Social Reinforcement and Generalization of Changes in Verbal Behavior Development

William J. Mayville

Western Michigan University

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SOCIAL REINFORCEMENT AND GENERALIZATION OF
CHANGES IN VERBAL BEHAVIOR DEVELOPMENT

by

William J. Mayville

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
July 1967
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William J. Mayville
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INTRODUCTION

The purposes of this research are to investigate the effects of specific variables and behavior modification procedures for developing and generalizing appropriate verbal behavior in an autistic child.

Ullmann and Krasner describe behavior modification as "...the application of the results of learning theory and experimental psychology to the problem of altering maladaptive behavior. The focus of attention is overt behavior and in terms of both development and change of behavior, no distinction is made between adaptive and maladaptive responses." Behavior modification as a therapeutic approach is replete with many different techniques all of which, however, utilize essentially the same principles of behavior control. An increasing amount of evidence has accumulated in the current psychological literature which attests to the growing popularity and overall effectiveness of operant conditioning techniques. The utility of these techniques has been demonstrated in a wide variety of settings encompassing many different types of abnormal human behavior. For example, Ayllon (1963) employing various operant conditioning techniques has effectively modified abnormal behaviors such as towel hoarding and wearing of excessive clothing by mental hospital in-patients. In the area of mental retardation, Birnbrauer (1965) through the use of programmed instruction, has increased the academic productivity of mentally retarded children.
Harris et al. (1964) and Allen et al. (1965) have demonstrated the elimination of such maladaptive responses as regressed crawling and isolate behavior in nursery school children by the systematic presentation and withdrawal of social reinforcement. Goldiamond (1960, 1962a) has applied operant conditioning procedures to the treatment of chronic stuttering to produce significant and dramatic changes in rates of fluent speech. The modification of abnormal verbal behavior has been a particularly popular focus in the area of behavior modification. For example, Isaacs, Thomas and Goldiamond (1960) using reinforcement procedures reinstated verbal behavior in two schizophrenic patients, both of whom had been mute for many years. Initially, verbalizations were shaped in these patients by using chewing gum as a reinforcer. Subsequently, the subjects were exposed to other reinforcers which were presented as a consequence of appropriate verbal requests and statements. Sherman (1965), in a similar study, demonstrated reinstatement of verbal behavior in three mute psychotics. Limited verbal repertoires were developed in two of the subjects through utilization of shaping and fading techniques. A third subject initially required imitation training of vocalizations which were later shaped into verbal responses. Ayllon (1964), in another study, has shown that systematic presentation and withdrawal of social reinforcement controlled symptomatic verbal behavior.

Research in verbal behavior has also been conducted in the area of childhood disorders. A growing number of behavioral engineers have focused attention on the deficient verbal behavior of
autistic children. Characteristically, these children possess verbal repertoires which are inadequately developed in terms of both quantity and quality of output. Ferster (1961) observed that total verbal output varies "from mutism to a repertoire of a few words" and that "even when large numbers of words are emitted, the speech is not normal in the sense that it is not maintained by its effect on a social environment." Verbal interaction with others is usually in the form of simple responses controlled by some current level of deprivation present in the speaker. There is a lack of "sensitive interchange" which is exemplified in the normal verbal interaction between speaker and listener.

Lovaas (1966, 1967), Risley (1966, 1967) and Sherman (1964) described specific procedures used to modify and develop the verbal behavior of children who exhibit impoverished verbal repertoires. Sherman suggests that if non-verbal children emit vocalizations, rapid progress can be made in verbal training. This progress is accomplished through differential reinforcement of various vocal sounds which are subsequently evolved to form words. This author also suggests that in dealing with children who emit no vocal behavior, it might be useful to develop imitative control over non-verbal behaviors initially and then progress to imitative vocalizations and then verbal behavior. Selection of a powerful reinforcer is important to the execution of a verbal development procedure such as the one described by Sherman. It has been suggested by researchers (Ferster, 1961; Lovaas, 1966; Risley, 1967) that secondary reinforcers such as various forms of social stimuli
are not initially effective in producing and maintaining desired behavior in autistic children. In their research and demonstrations, some form of food reinforcement has been employed at the outset of the developmental procedure. They have assumed that conditioned reinforcers would be relatively ineffective to produce initial control. However, Lovaas (1966) contends that social stimuli used as discriminative stimuli for primary (food) reinforcement will eventually acquire reinforcing properties and that these reinforcing properties will become more durable through subsequent intermittent association with the primary reinforcer. Lovaas (1966) also discusses the importance of establishing a "normal hierarchy of social reinforcers" which would enable the child to develop the myriad behaviors essential to effective functioning in its everyday social environment.

Another step in the development of adequate speech is the establishment of control over the existing mimicking repertoire of the child (Risley, 1966). This is accomplished by first presenting a verbal prompt to be mimicked after which reinforcement is given for appropriate mimicking responses. When sufficient control has been demonstrated, i.e., the child appropriately mimics all prompts emanating from the experimenter, the existing repertoire is then expanded to include other words or phrases similar in length or difficulty to the existing repertoire (Risley, 1966).

