

INAPPROPRIATE SPEECH IN A SEVERELY RETARDED CHILD: A CASE STUDY IN LANGUAGE CONDITIONING AND GENERALIZATION

ELIZABETH SPINDLER BARTON

KANSAS NEUROLOGICAL INSTITUTE

The modification of inappropriate speech, a class of behaviors rather than a limited number of specific examples, is little known in the severely retarded. In this study, operant techniques were used to modify the strikingly bizarre and inappropriate speech of a severely retarded boy. The boy's appropriate verbal responses to questions about magazine pictures were reinforced with candy. When he responded inappropriately, the magazine was withdrawn, and social interaction was discontinued for a 10-sec timeout period. Negative responses were ignored, the next picture displayed, and the next question asked immediately. In 10 sessions, appropriate responses increased from 26% to 86% of all responses. A reversal of reinforcement was then introduced, in which inappropriate responses were reinforced, appropriate responses resulted in timeout, and negative responses were treated as before. This reduced the percentage of appropriate responses to 24%. Subsequent sessions of reinforcement for appropriate responses increased appropriate responses to 96% of all responses. At significant stages in the experiment, a measure of possible generalization was attempted. Although some generalization was recorded, it was minimal: some explanations are discussed.

The use of operant procedures in remedial speech and language training is increasing rapidly. With this development new problems within the field are arising and new areas being increasingly explored.

In the modification of speech behavior, research has concentrated in two main areas. The first of these is the acquisition of language in those who do not, or never did, speak. Lovaas (1968) established speech in autistic and schizophrenic children using reinforcement techniques. Isaacs, Thomas, and Goldiamond (1960) used such procedures to reinstate speech in adult schizophrenics. Sherman (1968) reinstated verbal behavior in three long-term mute psychotics. He used shaping procedures with two subjects but the reinforcement of imitative verbal behavior was found to be more effective with the third. Although different techniques have been used, the importance of contingent reinforcement in developing and maintaining verbal behavior has been amply demonstrated.

The second main area in which behavior modification of speech has concentrated is in the control of the quality of existent speech. Operant techniques have been found to be useful to a marked degree in this area. Mowrer, Baker, and Schutz (1968) described the treatment of articulation disorders in normal children using shaping and reinforcing techniques. There is also the problem of ungrammatical speech, especially noticeable in the retarded. Guess (1968), for example, studied the effect of auditory discrimination training on plural acquisition among mental retardates and found little or no transfer from the receptive level to the expressive level.

A third dimension is the appropriateness of speech. Rimland (1964) described the inappropriate speech of children with behavior disorders. These children typically show pronominal reversal, perseveration, and mixed-up words and meanings. Rimland attributed the speech disorders of these children to an inability to generalize; he suggested that the underlying cause might be a neurological one, as inappropriate speech occurs not only in behavior disorders, but also in more obvious cases of brain damage. The children may articulate well and have large vocabularies, but much of what they say is inappropriate to the situation. Many of these children display

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echolalia, both delayed and instantaneous. Risley and Wolf (1967) worked on the development of functional speech in such children using a number of operant techniques. Four children were involved in programs of shaping, imitation, and the use of verbal prompts to develop appropriate speech. Inappropriate behaviors were decreased by extinction and timeout procedures. The authors concluded that such techniques were effective and felt that appropriate speech often generalized widely, particularly if steps were taken to encourage it and if the child's parents, teachers, *etc.* were involved.

Even though inappropriate speech might result from neurological or environmental defect, or both, Risley and Wolf showed that environmental techniques might still be tried for remediation. The present study was undertaken with a neurologically impaired retarded child who had a considerable amount of speech, most of which was inappropriate. It was predicted that the reinforcement contingencies that had been tried on simpler behaviors (dressing, naming) would also work in this more complex area. When a technique is found to be useful, it is necessary to discover its widest possible use. Generalization of any changes produced, moreover, is of great importance to the practical applications of such techniques. The study thus had the dual aim of investigating the effects of a well-known technique in a little-explored area, and of attempting to assess if any generalization occurred.

