The Modification and Generalization of Voice Loudness in an Emotionally Disturbed, Aphonic Girl as a Function of Reinforcement Contingencies in a Laboratory Setting

Donald Alan Jackson

Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/masters_theses

Part of the Experimental Analysis of Behavior Commons

Recommended Citation

Jackson, Donald Alan, "The Modification and Generalization of Voice Loudness in an Emotionally Disturbed, Aphonic Girl as a Function of Reinforcement Contingencies in a Laboratory Setting" (1968). Master's Theses. 3134.
https://scholarworks.wmich.edu/masters_theses/3134

This Masters Thesis—Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Master's Theses by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
THE MODIFICATION AND GENERALIZATION OF VOICE LOUDNESS IN AN 
EMOTIONALLY DISTURBED, APHONIC GIRL AS A FUNCTION 
OF REINFORCEMENT CONTINGENCIES IN A LABORATORY SETTING 

by 
Donald Al\c{c} Jackson 

A Thesis 
Submitted to the 
Faculty of the School of Graduate 
Studies in partial fulfillment 
of the 
Degree of Master of Arts 

Western Michigan University 
Kalamazoo, Michigan 
August, 1968
ACKNOWLEDGMENTS

I must express my gratitude to Dr. Robert P. Hawkins who served as my thesis advisor and an invaluable aid in this research, to Drs. B. L. Hopkins and Roger E. Ulrich who served on my thesis committee, to Mr. R. Frank Wallace for his continued help and guidance in carrying out this research, and to Miss Lynn Thomas, Miss Moira McArthur, Mrs. Sharron Wright, and Mr. Edward Hallin without whose patience, interest, and assistance this research would not have been possible. I would also like to acknowledge the support of Mr. Marland E. Bluhm, Director of Special Education and Mr. Albert L. Bradfield, Superintendent of the Kalamazoo Valley Intermediate School District.

Donald Alan Jackson

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
M A S T E R ' S  T H E S I S

JACKSON, Donald Alan
THE MODIFICATION AND GENERALIZATION OF
VOICE LOUDNESS IN AN EMOTIONALLY DISTURBED,
APHONIC GIRL AS A FUNCTION OF REINFORCEMENT
CONTINGENCIES IN A LABORATORY SETTING.

Western Michigan University, M.A. 1968
Psychology, experimental

University Microfilms, Inc., Ann Arbor, Michigan
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>II  METHOD</td>
<td>3</td>
</tr>
<tr>
<td>The Subject</td>
<td>3</td>
</tr>
<tr>
<td>The Apparatus</td>
<td>5</td>
</tr>
<tr>
<td>The Procedure</td>
<td>7</td>
</tr>
<tr>
<td>Conditioning Session</td>
<td>8</td>
</tr>
<tr>
<td>Laboratory Generalization Session</td>
<td>9</td>
</tr>
<tr>
<td>Classroom Generalization Session</td>
<td>10</td>
</tr>
<tr>
<td>Baseline Phase</td>
<td>12</td>
</tr>
<tr>
<td>First Experimental Phase</td>
<td>12</td>
</tr>
<tr>
<td>Reversal Phase</td>
<td>14</td>
</tr>
<tr>
<td>Second Experimental Phase</td>
<td>15</td>
</tr>
<tr>
<td>III  RESULTS AND DISCUSSION</td>
<td>16</td>
</tr>
<tr>
<td>Conditioning Session</td>
<td>16</td>
</tr>
<tr>
<td>Laboratory Generalization Session</td>
<td>20</td>
</tr>
<tr>
<td>Classroom Generalization Session</td>
<td>27</td>
</tr>
<tr>
<td>IV   APPENDIX A</td>
<td>32</td>
</tr>
<tr>
<td>V    APPENDIX B</td>
<td>34</td>
</tr>
<tr>
<td>VI   REFERENCES</td>
<td>35</td>
</tr>
</tbody>
</table>
In dealing with emotional disturbances in public school children, much attention has been focused on the child whose behavioral problems are quite obvious because of their bizarre or disruptive nature, and their aversiveness to others. Those children, on the other hand, who are "withdrawn" are many times forgotten, probably because the child's behavior is not aversive to anyone and therefore does not demand action. The consequence for this type of child is that his behavioral repertoire may become highly deficient, both in academic skills and in social skills that appear to be important for adjustment later in life.