Upon completion of the mimicking exercises, an attempt is made to bring the existing verbal repertoire under the control of the appropriate discriminative stimuli in the child's environment.
Risley (1967) suggests that the child be initially trained to name objects in response to the therapist’s questions relating to those objects. For example, the experimenter asks "What is this?" while pointing to a particular item. Social and primary reinforcements are received only after the correct name of that item has been supplied by the child. Partial prompts are presented to the child if it is having difficulty naming some object or objects. This partial prompt is given in the following manner: the therapist presents the initial sound of the word such as "Trrr" for train. Primary reinforcement is then given upon the emission of the correct response.

After an expanded naming vocabulary has been developed, the experimental work is directed toward the establishment of phrases and sentences in the verbal repertoire. Risley contends that in most cases it is not necessary to employ "explicit training" in this particular phase of the work. However, in those cases where "explicit training" is necessary "mimics of phrases are reinforced until the phrases are consistently imitated. Then the control is shifted to the appropriate circumstance itself, by introducing partial prompts which are gradually faded out." The partial prompts are presented in the form of verbal chains and the child is required to supply an increasingly greater number of the components or members of this chain. For example, the therapist introduces the partial prompts "This is a ________." "This is ________." "This ________." while holding or pointing to a familiar object.
At this point in the experimental sessions, Risley (1967) suggests that the child receive reinforcement for a wider variety of verbal behaviors such as "My name is ______." "I am _____ years old." "Hello, Mr. ________." Initially, food reinforcers are used to establish these new responses, but once established "...the opportunity to obtain some natural consequence can usually maintain the behavior."

An important aspect of any treatment procedure is to insure that gains obtained in the therapeutic area with the therapist are generalized to other areas and individuals. For example, Lovaas (1967), Risley (1966, 1967) and Wolf et al. (1964) have included the parents in the treatment of the children to insure that solidification and generalization of therapeutic gains will be extended to the home environment. Risley (1966) describes, in some detail, the manner in which various principles of behavior are conveyed to the parents in an attempt to develop the skills which will enable them to effectively manipulate and expand the verbal repertoires of their children.

The above mentioned research on the development of verbal behavior has apparently led to useful and practical procedures. However, parts of these procedures are based on untested assumptions and the relevance of other parts has not been demonstrated.

The first of these is the assumption (Ferster, 1961; Lovaas, 1966; Risley, 1967) that social reinforcers are generally ineffective to maintain or modify the verbal behaviors of autistic children. Lovaas has developed a technique for increasing the effec-
tiveness of social stimuli, but presents no data relating to the initial strength of such stimuli as reinforcing agents. Risley (1966) has only compared the effectiveness of social reinforcement to the effectiveness of food and social reinforcement. However, these comparisons were made with children who had previously been exposed to extensive imitative verbal training and therefore do not demonstrate the initial effectiveness of social stimuli as reinforcers. One purpose of the present study is to develop a design based on a multiple schedule of reinforcement. This multiple schedule design when employed in the beginning stages of work with the child, provides for the intercomparison of social, food, food and social and no reinforcement while control over the child's imitative repertoire is established.

This research also focuses on the extent to which experimentally produced changes in verbal behavior generalize to environmental situations outside the experimental setting. Risley (1966) describes various reinforcement techniques which were used after work in the experimental setting had been completed. The aim of these techniques was to increase the probability that improvements in the verbal behavior of the child obtained in the experimental setting would occur in other environmental conditions. However, this author presented no data on the quantity or quality of verbal behavior in the other settings prior to the experimental work with the child. Moreover, he did not collect data on the extent to which the desired changes in verbal behavior occurred in the extra-experimental conditions prior to the utilization of his techniques.
which were designed to produce such generalization of the behav-
ioral changes. Therefore, it is not clear that experimentally pro-
duced changes in verbal behavior fail to generalize from the experi-
mental to extra-experimental conditions. Consequently, the special
techniques for producing the generalization may be an unnecessary
step in the total procedure.

A second purpose of this research is, therefore, to determine
the extent to which appropriate verbal behavior occurs in the
natural environment prior to experimental work. After attempts
have been made to improve the verbal behavior of the child in an
experimental setting, a retest will be undertaken. The aim of this
retest will be to determine the effects of modifications made in
the experimental setting on the verbal behavior occurring in the
natural environment. Subsequent to the gathering of these data,
the aforementioned general reinforcement procedures described by
Risley (1966) will be utilized to determine if they are effective
in producing desired changes in verbal behavior emitted in the
natural environment.
METHOD

Subject

The subject was a twelve year old in-patient at Kalamazoo State Hospital. He was diagnosed autistic by the medical staff at this institution and for a period of five years has been assigned to an intensive treatment ward. During preexperimental observations, it was noted that the child emitted such autistic behaviors as toe walking, repetitive recitation of television commercial slogans, characteristic self-preoccupation and some echolalia. The observations also revealed that the child possessed a rather complex vocabulary which he seldom used in an effective or appropriate manner. Most of his social verbal responses were in the form of one or two word command type statements. For example, he would state, "off." instead of "please wipe the spoon off." The target behavior of this investigation was therefore designated as deficient verbal behavior and the behavioral objective was to improve these limited verbal skills. The subject was run in 112 daily sessions. These sessions were divided into six distinct experimental phases.