METHOD

Subject

Simon, an 11-yr-old boy in a state institution, was relatively normal in appearance, but his case history recorded some important neurological indications of brain damage, and his intelligence was severely retarded. The full diagnosis was: "Mental retardation associated with diseases and conditions due to trauma or physical agents, encephalopathy due to mechanical injury at birth. No genetic component present. Secondary hydrocephaly. No impairment of the special senses. Mixed convulsive disorder (controlled). Behavioral reaction. Hypotonia, quadriplegia, mild." His measured intelligence was estimated to be -4 standard deviations below normal, *i.e.*, profoundly retarded, according to the Merrill-

Palmer Scale, and the Peabody Picture Vocabulary Test. According to the Vineland Social Maturity Scale he had a Social age of 34.5 months.

The seizures associated with his brain damage were completely under control at the time of study, and he had not had one for at least six months. Simon walked quite well, though clumsily, and appeared to have poor spatial orientation and poor size and shape discrimination. Further, he was considered to be a ward behavior problem in that he was either withdrawn, or else showed aggressive behaviors toward the other children.

Simon's speech was clearly articulated and his vocabulary large; however, much of what he said was inappropriate. He frequently perseverated with one response. When asked questions about magazine pictures, many of his responses appeared to be random and unconnected with the picture; he responded to even simple questions with advertising jingles, and other inappropriate phrases. Thus, for example, on one occasion he asked for a pencil, but when asked why, he replied: "to keep my shirt clean".

Experimental Procedures

Simon's response to magazine pictures was selected as a useful target behavior for modification by reinforcement and timeout procedures. Accordingly, a setting was designed in which the experimenter sat with Simon at a table in a small and sparsely furnished room, some 50 yards away from his ward. Apart from the table and three chairs, the room contained only a locked cupboard, and a one-way window; it was thought important to make the room as free from distractions as possible. The experimenter had a small number of magazines on the chair beside her, out of Simon's sight. The first magazine was placed on the table and opened. The experimenter pointed to the picture (or if there were more than one to the most colorful or large one) and asked Simon an appropriate variation of one of the following questions:

- Question 1. Who, what, where is (that, doing _____)?
- Question 2. What, where (is, are) (he, she, it, they) (doing, having, playing, *etc.*) (here, there, on, in the _____)?

For example, with a picture of a girl the experimenter would ask either:

- Question 1. Who, what, where is (that, doing _____)? (e.g., "Who is this?")
 or
 Question 2. What, where (is, are) (he, she, it, they) (doing, having, playing, etc.) (here, there, on, in the _____)? (e.g., "What is she wearing?")

Only one of these two questions was asked for each picture presented. The question asked was determined unsystematically by the experimenter, who chose whichever question seemed more appropriate to that particular picture, and to the subject's presumed level of understanding and vocabulary. Thus, shown a picture of chess players, which included a dog lying under the chess table, the subject would be asked "Who is lying on the floor?" rather than "What are they doing?"

Definition of Appropriate, Inappropriate, and Negative Responses

An appropriate response was defined as one that was either a correct reply to the question asked, or was a very close approximation to one. An inappropriate response was one that had no apparent relevance to the picture. A negative response was defined as either silence or the reply: "No" or "I don't know". An example of an appropriate answer to Question No. 1. "Who is this?" would be: "A girl." An example of an appropriate answer to Question No. 2. "What is she wearing?" would be: "A dress." An example of an inappropriate answer to Question No. 1. "Who is this?" would be: "A jet plane." An example of an inappropriate answer to Question No. 2. "What is she wearing?" would be: "She's wearing a hamburger."

