THE UNIVERSITY OF MANITOBA

Effects of a Required Attending Response on Conditioned Reinforcer Effectiveness in a Picture-Naming and Reading Task with Retarded Children

by

Barry M. Brazier

A Thesis

Submitted to the Faculty of Graduate Studies

In Partial Fulfillment of the Requirements

For the Degree of Master of Arts

Department of Psychology

Winnipeg, Manitoba

October, 1977

EFFECTS OF A REQUIRED ATTENDING RESPONSE ON CONDITIONED REINFORCER EFFECTIVENESS IN A PICTURE-NAMING AND READING TASK WITH RETARDED CHILDREN

BY

BARRY M. BRAZIER

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

MASTER OF ARTS

ACKNOWLEDGEMENTS

This research was conducted at St. Amant Centre in Winnipeg, Canada as part of an ongoing research program under the supervision of Dr. J. Pear, associate professor of Psychology at the University of Manitoba. This research was supported, in part, by Medical Research Council Grant Number MA - 5647. I would like to thank my major advisor, Dr. Pear, for his constant interest, support, and advice. I would also like to thank the other members of my examining committee, Dr. Garry Martin, and Dr. G. Lowther. Furthermore, I am greatly appreciative of the generous cooperation extended by Sr. Desrosier and the staff of One East during the conduction of this research. In addition, I wish to extend a sincere thank you to Dr. C. Stephens for his genuine interest, advice, guidance, and unfailing support. It is gratefully acknowledged and sincerely appreciated.

Abstract

Picture-naming and reading behavior of two retarded children was compared in two experimental conditions. In Phase 1 the conditions were the same: a correct-response light flashed after every correct verbal response, and a primary reinforcer was automatically delivered immediately following the light after every fifth correct verbal response. There was no consistent difference in performance for either subject between conditions.

In Phase 2, a lever-press response was required to produce primary reinforcers after correct verbal responding. Condition 1 remained the same in Phase 2 as in Phase 1. The verbal performance of one subject was consistently superior in the condition requiring a lever-press response during this phase. For the other subject, there was no consistent difference in performance between conditions during this phase, nor was there any consistent change in performance in either condition from Phases 1 and 2.

Phase 3, for the subject who showed an increase in performance during the lever-press contingency in Phase 2, was a reversal to the conditions of Phase 1, in that a lever-press response was no longer required to produce primary reinforcers. Performance for this subject improved dramatically in both conditions compared to the prior performance exhibited in either Phases 1 or 2, but there was no consistent difference between conditions. The research ended for this subject at this point. In Phase 3 for the subject who showed no difference in performance between Phases 1 and 2, another primary reinforcer was introduced, in addition to the initial primary reinforcer, but delivered

according to a different schedule of reinforcement. The subject's performance changed dramatically and immediately, and was superior in the condition requiring a lever-press response.

In Phase 4, which was a reversal to the conditions of Phase 2, performance in the condition not requiring a lever-press response improved to the level attained in the condition requiring a lever-press response, but there was no consistent difference between conditions.

Phase 5, which was identical to the conditions of Phase 4, was conducted following a 7 month break in the research, and performance in both conditions deteriorated with no consistent difference between them.

Phase 6 was a return to the conditions of Phase 3, in that two primary reinforcers were delivered according to two different schedules of reinforcement. Performance improved in both conditions, but was superior in the condition requiring a lever-press response. This superior performance was consistently maintained throughout this phase.

Phase 7 was a return to the conditions of Phases 2 and 4, and performance deteriorated to the point of extinction, with no consistent difference between conditions throughout the phase. Thus, when the magnitude of reinforcement was increased for the second subject, her performance replicated the major finding that was obtained with the first subject: presenting reinforcement contingent on a lever-press response, after correct verbal responding, produced better performance than did presenting reinforcement contingent only on correct verbal responding.

LIST OF FIGURES

TABLE OF CONTENTS

INTRODUCTION

"Reinforcement - the control of behavior through its consequences - is generally recognized to be a key variable in determining the characteristics of behavior" (Sidman, 1960, p. 31). "A reinforcer (reinforcing stimulus) is an event which changes subsequent behavior when it follows behavior in time. Operationally, an event is identified as a positive reinforcer if the frequency of responses of a given class (operant) increases when the presentation of the event is made contingent upon a response of that class" (Morse, 1966, p. 53).

