discriminative stimuli, as was done in this study.



*Figure 5. A cumulative record of the frequency of S1's stereotyped chanting at home. At the arrow S1's parents began establishing appropriate behaviors incompatible with chanting.*