

THE UNIVERSITY OF MANITOBA

AN INVESTIGATION OF SUBJECT - EXPERIMENTER
RATIOS: VERBAL TRAINING SESSIONS WITH ONE RETARDED
CHILD AND WITH TWO SIMULTANEOUSLY

by

JOHN R. BIBERDORF

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTORATE OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

WINNIPEG, MANITOBA

October, 1974

AN INVESTIGATION OF SUBJECT - EXPERIMENTER
RATIOS: VERBAL TRAINING SESSIONS WITH ONE RETARDED
CHILD AND WITH TWO SIMULTANEOUSLY

by

JOHN R. BIBERDORF

A dissertation submitted to the Faculty of Graduate Studies of
the University of Manitoba in partial fulfillment of the requirements
of the degree of

DOCTOR OF PHILOSOPHY

© 1975

Permission has been granted to the LIBRARY OF THE UNIVER-
SITY OF MANITOBA to lend or sell copies of this dissertation, to
the NATIONAL LIBRARY OF CANADA to microfilm this
dissertation and to lend or sell copies of the film, and UNIVERSITY
MICROFILMS to publish an abstract of this dissertation.

The author reserves other publication rights, and neither the
dissertation nor extensive extracts from it may be printed or other-
wise reproduced without the author's written permission.

ACKNOWLEDGEMENTS

I would first of all like to thank my wife, Edie, without whose help and encouragement this research would have been impossible. I would also like to thank my advisor Dr. J. J. Pear and the other members of my committee for their guidance during the running of this research and their helpful comments during its write-up. Finally, I would like to thank Sister Bauman and all the other staff at St. Amant for their patience and assistance during the experiment.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION.....	3
1. Elimination of undesirable behavior..	4
2. Training in self-help skills.....	6
3. Training in academic skills.....	9
II. STATEMENT OF THE PROBLEM.....	15
III. EXPERIMENT I.....	23
Subjects.....	23
Apparatus and Materials.....	26
Preliminary Training.....	27
General Procedures.....	32
Specific Procedures.....	39
Results.....	46
Discussion.....	94
IV. EXPERIMENT II.....	98
Rationale.....	98
Specific Procedures.....	99
Results.....	103
Discussion.....	124
GENERAL DISCUSSION.....	126
VI SUMMARY.....	132
REFER NCES.....	134

ABSTRACT

The training of two retarded children simultaneously on a picture-naming task was investigated as a possible alternative procedure to the more traditional one involving a one-to-one subject-experimenter ratio.

In Experiment I, there were two conditions. Under the Simultaneous Condition, incorrect responses, omissions, and ten-second intervals of inattention were followed by the experimenter switching to the other subject. Under the Individual Condition, errors, omissions, and inattention were ignored. In both conditions every correct response was reinforced with a "Good boy" or "Good girl" and every fifth correct response was reinforced with an edible reinforcer. Proportionally to the subject-experimenter ratio (2:1 vs 1:1), all subjects initiated more trials, emitted a larger number of correct responses, spent less time in inattentive behavior, and learned more words in the Simultaneous Condition than in the Individual Condition. Results from Experiment I also suggested that the subjects learned some of their partner's pictures as well as their own, thus indicating a further advantage of the Simultaneous Condition over

the Individual Condition.

In Experiment II, the two conditions were equated except for the presence of another subject performing at the picture-naming task. The results of this manipulation demonstrated that the increased rate of responding found in Experiment I was probably due to the presence of the other subject. Experiment II also demonstrated quite conclusively that the subjects were learning some of their partner's words as well as their own.

It would appear, therefore, that a Simultaneous Condition procedure is a viable alternative to the traditional one-to-one subject-experimenter ratio. More research on group vs. individual training in this and in other applied areas appears warranted given the efficiency of this procedure.