The most common experimental procedure with children involves the presentation of positive reinforcers. Such popularity probably stems from the fact that sensitivity to stimulus consequences is one basic criterion for establishing a response as an operant and that presentation of positive reinforcers is the most acceptable reinforcement to apply to children (Bijou and Baer, 1966).

One type of positive reinforcer that has proven popular with children has been classified as consummables (Bijou and Sturgess, 1959) and include candy (M&M's, Smarties), other solid foods (raisins, currants, peanuts, cookies), and various liquids (milk, Kool-aid, apple juice). There are many studies in the literature where consummables have been used as reinforcers. For example, Fuller (1949) used a warm sugar-milk solution to shape arm-raising behavior in a "vegetative human organism". Patterson (1966) used M&M's as a primary reinforcer with a five year old boy to extinguish his tantrum behavior. Wolf, Risley, and Mees (1964) used bites of breakfast as a primary reinforcer to teach a $3\frac{1}{2}$-year-old autistic boy to wear his

glasses.

It is evident that not all behavior is generated and maintained solely by primary reinforcers. A primary, or unconditioned, reinforcer (e.g., food, water, etc.) is a stimulus whose reinforcing properties do not depend on a history of conditioning - or at least, not on a history of conditioning that can be specified (Kelleher, 1966). Much, if not most, behavior of humans is generated and maintained largely by secondary, or conditioned, reinforcers (e.g., money, tokens, praise, etc.). Such conditioned reinforcers as poker chips and pegs (tokens) have been used in conjunction with such unconditioned reinforcers as candy, ice-cream, and cookies (as back-up reinforcers) to generate and maintain a wide variety of human behaviors (e.g., Dalton, Rubino, and Hislop, 1973, used tokens, praise, and candy with severely retarded children to test the effectiveness of a token economy system; Miller and Schneider, 1970, used pegs, snacks, and activities to generate and maintain writing responses with normal children in a Head Start program; Mandelker, Brigham, and Bushell, 1970, used poker chips, gym-time, cookies, and stories to compare the effects of token procedures on a teacher's social contacts with her students; and, Ferritor, Buckholdt, Hamblin, and Smith, 1972, used poker chips, ice-cream, candy, and field trips to generate and maintain attending behavior and correct work in a third grade classroom).

A review of the literature indicates that seldom is an unconditioned reinforcer used alone to generate and maintain behavior in higher organisms. Rather, unconditioned reinforcers are most often used in conjunction with conditioned reinforcers to generate and

maintain behavior; and with good reason. Many problems can arise when utilizing unconditioned reinforcers that can be easily rectified through the use of conditioned reinforcers. For example, it is often the case that the unconditioned reinforcer cannot be arranged to immediately follow the behavior to be strengthened. Because a reinforcer strengthens behavior it follows, any delay between a specific behavior and the presentation of the reinforcer reduces the probability of strengthening that specific behavior. For example, in an experiment with rats, Grice (1948) found that with as little as two seconds delay in delivery of the reinforcer, it required about ten times as many conditioning trials to form a discrimination than were required with immediate reinforcement.

A second problem, specific to utilizing primary reinforcers, is that presenting reinforcers immediately after a specific behavior often interrupts responding (Ayllon and Azrin, 1968). For example, reinforcing a child with M&M's involves time for consuming the candies that could have been utilized to generate more responses.

A third problem, often a natural consequence of the second, is that reinforcing a high rate of responding on a continuous or low intermittent schedule of reinforcement with primary reinforcement could cause satiation (Ayllon and Azrin, 1968). A continuous schedule of reinforcement is reinforcement of every response within the limits of an operant class, whereas a low intermittent schedule of reinforcement of some, but not all, responses within the limits of an operant class (Catania, 1968).

