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Control of Echolalic Speech in Psychotic Children[1]

Edward G. Carr,[2] Laura Schreibman, and O. I. Lovaas
University of California, Los Angeles, and Claremont Men's College

Immediate echolalia, a common language disorder in psychotic children, was studied in a series of replicated single-subject designs across six schizophrenic and five normal children. In Experiment 1, each child was presented with several questions and commands, some of which set the occasion for specific, appropriate responses and some of which did not. The former were referred to as discriminative stimuli and the latter, as neutral stimuli. The psychotic children tended to echo the neutral stimuli while responding appropriately to the discriminative stimuli; the normal children, in contrast, typically echoed neither type of stimulus. In Experiment 2, three psychotic children were taught appropriate responses to each of several neutral stimuli. Following this training, the children generally responded appropriately to these stimuli without echoing. A plausible interpretation of these results is that the neutral stimuli were initially incomprehensible or meaningless to the children (whereas the discriminative stimuli were comprehensible or meaningful) and that verbal incomprehensibility may be one important determinant of immediate echolalia. Finally, the results are noteworthy in that they isolate a sufficient *treatment variable (i.e., the reinforcement of alternative, nonecholalic responses) for eliminating instances of this language anomaly.*

Persistent echolalia is frequently used as a diagnostic criterion for autism and childhood schizophrenia. This speech anomaly takes two forms. In *delayed echolalia* the child will repeat, at an inappropriate time or place, statements he has

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[2] Requests for reprints should be sent to Edward Carr, c/o Lovaas Laboratory, Department of Psychology, University of California, Los Angeles, California 90024.

heard in the past. For example, a child, while seated at dinner, may suddenly repeat phrases from a television commercial he has heard several days before. In *immediate echolalia* the child will repeat all or part of what someone has just said to him. For example, an adult may ask the child, "What's your name"? to which the child will respond, "What's your name"? The present paper is concerned with this latter type of echolalia.

Immediate echolalia is of considerable interest to the therapist because it can interfere with the development of effective communication. For example, the child who echoes his teacher's commands rather than carrying them out is unlikely to learn in a classroom situation. The child who echoes his parents' expressions of affection rather than responding affectionately is unlikely to develop appropriate social relationships.

To date there have been few experimental studies conducted dealing with the problem of echolalic speech. Risley and Wolf (1967) and Lovaas, Koegel, Simmons, and Long (1973) were able to teach echolalic autistic children simple object-labeling, abstract speech, and later, the use of sentences by a combination of prompting techniques and timeout or punishment. These gains in appropriate speech were accompanied by decreases in the frequency of echolalic speech. Although these studies provide useful information about how to help echolalic children to use language appropriately, knowledge about what stimulus variables might be important in controlling echolalia remains scarce.

There are considerable observational data which suggest that those psychotic children who are echolalic possess few language skills (Wolff & Chess, 1965; Cunningham, 1968; Fay & Butler, 1968; Fay, 1969). A plausible implication of this finding is that echolalic speech may represent a general response strategy which the child employs in the many communication situations in which he cannot respond more appropriately. The child's response strategy may be as follows: "If confronted with a verbal stimulus to which you *can* respond, give the appropriate response; if confronted with a verbal stimulus to which you *cannot* respond, *echo* the verbal stimulus." If the children do have such a response strategy, it should be possible to construct an experimental analog of echolalia. The two studies reported herein are such an attempt.

In the first experiment, we assessed the amount of echolalia which schizophrenic children showed in response to *neutral* and *discriminative* stimuli, respectively. We defined a neutral stimulus as one to which no appropriate response existed. A discriminative stimulus was defined as a stimulus which set the occasion for an appropriate response.

Having made our initial assessment, we proceeded in the second experiment to make the neutral stimuli discriminative by training the child to make a specific appropriate response to each of the neutral stimuli. We then measured the amount of echolalia which each child showed to the previously neutral stimuli to see if our training intervention reduced the frequency of echolalic speech.

METHOD – EXPERIMENT 1

Five echolalic psychotic children and five normal children were each presented with discriminative and neutral stimulus phrases. The discriminative stimulus phrases called for either an appropriate verbal or an appropriate nonverbal response. The percentage of echolalic responses made to each of the two types of stimuli was measured for each group of children.

Subjects

We ran two groups of children. The children in the first group were all diagnosed as schizophrenic by agencies not associated with this study. This group consisted of three boys and two girls, with a mean chronological age (CA) of 12.2 years (range 10–15 years). The mean mental age (MA), taken from the Peabody Picture Vocabulary Test, was 3.6 years (range 2–5 years). All of the children exhibited both delayed and immediate echolalia but had very little appropriate, expressive speech. Their appropriate speech was limited almost exclusively to simple verb–noun combinations generally pertaining to physical needs (e.g., "want cookie" or "go potty"). All of the children had poorly developed receptive speech. Four of the children (Marni, Blake, Dean, and Gary) could obey simple commands such as "Pick up your clothes" or "Bring me the chair." One of the children (Ruby) functioned at a level below that of the other children. She could obey only the most simple commands such as "Come here" or "Sit down." None of the children could respond appropriately to complex demands involving abstract terms such as prepositions, pronouns, or time. All of the children were socially withdrawn and frequently exhibited self-stimulatory behaviors such as rocking and hand-gazing.

The second group consisted of five normal children (three girls and two boys) with a mean CA of 2.8 years (range 2.1–3.7 years). These were children of friends of the authors working at the university.

Stimulus Materials

A total of 20 stimulus phrases were selected for use in this study. These stimuli were equally divided into two categories labeled discriminative and neutral. Discriminative stimuli were defined as stimuli to which some appropriate verbal or nonverbal response existed (e.g., "What's your name?" and "Touch your head," respectively). Neutral stimuli were defined as stimuli to which no appropriate verbal or nonverbal response existed (e.g., the stimuli "off plot" and "min dar snick").