Chapter I

Introduction

President Kennedy's panel on mental retardation estimated that, in North America, three percent of the population could be described as falling into the mentally retarded range (see Edgerton, 1967, p.1). Such being the case, one can reliably estimate that there are over seven and one-half million individuals in North America that are mentally retarded. Added to this is an even larger number (sixteen and three-quarter million) borderline individuals who may or may not be considered mentally retarded dependent upon the degree of adaptive behaviors they possess (see Grossman, 1973, p.18). Given the enormity and severity of this problem, a great many operant conditioners are turning their attention to the training of this population. Most of their research in this field has concerned itself with three main areas:

1. elimination of undesirable behaviors (e.g. eliminating tantrum behavior);
2. training in self-help skills - personal, vocational and social (e.g. teaching a child to dress himself); and

3. training in "academic" skills (e.g. teaching a child to speak).

Elimination of Undesirable Behavior

The majority of the earliest works in behavior modification dealt with the elimination of undesirable behavior in schizophrenic and mentally defective patients. For example, as early as the late 1950's, Ayllon and Michael (1959) successfully eliminated the "disruptive" behaviors of frequent visits to the nurses' office, psychotic talk, violent behavior, refusal to eat and hoarding of paper and rubbish. They accomplished this by using the nurses' attention as reinforcement and the withdrawal of this attention as punishment.

With this impetus, other operant conditioners soon began to use the same behavior modification principles and techniques with the mentally retarded. Wolf, Birnbrauer, Williams, and Lawler (1965), for example, successfully eliminated classroom vomiting through the use of extinction and the positive reinforcement of alternative, appropriate behaviors. Within 30 class days, the vomiting behavior declined to a zero level as did the other behaviors that occurred with every

vomiting episode - screaming, clothes tearing, and destruction of property. It was also noted that productive classroom behavior and responsiveness to the teacher's requests improved markedly.

Another undesirable behavior that has received considerable attention by operant conditioners is self-injurious behavior. Tate and Baroff (1966), for example, successfully used response contingent electric shock with a nine-year-old blind boy residing in an institution for the mentally retarded. The boy emitted a variety of self-injurious behaviors including head-banging, face slapping, punching his face and head with his fist, hitting his shoulder with his chin and kicking himself. As a result of the high frequency of such behaviors (2 per minute) the child spent most of his time restrained in bed. With the initiation of response contingent shock, the number of self-injurious behaviors dropped to .06 per minute the first day, and to .03 per minute the second day. The subject was then continued on the program for an additional 165 days, with no self-injurious behaviors observed during the last 20 days.

Hamilton, Stephens and Allen (1967) used a combination of time out (the withdrawal of the opportunity of obtaining reinforcement) and physical restraint in a program to eliminate a variety of aggressive and destructive behaviors in five severely and profoundly retarded adolescents and adults. Following the occurrence of the target behavior, the subject was placed in a time-out area from 30 to 120 minutes, during which time she was either restrained to a padded chair bolted to the floor or, with one subject, restrained to her bed. Such undesirable behaviors as high frequency head and back banging, window breaking, body-slammings, clothes tearing and abusive aggressive behavior were quickly eliminated using this procedure.

Using similar procedures as those outlined above, a great many other undesirable behaviors have been reduced or eliminated. These include refusing to eat properly, rectal digging, sexual misconduct, hyperactivity, stealing, dangerous climbing and a myriad of others. (See Gardner, 1969, for a review.)

Training in Self-Help Skills

With the advent of the token economy in the mid-

sixties, emphasis in behavior modification changed from one of eliminating undesirable behavior to that of generating more appropriate behaviors. Using conditioned reinforcers which are only occasionally backed up with primary reinforcement, operant conditioners began ward-wide programs to teach self-care skills, vocational skills, and pro-social behavior. Examples of self-care programs have been provided by Bensberg, Colwell and Cassel (1965); Whitney and Barnard (1966); Peterson (1967); Roos (1965); and Karen and Maxwell (1967). An excellent example of this type of work is provided by Minge and Ball (1967) who devised a detailed step by step program for shaping up dressing behavior. The steps included behaviors such as attending, coming to the trainer, sitting down, remaining seated, and removing and putting on various articles of clothing. Six girls with an average I.Q. of 16, none of whom were toilet trained nor used words to communicate or made any effort at dressing themselves, were studied. Food was used as the reinforcer. Training occurred twice a day for fifteen minutes. At the beginning, gestures, tugs, and other prompts in addition to a verbal request were given. To obtain reinforcement, the girls had to respond correctly to prompts which

were reduced over time. After only two months, significant progress was observed.