Apparatus

Phases 2 and 3 of the experimental sessions took place in a 10 foot by 9 foot by 10 foot room. During the sessions, this room contained (1) a bed which was bolted to the floor and which was
located in the center of the room, (2) two chairs; one for the experimenter and one for the subject, (3) the recording apparatus, (4) a food tray and eating utensils, and (5) a picture book. Illumination was supplied by a large window located at the south end of the room and by two 100 Watt light bulbs.

The subject and experimenter were seated at the north end of the room, occupying the area between the bed and the wall. The experimenter sat facing the subject with the recording apparatus positioned to the left and the child's food tray to the right on the foot of the bed.

The experimental data were recorded on a four channel event recorder which along with a power supply was encased in a 36 inch by 5 inch by 24 inch container. Four lever switches and a toggle switch were mounted on the top of the container. Whenever the child emitted one of the verbal behaviors used as dependent variables, the experimenter depressed a particular lever switch which electrically activated one of the marker solenoids on the event recorder.

Phases 1, 4, 5, and 6 of the experimental sessions were conducted in the general ward area which included the individual sleeping rooms, two long halls, a large day room, the occupational therapy shop, a dining room and the smoking porch. The experimental data during these phases were gathered with a Craig U 09 portable tape recorder which was carried by the subject.
Procedure

Phase 1

The first six sessions with the subject were conducted in the general ward area and were devoted to collecting base-rates on four different characteristics of the child's verbal behaviors. The child carried a tape recorder for a duration of 40 minutes. The experimenter avoided interacting with the subject except to prohibit the subject's tampering with the recorder. This recorder was fitted with a microphone which was pinned to the front of the child's shirt. This allowed for the recording of all vocal responses made by the child. The recorded tapes were subsequently analyzed according to the following verbal response categories:

(1) Nondiscriminated single word verbalizations - These are single word statements which are emitted in a repetitious and bizarre manner such as "nose," "nose," "nose." Before a single word verbalization is placed into this category, there must be evidence to indicate that these statements are not relevant to events or objects in the child's environment.

(2) Nondiscriminated multiple word verbalizations - These are multiple word statements which are also emitted in a repetitious and bizarre manner and which often occur in the form of chanted television commercial slogans. For example, the subject would state "Campbell's pork and beans," "Campbell's pork and beans." Before a multiple word verbalization is placed in this category,
there must be evidence that these statements are not relevant to events and objects in the child's environment.

(3) Discriminated single word verbalizations - These are single word statements which are relevant to some event or object in the child's environment. For example, the subject would state "cart," "cart," as the food cart entered the dining room at lunch time.

(4) Discriminated multiple word verbalizations - These are multiple word statements which are relevant to an event or object in the child's environment. For example, the subject would state "Sit down, please, Mr. Mayville," while pointing to an empty chair.

Phase 2

Phase 2 involved 17 sessions which were conducted in one of the individual sleeping rooms during lunch time. These sessions were 40 minutes in length and the duration of each component was 10 minutes. The components were selected for presentation on a random basis. This phase was devoted to the gathering of data on imitative verbal responses under a multiple schedule of reinforcement.

The multiple schedule of reinforcement design was divided into four components. These components differed with respect to constant stimulus conditions which signalled each component and the consequences which were contingent upon accurate imitative verbalizations. The four components were conducted in the following manner:
Component 1 - The experimenter leaned forward in the chair and moved the food tray along the top of the bed toward the subject. The faces of the experimenter and subject were separated by a distance of approximately twelve inches. The constant stimuli in Component 1 were, therefore, the forward position of both the experimenter and the food tray and close proximity of faces. These constant stimulus conditions signalled that simultaneous presentation of primary reinforcement (e.g., bites and sips of lunch) and social reinforcement (e.g., "Good boy" and a pat on the back) would be contingent upon the emission of accurate mimicking verbalizations.

Component 2 - The experimenter leaned forward in the chair, and the food tray was moved away from the subject along the foot of the bed. The faces of the experimenter and the subject were approximately twelve inches away from each other. The constant stimuli in Component 2 were, therefore, the forward position of the experimenter and the backward position of the tray along with the close proximity of the faces. These stimulus conditions signalled that social reinforcement only (e.g., "Good boy" and a pat on the back) would be presented upon the emission of accurate mimicking verbalizations.

Component 3 - The experimenter leaned back in the chair with arms and legs crossed and moved the food tray away from the subject. The faces of the experimenter and the subject were separated by approximately thirty-six inches. The constant stimulus conditions in this instance were the backward position of the
experimenter with legs and arms crossed, increased distance between faces, and the backward position of the food tray. These conditions signalled that no reinforcement would be forthcoming upon the emission of accurate mimicking verbalizations.