Half of the discriminative stimuli called for a nonverbal response. These stimuli were combined with half of the neutral stimuli to form the *nonverbal*

Table I. List of Discriminative and Neutral Stimuli Used in the Verbal and Nonverbal Response Tasks for the Psychotic and Normal Children -- Experiment 1

Discriminative stimuli	Neutral stimuli
Verbal response task	
Are you good?	Bot ni ork
What's your name?	Gin ra moo
What is this?	Min dar snick
What color is this?	Dit kalat es blit
How are you?	Tas poo grot
Nonverbal response task	
Drink the water.	Fop vit gerpy
Stand up.	Off plot
Touch your head.	Blat ver shot
Clap your hands.	Mon dok ped
Give me the ball.	La kels bes chern

response task. The remaining half of the discriminative stimuli called for a verbal response and these were combined with the remaining half of the neutral stimuli to form the *verbal response task.* Thus each of these tasks was composed of five discriminative and five neutral stimuli. Table I lists the stimuli which were used in the two tasks.

The discriminative stimuli of the nonverbal response task were selected as being those phrases to which the children were most likely to be able to respond appropriately. The nursing staff advised us that the children had had at least some training in responding appropriately to these stimuli and that the stimuli were often presented to the child in his everyday environment. The neutral stimuli were selected as being composed of sounds already in the child's expressive repertoire. Each neutral stimulus was matched with one of the discriminative stimuli on the basis of number of words in the stimulus phrase and the distribution of syllables among the words. For example, the neutral stimulus "fop vit gerpy" and the discriminative stimulus "Drink the water" are alike in that each stimulus has the same number of words (three) and the same distribution of syllables (first word: one; second word: one; third word: two).

The discriminative stimuli of the verbal response task were selected as being those to which the children could respond appropriately. These were stimuli often presented in the child's everyday environment and, again, we were advised by the nursing staff that the children had had some training on the phrases. The neutral stimuli for the verbal task were composed of sounds in the children's expressive repertoires and were matched with the discriminative stimuli on number of words and distribution of syllables.

Procedure

We employed a replicated single-subject design. Each child was tested in two sessions. One session involved presentation of the stimuli for the nonverbal response task and the other session involved presentation of the stimuli for the verbal response task. The order of tasks, verbal and nonverbal, was counterbalanced across children.

Each session consisted of the five discriminative stimuli and the five neutral stimuli in the task, presented in a semirandomized order such that each stimulus was presented a total of four times. In no instance were more than three discriminative or three neutral stimuli presented consecutively. Each session, therefore, consisted of 40 stimulus presentations with each child receiving a different order of stimulus presentations.

During each session the experimenter sat facing the child across a small table. The table was empty except during the nonverbal response task sessions in which objects which were required for the performance of the correct response to the discriminative stimuli were present (e.g., a ball and a glass of water). The experimenter delivered the stimulus only when the child was sitting quietly with hands on his lap and visually orienting to the experimenter's face. The stimulus was presented slowly and clearly. The experimenter was then silent and watched the child for 5 seconds. Any response by the child within this 5-second interval was recorded by the experimenter. The stimuli were presented 15–30 seconds apart.

In order to maintain the child's responding in the experimental sessions, food reinforcers and praise were delivered on an intermittent and noncontingent basis. The child received a reinforcer on the average of once every 3 minutes. The reinforcer was never presented immediately following the child's response to a task stimulus. Instead, the experimenter would wait for at least 10 seconds to elapse at the end of a trial and then would say, "Good sitting" or "Good looking" and give the child a small piece of candy. Care was taken to respond indifferently to any response that the child made to the task stimuli; that is, the experimenter presented the stimulus, watched for 5 seconds, and looked down to record the response. This procedure was adopted to reduce the possibility of inadvertently reinforcing responses to the task stimuli.

Response Recording and Reliability

Each response was recorded by the experimenter on a precoded data sheet. Another experimenter sat nearby and independently recorded the responses on an identical sheet. As previously described, any response by the child occurring within 5 seconds of the stimulus presentation was recorded. The responses re-

corded included (a) echolalia, (b) appropriate nonverbal response (for the nonverbal task), (c) inappropriate nonverbal response (for the nonverbal task), (d) appropriate verbal response (for the verbal task), (e) other (nonecholalic) verbal response. An echolalic response was scored if the child repeated *any part* of the stimulus. That is, whether the child echoed the entire stimulus phrase, or one word, or only one of the syllables, the response was scored as echolalia, provided that the child did not extend his answer to include the correct response. For example, if we asked Jimmy, "What's your name"? and he answered, "name, Jimmy," we would score this answer as appropriate, but if he answered only, "name," we would score this answer as echolalia. An appropriate nonverbal response was recorded if the child gave the correct response to the stimulus (e.g., drank water when presented with "Drink the water"). An inappropriate nonverbal response was scored if the child gave an incorrect nonverbal response (e.g., clapped his hands when presented with "Stand up"), or failed to respond within 5 seconds. An appropriate verbal response was scored if the child responded with the correct answer to a discriminative stimulus (e.g., answered, "Fine," when asked, "How are you"?). Any other nonecholalic verbal response was recorded as "other verbal" (e.g., the child said, "Okay," when asked, "Are you good"?).

Reliability checks were conducted on every session in the experiment. The data sheets of the experimenter and the independent observer were compared and reliability was computed by dividing the number of agreements per session by the number of agreements plus the number of disagreements per session and multiplying this fraction by 100. In all instances, the agreement between observers was 100%.

RESULTS AND DISCUSSION – EXPERIMENT 1

The main result of Experiment 1 was that the psychotic children typically echoed the neutral stimuli but rarely echoed the discriminative stimuli. In contrast, the normal children generally did not echo either type of stimulus.