One important element of the group of behaviors that causes a child to be labeled "withdrawn" is the child's verbal behavior. The human infant, no doubt, begins to develop communication skills almost coincidental with the start of life, and the development of his verbal behavior is probably highly dependent upon the training given the child.

Early investigators who were concerned with verbal behavior showed little interest in it as an interesting behavior in itself, but rather considered it to be merely an index of some more significant psychological process. For example, many investigators studied verbal behavior as a dependent variable, but only as reflecting other dependent variables in which they were more interested, such as "attitudes" or "feelings". The importance of collecting information on the experimental manipulation of verbal behavior itself, has been pointed out in reviews of verbal conditioning experiments by"
Krasner (1958) and Salzinger (1959). These authors emphasized the need to identify the variables responsible for changes in verbal behavior.

Reports on the use of verbal conditioning techniques have shown its applicability to the treating of speech disorders in children (Kerr, Meyerson, and Michael, 1965; McReynolds, 1967; Salzinger, Feldman, Cowan and Salzinger, 1965), the treatment of mutism in long term psychotics (Isaacs, Thomas, and Goldiamond, 1960; Sherman 1965) and the control of operant stuttering (Flanagan, Goldiamond and Azrin, 1958). It has also been shown that reinforcement contingencies can be effective in controlling the rate of speech (Shearn, Sprague, and Rosenzweig, 1961; Yoder, 1967; Salzinger, Salzinger, Portnoy, Eckman, Bacon, Deutsch and Zubin, 1962), its pitch (Cross and Lane, 1962), its duration (Lane, 1964), and problems of speech loudness or aphonia (Black, 1951; Walton and Black, 1959; Bijou and Bear 1966; Bangs and Freidinger, 1949).

It is with this last problem, the problem of aphonia or abnormally quiet speech, that the following research is concerned. The present experiment was designed to explore the feasibility of treating such a disorder in a laboratory setting and to study the generalization of this training to situations more similar to the school classroom. As in the Bangs and Freidinger (1949) study, voice loudness was shaped by requiring the subject to emit an increasingly louder response, which each time would more closely approximate the terminal behavior desired, namely, normal voice loudness.
METHOD

Subject

The child in this study was a fifteen-year-old girl, whom we shall call Alice. She is the second of five children in a lower-middle class family. The father is characterized by his wife as being a hard worker and a good provider. The mother says of herself that she is withdrawn and feels insecure most of the time. The parents reported that Alice has no problems and that she is rather shy. At school, however, Alice was never known to interact with anyone unless told to do so (data were recorded on this behavior by the teacher in a special education classroom, but recording was terminated when no spontaneous interactions had occurred in three weeks of observation). She characteristically would spend the day sitting at her desk, with her head bowed and her long, stringy hair almost completely obscuring her face from view. She was rarely observed to look up from her desk unless it was necessary to do so in order to complete an assignment. At one point an observer recorded the number of times Alice looked up from her desk to attend to other stimuli for 45 minutes per day for three weeks. Upon the subsequent application of social and token reinforcement for handraising and eye-contact with other people, the frequency of looking up rose from zero to a mean of 1.8 responses per session (the median, however, remained at zero).

Alice virtually never spoke except in response to a
question, and even then, she would often shrug her shoulders rather than give a verbal response. When she did answer a question verbally, her response was barely audible. Attempts to get Alice to speak louder in the classroom had been consistently futile. The teachers had, at best, only minimal success when they had told Alice to speak louder, when they had scolded her for responding inaudibly, and when they had rewarded her with praise and tokens when she would more closely approximate a normal voice level.

Alice had been in a classroom for educable retardates for eight years (since she was seven years old) before being placed in a classroom for emotionally disturbed children three months prior to the beginning of the present experiment. She had been evaluated by school diagnosticians when she was 7, 9, 12 and 14 years old, and by a child psychiatrist when she was 15 years old. Her latest scores (at age 14) on the Wechsler Intelligence Scale for Children were: Verbal I.Q. 76, Performance I.Q. 79, and Full Scale I.Q. 75. At age 14 her scores on the Wide Range Achievement Test were: Arithmetic grade level 4.5, Reading grade 4.2, and Spelling grade 3.5. She had been seen regularly by visiting teachers when she was 9, 11, and 12 years old. When, at the age of 15, Alice was referred to a program for emotionally disturbed children (described by Hawkins, McArthur, Rinaldi, Gray, and Schaftenaar, 1967) she was described as being severely disturbed and withdrawn, and functioning in the mildly retarded range. This description was much
the same as when she had first been referred to special education at the age of seven.