Component 4 - The experimenter leaned forward, positioned the left hand on the left knee, and moved the food tray toward the subject. The faces of the experimenter and the subject were separated by approximately twelve inches. The constant conditions in this component were, therefore, the forward position of the experimenter and food tray, the placement of the left hand on the left knee, and the close proximity of the faces. These conditions signalled the presentation of primary (food) reinforcement only upon the emission of accurate mimicking verbalizations.

Table 1 summarizes the manner in which the discriminative stimuli and reinforcement contingencies of the four components were presented.

An approximate delay of three seconds was employed between the emission of an imitative verbal response and the presentation of the next phrase to be mimicked. Only components 1 through 3 were employed over the first nine sessions of this work (i.e., sessions 7 through 15) in the room. However, component 4 was subsequently used in the remaining eight sessions (i.e., sessions 16 through 23).

The experimenter recorded the data after each response by manipulating the appropriate lever switches on the four channel event recorder described above. These data were then analyzed according to the following mimicking verbal response categories:
Table 1 Description of components with the discriminative stimuli and reinforcement contingencies for each.
<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
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<tbody>
<tr>
<td>Discriminative</td>
<td>E Forward</td>
<td>E Forward</td>
<td>E Back</td>
<td>E Forward with hand on knee</td>
</tr>
<tr>
<td>Stimuli</td>
<td>B) Tray Forward</td>
<td>B) Tray Back</td>
<td>B) Tray Back</td>
<td>B) Tray Forward</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>Food and Social</td>
<td>Social Only</td>
<td>No Reinforcement</td>
<td>Food</td>
</tr>
<tr>
<td>Contingency</td>
<td></td>
<td></td>
<td></td>
<td>Only</td>
</tr>
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</table>
(1) Accurate mimicking verbalizations - A response is placed into this category after an appropriate and complete mimicking verbalization is emitted by the subject. For example, if the experimenter presents the phrase "this is a chair," the subject must also state "this is a chair."

(2) Other inappropriate verbalizations - These are not mimicked responses, but are instead spontaneous verbalizations which follow the stimulus presentation and are emitted in a bizarre and repetitious manner. There is no evidence that these statements are relevant to events or objects in the child's environment. For example in responding to the phrase "this is a chair," the subject might say, "this is Marlboro country," "this is Marlboro country."

(3) Inaccurate mimicking verbalizations - A response is placed into this category following the emission of an incomplete reproduction of the phrase to be mimicked. For example, the subject might state "milk" in response to the phrase "please pass the milk." Also included in this category are statements which are irrelevant to the phrase to be mimicked, but relevant to some other event or object in the child's environment. For example, the experimenter presents the phrase "May I please have a bite of dessert?" and the subject might state "Pass the bread, please," while pointing to a piece of bread on the food tray.

(4) Other appropriate verbalizations - These are spontaneous statements which follow the stimulus presentation and are relevant to some event or object in the child's environment. For example, the experimenter presents the phrase "please pass the peas," and
the subject might state "A drink of milk, please, Mr. Mayville," while pointing to or looking at a glass of milk. Also included in this category are spontaneous verbalizations which follow the emission of accurate imitative responses. For example, the experimenter might present the phrase, "Please pass the corn," and the subject would state, "Please pass the corn," after which he might add "A bite of potatoes, please."

Phase 3

Phase 3 was devoted to the establishment of a more complex verbal repertoire which included the task of increasing the extent to which the experimenter exerted control over the mimicking verbal behavior of the subject. This work involved fifty sessions and utilized a picture book which included stimuli related to common household and ward objects. For example, some of the stimuli included such items as a front yard, a house, a refrigerator, a desk and chair, a toothbrush and toothpaste, and a bar of soap. Sentences were constructed, using the various stimuli depicted by the picture book and the experimenter presented these sentences as prompts to be mimicked by the subject. Primary and social reinforcement were contingent upon the appropriate mimicking of sentence prompts presented by the experimenter. Social reinforcement, however, temporally preceded the presentation of primary reinforcement by approximately 1-1/2 to 2 seconds. The presentation of social reinforcement was employed as a discriminative stimulus for an orienting response which was followed by the contingent presen-
tation of food reinforcement. This latter procedure is patterned after certain aspects of Lovaas' work (1966) in which he employed procedures designed to increase the effectiveness of social stimuli as reinforcers for autistic children. Essentially his procedure employs the social stimuli as discriminative stimuli for responses which are followed by positive reinforcement. The sentence prompts were structured in the following manner:

1. Simple sentences (e.g., This is a house.).
2. Sentences containing conjunctions (e.g., This is a house and this is a garage.).
3. Sentences containing conjunctions and color concepts (e.g., This is a blue house and this is a yellow garage.).
4. Sentences containing personal pronouns (e.g., I knock on the door.).
5. Sentences containing personal pronouns and color concepts (e.g., I knock on the blue door.).
6. Simple request sentences (e.g., May I please go inside the house?).
7. Simple command sentences (e.g., Don't play in the driveway.).
8. "Let's" statements (e.g., Let's go outside and play.).