Reliability Procedures

Tape recordings were made of Simon's responses during the fourth and seventh sessions in the second 10 sessions of reinforcement of appropriate responses. The microphone was concealed and the tape recorder was placed in an adjoining room: thus, Simon was unaffected by these procedures. The magazine pictures used in these sessions were numbered. In the fourth session there were 50 pictures, and in the seventh, 46 (four pictures were

omitted by accident). Two judges rated these tapes (a social worker rated the fourth session, a psychologist the seventh). They were told the definitions of appropriate, inappropriate, and negative responses exactly as stated under Experimental Procedures. The tape recording was then played while the judge looked at the pictures. As soon as each of Simon's responses was played, the tape was stopped so that the experimenter's response (e.g., "Good, Simon.") would not be heard by the reliability judge. The judge then verbally scored the response and the experimenter wrote them down, remaining unresponsive, except to repeat the definitions when a judge seemed unable to decide (a rare event). In most cases there was no hesitation as to the decision.

Experimental Design

The basic design was to reinforce Simon's appropriate responses and to impose timeout from reinforcement for inappropriate ones.

A baseline was first established (one session). Then, appropriate responses were reinforced, inappropriate responses were not, and negative responses were ignored (10 sessions). At this point, a probe (no-contingency) session was carried out (one session).

The contingencies were then reversed: inappropriate responses were reinforced, appropriate responses were timed out, and negative responses ignored, as before (five sessions).

A probe (no-contingency) session was then carried out. The original contingencies were then reinstated: appropriate responses were reinforced, inappropriate responses were not, and negative responses ignored (10 sessions).

This was followed by a final probe (no-contingency) session.

Reinforcement and Timeout

Simon was presented with 50 pictures (and thus 50 questions about them) each session. If he made an appropriate response he was told "Good, Simon" and given an M & M; the page was then turned to the next picture. If he made an inappropriate response, a timeout occurred (the magazine was closed and covered by the experimenter's arms; the experimenter then turned away from him for 10 sec). At the end of the 10 sec timeout period, the experimenter turned back, the magazine was reopened to the next picture, and a new question was asked. Negative responses were

ignored; the experimenter simply turned the page to the next picture and asked a new question.

Simon usually had two sessions per day (as long after a meal as possible to increase the reinforcing function of the candy), three days a week. Different pictures were shown at each session. None of the pictures was shown more than once. In all experimental conditions, magazine pictures were avoided if they were identical to those used in the generalization testing. To ensure as much variety in the pictures and questions as possible, many different magazines were used, those with the largest proportion of pictures to copy being preferred.

Generalization Testing

The importance of generalization cannot be over-emphasized. However effective a procedure may prove in the laboratory, if its effects do not generalize to home, classroom, or hospital ward, the practical implications are minimal. It was decided that it would be most useful initially to investigate a situation where generalization would be most likely to occur to see what effect just a slight difference in the generalization situation from the experimental situation would produce. Therefore, a test similar to the task in the reinforcement sessions was devised and was administered by the same experimenter, in the same situation, except that no reinforcement was given. It contained 99 items and was composed of two sub-tests: one of magazine pictures, described in Table 1, with 33 questions, and one of 66 general conversation questions, listed in Table 2. No reinforcement was given for responses to either of these tests. The tests were standard in that they were repeated without change during the study at times when the current level of generalization would be of interest. Specifically, the tests were given three times before the first baseline session (to examine the relative stability of appropriate, inappropriate, and negative responses); once immediately after the first 10 sessions of reinforcement of appropriate responses (before the no-contingency session that also followed those 10 sessions); and once again, at the end of the second 10 sessions of reinforcement of appropriate responding (but this time, *after* the no-contingency session that also followed those 10 sessions to control for any sequence effects).

Table 1

Magazine Pictures with 33 Standard Questions

Pictures	Number of Questions Asked
Paper cup of popcorn	3
Girl, dog, toys on doorstep	4
Car outside house	3
Horses in field	2
Airplane	1
Woman in bedroom on telephone	2
Man drinking coffee	2
Hot dog	2
Couple outside house	2
Girl on father's knee	4
Group sunbathing	3
Grocery store	3
Baby crying	2
Total	33

RESULTS

Reliability

The percentage reliability between the experimenter and two judges is presented in Table 3. These results indicate that there was fairly substantial agreement between the experimenter and the two judges for the three categories of behavior under study.

Responses to Contingency Sessions

Figure 1 shows the varying percentage of appropriate, inappropriate, and negative responses that Simon made to the questions about the magazine pictures.