Figure 1 (left half) presents the response data for the psychotic children and the normal children on the nonverbal response task. The hatched bars are the data for the neutral stimuli and the filled bars are the data for the discriminative stimuli. The percentage of stimuli echoed is shown on the ordinate.

As can be seen, all five psychotic children echoed the neutral stimuli (i.e., those stimuli to which they had no appropriate response). In four of the children, the echolalia occurred 100% of the time. The fifth child (Gary) echoed 80% of the time; otherwise, he remained silent.

On the other hand, the data for the discriminative stimuli (i.e., those stimuli to which the child had an appropriate response) show that the psychotic children generally did not echo these stimuli but, instead, gave the correct nonverbal

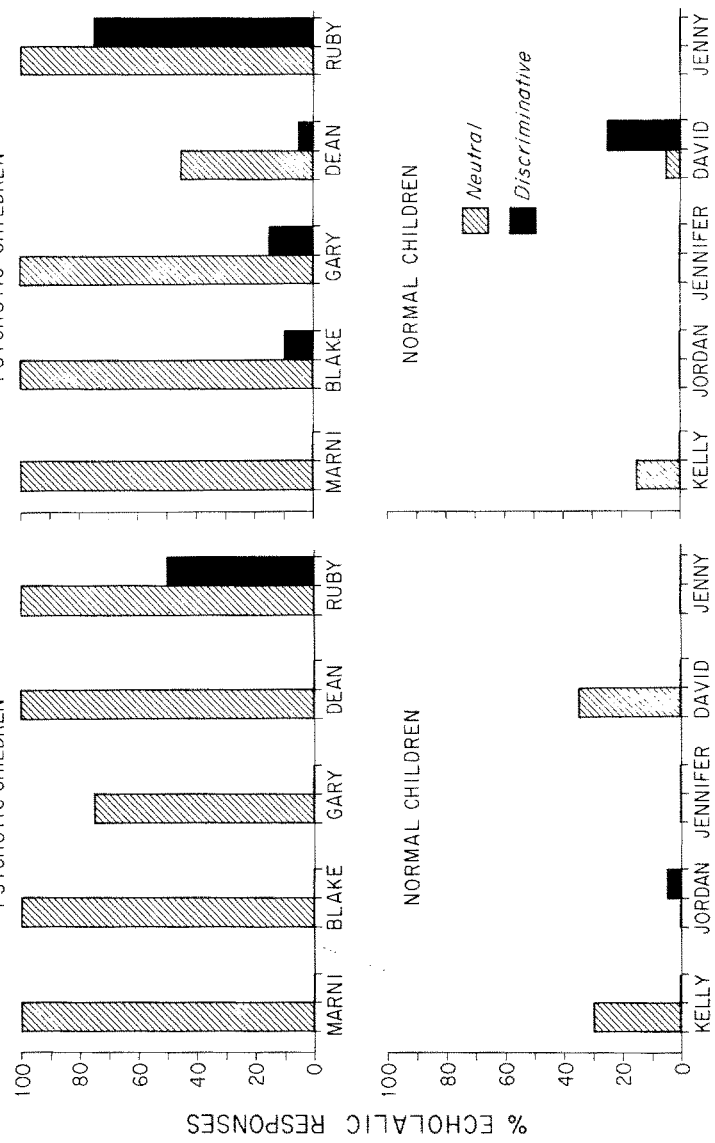

Fig. 1. Percentage of echolalic responses for the psychotic and normal children on the nonverbal response task (left half) and verbal response task (right half) as a function of type of stimulus presented. The hatched bars are the data for the neutral stimuli and the filled bars are the data for the discriminative stimuli.

response. In four of the psychotic children, this was always the case. The fifth child (Ruby) responded correctly to 50% of the discriminative stimuli without echoing but echoed the remaining 50% of the discriminative stimuli.

The data for the normal children show that they rarely echoed but on those few occasions when they did echo (see the data for Kelly and David), they, like the psychotic children, would typically echo a neutral stimulus rather than a discriminative stimulus. When presented with the neutral stimuli, the normal children would usually remain silent or ask "What"? or "Huh"? When presented with the discriminative stimuli, they gave the correct nonverbal response without echoing.

Figure 1 (right half) presents the response data for the psychotic children and the normal children on the verbal response task. As can be seen, all five psychotic children echoed the neutral stimuli. In four of the children, the echolalia occurred 100% of the time. The fifth child (Dean) echoed 45% of the time; otherwise, he remained silent.

With the exception of one child (Ruby), the psychotic children did not echo the discriminative stimuli. Ruby, however, echoed 75% of the discriminative stimuli. She always echoed two of the phrases ("Are you good"? and "How are you"?) while never giving the correct response to these stimuli.

The normal children generally echoed very few of the stimuli, whether the stimuli were neutral or discriminative. When the normal children were not echoing, they would invariably give the correct verbal response if the stimulus was discriminative or remain silent or ask "What"? if the stimulus was neutral.

The results of Experiment 1 indicate that the psychotic children tended to echo neutral stimuli and not to echo discriminative stimuli. One interpretation of these results is that a stimulus which is discriminative for some appropriate response is, in one sense, comprehensible or meaningful to the child, whereas neutral stimuli (which do *not* set the occasion for an appropriate response) are incomprehensible or meaningless. The logical extension of such an interpretation would be that verbal incomprehensibility is one determinant of echolalic speech. If this speculation has merit, it should be possible to control the probability of an echolalic response by systematically manipulating the comprehensibility of a verbal stimulus. The test of this hypothesis awaits future research.