These, and other problems pertaining to the use of primary re-

inforcers may be circumvented by the use of conditioned reinforcers. A conditioned reinforcer bridges the delay between the desired response and the delivery of the reinforcer; a conditioned reinforcer allows sequences of responses to be reinforced without interruption by delivery and consumption of the reinforcer; a conditioned reinforcer allows the response to be reinforced at any time. This last-mentioned advantage is partially advantageous when using primary reinforcers (e.g., picnics, parties) whose presentation are restricted to time and place (Ayllon and Azrin, 1968).

However, while the effectiveness of conditioned reinforcers have been widely investigated in both basic and applied research (discussed extensively by Hendry, 1969; Kelleher, 1966; Kelleher and Gollub, 1962; and, Ayllon and Azrin, 1968), rarely have they been the specific variable of interest in either area of research; i.e., investigation into the precise conditions for developing a conditioned reinforcer. It could be that applied researchers see this an an issue for basic research, but Sidman (1960) states, and it is doubtful this statement is restricted to basic research, that precise investigation of specific variables is crucial to the science of behavior. He says "we must consider our science immeasurably enriched each time someone brings another sample of behavior under precise experimental control"(Sidman, 1960, p. 17).

Fortunately, there are a few applied studies that have investigated the precise conditions necessary for the establishment of a stimulus as a conditioned reinforcer. For example, Lovaas, Frietag, Kinder, Rubenstein, Schaffer, and Simmons (Note 1) initially paired

the conditioned reinforcer "good" with each bite of food received by a psychotic child independent of his behavior. After this pairing was well established each bite of food was then made contingent on a lever-press response. The conditioned reinforcer "good" continued to be paired with food delivery. Once the lever-pressing behavior was strengthened they gradually increased the number of correct responses required for a bite of food. Each correct lever-press response continued to be accompanied by the conditioned reinforcer "good". Lovaas, et.al. (Note 1) found they were able to strengthen and maintain lever-pressing behavior with much less primary reinforcement than was initially required as long as the conditioned reinforcer "good" was occasionally paired with the unconditioned reinforcer (food). Reynolds and Risley (1968) described the conditions under which adult attention would function as a reinforcer. They found pairing adult attention with primary reinforcers could increase a four year old child's rate of talking if they attended to the child verbally when she talked. Conversely, the adult attention lost its reinforcing properties when primary reinforcers were no longer paired with it. Stephens (Note 2) compared the effects of tokens and praise as conditioned reinforcers in a picture-naming task with retarded children. He reported that the children learned to name more pictures, emitted more correct responses, and spent less time engaging in inattentive behavior when praise was the conditioned reinforcer employed. However, Brazier (Note 3) reported that the children in his research learned to name more pictures, emitted more correct responses, and spent less time engaging in inattentive behavior when tokens were the conditioned reinforcer

employed. This example serves to emphasize the importance of Sidman's (1960) criticisms; i.e., that precise investigation of specific variables is the key to developing a science of behavior. Baer, Wolf, and Risley (1968) lend further support to Sidman by advocating that applied behavior analysis should attempt to analyze effective procedures into their effective components. In other words, precise investigation of specific variables.

In a more recent study, Stephens (Note 4) investigated the effects of sequential and non-sequential conditioned reinforcers in a picture-naming task with retarded children. Picture-naming behavior was compared in two experimental conditions. In one condition sequentially illuminated lights, which accumulated, were contingent upon correct responses, whereas in the other condition, light-flashes, which did not accumulate, were contingent upon correct responses. The subjects were reinforced according to a fixed-ratio schedule of reinforcement where delivery of a primary reinforcer was contingent on five correct verbal responses (FR5). In addition, during specific phases of the research, subsequent to emitting five correct verbal responses a lever-press response was required to produce primary reinforcement, to increase the likelihood that the children attended to the lights. Stephens found, initially, that performance was superior for one subject in the light-flash condition, as compared to the sequentially illuminated light condition, but not different for the other two subjects. With the introduction of the lever-press response requirement, he found performance was consistently superior in the light-flash condition for all subjects. Furthermore, when the

schedule of primary reinforcement was increased to FR10 the behavior of two subjects remained consistently superior in the light-flash condition, while the behavior of one subject deteriorated in both conditions. When the schedule of primary reinforcement was reversed to FR5 the performance in the light-flash condition seemed to be superior to the sequential light condition as a result of sequential lights discriminatively controlling low response rates when the probability of delivery of primary reinforcers was low. Furthermore, for two subjects, the lights in either condition seemed to function as conditioned reinforcers only when a specific attending response was required. This too would lend support to Sidman's (1960) criticisms regarding precise investigation of specific variables, since Stephens' research seems to indicate that the simple pairing of stimuli and reinforcers is not always a sufficient procedure for establishing stimuli as conditioned reinforcers.