The first baseline session at the beginning of the experiment showed initial percentages of 24% appropriate, 70% inappropriate, and 6% negative responses. When reinforcement was applied to appropriate responses, both the percentages of appropriate and inappropriate responses changed. By the tenth session of this condition, there were 86% appropriate, 14% inappropriate, and no negative responses. A no-contingency session was conducted then, and yielded a result of 80% appropriate, 18% inappropriate, and 2% negative responses.

When the reinforcement and timeout contingencies were then reversed for five sessions, these percentages shifted back toward their baseline levels. The fifth reversal session showed 24% appropriate, 76% inappropriate, and no negative responses. The subsequent no-contingency session showed a similar reversal from the previous no-contingency and base-

Table 2

66 General Conversation Questions

1. What do they call you?	34. What's this? (pointing to car)
2. What is this? (tape)	35. What's this? (pointing to key)
3. Who is this? (pointing to him)	36. What's this? (pointing to bed)
4. Are you a boy or a girl?	37. What's this? (pointing to box)
5. What ward are you on?	38. What's this? (pointing to doll)
6. What is my name?	39. What's this? (pointing to flag)
7. Where is this?	40. What's this? (pointing to eye)
8. Do you go to school?	41. What's this? (pointing to mouth)
9. Who is your teacher?	42. What do you eat with?
10. What do you do at school?	43. What are you sitting on?
11. Do you watch T.V.?	44. What do you write with?
12. Do you like it?	45. What are these? (pointing to jeans)
13. What do you watch?	46. What color are they?
14. What else?	47. What's this (pointing to sack)
15. What are you wearing?	48. Where are we?
16. What am I wearing?	49. Where do you sleep?
17. What color is your hair?	50. What do you sleep in?
18. What color is my hair?	51. What do you wear on your feet?
19. What do you do with a chair?	52. What did you eat at lunchtime?
20. What do you do with a book?	53. What do you see with?
21. What do you do with a spoon?	54. What is this? (taking his hand)
22. What do you do with a car?	55. What does a radio do?
23. What do you do with a bed?	56. What do you do with a radio?
24. What's this? (pointing to table)	57. Have you a radio?
25. What's this? (pointing to chair)	58. Do you listen to the radio?
26. What's this? (pointing to hand)	59. What do you hear?
27. What's this? (pointing to shoe)	60. What do you hear on the radio?
28. What's this? (pointing to leg)	61. What are you standing on?
29. What's this? (pointing to toy dog)	62. What do you hear with?
30. What's this? (pointing to toy cat)	63. What's this? (pointing to mike)
31. What's this? (pointing to fork)	64. What does it do? (pointing to tape)
32. What's this? (pointing to ball)	65. How are you feeling?
33. What's this? (pointing to spoon)	66. Where is your daddy?

Table 3

Numbers of judges' agreements with experimenter by category of response.

	Judge 1	E	Judge 2	E
Appropriate	36	39	44	42
Inappropriate	14	11	2	4
Negative	0	0	0	0
Number of Agreements	47 (of 50)		44 (of 46)	
Per cent Agreement	94%		96%	

line sessions: 34% appropriate, 66% inappropriate, and no negative responses.

The final 10 sessions of reinforcement for appropriate responses produced an almost complete preponderance of appropriate responses. The tenth session yielded 96% appropriate, 4% inappropriate, and no negative responses. The no-contingency session following resulted in only a slight shift to 92%

appropriate, 6% inappropriate, and 2% negative responses.