A second point concerns the fact that although it was possible for the children to give the correct response *and* echo the stimulus (e.g., the child could have responded to the stimulus "How are you"? by saying, "How are you — fine"), this situation occurred only three times during the entire experiment. In general, then, if the stimulus was echoed, the psychotic child did *not* respond correctly. If the child did respond correctly, he did not echo. These data suggest that echolalic and appropriate speech may be mutually exclusive response classes.

Finally, these data relate the verbal behavior of the psychotic children to that of the normal controls. The normal children who did show some echolalia

were the youngest children with whom we worked (Kelly was 25 months old and David was 26 months, compared to an age range of 36–44 months for the other normal children). These results are consistent with the literature on echolalic behavior in normal children which indicates that very young normal children engage in echolalic behavior (Van Riper, 1963) and that this behavior peaks in normals at about 24–30 months of age (Nakanishi & Owada, 1973). Thus, it might be that the psychotic children are functioning at the level of very young normal children and have failed to progress along the same verbal continuum.

METHOD – EXPERIMENT 2

Three psychotic children who echoed neutral stimulus phrases were taught to perform alternative (nonecholalic) responses to several of these phrases. This procedure was carried out in a multiple baseline design (1) to assess the effects of such training on the frequency of echolalic speech and (2) to assess generalization of the effect to neutral phrases to which no alternative response had been taught.

Previously published reports on the remediation of echolalia (Risley & Wolf, 1967; Lovaas et al., 1973) employed a *combination* of several treatment variables (i.e., reinforcement of alternative responses, timeout and/or punishment). It is not clear from these studies what a *sufficient* treatment variable is for the remediation of this problem. Based on the results of Experiment 1 (which demonstrated that psychotic children generally did not echo stimuli which were discriminative for some appropriate response), we hypothesized that a sufficient condition for the amelioration of echolalic speech would entail the training of an alternative response to each of the echoed stimuli. Experiment 2 was a test of this hypothesis.

Subjects

Of the five psychotic children worked with in Experiment 1, one was discharged and was therefore no longer available and two had become clinically unmanageable because of their aggression. The two remaining children, Blake and Marni, were worked with in Experiment 2. A third child, Jimmy, was added. Jimmy had a diagnosis of schizophrenia, childhood type with autistic features, the diagnosis being made by agencies not associated with this study. Jimmy had a CA of 9.5 years and an MA (on the Peabody Picture Vocabulary Test) of 1.9 years. He had negligible expressive speech. His verbal repertoire consisted almost exclusively of immediate echolalia. His receptive speech was limited to carrying out very simple commands. He was socially withdrawn and engaged frequently in self-stimulatory behavior such as hand-flapping.

Stimulus Materials

Blake and Jimmy participated in a screening procedure to determine a list of neutral stimuli to be used with them in the study. During this phase of the study, the experimenter sat across a small table from the child and presented several stimulus phrases. Each phrase was presented on five consecutive trials with an average intertrial interval of 15 seconds. A stimulus was considered to be neutral if the child *never* responded appropriately. Using this procedure, four neutral stimuli were selected for Blake and for Jimmy. For Marni, we used the same 10 neutral stimuli as in Experiment 1.

Again as in Experiment 1, the stimuli were equally divided into two tasks. In the nonverbal response task, the children were subsequently trained to perform a specific nonverbal response to each of the neutral stimuli (e.g., touching the forearm in response to "Tap your ulna"). During the later training in the verbal response task, the children learned to perform a specific verbal response to each neutral stimulus (e.g., saying "game" in response to the question "What is baseball"?).

Table II lists the neutral stimuli used for each child as well as the responses subsequently trained to each of the stimuli. The responses which were trained are shown in parentheses.

Procedure

After initial screening to determine a list of neutral stimuli, each child participated in two types of sessions, test and training. The tests sessions were conducted to provide an ongoing assessment of the amount of echolalic responding to the neutral stimuli. The training sessions were conducted to teach the child a

Table II. List of Neutral Stimuli Used for Each Psychotic Child in the Verbal and Nonverbal Response Tasks – Experiment 2. (The Response Subsequently Trained to Each Stimulus is Shown in Parentheses)

Child	Verbal response task	Nonverbal response task
Marni	tas poo grot ("shoe")	off plot (turns over toy hourglass)
	min dar snick ("juice")	blat ver shot (taps table)
	bot ni ork ("room")	la kels bes chern (touches toy horse)
	dit kalat es blit ("cookie")	mon dok ped (puts plastic donut on cylinder)
	gin ra moo (untrained)	fop vit gerpy (untrained)
Blake	What is a rose? ("flower")	Tap your ulna. (taps his forearm)
	Who is Dirk? ("man")	Feel the cloth. (feels cloth)
Jimmy	What is baseball? ("game")	Indicate the eraser. (touches eraser)
	Who is Laura? ("you")	Feel the cloth. (feels cloth)

specific response to each of the neutral stimuli so that the effects of such training on the frequency of echolalic responding to these stimuli could later be determined.

Test Sessions. Each test session, for Blake and Jimmy, consisted of four presentations of each of the two neutral stimuli. A test session, therefore, consisted of a total of eight randomly ordered neutral stimuli for each of the two response tasks. For Marni, a test session consisted of a total of 20 stimulus presentations, either four presentations of each of the five neutral stimuli in the verbal response task or four presentations of each of the five neutral stimuli in the nonverbal response task. The manner of stimulus presentations and response recording was identical to the procedure described in Experiment 1. Occasionally, an observer who was naive about the purpose of the experiment presented stimuli to the children. The length of time a child spent in the experimental situation, on each occasion, varied between 20 and 40 minutes. Again, only intermittent and noncontingent reinforcement was used to maintain a child's responding during the experiment.

Test sessions were continued until the data indicated that stable levels of echolalic responding to each of the neutral stimuli were present. When this stability occurred, training began on one of the stimuli at a time in a multiple baseline design.