A wide variety of self-care skills has been generated thus far. These include toilet training, dressing, shoe tying, shaving, eating properly, washing, talking, teeth brushing, hair combing and showering. (For major reviews in this area, see Watson, 1967; Gardner, 1971; and Thompson and Grabrowski, 1972.)

Many people have also benefited from the use of operant techniques in vocational training. Kliebhan (1966) and Evans and Spradlin (1966) are recent authors who pointed out that in a workshop situation, retardates are responsive to induced expectancies, modeling, and monetary rewards. In large scale token economies, for example, the residents have been taught to make beds, do house-keeping chores, work in the laundry and kitchen, sew, and do wood-working, clerical duties and numerous other meaningful jobs. (See, for example, Zimmerman, Stuckey, Garlick, and Miller, 1969.)

Finally, a great deal of attention has recently turned to the generation of more "sociable" behavior

such as playing together, co-operation, imitation, and the reduction of "apathetic" or "institutionalized" behavior. Studies reported by Bensberg et al. (1965); Wiesen and Watson (1967); Gorton and Hollis (1965), and Girardeau and Spradlin (1964) are excellent examples of training the retardate in the development of socialization skills.

Training in "Academic" Skills

In recent years, a major focus of attention by behavior modifiers in mental retardation has concentrated on the classroom situation and the acquisition of responses taught therein.

The first problem encountered in any classroom is getting the pupils to emit certain pro-social behaviors as necessary, albeit not sufficient, conditions for education. These behaviors may be called "attending", or "self-control", and typically involve sitting at a desk quietly and looking at the teacher. Birnbrauer (1967) described the application of behavioral concepts to a classroom of twenty boys with I.Q.'s of less than 44. The teacher used tangible reinforcers, then token reinforcers, and finally symbolic and social reinforcement.

Time out from reinforcement, such as removal of the opportunity to earn tokens in the classroom, was also used. Doubros (1966) reported on individual therapy situations to ameliorate disruptive behavior in retarded children and replace this with appropriate attending behaviors, while Santostefano and Stayton (1967) trained mothers who in turn trained their children to deploy attention selectively, actively and appropriately.

Once the child has been prepared for the classroom situation, the next matter is the operation of the classroom itself. Birnbrauer, Bijou, Wolf and Kidder (1965) and Birnbrauer, Wolf, Kidder and Tague (1965) described a classroom in which irrelevant and disruptive behavior was extinguished and appropriate behaviors or approximations were reinforced.

The content of instruction in such classrooms has varied greatly from study to study, but a large portion of the research has dealt with the modification of speech behavior. Typically, this research has concentrated in three main areas.

The first area in which behavior modification of speech has concentrated is in the reduction or elimination of

inappropriate or undesirable verbal behavior. Time out (as previously defined) has been the main tool in accomplishing this reduction. Such undesirable behavior as talking out in class, verbal jargon and echolalia have all been reduced successfully using this procedure (Barton 1970; Hall, Fox, Willard, Goldsmith, Emerson, Owen, Davis and Porcia, 1971; Risley and Wolf, 1967; McReynolds, 1969).

The second main area of research in behavior modification of speech has dealt with the improvement of the quality of existing speech. Such examples as teaching the use of plural nouns (Guess, Sailor, Rutherford and Baer, 1968; Guess, 1969; Sailor, 1971), adjectival inflections (Baer and Guess, 1971), verb inflections (Schumaker and Sherman, 1970), prepositions (Sailor and Taman, 1972) and syntax (Garcia, Guess and Byrnes, 1973) have all been researched. Others have taught the retardate to speak in whole sentences as opposed to an incomplete "telegraphic" sentence pattern (Wheeler and Sulzer, 1970), to ask questions appropriately (Twardosz and Baer, 1973), to answer questions on current events (Keilitz, Tucker and Horner, 1973), and to speak in the appropriate conversational speech form (Garcia, 1974).