Throughout the picture book exercises in the room, weekly checks were made to determine the effects of these manipulations on the child's original mimicking performances. Sessions 37, 41, 46, 50, 54, 58, 62, 66, 69, 73, 77, 81, and 85 were devoted to this work, which employed identical procedures to those used originally.
in Phase 2. Data were again collected utilizing the multiple schedule of reinforcement design with its four component parts (e.g., food and social reinforcement, social reinforcement only, no reinforcement, food reinforcement only).

Phase 4

Upon completion of work in the room, the subject was again equipped with a tape recorder and allowed to roam about the general ward area. Procedures identical to those used in Phase 1 were employed. One 40 minute session (the 86th session) was devoted to this work, in an attempt to check the effects of manipulations in the room on the child's verbal behavior emitted on the ward. Again, data were collected on the number of nondiscriminated single word verbalizations, nondiscriminated multiple word verbalizations, discriminated multiple word verbalizations and discriminated single word verbalizations which were emitted by the subject.

Phase 5

An attempt was made in this phase to determine the extent to which generalization of the control exerted over the imitative repertoire of the child in the room had taken place on the ward. The subject was again equipped with the tape recorder, and during Sessions 87, 88 and 89 was presented with phrases to be mimicked. Available stimuli in the general ward area were depicted by these phrases. The experimenter presented primary and social reinforcement to the subject (e.g., pieces of miniature marshmallows) for
accurate mimicking responses. The data were analyzed according to the aforementioned categories of verbal responses which are as follows:

1. Accurate mimicking verbalizations,
2. Other inappropriate verbalizations,
3. Inaccurate mimicking verbalizations, and
4. Other appropriate verbalizations.

Phase 6

Phase 6 was conducted on the ward and was devoted to various fading procedures. One of the primary elements of these procedures was a verbal chaining process. In this process, the prompts presented by the experimenter are in the form of sentences or verbal chains. The individual words in these sentences are regarded as members of the verbal chains. The subject is required to supply missing members of these chains after which reinforcement will be forthcoming. In addition to the verbal prompt, the experimenter utilizes a nonverbal pointing prompt, thereby indicating to the subject which member or members are required in a given chain. For example, in the first session of this work, the experimenter presented such prompts as "This is a ______" while pointing to a chair. The subject received both primary reinforcement (e.g., pieces of marshmallows) and social reinforcement (e.g., "Good boy" and a pat on the back) after supplying the correct missing member in the chain (chair). Again, as in Phase 3, social reinforcement temporally preceded the presentation of primary (food) reinforce-
ment. However, during this phase, the delay between the presentation of social and primary reinforcement was of shorter duration (approximately one second). In subsequent sessions, the subject was required to supply a progressively larger number of members in each verbal chain presented by the experimenter. For example, in Session 92, the subject was required to supply the last two members in the chain and in the 93rd session, the last three members. During the 95th through the 99th sessions, all but the last member in the verbal chain was provided by the subject. The experimenter presented the subject with such partial prompts as, "This ___ ___ _______" while pointing to a chair. In each instance, the subject was immediately given social reinforcement which was followed by primary reinforcement for accurate completion of the partial prompts. At the end of the 99th session and extending through the remaining eleven sessions devoted to fading procedures (100-106, 107, 109-111), the experimenter began presenting prompts in the form of questions after which the subject was required to supply a complete and accurate answer. For example, the experimenter would ask, "Who are you?" and the subject would then answer, "I am R. R." It was occasionally necessary for the experimenter to present both the question and the answer at the outset of such exercises in an attempt to indicate to the subject that a change in reinforcement contingencies had taken place. The subject was given both primary and social reinforcement for supplying a complete and accurate answer to the questions emanating from the experimenter.

All of the experimental fading exercises to this point were
focused on the general task of naming certain ward and personal objects, patients, and staff. In addition, the subject was required to produce sentences containing conjunctions, color concepts, and personal pronouns relating to the above mentioned items and personnel. Throughout this work, a delay of approximately five seconds was instituted between the presentation of prompts and the emission of responses. Other appropriate verbalizations (i.e., discriminated single and multiple word verbalizations) were reinforced with both primary and social reinforcement. These responses were often related to current material and were rapidly emitted. For example, if the task confronting the subject was the naming of various objects and people in the occupational therapy shop, the subject might state, "This is a picture," "Those are scissors," "That is a fan," "Hi, Mr. Mayville!" When the subject responded with other inappropriate verbalizations (i.e., multiple or single word statements which are not relevant to events or objects in the child's environment), a five second time out from positive reinforcement was utilized. For example, the subject would state in a repetitious and bizarre manner, "nosey"-"nose," "nose." The experimenter then immediately turns away from the subject removing all primary and social reinforcement for a period of approximately five seconds.

Throughout this work on the ward, periodic checks were made to determine the effects of these manipulations on the subject's original ward performances. This return to procedures was employed in Phases 1 and 4 and was conducted during Sessions 90, 94, 97, 108,
and 112. These data were analyzed according to the following verbal response categories:

1. Nondiscriminative single word verbalizations,
2. Discriminative multiple word verbalizations,
3. Discriminative single word verbalizations, and
4. Discriminative multiple word verbalizations.