Training Sessions. In each training session, the child was presented with only one neutral stimulus. If an appropriate response to that stimulus *existed* (e.g., saying "flower" to the question "What is a rose"?), the child was taught to make that response. If *no* appropriate response to the stimulus existed (e.g., the stimulus, "la kels bes chern"), the child was trained to make an arbitrary experimenter-defined response (e.g., in this case, the child was trained to touch a toy horse). During each training session, the stimulus was presented and the correct response was prompted and reinforced with praise and food. The prompts were gradually withdrawn until the child responded correctly without any prompt. Training on the stimulus continued until the child responded correctly on 10 consecutive stimulus presentations with no prompt. By the end of training the rate of reinforcement was decreased from one reinforcer for each correct response to one reinforcer for every fifth correct response, on the average. Since the training procedure differed according to whether a verbal or nonverbal response was being taught, the specific procedures will be described separately.

For those sessions in which a verbal response was to be trained, the experimenter first presented the neutral stimulus and then *immediately* presented the correct response. For example, the experimenter might say, "tas poo grot — shoe." By placing the correct response at the end of the phrase, it was very likely that the response would be echoed. This procedure is similar to that used by Risley and Wolf (1967). When the prompt was echoed by the child, the experimenter reinforced the response. The prompt was gradually faded until the child

would give the correct response unprompted. It is important to note that in no instance was echolalia consequated with timeout or punishment.

For sessions in which a nonverbal response was to be trained, the various stimuli required in the task were placed on the table in front of the child. The experimenter began by presenting the neutral stimulus and manually prompting the correct response. This prompting was done by guiding the child's hand through the motions and reinforcing the prompted response. The prompt was gradually withdrawn until the child could perform correctly, unprompted. Again there was no timeout or punishment for an echolalic response.

After the child reached criterion on a given stimulus (i.e., 10 consecutive correct responses without any prompt), test sessions were again conducted for the purpose of assessing (1) the amount of echolalic responding to the stimulus and (2) the amount of echoing to the other, untrained, neutral stimuli. If, at any time, the percentage of echolalia and/or incorrect responding appeared unstable for a trained stimulus (i.e., three or more echolalic and/or incorrect responses in two consecutive trial blocks), the training sessions were reintroduced for this stimulus. When training was reintroduced, the training continued until the child again reached the criterion.

Response Recording and Reliability

The procedure for recording and scoring responses was identical to that used in Experiment 1. The experimenter used a precoded data sheet to record any response made by the child within 5 seconds of the stimulus presentation. The responses scored included echolalia, appropriate nonverbal, appropriate verbal, and "other verbal" responses. The definitions of these behavioral categories have been presented in Experiment 1. On several occasions an independent observer sat in the room with the child and the experimenter and scored the child's responses on an identical data sheet. The percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying this figure by 100%. For Marni there was a total of 20 reliability checks, covering both nonverbal and verbal tasks. Interobserver agreement was 100%. For Blake, there were 4 reliability checks and 100% interobserver agreement. For Jimmy, there were 12 reliability checks with a mean percent agreement of 99% (range 94%–100%).

RESULTS AND DISCUSSION – EXPERIMENT 2

The results of Experiment 2 may be summarized as follows: (1) Experiment 2 replicated Experiment 1 in demonstrating that the psychotic children

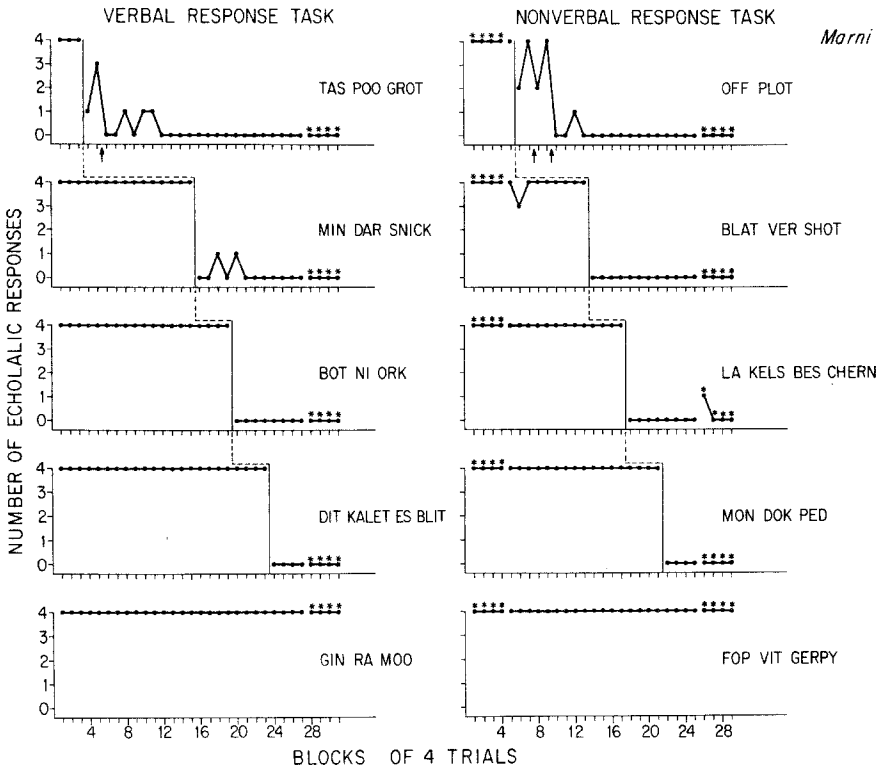

Fig. 2. Number of echolalic responses made by Marni to several stimulus phrases before and after training over blocks of four trials. The left half of the figure presents the data taken from the verbal response task and the right half presents data from the nonverbal response task. Arrows beneath abscissa show temporal position of later training sessions. Data collected by naive experimenters are indicated with asterisks.

generally *echoed* those stimuli to which they had *no* appropriate response in their repertoires (i.e., the neutral stimuli); (2) Experiment 2 extends the analysis presented in Experiment 1 by demonstrating that, in general, as the children were taught to make an appropriate response to a neutral stimulus, they not only learned to make the appropriate response but also stopped echoing that stimulus. The results for each child follow.