The third and final area of research in verbal behavior has dealt with the acquisition of language in

those who have never spoken or have spoken very little. Kerr, Meyerson and Michael (1965), for example, shaped vocalizations in a mute three-year-old retarded girl using juggling and singing as reinforcers. Eventually the child could exhibit the precursor to imitative verbal behavior; namely, to make a sound within a short interval after the experimenter had made a sound. Risley and Wolf (1967), on the other hand, taught functional speech to echolalic children using a picture naming task. This involved the use of positive reinforcement to increase the children's imitation of object names and then bringing the imitation so strengthened under the control of the appropriate pictures.

Two recurring problems in studies of this sort have been those of inattention and incorrect responses. That is, typically in such tasks, the subject may not attend to the pictures being presented or, if he does attend, he may frequently incorrectly name them. Several procedures have been used to reduce these undesirable behaviors but, unfortunately, each has several disadvantages associated with it.

Time out has been one common technique used in the

past for reducing inattention and incorrect responses (Barton, 1970; McReynolds, 1969; Risley and Wolf, 1967). This procedure, however, may have the disadvantage of subtracting from the time available for training. Also, at least one study has shown that time out may, in fact, be reinforcing for some subjects (Steeves, Martin and Pear, 1970).

Response cost (the withdrawal of positive reinforcement following an error or inattention) is another procedure used to reduce these undesirable behaviors. Typically this procedure involves the removal of conditioned reinforcers, such as points or tokens, but some investigators have used the withdrawal of primary reinforcers such as candy or cartoons (Sailor, Guess, Rutherford and Baer, 1968; Hamilton, Stephens and Allen, 1967). But it has been suggested (e.g., Gardner, 1969) that such a withdrawal of reinforcement may unfortunately produce several undesirable side effects such as disruptive emotional states and aggression.

Perhaps the most frequently used punishment paradigm for errors and inattention has been that of presenting an aversive stimulus such as a sharp "No", a slap on the hand, or an electric shock (Kircher, Pear and Martin,

1971, and Martin, England, Kaprowy, Kilgour and Pilek, 1968). With the use of such procedures, however, there is always the possibility that the experimenter may in fact punish the desired verbal responses when they occur in close temporal proximity with the undesirable behavior. Also, as with response cost, it has been suggested that the use of punishment involving presentation of aversive stimuli may generate escape and avoidance behaviors, aggression, a reduction in the reinforcing powers of the experimenter, and other undesirable side effects.

As well as all the above disadvantages, it should be pointed out that all these punishment procedures are far from being totally effective. Some have reduced the amount of inattention of the subjects by only a few seconds per session or reduced only minimally the number of errors emitted (see, for example, Kircher et al, 1971). The problem remains, then, of how to teach retarded children appropriate verbal behavior while at the same time effectively reducing both the amount of time spent in inattention and the number of errors emitted.

Chapter II

Statement of the Problem

The present study was directed towards an important problem facing those who use operant techniques to teach verbal behavior to severely and profoundly retarded children. In many of the studies cited in the introduction, the initial training of speech acquisition with severe and profound retardates is done with a one-to-one subject-experimenter ratio. As mentioned previously, such sessions are plagued by the problems of inattention and errors emitted by the subject. One possible solution is to have the experimenter work with two subjects at one time. The straightforward question we were asking in the present research was therefore this: Is it more efficient in terms of performance of the children on a picture-naming task for an experimenter to work in sessions of a specified duration with one subject, giving that subject his (the experimenter's) exclusive and continuous attention? Or, is it more efficient for an experimenter to work in sessions of the same length with two subjects, teaching each a different picture and dividing his (the experimenter's) attention between the two sub-

jects such that if one subject is not attending or makes an error, the experimenter will switch to the other subject and vice versa?