The purpose of the present research, which was a systematic replication of Stephens (Note 2), was to further investigate one of his major findings. Stephens found, that for all subjects, performance in the light-flash condition was superior to that in the sequential light condition and that performance under FR5 was superior to that under FR10. He found also that the stimulus lights on the stimulus response panel apparently functioned as conditioned reinforcers for two of the three subjects, only when a specific attending response (lever-press) was required to produce primary reinforcement.

The present research, employing an FR5 schedule of primary reinforcement, compared two conditions, which differed only in that in

one condition a required attending response was necessary to produce primary reinforcers in some experimental phases. Specifically, correct-response light-flashes followed each correct verbal response in both conditions, with primary reinforcement contingent upon completion of the ratio of the schedule of reinforcement in effect. However, in one of the conditions in certain phases, subsequent to completing the ratio of reinforcement in effect for picture-naming and reading responses, a specific response was required to produce primary reinforcers. In summary, in one condition a correct-response light-flash followed each correct verbal response and was paired with the automatic delivery of a primary reinforcer after each fifth correct verbal response. In another condition, a correct-response light-flash followed each correct verbal response, but the subjects were required to emit a specific response following completion of the ratio of reinforcement in effect, in order to produce delivery of a primary reinforcer.

METHOD

Subjects

The subjects were two autistic children from Mapleside Cottage at the St. Amant Centre, Winnipeg, Canada. The children in this research had been hospitalized for several years prior and were chosen on the basis of the following criteria:

1) Both subjects could imitate some of the verbal responses of the experimenter. For example, if the experimenter held up a picture of a ball and said, "What's this? A ball"., the subjects would imitate the response "ball".

2) Both subjects had limited object-naming repertoires. Arlene could not speak in complete sentences, or imitate many words reliably, and in many instances per pronounciation of certain words was inappropriate. Gary had a more extensive verbal repertoire than Arlene and was able to talk in simple complete sentences.

Arlene was five years old and had been hospitalized for almost 4 years at the time of this research. She displayed very little unprompted verbal behavior and that verbal behavior emitted was often unintelligible. She preferred to play on her own and would often sit for long periods of time either staring at her hands, rocking back and forth, turning in circles, or a combination of all three. Arlene was totally naive to all aspects of this research. She had never encountered the experimental equipment, picture-naming procedures, or schedule of reinforcement used.

Gary was also five years old and had been hospitalized since he was two months old. Gary's verbal repertoire was more extensive than

Arlene's. He was a very hyperactive child, rarely sitting still for more than a few seconds. He was familiar with many aspects of this research having been a subject in two earlier experimental investigations (Stephens, Note 2, Note 4). Therefore, he had previously encountered the physical surroundings, equipment used, was familiar with the picture-naming procedure, and had been exposed to the schedule of reinforcement.

Apparatus

This research was conducted in the Behavior Modification Research Laboratory at the St. Amant Centre in Winnipeg, Canada. The laboratory was divided into several small cubicles of varying size, sufficient for research involving single subjects. The cubicle used in this research was approximately 8 ft. x 10 ft. and contained a low counter along one wall on which was placed a Lehigh Valley Electronics Modular Human Intellignce System (#520 - 02). The cubicle also contained a small child-size table, three child-size chairs, a one-way window, and a small hole through which passed power cables from the Human Intelligence System. The one-way window and hole were located in the wall separating the experimental cubicle from the equipment room. A subject was seated at the table opposite the experimenter with the Human Intelligence System located on the counter to his immediate left and within easy reach.

The Human Intelligence System was composed of six snap-on panels of which only two were operative throughout this research. One of the operative panels was a candy dispenser and the other contained two translucent stimulus-response keys. These keys could be individually