Figure 2 (left half) shows the results of training Marni (in a multiple baseline design) to make an experimenter-defined *verbal* response (i.e., the verbal response task) to each of four neutral stimuli, while a fifth neutral stimulus was left untrained. Number of trials, in blocks of four, are plotted along the abscissa and number of echolalic responses are plotted on the ordinate. If Marni echoed

all four stimuli in a trial block, she would receive a score of 4 on the ordinate; if she echoed three of the stimuli in a trial block, she would receive a score of 3 on the ordinate, and so on.

The stimulus phrase "tas poo grot" was the first on which Marni was trained. This phrase appears at the very top of the figure. Data to the left of the solid vertical line were collected before the first training session on "tas poo grot" (i.e., the baseline). As can be seen, Marni echoed the stimulus each time it was presented during baseline. Following the first training session (data to the right of the solid vertical line), however, she echoed the stimulus only once while giving the correct verbal response ("shoe") on the remaining three presentations of "tas poo grot" (block 4). During block 5, her performance deteriorated and she echoed three times while giving the correct response only once. Because her performance during blocks 4 and 5 did not meet the minimum stability criterion stated above, Marni was given a second training session. (The temporal position of training sessions subsequent to the first one are indicated by the arrows which appear beneath the abscissa.) Following the additional training, she echoed only three times in the next four trial blocks (blocks 8–11) and stopped echoing altogether after that (blocks 12–31); that is, she would always say, "shoe," when the experimenter presented the stimulus "tas poo grot" and never again echoed that stimulus. During trial blocks 4–15, no training was given on the remaining four stimulus phrases. Figure 2 shows that during this time period, Marni continued to echo all of the other stimulus phrases four out of four times in each trial block.

The results of Marni's training on the remaining neutral stimuli resemble those obtained with the stimulus "tas poo grot." More specifically, as Marni was trained to make a particular verbal response to "min dar snick" (between trial blocks 15 and 16), "bot ni ork" (between trial blocks 19 and 20), and "dit kalat es blit" (between trial blocks 23 and 24), she stopped echoing each of these stimuli in turn and would give the correct verbal response to each of them.

Marni was not trained to make a specific verbal response to "gin ra moo." Significantly, she never stopped echoing that stimulus. During 31 blocks of trials, Marni echoed "gin ra moo" each time that stimulus was presented to her.

One final point concerns the asterisks which appear above the last four trial blocks (blocks 28–31). During these trials, an experimenter who was naive about the nature of the study presented Marni with the five different stimulus phrases. This manipulation was introduced to ensure that Marni's responses were not due to any idiosyncratic manner of stimulus presentation on the part of the informed experimenters. As can be seen from the figure, Marni continued to give the appropriate response to each stimulus phrase on which she had been trained and continued to echo the phrase on which she had not been trained, even though the stimuli were presented to her by a naive experimenter.

Figure 2 (right half) shows the results of training Marni to make an experimenter-defined nonverbal response (i.e., the nonverbal response task) to each of

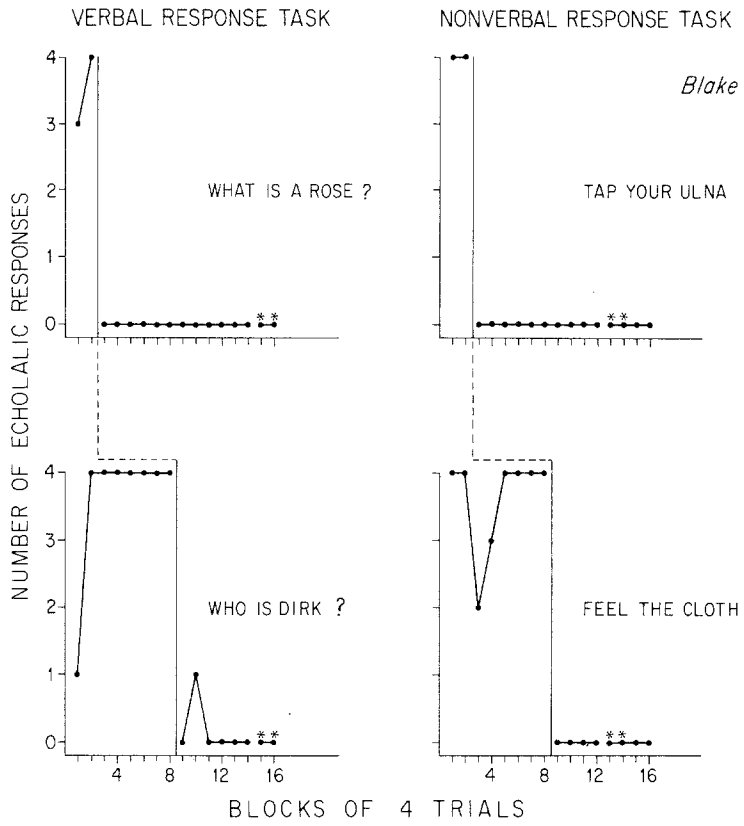

Fig. 3. Number of echolalic responses made by Blake to several stimulus phrases before and after training over blocks of four trials. The method of plotting the data is the same as for Figure 2.

four neutral stimuli while a fifth neutral stimulus was left untrained. The results on this nonverbal response task exactly parallel those obtained on the earlier presented verbal response task.