As part of an overall treatment program employed in the classroom for emotionally disturbed children, a program of intensive treatment was undertaken for Alice. Because of the severity of Alice's withdrawal and because less intensive procedures used by the teachers had been ineffective, it was decided that her withdrawal would be modified piecemeal, beginning with the aphonia. The treatment plan also provided an opportunity to study aphonia in a laboratory setting.

Apparatus

The conditioning took place in one end of a spare classroom, across the hall from Alice's classroom. Alice sat in a three sided cubicle (4' x 4' x 4') which was lined with acoustical tile and contained a table and chair, a box to hold tokens, a paper on which to record the number of tokens earned, a small white cue light, a stack of flash cards with one monosyllabic word written on each (see Appendix A), and two microphones fastened to a stiff wire lavalier. A poker chip dispenser was constructed with a vertical aluminum tube, large enough to hold 100 chips, inside a wooden box, with the bottom of the tube held above the floor of the box a distance slightly greater than the thickness of one poker chip. The dispenser was located on a high table near the cubicle. When activated by a solenoid, a flat metal blade, constructed of sheet aluminum, would slice off
the exposed chip at the bottom of the vertical tube, sending it down a length of flexible four-inch clothes dryer tubing to the box in Alice's cubicle.

The experimenter sat in a cubicle identical to Alice's and approximately fifteen feet away. The instruments in the experimenter's cubicle included a voice-operated relay (Hunter Manufacturing Co.) which was used to establish and maintain a certain criterion level of voice loudness. By decreasing the sensitivity of the relay, the experimenter could require more voice volume in order to operate the relay, and hence meet the current criterion for reinforcement.

Voice loudness was read directly from a decibel meter (Heath Company, Vacuum tube volt meter, model V-7A) that was calibrated by means of a sound level meter (General Radio Company, Model 759). One cue light in the experimenter's cubicle indicated when Alice's cue light was on, and a second light indicated when she had met the criterion for reinforcement. A Panasonic portable tape recorder (model RQ-116) with a nine volt A.C. adapter was used for recording Alice's speech during generalization sessions in the laboratory and in the classroom. Tokens from the token dispenser were triggered manually by a button in the experimenter's cubicle. An air circulation fan was used to partially mask noises from outside the room so as to prevent the accidental measurement of sounds other than Alice's voice. This fan was located approximately eight feet behind Alice, and in combination with other random sounds in the building, produced an ambient noise.
level of 58 decibels.

Behind the experimenter was the necessary relay circuitry to control the cueing and recording of responses. The relay rack was enclosed in a cupboard and the sound the relays made, which was slightly greater when Alice had met criterion level, may have been audible to Alice. However, the only disadvantage that could have resulted from her hearing this sound is that it could have served as an additional conditioned reinforcer during the Experimental Phase (see Procedure section), and consequently diminish the effect of a DRO reversal procedure.

Procedure

Because of the severity of the problem under study, and because of the ineffectiveness of treatment procedures that were tried in the classroom setting, it was decided that a more purely laboratory approach might be best. If voice intensity could be affected in such a setting, it would then be easier to produce the same results in the classroom. In addition, the laboratory setting was desirable for the following reasons of control and experimental precision: (1) it removed Alice from some of the social SRs that probably were important in maintaining her quiet voice; (2) it allowed for the controlled manipulation of different variables until one was found that would modify the behavior; (3) it allowed for very intensive treatment during a portion of the day; and (4) it made possible the detection of very slight increases in loudness and thus the
gradual shaping of response topography that might not have been possible with a subjective evaluation of loudness.

Data were taken in three separate settings, one Conditioning Session and two Generalization Sessions. The generalization data were taken for two reasons. First, even a gradual change in behavior in the Conditioning Session and not in the two Generalization Sessions would be an indication that our independent variable was the cause of the change, especially if a change in behavior subsequently occurred in the generalization settings when the same independent variable was applied there. Second, since the two generalization settings were more similar to the classroom, it would be possible to observe to what degree an intensive treatment in a special setting would produce an improvement in Alice's voice level in the "natural" setting. These generalization data also would hold implications for professionals involved in treating disturbed children in clinics or even in special interviewing rooms within the school building.