Table 2 summarizes all the phases of the experimental work and provides a brief description of each.
Table 2 A presentation of the experimental phases and the sessions which are included in those phases. A brief description of each phase is also presented.
<table>
<thead>
<tr>
<th>PHASES</th>
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<td>SESSIONS</td>
<td>A) 1-6</td>
<td>A) 7-23</td>
<td>A) 24-86 Except for sessions in B) 37, 41, 46, 50 54, 58, 62, 66 69, 73, 77, 81 85</td>
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<td>DESCRIPTION</td>
<td>A) Ward Baseline</td>
<td>A) Multiple Schedule, four components, on imitative verbalization</td>
<td>A) Increase the effectiveness of social stimuli B) Multiple schedule four components on imitative verbalizations</td>
<td>A) Effects of room manipulations on ward baseline</td>
<td>A) Control over imitative verbal behavior on ward.</td>
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RESULTS

Phase 1

Phase 1 was devoted to collecting baseline data on the quality and quantity of the child's verbal responses emitted in the general ward area. These data are presented in figures 1 and 2.

There is a progressive decrease in the rate of nondiscriminated single word verbalizations emitted over sessions. These responses were emitted at a rate of 23 per 40 minute period in session 1, then decreased to 9 in session 3, and finally to 2 in session 6. Discriminated single word verbalizations were emitted at a stable and low rate. In session 1, two of these responses were emitted, 6 were emitted in session 3, and 6 in the 6th and final session.

The rates for nondiscriminated multiple word verbalizations and discriminated multiple word verbalizations are shown in figure 2. The rates for both of these verbal categories are relatively low. However, the rates for discriminated multiple word verbalizations are lower than those for nondiscriminated multiple word verbalizations and they are less variable. In session 1, the rate for discriminated multiple word verbalizations was 12 per 40 minute period, in session 3, there were 6 responses and in the 6th session, there were 8 responses emitted per 40 minute period. The response rates for nondiscriminated multiple word verbalizations on the other hand ranged from a high of 29 to a low of 3 verbalizations per 40 minute period.
Figure 1  Total number of discriminated single word verbalizations (DSWV) and nondiscriminated single word verbalizations (NDSWV) emitted on the ward per forty minute period.
Figure 2 Total number of discriminated multiple word verbalizations (DMWV) and nondiscriminated multiple word verbalizations (NDMWV) emitted on the ward per forty minute period.
Phase 2

During phase 2, the multiple schedule of reinforcement design with its four component parts was used in an attempt to increase the complexity of the child's verbal repertoire and to establish control over his imitative verbal behavior.

Data for appropriate mimicking verbalizations (AMV's) are shown in figure 3. These data were gathered during the four components of the multiple schedule design and were analyzed according to proportions of the various responses per number of $S^D$'s presented. The subject emitted AMV's at a relative rate of $0.74$ responses per $S^D$ presented during component 1 (i.e., food and social reinforcement) in session 7. In session 15, this relative rate rose to $0.82$ and then dropped to $0.73$ at the end of phase 2.

During component 2, social reinforcement, the proportion of AMV's per $S^D$ presented dropped from $0.63$ in session 7 to $0.32$ in session 15 and then finally to $0.22$ at the end of the phase.

The relative response rates during component 3, no reinforcement, were similar to those during component 2, dropping from $0.46$ in session 7 to $0.22$ in session 15 and then to $0.08$ in the final session.

Data for component 4, food reinforcement, were gathered from the 16th through the 23rd sessions and were similar to those data collected under component 1. In session 16, the subject emitted $0.74$ AMV's per $S^D$ presented and in session 19, the relative rate
Figure 3 The relative rates of accurate mimicking verbalizations (AMV) during components 1-4 in the room.
rose to .84. In the final session, there was a drop to .78.

In summary, the data shown in figure 3 reveal high and stable relative rates during components 1 and 4. However, in components 2 and 3, the data depict a downward trend followed by a stable, low relative response rate.

In figure 4, the data for other inappropriate verbalizations (OIV's) are presented. The rate of other inappropriate verbalizations relative to the number of $S^D$'s presented during component 1 is low and stable throughout the phase. This relative rate varied from .0 in sessions 14, 16, 17, 18 and 22 to .28 in session 8.

During component 2, social reinforcement, the proportionate rate of OIV responses accelerated through the first session of the phase and then varied around a relatively constant mean through the last nine sessions. The curve representing the proportionate emission of OIV's during component 3 is similar to the curve for component 2. During component 4, the proportionate OIV rate was very low and stable. In summary, there was a marked divergence in sessions 7 through 23 of proportionate OIV rates during components 2 and 3 away from the rates during components 1 and 4. The proportionate OIV rates during both components 2 and 3 accelerated and then appeared to approach asymptotes. The proportionate OIV rates during both components 1 and 4 were low and relatively stable with no obvious trends.

Data for other appropriate verbalizations (OAV's) are presented in figures 5 and 6. These data reveal consistently low and stable relative response rates during each of the four components.
Figure 4 The relative rates of other inappropriate verbalizations (OIV) during components 1-4 in the room.
Figure 5 The relative rates of other appropriate verbalizations (OAV) during components 1 and 2 in the room.
Figure 6 The relative rates of other appropriate verbalizations (OAV) during components 2 and 3 in the room.
Phase 3

This phase was devoted to the development of social stimuli (i.e., "Good boy" and a pat on the back) as reinforcing agents and to the repeating of procedures used in phase 2.