The results of training Blake on the verbal response task and the nonverbal response task are shown in Figure 3 (left and right halves, respectively). On the nonverbal response task, Blake, like Marni, would merely parrot the neutral stimuli (pure echolalia). However, on the verbal response task, Blake would incorporate part of the (neutral) stimulus question into a grammatically correct but meaningless answer; that is, he exhibited what is referred to in the literature as "mitigated echolalia" (Fay, 1967). For example, in response to the question "What is a rose"? he would answer, "A rose is shake," and in response to the question "Who is Dirk"? he would answer, "I am a Dirk." Interestingly, both

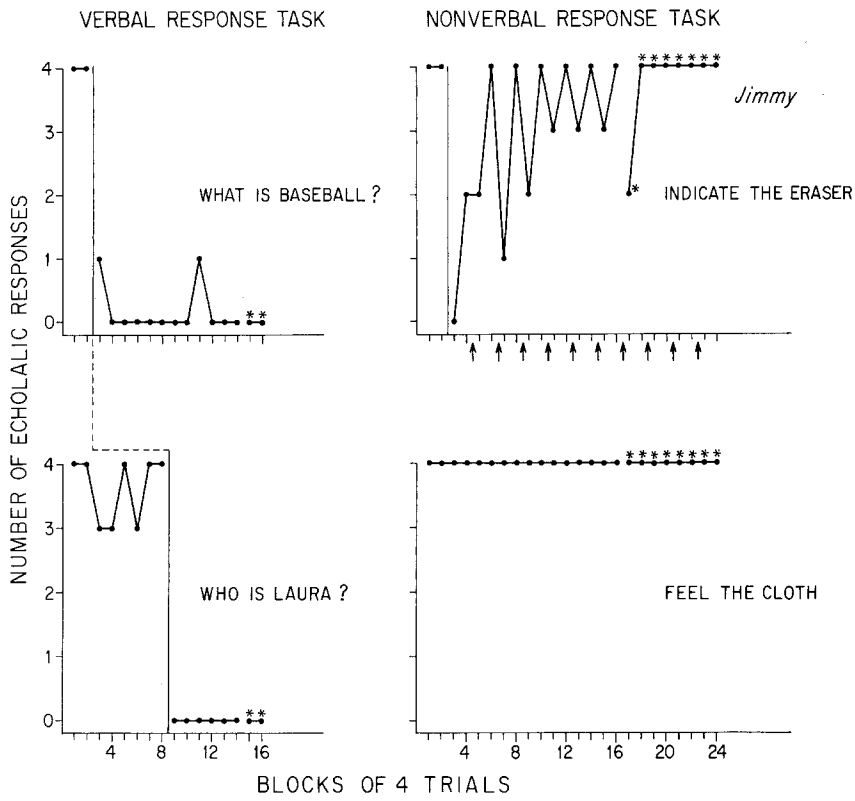

Fig. 4. Number of echolalic responses made by Jimmy to several stimulus phrases before and after training, over blocks of four trials. The method of plotting the data is the same as for Figure 2.

types of echolalia, pure and mitigated, were eliminated using the same treatment technique, the training of an alternative response to each of the echoed stimuli.

Figure 4 (left half) shows the results of training Jimmy on the verbal response task. Jimmy's data parallel those of Marni and Blake in showing a decrease in echolalia following the training intervention.

Figure 4 (right half) presents the results of training Jimmy on the nonverbal response task. The figure shows that during baseline, Jimmy echoed the stimulus phrase "Indicate the eraser" four out of four times in each of the two trial blocks. Following his first training session his echolalia dropped to zero and he responded appropriately to the command each time it was presented (trial block 3). On the fourth trial block, his echolalia increased to two out of four trials. This pattern of decreased echolalia immediately after training followed by recovery of echolalia at a later period after training was repeated after each of

the next seven training sessions. After training sessions 9, 10, and 11, (8th, 9th, and 10th arrows under the abscissa), however, there was no change in echolalia from the baseline: He echoed four out of four times in each trial block even while performing the correct response at the same time. During the time period we were attempting to train him on "Indicate the eraser," Jimmy received no training on "Feel the cloth" and continued to echo that command four out of four times during each of the 24 blocks of trials on which this command was presented.

Jimmy's behavior on the nonverbal response task was the one exception to the rule that the children stop echoing the neutral stimuli following training. We can speculate on why this situation occurred. During the training sessions for the nonverbal response task, each child stopped echoing abruptly as he/she learned an appropriate nonverbal response. Jimmy never completely stopped echoing even after he learned that "Indicate the eraser" was the stimulus for touching the eraser on the table. (This problem did not arise during the verbal response task and, significantly, Jimmy mastered that task and stopped echoing.) It is possible, then, that we inadvertently reinforced the response sequence "Echo and then touch the eraser." Over many training sessions, this response sequence would have been strengthened through frequent reinforcement. Possibly, the steady rise in the number of echolalic responses in Figure 4 (right half) reflects this adventitious reinforcement contingency. It should be noted as well that Jimmy was the most severely regressed child (in terms of both language ability and general level of functioning) that we worked with in the study. Perhaps, in working with children like Jimmy, it is necessary to take explicit measures to prevent the accidental chaining of responses noted above. For example, we might have removed the eraser every time Jimmy echoed at the start of a training trial, thus terminating the trial. In this way, accidental reinforcement of the "Echo and then touch the eraser" response sequence would have been prevented.

Experiment 2, in summary, replicated the findings of Experiment 1 in demonstrating that each child generally echoed the stimulus phrase to which he/she had no response (that is, the neutral stimulus).