**Conditioning session**

During the Conditioning Session, Alice was seated at the table in her cubicle in the laboratory with the microphones hung around her neck. The 100 flashcards were in front of her. The small cue light on the table would alternate being on for five seconds and off for two seconds. Alice was instructed that each time the cue light came on, she was to say the word on the top card, then wait until the light went off and came back on again before saying the word on the next card. Alice would say 100
words in each session. The experimenter was seated in his own cubicle and would read from the meter the loudness of each word and record this reading on a data sheet. A "mean loudness per word" was calculated for each session.

Tokens were dispensed from the poker chip dispenser in all Conditioning Sessions subsequent to the Baseline Phase of the experiment. If Alice had met the criterion for reinforcement in reading a word the experimenter would release a token. The sound of the solenoid in the chip dispenser occurred almost immediately after the word was said, and thus probably served as an additional conditioned reinforcer since it was closely paired with the delivery of a token. Tokens were exchangeable for a variety of items that Alice had indicated she would like to earn (see Appendix B).

Laboratory generalization session

As a test of whether changes in the voice loudness seen in the daily Conditioning Session would generalize to a situation somewhat similar to it, Alice was required to read from a book for ten minutes immediately following the Conditioning Session. The book was a reading text that was three grade levels below her current level of reading skill so as to insure easy, fluent reading. Alice remained in the cubicle and the experimenter sat beside her and listened silently during this period. The experimenter took care not to differentially reinforce loud reading during this time, with the exception of sessions 41
through 47, which are discussed below.

The Laboratory Generalization Sessions were recorded on tape so that the experimenter could later go back to measure the voice loudness, by connecting the decibel meter directly to the tape recorder while keeping the volume and tone controls constant. Three 50-word samples were taken. Each word in the samples was measured separately, and their levels were recorded in order on a data sheet.

**Classroom generalization session**

As a measure of the effect of the laboratory conditioning on the level of Alice's voice in the classroom, data were collected, by means of a tape recorder, during the daily English session. For English, Alice was seated at a six sided table with four classmates and the teacher. The table was specifically constructed so that regardless of what side of the table Alice sat on, she would be approximately the same distance from the microphone. The tape recorder was concealed in a box mounted on the underside of the table and the microphone was in a small artificial flower arrangement in the center of the table. Data were recorded on all five children by connecting the decibel meter directly to the tape recorder and taking readings on the first twenty-five words that were spoken by each child. The activity during this session was always reading questions, answers or instructions from a book.

The session explained above took place at three different
times during the day. At about 9:15 a.m., Alice would come into the laboratory for a Conditioning Session, followed by a Laboratory Generalization Session. The Conditioning Session would take about twelve minutes and the Laboratory Generalization Session would take ten minutes. Including the time it took to begin and the time necessary to count and record the tokens at the end of the session, these two periods would consume approximately thirty minutes. Later in the morning, usually about 11:15, data were recorded in the classroom during the English session. Again at 1:15, Alice would come into the laboratory for another Conditioning Session and a Laboratory Generalization Session. Thus each day typically included two Conditioning Sessions, two Laboratory Generalization Sessions and one Classroom Generalization Session, although on some days there was only one of each session.

Absolute levels of loudness cannot be compared across the different sessions, because loudness was measured in different ways in the different settings. It is only possible, then, to look for generalization of changes and to compare the data on Alice with data on some of her peers.

The experiment was divided into four phases: The Baseline Phase, the First Experimental Phase, the Reversal Phase and the Second Experimental Phase. The general daily procedure outlined above was followed in each phase. The procedures specific to the four phases are presented here in order.
Baseline phase

During this phase the intensity of Alice's voice was measured in all three settings. The experimenter and the teacher did not reinforce or prompt loudness, except that when Alice gave an inaudible response to a question, the teacher would simply say, "I beg your pardon?" or something similar.

When an adequate estimate of the pre-treatment loudness of Alice's voice had been obtained, the First Experimental Phase was begun.

First experimental phase

The shaping of Alice's voice intensity was done during the First Experimental Phase of the experiment. Before the first Conditioning Session in this phase, the experimenter told Alice that she would be able to earn a token for each word that she said, but that in order to earn the token, she would have to say the word loudly, and that if she failed to say the word loudly enough, no token would be delivered. These instructions were repeated (in this general form) before every Conditioning Session of this phase. (The effectiveness of using instructions accompanied by reinforcement is shown by Ayllon and Azrin, 1964. These experimenters found that neither reinforcement nor verbal instructions alone were as effective as was the combination of the two in modifying a socially desirable response in mental patients.)
Whenever Alice said a word loudly enough to close the voice operated relay, a point would be scored automatically on a counter, a cue light would come on in the experimenter's booth, and the experimenter would trigger the token dispenser. At the start of some of the sessions, if Alice was speaking extremely softly, the experimenter would shape voice loudness to the current criterion level by dispensing tokens for two or three trials that had not quite met criterion.