Generalization Results

Figure 2 shows the effect that conditioning of appropriate responses to magazine pictures in training sessions had on the generalization test. This test was given three times before the start of training; the average percentage of responses on the 33 questions to standard magazine pictures was 36% appropriate, 54% inappropriate, and 10% negative. The 66 general conversation questions yielded results of 26% appropriate, 35% inappropriate, and 39% negative. After the first 10 reinforcement sessions (post 1), the responses had changed: in the 33 questions to standard magazine pictures subtest there were 54% appropriate, 39% inappropriate, and 6% negative responses. On the 66 general conversation questions subtest there were 46% appropriate, 21% inappropriate, and 33% negative responses. After the second 10 appropriate response-reinforced

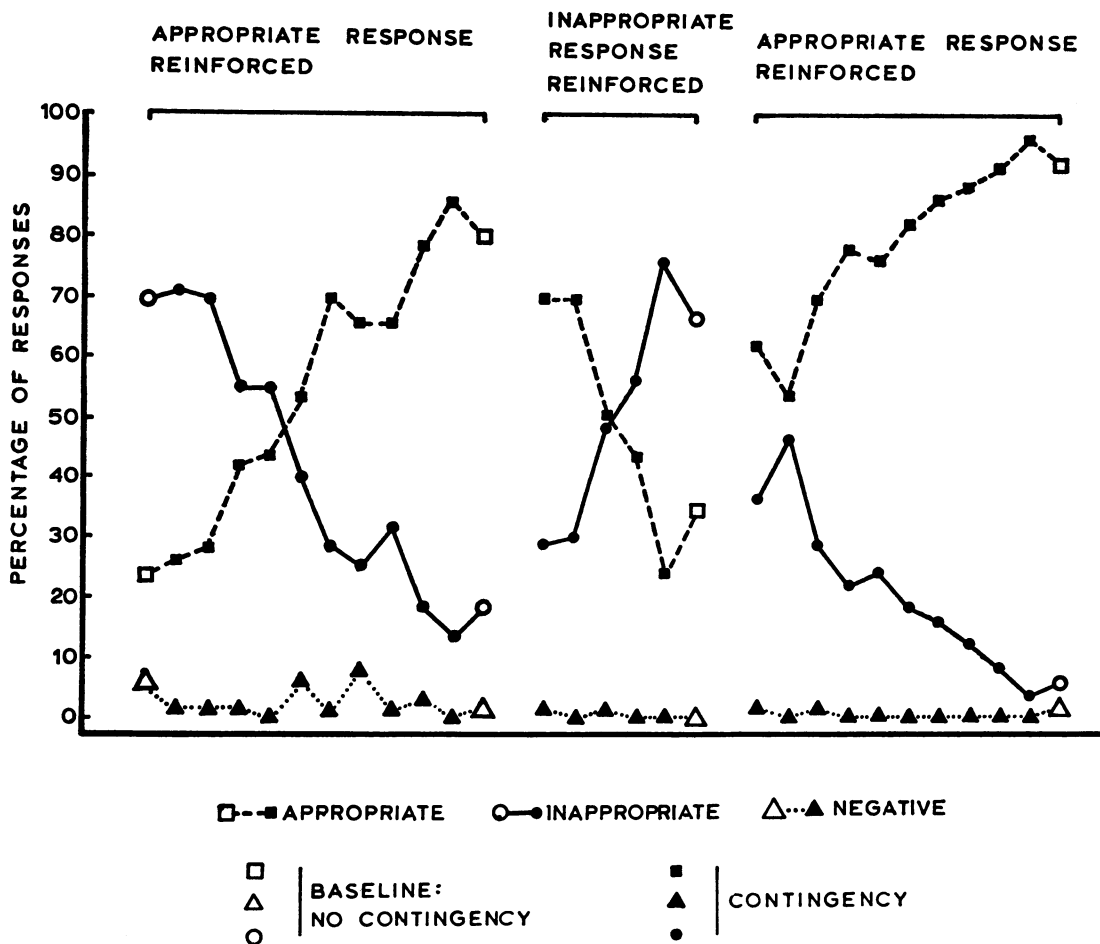


Fig. 1. Percentage of appropriate, inappropriate, and negative responses in the training and no-contingency conditions.

sessions, at the end of the experiment, the standard test was again given. The results for the 33 questions to standard magazine pictures this time showed 48% appropriate, 52% inappropriate, and no negative responses. The 66 general conversation questions showed 58% appropriate, 18% inappropriate, and 24% negative responses.