Experiment 2 also demonstrated that it is possible to stop a child from echoing a neutral stimulus by making that stimulus discriminative. That is, after we had trained the child to make a specific response to the neutral stimulus, the child was generally not only able to make the appropriate response but at the same time stopped echoing the stimulus. It is important to note that it was always possible for each child to perform the correct response *and* to echo the stimulus. For example, when the child was presented with the stimulus "What is baseball"? he could have said, "What is baseball — game." This would have been both an echolalic response and a correct response. In practice, however, the children almost never did this. Our data suggest that echolalia and appropriate verbal

behavior may be what has been termed mutually exclusive response classes: When echolalia occurs, appropriate verbal behavior does not, and vice versa.

Another point worth noting is that our naive experimenter control condition demonstrated that the findings which we obtained were not due to some idiosyncratic method of stimulus presentation associated with the informed experimenters since even experimenters who were totally unfamiliar with the nature of the experiment were able to generate the same data as those who were familiar.

GENERAL DISCUSSION

The two experiments presented here have several clinical implications. First, it would seem that when a psychotic child echoes a question or command, there is a good chance that he does so because he has no other more appropriate response in his repertoire. We have suggested the possibility that echolalic speech in such circumstances, occurs as a response to verbal stimuli which are incomprehensible or meaningless to the child. Although the present experiments should not be construed as a test of the above hypothesis, the results are nonetheless consistent with this supposition. Several previously published reports have also implied the possibility of a functional relationship between echolalic speech and verbal comprehension (Myklebust, 1957; Rutter, 1968; Fay & Butler, 1968; Matheny, 1968). Future research should explore this possibility. Several caveats are in order, however. First, echolalic speech, like any complex behavior is likely to have multiple determinants. Kanner (1948), Piaget (1962), and Hartung (1970) have all provided detailed discussions of other possible controlling variables in echolalia. Thus, one must be wary of attributing all echolalic speech to a lack of verbal comprehension. Also, the sample of psychotic children which we studied was small and therefore any statement on the generalizability of our results to other psychotic children must await additional experimentation.

Second, the multiple baseline design which we used for each child in Experiment 2 demonstrates that the cessation of echoing was a direct result of our training intervention. It appears that echolalic responding does not cease simply with the passage of time nor is one able to cause a child to stop echoing merely by presenting a given question or command over and over again. This conclusion is borne out by Marni's data (Figure 2). We did not give Marni any training on the final verbal and nonverbal response task stimuli to which she was exposed and, significantly, she did not stop echoing these stimuli. Our children echoed what was said to them until they received explicit training on what response was appropriate for a given question or command. Thus, the training of alternative responses is seen to be a *sufficient* condition for the elimination of instances of echolalic speech; punishment and/or timeout are not *necessary* conditions.

A third point concerns the fact that, at least for one of our children, Blake, both pure and mitigated echolalia could be eliminated using the same training procedure. Although several more children would have to be treated successfully in order to be confident about the generality of this finding, the possibility would seem to exist that both communication disorders — pure echolalia and mitigated echolalia — might be eliminated using the same prompt-fading techniques previously described.

Finally, it is important to note that training an echolalic child to respond appropriately to (and not echo) several questions and commands does not produce a general cessation of all echolalia. It was necessary to teach the child to make the appropriate response to each statement echoed in order to stop the echoing of that statement. This fact suggests a more economical treatment intervention than the one used in the current study: If a child could be taught to make a general verbal response to stimulus phrases to which he had no appropriate response, the duration of treatment might be greatly abbreviated. For example, a child might be taught to say "I don't know" to all questions that he could not answer and "What"? to all commands which he could not carry out. As a result of such training, the echolalic child's verbal behavior would appear very similar to that of a normal child confronted with the same neutral stimulus material. We are currently investigating this treatment strategy.

The present study has several theoretical implications as well. One important observation, noted above, was that echolalia and appropriate speech may constitute mutually exclusive response classes; when echolalia occurs, appropriate verbal behavior does not, and vice versa. We can speculate on why this should be so. Skinner (1957) has noted that parents and teachers will frequently teach language to a young child by reinforcing his echoing. For example, it is common for an adult to point to a tree and say, "This is a tree." When the child echoes, "tree," the adult will reinforce him. In this manner echolalic behavior can become a very high probability response in a structured learning situation. Normally the child would be taught to echo only when asked to. He would eventually be reinforced only for appropriate nonecholalic verbal behavior and such behavior would become the highest probability response in his hierarchy of verbal behavior. If the child, for some reason, does not learn the appropriate responses, echolalia would remain his most probable verbal behavior. Thus, we would expect the child to exhibit considerable echolalia in any structured learning situation. Perhaps the echolalic behavior of the children in the present study reflects this hierarchy. If so, then the main effect of our training intervention was to alter each child's verbal hierarchy so as to make nonecholalic responses to certain stimuli the most probable response.

Our data also bear on several major theoretical conceptions of echolalia which exist in the published literature. Psychoanalytically oriented theorists such as Griffith and Ritvo (1967) and Carluccio, Sours, and Kalb (1964) have suggested that echolalic speech is an expression of hostility or aggression. This

conceptualization would suggest that the child should echo *nonselectively* anything that is said to him. Instead, our data suggest that the children *selectively* echo neutral stimuli to the exclusion of echoing discriminative stimuli, an observation which is at variance with the prediction derived from the psychoanalytic point of view.

Developmentally oriented theorists suggest that echolalia reflects an early stage in the development of normal linguistic functioning (Myklebust, 1957; Van Riper, 1963). The present findings support this contention in that (1) the youngest of our normal children did show some echolalia and (2) all of our psychotic children had very low MAs (as measured by the Peabody receptive language test), which demonstrates that they had only the most elementary language skills.

Finally, our data suggest that the successful remediation of echolalia reported by Risley and Wolf (1967) and Lovaas et al. (1973) was probably due, in large part, to their method of training the children to make *appropriate* responses to stimuli which had, at first, *not been discriminative* for any appropriate response.

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