Several times during the First Experimental Phase the criterion for reinforcement was raised by decreasing the sensitivity of the voice-operated relay, thereby requiring Alice to speak even louder than before in order to receive tokens. Criterion was raised in such a manner during sessions 18, 20, 26, 28, 29, 30, 32, 35, 38, 47, 54, and 57. Criterion was always raised during a session to assure that Alice was responding loud enough to meet the prevailing criterion level before requiring her to become even louder.

The number of tokens earned in the Conditioning Session was recorded at the end of the period on a sheet of paper left in Alice's cubicle, and these points were periodically traded for material items. A list of the items Alice earned, when she earned them, and how much they cost her is given in Appendix B. Alice was able to make a purchase approximately every six sessions on the average.

During sessions 49 through 55, a similar token reinforcement system was instituted in the Laboratory Generalization
Session. On session 42 (point "a", Fig. 6) the experimenter gave Alice instructions to speak as loudly in the classroom as she was in the laboratory. On session 43 (point "b", Fig. 6), the teacher began systematically prompting and reinforcing loudness in the Classroom Generalization sessions by telling Alice to speak loudly and then rewarding her with praise and tokens if she increased her voice level at all (this reinforcement contingency, of course, was based only on improvements detected by the teacher). This latter procedure remained in effect throughout the remainder of the experiment.

Reversal phase

In order to make sure that the contingent reinforcement was the significant causative factor in the change in Alice's behavior, a reversal period was started on session 64 and continued for five sessions. During this period the reinforcement contingency was reversed, so that rather than being reinforced for loudness, Alice was receiving a token whenever she spoke softly. The advantage of such a reversal, which is called the differential reinforcement of other (or, in this case, "opposite") responses (DRO), is indicated in the following statement by Bijou and Baer (1966):

(The DRO)...schedule allows reinforcers to be delivered at the usual rate to the subject, but not contingent on previously reinforced behavior; thus it constitutes an extinction condition minimally different from the reinforcement conditions of the schedule (p. 770).

The DRO type of reversal also has the advantage over the
simple extinction type of reversal (in which no reinforcement is delivered) of being a strong test of the contingency itself, for the contingency is not merely removed but actually attached to different behavior.

A reversal technique of this kind has been employed in a number of studies (e.g. Ayllon and Michael, 1959; Harris, Johnson, Kelly, and Wolf, 1964; Timmons, 1959, and Long, 1962). The technique used in the present experiment resembles closely that used by Lane (1964) in his study of the differential reinforcement of vocal duration. As in Lane’s work, Alice’s behavior was gradually shaped in a direction opposite to that of the Experimental Phase. Alice, therefore, was gradually required to speak softer and softer in order to earn tokens, even though the instructions given by the experimenter indicated otherwise.

On the first day of the Reversal Phase, the instructions given Alice were the same as before, indicating to Alice that she must speak loudly in order to earn tokens. On the subsequent days of the Reversal Phase, the experimenter told her, “Do a good job so you can earn lots of tokens,” with no direct referral to having to speak loudly. This type of instruction, in fact, was given many times during the Experimental Phases as well.

Second experimental phase

After the Reversal Phase, the contingency was returned to its initial condition, so that Alice was again reinforced for loudness, as she had been during the first Experimental Phase.
Instructions to speak loudly were given as they had been before, and the criterion was returned to the level in effect at the end of the First Experimental Phase.

Periodically, some of Alice's classmates were asked to go through a Conditioning Session and a Laboratory Generalization Session under the same conditions that prevailed for Alice during the Baseline Phase. No reinforcements were dispensed, and the instructions were the same as they had been for Alice during the Baseline Phase. This allowed for an objective comparison between the voice level that was normally used by these children and any increase in Alice's voice level as a result of the conditioning.

RESULTS AND DISCUSSION

Conditioning Session

The mean decibels per word in the Conditioning Session is shown in Fig. 1. During the Baseline Phase, the level of Alice's verbalizations was unfortunately too soft to be measured on the decibel meter. It is known only that the level was below 72 decibels, because that was the least intense sound to which the meter would respond. The data for the peers are indicated in Fig. 1 as individual data points.