Intuitively, it would seem that the probability of both children being inattentive at a given time is lower than that of one child alone. This, then, should reduce the time wasted while a given child is inattentive. By switching to the other subject following an error we are, in effect, administering a time-out period without the loss of valuable working time. This should reduce the number of errors.

There may be other beneficial effects, as well. Some research relevant to this possibility comes from the social psychology literature on "social facilitation". Primarily, this research has demonstrated that the performance of an individual subject is facilitated by the presence of others, whether they be passive spectators or peers working on the same task. (Bergum and Lehr, 1963; Dashiell, 1930; Allport, 1920). For example, Travis (1925) presented twenty-two college undergraduates with a revolving disc on which there was a small circular target. They were given flexible pointers with which to follow the rotating target as long as

possible. The apparatus, called the pursuit rotor, was wired so that when the pointer was held on the target for one complete revolution, the subject obtained a score of ten. The scores for the first few days were all around 150 per session, but then they began to rise, at first rapidly, then at a slower rate and finally levelled off completely. When the subject reached a stable level, he was considered to have mastered the task, and training was concluded.

The following day the subject was called to the laboratory and given five trials. After completing them, he was told that "a number of individuals wished to observe him follow the target!" This audience, consisting of from four to eight upperclassmen and graduate students, had been instructed to watch the subject quietly but attentively. Ten trials were administered to all subjects in the presence of this audience.

In analyzing the results, Travis compared the subjects' performance while working in the presence of the audience with their prior performance in two ways. First, the average of the ten audience trials was compared with the highest ten consecutive scores that each subject received dur-

ing training. The average of the highest ten consecutive "alone" scores was 172.26, while the average of all the audience trials was 177.42. Second, the highest score that each subject received during training was compared with the highest score he reached during his audience performance. The average of the former was 184.68 and of the latter 188.86. Both comparisons show that the subjects' performance in the presence of an audience surpassed their performance while working alone.

However, not all studies involving more than one person have found a facilitative effect on performance. Ader and Tatum (1963), for example, confronted graduate and medical students with the following situation. The subjects, upon entering the laboratory in pairs and alone, were seated at a table and shock electrodes were attached to their legs. They were asked not to smoke, speak, get up from the chair, or touch the electrodes. The table, otherwise quite ordinary, was equipped with a red button. After placing the subject in position, the experimenter left the room without any further instruction. Now the individual would receive a shock for a period of one-half second every ten seconds unless he pressed the red

button. Pressing the red button automatically delayed the shock for a period of ten seconds. Note that the experimenter said nothing to his subjects about the purpose of the experiment, about the significance of the button, or about what they were expected to do.

In one condition the subjects worked alone; in another they were brought to the room in pairs and seated across from each other. The subject (or the pair) was considered to have learned the task if he (or they) did not receive more than five shocks in a period of five minutes. The authors report that the individually conditioned subjects required, on the average, eleven minutes and thirty-five seconds to reach this criterion of learning. Of the twelve pairs in Ader and Tatum's experiment, only two eventually learned the avoidance response. These two pairs required forty-six minutes and forty seconds and sixty-eight minutes and forty seconds to reach the criterion of learning.

Similarly, Pessin (1933) found that when college students were required to learn a list of nonsense syllables with several spectators present, learning was slower than when learned alone. Husband (1931) also found that

the presence of others disturbed and interfered with the learning of a finger maze.

Researchers in this area have attempted to resolve this discrepancy by stating that coaction and the presence of others facilitates the emission of well-learned responses but impairs the acquisition of new responses. (For example, see Zajonc, 1966.)

Although the social facilitation literature sheds some light on the possible outcome of the proposed comparison, the present research was necessary for at least three reasons. One reason was the fact that a large portion of this social facilitation literature with human subjects was based on results with college students working on tasks totally unrelated to a picture-naming task with retarded children. The second main reason for conducting the study was the above-mentioned distinction made by Zajonc (1966) between acquisition and maintenance. In a picture-naming task, the subject is not only rehearsing well-learned responses, but is also acquiring new responses. Finally, with the presentation of different pictures to each subject, there was the possibility that this would interfere with each subject learning to