Figure 7 depicts a portion of the subject's verbal behaviors during the picture book exercises in the room. These data were analyzed according to the number of accurate mimicking verbalizations (AMV's), other inappropriate verbalizations (OIV's), inaccurate mimicking verbalizations (IMV's) and other appropriate verbalizations (OAV's) emitted per S^D presented.

The AMV's accelerate and stabilize at almost perfect performances. In session 24, the rate was .40, in session 33, .85 and in the 45th session, .86 per S^D presented. The relative rate of OIV's emitted was stable and low throughout this phase. The number of IMV's per S^D presented shows an initial decrease with subsequent stability. The relative rates were .60 in session 24, .14 in session 33, and .12 in session 45. The relative rate of OAV's represents an upward trend (.00 in session 24, .40 in session 33, .60 in session 45) with considerable variability.

Procedures used in phase 2 were then employed to determine the extent to which manipulations in the room had changed the effectiveness of the social reinforcers (i.e., "Good boy" and a pat on the back).

In figure 3, the data for the second half of phase 3 are pre-
Figure 7  The relative rate of accurate mimicking verbalizations (AMV), inaccurate mimicking verbalizations (IMV), other appropriate verbalizations (OAV), and other inappropriate verbalizations (OIV) obtained during phase 3 in the room.
sented. The relative rate of AMV's under component 1 (food and social reinforcement) remained quite high and stable during phase 3. There is no noticeable increase in relative response rates from phase 2 to phase 3 during this component. There was a marked inter-phase increase in the AMV relative response rate during component 2 (social reinforcement). The rate increased from .22 in session 23 of phase 2 to .82 in session 37 of phase 3. There is no evident trend in the relative rate during phase 3. The relative rate of AMV's during component 3 (no reinforcement) increased from .08 in session 23 of phase 2 to .42 in session 37 of phase 3. The relative rate in this component continued to increase to .58 in session 62 and then decreased to .32 in session 85. The relative rate of AMV's during component 4 (food reinforcement) remained high and relatively stable during phase 3. Except for a slight initial decrease in phase 3, there were no marked differences between the rates in this component in phase 2 and the rates in phase 3.

In figure 4, the relative rates of OIV's during component 1 decreased from .09 in session 23 to .00 in session 37. This rate remained at zero throughout the remaining sessions of phase 3. In component 2, the response rate per S^D presented did not decrease appreciably between the last session of phase 2 and the first session in phase 3. However, there was a rapid deceleration in the relative rate after session 37 and the rate remained near zero for the remainder of phase 3. During component 3, the proportionate rate of OIV's decreased from .54 in session 23 of phase 2 to .04 in session 37 of phase 3. This rate, with the exception of session 46,
remained near zero for the remainder of the sessions. During component 4, the OIV relative response rate was constantly low across all sessions of phase 2 and phase 3.

The proportionate rates for OAV's are presented in figures 5 and 6. During component 1, there was no appreciable increase in the relative rates from session 23, phase 2 to session 37, phase 3. The rate increased to .50 in session 62 and then stabilized. During component 2, there was a drastic increase in the relative rate of OAV's from .00 in session 23, phase 2 to .73 in session 37 of phase 3. Subsequently, the rate decreased, but generally it remained above the rate obtained in phase 2. Under component 3, there was an increase from .08 in session 23 of phase 2 to .21 in session 37, phase 3. In session 66, the rate increased to .28 and in session 85 there was another increase to .35. During component 4, the relative rate increased from .00 in session 23 of phase 2 to .28 in session 37 of phase 3 and then stabilized in subsequent sessions. The rates obtained under component 4 of phase 3 remained above the corresponding rates in phase 2.

Phase 4

During phase 4, session 86 was devoted to determining the effects of work in the room on the ward baseline behavior. These data will be compared with the data from phase 1.

The data in figures 1 and 2 show a marked increase in the absolute rate of both discriminated single word verbalizations and discriminated multiple word verbalizations from session 6 to session
The rate for discriminated single word verbalizations increased from 6 responses per 40 minutes in the 6th session of phase 1 to 21 responses per 40 minutes in session 86 during phase 4. The rate for nondiscriminated multiple word verbalizations dropped from 24 responses per 40 minutes in session 6 of phase 1 to 9 responses per 40 minutes in session 86 during phase 4. There was no appreciable change in the rates of nondiscriminated single word verbalizations from phase 1 to phase 4.

Phase 5

Phase 5 was devoted to determining the extent to which control over the child's imitative verbal behavior which had been established in the room generalized to the ward. During the three sessions (87, 88, 89) of this work on the ward, the data collected on the four dependent variables (i.e., accurate mimicking verbalizations, other inappropriate verbalizations, inaccurate mimicking verbalizations, and other appropriate verbalizations) quickly approximated similar data which were obtained in the experimental room (figure 8).