On the first day of the First Experimental Phase, Alice's voice level increased markedly. Because the meter was not sensitive enough to produce a reading during Baseline, however,
Fig. 1. Conditioning Session. Breaks in the line indicate where the criterion for reinforcement was raised. Loudness during Baseline is known only to be less than 72 decibels.
the actual amount of this increase is not known. Throughout the First Experimental Phase, Alice continued to make gradual improvements. Breaks in the line during the Experimental Phase indicate where criterion was raised during the session. It will be observed that typically Alice adjusted fairly rapidly to the new requirements, for her loudness during the second half of the session was usually above that for the first half, a phenomenon that was present but not nearly as marked during sessions in which the criterion for reinforcement was not raised.

At point "a" on Fig. 1 the regular school year ended. Alice enrolled in a summer program that was a continuation of the School Adjustment Program, but was to be held in a different school building. The laboratory was therefore moved to this new setting. On the first session in the new building it was found that Alice had a much easier time getting reinforcements; she did not have to talk as loudly as before in order to meet the criterion for reinforcement. This effect can be seen in Fig. 1, session 55. The reason for this sudden change in the sensitivity of the voice-operated relay is not known, but it is thought to be due to a difference in acoustics, because the ceiling was much lower in the new building. Criterion was raised two sessions later (session 57), after which Alice's measured voice level returned to and surpassed her previous high point.

The Reversal Phase was marked by a sudden drop in voice loudness, testifying to the fact that the reinforcement contingency had been the significant causative factor in Alice's
increased voice loudness. When asked, after the second session of the DRO procedure, if she thought anything was different, Alice was able to specify that she was only receiving tokens when she talked softly. When tokens were again made contingent upon loud reading, in the Second Experimental Phase, her voice level again rose gradually.

It is most significant, to notice that the loudness of Alice's voice in the Conditioning Sessions near the end of the experiment was higher than that of any of her classmates, all of whom spoke with "normal" loudness. The change in the loudness of Alice's speech was quite dramatic by subjective impression also. Near the end of the experiment, in fact, the experimenter observed that Alice was speaking so loudly in the Conditioning Session that she would have been considered to be speaking abnormally loud if she were to use the same voice in the classroom.

During the Baseline Phase of the research, the experimenter was unable to understand the words that Alice was saying in the Conditioning Sessions, even though he was just 15 feet away. On several occasions during the Experimental Phase, outside observers had silently hidden in a booth across the room (about 25 feet away) during Conditioning Sessions and written down the 100 words that Alice said as they heard them. On four such occasions, different observers were able to correctly identify 65, 84, 73, and 82 percent of the words spoken by Alice. All of these observations were made during the first half of the
First Experimental Phase, and hence before Alice had made her greatest improvement. Most of the words missed by these observers, moreover, were guessed to be something very similar to the actual word. For example, "an" would be heard instead of "ant", "hats" instead of "pats", and "rat", instead of "raft".

During the Second Experimental Phase, a television camera was focused on Alice to observe her behavior during the Conditioning Sessions. It was observed that a rather peculiar head movement accompanied the pronouncing of some of the words. Alice would make a side-to-side movement as if to help her say the word louder. It did not appear, however, that she was leaning into the microphone, which would have been awkward to do because the microphone was hanging around her own neck and resting on her chest.

Laboratory Generalization Session

The Laboratory Generalization Sessions consisted of ten minutes of reading. Since Alice would read approximately 1100 words during this time, it would have been impractical to score all of the words. Fifty-word samples were therefore taken from the very beginning, from the middle, (taken at the mid-point of the session, which was identified on the tapes as the point at which the experimenter had coughed loudly), and from the very end of each session.

Early in the Experimental Phase it was discovered that
"temporal" generalization from the Conditioning Sessions was occurring. Alice read more loudly at the beginning of the Laboratory Generalization Sessions than later in that period. This generalization effect is evident in Fig. 2, where loudness data of the first 50 words of each session are presented separately from those of the last 50 words. In nearly every session, Alice spoke louder in reading the first 50 words than in reading the last 50 words.

This effect is presented in more detail in Fig. 3, where the data of sessions 15 through 24 are combined to show the general progress of Alice's loudness as a Laboratory Generalization Session progressed. The mean loudness of the first five words of all ten sessions combined are presented as the first data point, the mean loudness of the second five words are presented as the second data point, and so on. This method of combining data was used for the first 50, the middle 50, and the last 50 words of the ten sessions. The data show that, on the average, Alice spoke more quietly as the Laboratory Generalization Session progressed.