DISCUSSION

The results show that, simply by reinforcing appropriate or inappropriate responses, their numbers can be increased, almost to the exclusion of the unreinforced class. This effect was shown to persist for at least one session when the contingencies were withdrawn. A certain amount of generalization was demonstrated following the two periods of reinforce-

ment of appropriate response (the only occasions on which it was examined).

The present study involved the use of both direct and systematic replication to demonstrate these effects. The target behavior was appropriate responses, and these were reinforced until they occurred with great frequency. At that point, reinforcement was discontinued. The percentage of appropriate responses thereupon decreased to its pre-training level. Then reinforcement of appropriate responses was resumed and continued until almost all responses were appropriate. Thus, a direct replication of the effects of reinforcement of appropriate responses was demonstrated. At the same time that reinforcement of appropriate responses was discontinued, a similar reinforcement of a second behavior (inappropriate responses) was introduced. The

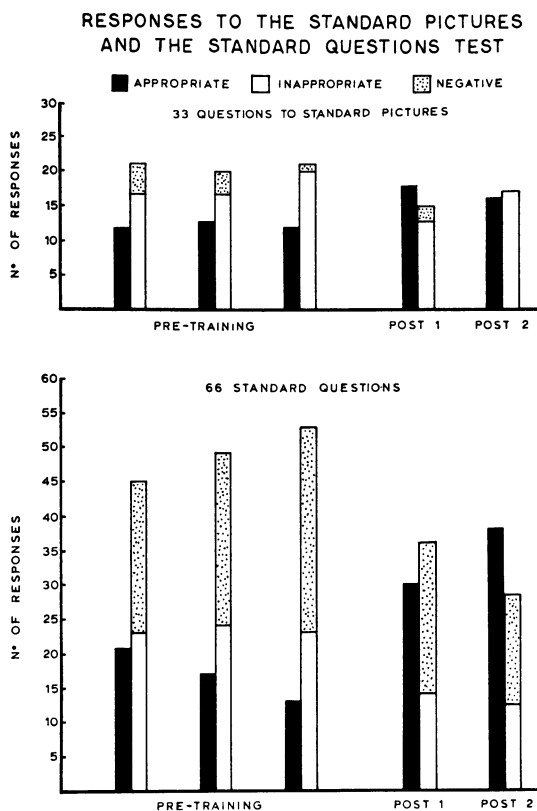


Fig. 2. Results of the generalization tests.

inappropriate responses then increased in the same way that appropriate responses had increased when they were reinforced. Thus, systematic replication of the effect was shown.

The basic principles of operant conditioning have been confirmed in many studies that directly modify simple behaviors such as self-dressing, biting, *etc.* It is more important now to determine whether these principles hold for more complex behaviors, especially for classes of behavior for which it is impossible to apply the contingencies to every example of the behavior. In dressing, for instance, a child is taught to put on his socks, shoes, underwear, *etc.* Every example of dressing behavior typically undergoes training. With a more complex behavior class, however, such as appropriate speech, this is not possible; there are far too many examples. Thus, one may teach a child to differentiate "cup" and "cups", "dog" and "dogs" (Guess, Sailor, Rutherford, and Baer, 1968) but one cannot hope to teach directly the differentiation of all singular and plural nouns. This requires the training of a rule, or "response class", rather than each

specific example. It is well known that specific examples can be trained; the task is now to find out how an entire response class can be trained, using the same basic principles of operant conditioning.

The present study did indeed modify not a single aspect of behavior, but an entire response class, by placing a contingency upon only a few, presumably representative, members of that class. That is, by modifying specific examples of the class "inappropriate responses", other diverse members of this class were modified as well.

The effects of operant conditioning on speech and language have been demonstrated in many studies. There are two main areas in which these techniques have been put to use: in acquiring speech, and in improving speech. Most work so far has emphasized the former of these (Lovaas, 1968; Sherman, 1968). However, once speech is acquired by the retarded, considerable work in the areas of articulation, grammar, and appropriateness needs to be done.