Phase 6

In phase 6, various fading procedures were employed in an attempt to bring the child's verbalizations under the control of appropriate environmental stimuli. Throughout this phase data were collected to determine the extent to which changes had occurred in the child's baseline performances on the ward.
Figure 8 The relative rate of accurate mimicking verbalizations (AMV), inaccurate mimicking verbalizations (IMV), other appropriate verbalizations (OAV) and other inappropriate verbalizations (OIV) obtained during phase 5 on the ward.
The data in figure 9 reveal a drastic acceleration in the relative rates of other appropriate verbalizations over this phase. During session 91, there were 0.36 other appropriate verbalizations per S presented. By session 101, this rate had increased to 1.13 and in the final session a still higher rate of 1.35 was emitted. The proportionate rates for accurate completions were high and relatively stable and the rates for inaccurate completions and other inappropriate verbalizations were low and also stable.

The last portion of figure 2 depicts the data collected upon return to ward baseline procedures. The response rates for nondiscriminated single word verbalizations were low and relatively stable. The rates for discriminated single word verbalizations dropped from 22 responses per 40 minute period during session 86 of phase 4 to 5 responses in session 90 of phase 6 and remained relatively low for the remaining sessions of phase 6. The subject emitted discriminated multiple word verbalizations at a rate of 33 per 40 minutes in session 90 then dropped to 23 per 40 minutes in session 97 and finally increased to 36 per 40 minutes in session 112. The rate of nondiscriminated multiple word verbalizations decreased from 9 responses per 40 minutes in session 86, phase 4, to .00 responses per 40 minutes in session 90 of phase 6. The rate of these responses approximated zero per 40 minutes for the remainder of the sessions in phase 6.

Reliability checks were made on procedures used during the collecting of ward baseline data (phase 1), the imitative verbal
Figure 9 The relative rates of accurate completions (AC), inaccurate completions (IAC), other appropriate verbalizations (OAV), and other inappropriate verbalizations (OIV) during the fading procedures on the ward.
training (phase 2) and the fading exercises on the ward (phase 6).

Two different individuals rated ward baseline and fading pro-
cedures utilizing tapes of the recorded sessions and analyzing the
data from these tapes according to the categories of verbal behav-
ior appropriate to those procedures. The experimenter and one
other individual rated that data gathered during imitative training
in phase 1. However, during this check the other rater accompanied
E to the experimental room and gathered data while the exercises on
imitative training were being conducted.

For the data collected in phases 1 and 6, rater agreement was
.93 and .91 respectively. The agreement during imitative training
was .83.

These agreement figures were computed in terms of averages of
individual scores obtained in each verbal response category.
DISCUSSION

One of the main purposes of the present study was to investigate the initial effectiveness of social reinforcers in developing and maintaining the verbal behavior of an autistic child. This investigation focused on the intercomparisons of social, food, food and social, and no reinforcement.

The intercomparison data indicate that some form of food reinforcement was necessary to gain initial control over the imitative verbal repertoire of this autistic child. For example, when food reinforcement was presented to the subject contingent upon accurate mimicking verbalizations, a high relative response rate was emitted. In contrast, when no reinforcement was presented for accurate mimicking verbalizations, the relative response rate was quite low.

When the relative response rates during social reinforcement only were compared to those rates obtained during food reinforcement only, it was found that higher rates of accurate verbalizations were obtained during periods of food reinforcement. Moreover, the relative rates of accurate mimicking verbalizations during social reinforcement only were very similar to the low rates emitted in no reinforcement or extinction periods. The relative rates of accurate mimicking verbalizations during food and social reinforcement and food reinforcement only were quite similar and seem to indicate that no real differences exist in the control exerted under both conditions. These findings give support to the
general assumption made by Ferster (1961), Lovaas (1966b), and Risley (1967) that initially social stimuli are relatively ineffective in producing and maintaining desired behaviors in autistic children.

A second major purpose of the present study was to determine the extent to which generalization of changes obtained in the room and general ward area had occurred in the child's natural environment.

Initially, there was a predominance of nondiscriminated multiple and single word verbalizations emitted in the ward. However, after work in the room was completed, these nondiscriminated verbalizations had decreased considerably and the emission of discriminated verbalizations, both single and multiple, had substantially increased. Upon the completion of various fading procedures on the ward, a still higher rate for discriminated verbalizations was obtained. These results support the conclusion that generalization of improvements in the room occur on the ward and that the fading procedures described by Risley (1966) do increase the probability that further generalization of effects will be obtained.

In addition to the above results and conclusions, it was found that the subject emitted other appropriate verbalizations at progressively higher rates during fading procedures (phase 6). Although the relative rates of other appropriate verbalizations generally increased under all components from phase 2 to phase 3, they still remained at fairly low levels. The increased rate during phase 6 was probably due to the use of systematic presentation...
of reinforcement immediately contingent upon the emission of other appropriate verbalizations. In phase 2, these responses were never reinforced with food and only occasionally with social reinforcement. In phase 3, the subject was occasionally presented both food and social reinforcement upon the emission of other appropriate verbalizations, but this was not in a systematic manner.
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