It is possible, however, that Alice spoke progressively softer because she merely became tired during each session. This hypothesis would be supported if during Baseline, Alice had shown a similar progression from loud to soft. The loudness of successive blocks of five words was therefore measured for all Baseline sessions as had been done for the data in Fig. 3. The mean values of these successive blocks for all of the
Fig. 2. Laboratory Generalization Session. Mean loudness is presented separately for the beginning and the end of each session.
Fig. 3. Generalization voice loudness during Laboratory Generalization Session. The data show consecutive words (in five-word blocks), averaged across sessions 15 through 24, to illustrate the gradual decrease in loudness after the Conditioning Session.
Baseline are presented in Fig. 4. It is evident that there was very little fatigue effect. Alice spoke only slightly softer as the session progressed during Baseline.

It appears in Fig. 2 that the temporal generalization obtained early in the Experimental Phase began to disappear later in that Phase. Therefore, the mean loudness of successive blocks of five words was taken for session 56 through 63, as is shown in Fig. 5. It can be seen from this Figure that the temporal generalization effect was not as pronounced at this point as it had been earlier in the Experimental Phase, and that generally, Alice was speaking considerably louder throughout the entire Laboratory Generalization Sessions.

Inter-observer reliability measures were taken on the Laboratory Generalization data to determine how accurately the experimenter was reading the decibel meter. An observer was told to take the same samples from the tapes that had been taken by the experimenter, measuring the loudness of each word in the sample with the decibel meter. The mean loudness per word was calculated for each sample and then compared with the scores obtained by the experimenter. The percent of agreement of the two mean values obtained for each sample was determined by dividing the smaller score by the larger. The percent of agreement scores for the first and last samples appear over the corresponding session number near the bottom of Fig. 2. These were the most difficult data to record, because they were of Alice reading. It was therefore considered to be unnecessary.
Fig. 4. Laboratory Generalization Sessions during Baseline Phase. The data show very little decrease in loudness as these sessions progressed.
Fig. 5. Generalization of voice loudness during Laboratory Generalization Sessions. These data, averaged across sessions late in the First Experimental Phase, show Alice to be speaking considerably louder than before throughout the entire session.
to take reliability on other data.

During sessions 49 through 55, Alice was told to read her story loudly and tokens were dispensed by the experimenter if she did read loudly. A second experimenter sat in the experimenter's cubicle during these Laboratory Generalization Sessions and read the decibel meter. If Alice could move the needle up to a specified criterion level, the second experimenter would flash the cue light in Alice's booth, and the experimenter with Alice would drop a chip on the table. This was discontinued, however, as it was ineffective in producing generalization, as is verified by Fig. 2.

Unfortunately, three data points during the Reversal Phase were lost due to technical problems. It would have been interesting to see if the DRO contingency being used in the Conditioning Session would have had an effect on these generalization data.

Classroom Generalization Session

The data regarding generalization of effects achieved in the laboratory setting into the classroom are shown in Fig. 6. This Figure shows the mean (heavy line) and the range (dashed lines) of the voice loudness of Alice's peers during English. Alice's loudness is indicated by the bottom line. There is a greater amount of variability from session to session during the Experimental Phase than there was during the Baseline Phase, but there seems to be little other effect of the conditioning taking place during
the Conditioning Sessions. At point "a" the experimenter told Alice to speak loudly in the classroom. This seems to have had no effect, but of course, the child had been told the same thing innumerable times before by various adults. At point "b" the teacher began instructing Alice to talk louder and reinforcing loudness in the Classroom Generalization Sessions. There appeared to be an upward trend, until the end of the school year. When summer school started (point "c"), Alice's voice loudness was lower again, even though the teacher continued instructing and reinforcing.

In general, it can be said that the good results seen in the Conditioning Session were quite highly discriminated. The fact that Alice spoke loudly in the laboratory while continuing to speak softly in the classroom is testimony to the significance of the reinforcement contingency employed in the laboratory. The fact that somewhat similar treatments of using tokens in the Laboratory and Classroom Generalization Sessions failed to affect the behavior in these settings, on the other hand, indicated that the stimulus conditions, reinforcement contingencies and/or response requirements were too grossly different from those in the laboratory setting. The response requirements of reading or answering questions with appropriate loudness while with a group of people turned out to be much greater than saying monosyllabic words while virtually alone and while being rewarded for saying each one with appropriate volume.