The present study demonstrated that in this case it was possible to use operant techniques to increase the proportion of appropriate speech utterances. Prior work in a mental hospital ward by Ayllon and Michael (1965) showed that reinforcing either "sensible" or "psychotic" patient conversation would increase the relative rate of either type of speech. The present study demonstrated the effectiveness of a similar technique, in a somewhat different situation. Further work may lead to a comparison of techniques and development of more effective techniques of response-class generation and measurement. The reinforcement technique of this study was effective; however, it is not known if both the candy *and* the social approval were necessary to produce conditioning. Risley and Wolf (1967) suggested that strong reinforcers such as food may be necessary initially to establish speech behaviors, but that it might be preferential from the point of view of generalization to use verbal praise as a reinforcer once basic conditioning was established. Similarly, the withdrawal of attention involved in the timeout procedure may not have been necessary. It added a considerable amount of time to the sessions, and also gave Simon the opportunity to get up, walk around, and become involved in various other disturbing behaviors. Risley

and Wolf (1967) indicated that for more disruptive behaviors, more severe timeout procedures, *e.g.*, removal to another room, might well be necessary. It was evident, however, that negative responses decreased without the 10-sec timeout contingency being applied to them. It is important to investigate economical contingencies as well as powerful ones.

Generalization is of obvious importance, particularly with social skills where the child or patient might well be required to exercise newly developed skills in a great variety of situations and with a number of different people; self-help skills in contrast are usually carried out in a much narrower range of situations. The results of the generalization test were, therefore, disappointing. Although no special techniques to increase generalization were used in the experimental procedures, the generalization sessions were sufficiently similar to the experimental sessions for quite considerable transfer to be expected. There are, however, a number of possible reasons why generalization occurred only minimally. One possibility is that Simon was accustomed to 100% reinforcement in the training sessions and so was well able to distinguish the generalization from the experimental sessions. The probe (no-contingency) sessions however, did not have this effect (nor did the probe that occurred after the generalization test show diminished conditioning) and so it is unlikely that lack of reinforcement alone was the cause of little generalization. It may nevertheless have had an interactive effect with one or more of the other suggested causes of minimal generalization.

There is also a possible connection between the lack of generalization and the fact that the subject was brain-damaged. This hypothesis could be tested in a study using both types of children, were it possible to make reliable diagnoses.

The generalization test was repeated and so may well have not been able to hold Simon's attention, whereas in the experimental sessions new stimuli were used every time. It is commonly reported that brain-damaged children are far more distractible than non brain-damaged; they appear to reach a saturation point with a given stimulus more quickly than others, and it is quite possible that this factor reduced the development of generalization, (Reynell, 1970). This suggests the im-

portance of attention in the operant conditioning of a complex behavior. Simon may have seen the experimental sessions as new stimuli plus reinforcement and the generalization sessions as old stimuli with no reinforcement. Thus, to him the two situations would appear far more different from each other than they did to the experimenter.

The general conversation questions, which were a large part of the generalization tests, might well have been associated by Simon with the ward environment where the reinforcement schedule appeared to oppose the laboratory one (in that inappropriate speech, rather than appropriate speech, seemed to receive attention).

It may be important to look further into measurement techniques for tests of generalization. The sets of pictures and questions used to study generalization were found to have many limitations. The test behavior appeared to be much less sensitive to change than the training session behavior. Also, the number of negative responses to the 66 standard questions was remarkably high. This probably reduced the sensitivity of the test.

In conclusion, it is suggested that generalization may not occur naturally to any great extent, and, further, more sensitive measures of generalization need to be developed.

The results of this paper bear out to a large extent Risley and Wolf's (1967) findings. Gray and Fygetakis (1968) also have reported that they were able to use operant conditioning techniques to develop appropriate language in dysphasic children, *i.e.*, children with normal intellectual potential but whose linguistic performance was poor as a result of neurological impairment. They concluded that the behavioral model triumphs over the medical model insofar as the development of speech for dysphasic children is concerned. It is felt that the present paper underlines and extends this conclusion in that it demonstrates that procedures developed from this model are valuable with severely subnormal dysphasic children. It also emphasizes, however, that considerable attention needs to be paid to generalization in order to achieve and to measure it.

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