There were some subjective indications, however, that Alice
was improving in the classroom. The teachers reported that since the experiment had started, Alice would occasionally respond to them with very normal voice volume, and that she seemed to be responding somewhat to her environment by looking around and acknowledging things that were going on around her. Other improvements were noted, although they might have been as a result of numerous things. Alice began to pin her hair behind her ears, something she had never done before. She also allowed a beautician to cut her hair, which seemed significant since she had always refused to have it cut before.

Further research on this problem with this same subject is aimed at determining how to shape appropriate voice loudness in situations that successively approximate the classroom and with responses that successively approximate those expected of Alice by her teachers and peers. This is being done by requiring a greater and greater quantity of speech per reinforcement, and by making the laboratory increasingly similar to the classroom.

The research presented here shows that the differential reinforcement of speech loudness can increase the voice level when the reinforcement is dispensed systematically in a laboratory setting. The significance of this modification of behavior is pointed out by Holz and Azrin (1966) who said that "duration along with pitch and intensity comprise the major physical dimensions of speech," and that if these dimensions can be modified by conditioning, it is likely that words, phrases and similar "aspects of the flow of speech can be shaped.
into various patterns by their consequences" (p. 813).

The medical model of behavior maladjustment has led to the treatment of maladjusted persons in clinics and offices as though to cure them of a disease and then send them back out into their daily environment "whole" again (Ullmann & Krasner, 1965, pp. 1 - 63). That this can be a misconception is pointed out in the research presented here. Alice's increased voice loudness was highly discriminated to the laboratory environment, and to a simple specified response. Outside of the laboratory the same behavior was not being maintained.

What has been demonstrated, then, is simply that voice volume can be modified by the systematic application of consequences. The procedure is not necessarily being recommended as a method of treatment, and the successful modification of voice volume is certainly only a small portion of the solution to Alice's problems. The fact that this behavior can be conditioned in this manner, however, holds implications for the future study of "withdrawn" behavior and certain kinds of speech pathology.
APPENDIX A

Alice would say 100 of the words presented here during each Conditioning Period.

lamp  sad  help  spill  ship  grass
dig   scratch  give  pats  wet  bank
deck  snap  live  bill  than  thing
black bit  past  pen  is  chin
ink   crash  hand  last  milk  lap
raft  bed  bag  fat  shell  this
rang  step  fan  beg  tin  ring
wig   fix  man  kick  tab  glad
have  at  crab  I  slid  has
pick  which  glass  bat  rat  egg
trap  pack  catch  red  fast  his
bath  stick  tan  trip  can  sack
fill  chill  best  then  hit  up
brick back  will  hang  dress  bring
mat   six  sit  thin  plant  it
miss  fin  map  ran  sick  men
bell  get  as  sang  fit  peck
witch sand  well  kiss  cat  am
pitch went  nest  nap  king  pill
print big  pinch  left  pant  did
bang  hill  next  sank  nip  splash
leg   ant  shelf  pin  ding  tap
sat with
 cats him
 fish to
 peg had
 pink kit
 chick her
 track sniff
 dish pet
 pan sled
 swam lick
 wing skip
 hid swim
 win swing
 and still
 ten sting
 sing hatch
 lips band
 match mitt
 drip rich
 sink bend
 hat Sam

stand
that
bent
desk
tent
APPENDIX B

The following is a list of the items Alice purchased with her tokens.

<table>
<thead>
<tr>
<th>Session</th>
<th>Item</th>
<th>Price (in tokens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>cologne</td>
<td>260</td>
</tr>
<tr>
<td>24</td>
<td>Photo album</td>
<td>600</td>
</tr>
<tr>
<td>26</td>
<td>magazine</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>trip to old classroom</td>
<td>300</td>
</tr>
<tr>
<td>32</td>
<td>magazine</td>
<td>50</td>
</tr>
<tr>
<td>43</td>
<td>book</td>
<td>800</td>
</tr>
<tr>
<td>49</td>
<td>book</td>
<td>400</td>
</tr>
<tr>
<td>54</td>
<td>bracelet</td>
<td>500</td>
</tr>
<tr>
<td>70</td>
<td>hair shampoo and set</td>
<td>700</td>
</tr>
<tr>
<td>72</td>
<td>magazine</td>
<td>100</td>
</tr>
</tbody>
</table>
REFERENCES


Sherman, J. A. Use of reinforcement and imitation to reinstate verbal behavior in mute psychotics. *Journal of Abnormal Psychology*, 1965, 70, 155-164.


