THE USE OF TIME DELAY AS AN INSTRUCTIONAL PROCEDURE WITH THE SEVERELY HANDICAPPED

A Thesis

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ABSTRACT

THE USE OF TIME DELAY AS AN INSTRUCTIONAL PROCEDURE WITH THE SEVERELY HANDICAPPED. (May 1982)

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The use of time delay as an instructional procedure was investigated with three moderately or severely retarded, behavior disordered children who resided in a group home. A multielement experimental design across two responses, incorporating an A-B-A-C pattern in a single-subject diagram, was implemented during a five week period during lunchtime. Target responses were complete meal requests in phase (B), and complete drink requests in phase (C). Phase (B) involved two different components: a 15-second delay, then the same delay + modelling. Phase (C) also involved two different components: a trial-and-error procedure, then an errorless learning, 4-second delay procedure. Subjects were allowed to respond utilizing manual sign language, gestures, or verbalizations. Results indicate that a 15-second delay used singly was ineffective in the production of complete meal requests, but the same delay + modelling was sufficient in obtaining these complete meal requests. Trial-and-error procedures obtained drink requests from

one subject but the remaining subjects did not produce any complete drink requests, and did not respond at all on several occasions. In addition, there were more errors in the trial-and-error phase than in any other phase. The 4-second delay was effective in obtaining earlier responses and more complete drink requests from all three subjects than the trial-and-error procedure.

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Finally, the author extends his deepest appreciation to his wife, Sue, for the many hours spent typing, retyping, and editing. Her encouragement, support, and love were continuously demonstrated.

DEDICATION

The author wishes to dedicate this thesis to his parents--Mr. and Mrs. James B. Cole, Jr., for their loving home, invaluable advice, and inspiration to "be all that you can be". Most importantly, the author expresses gratitude to them for instilling in him the gift of patience and love for children.

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CHAPTER 1

Recent trends in education for the handicapped place strong emphasis on the individual child. This emphasis has gained much impetus from Public Law 94-142 (Etten, Arkell, and Etten, 1980) as evidenced in written individualized educational programs and annual habilitative treatment plans. Therefore, instruction has been undergoing a changing process to better accomodate the individual needs of each child. Where possible, one-to-one instruction is carried out if the proper ratio is found in the classroom.

However, a still larger concern of educators of the handicapped is the multitude of various teaching strategies and techniques available from which to select the most beneficial for each child. Educators are faced with deciding how to teach these slow learners in the most conducive manner, and they often encounter several problems such as: (1) When teaching a new behavior, a high rate of student errors or a complete absence of responding is expected unless the teacher introduces some type of stimulus or response prompt into the task; (2) Once the teacher has introduced this prompt, it becomes difficult to fade the prompt without observably increasing student errors.

Although these problems frequently exist, most teachers are in agreement upon the importance of minimizing errors in the acquisition stage of the learning process (Snell, Touchette, Gast, and Striefel, 1978).

Sidman and Stoddard (1966) provided a series of procedures for educators to follow in order to minimize student errors. They include task analyzing the skill, providing effective reinforcement, supplying corrective instruction and feedback when errors occur, and regarding errors as a program inadequacy rather than as a learner inadequacy. However, the reduction or elimination of errors during acquisition is still difficult even when utilizing these techniques.

There are many reports in the literature regarding discrimination task acquisition by severe and profound retarded individuals while minimizing errors. The studies range from Terrace's (1963a, 1963b) errorless techniques performed with pigeons to Sidman and Stoddard's (1967) report on an extension of the procedures using form discrimination with severely retarded subjects. More recently, Dorry and Zeaman (1973, 1975) used fading principles to teach sight words to the moderately and severely retarded. However, several drawbacks to these studies, as reported by Snell et al. (1978), include the fact that some of the errorless learning studies were conducted in laboratory settings

rather than classroom settings. Several studies also involved experimenters rather than teachers. Still, the most distressing characteristic was their reliance upon multiple versions of the stimulus materials. Since the studies employed a simultaneous stimulus shaping and stimulus fading procedure, many elusive variations of the task materials were necessary in order to fade out the irrelevant portions that serve to prompt the response and fade in the relevant portions of the stimuli. Implementation of this type of errorless learning seems less feasible for the classroom because of the need to obtain all the necessary teaching materials.

Typically, academic tasks are presented to children in a trial-and-error method (i.e., after receiving the verbal cue, correct responses to the stimuli are reinforced and incorrect responses to the stimuli are corrected but not reinforced). When seeking successful methods to teach handicapped children, Etzel and LeBlanc (1979) stated that teachers should know what skills children already possess as well as how to teach children those skills required to learn a new skill. They further suggested that educators involved with handicapped children should follow the "principle of parsimony" (p. 362) in teaching which, simply stated, means teachers should seek the least complex

but still effective procedure for changing behavior. This selection process can be very enigmatic due to the overwhelming differences in individuals.

Etzel and LeBlanc (1979) pointed out the importance of following the parsimonious approach only after determining that the traditional trial-and-error method fails to produce successful learning.

Several studies have been conducted which implement a variety of procedures that exist as a part of a developing technology of stimulus control resulting in errorless learning. These studies (e.g., Sidman and Stoddard, 1966; Bijou, 1968; Touchette, 1968; Dixon, Spradlin, Girardeau, and Etzel, 1974; and Schreibman, 1975) provided information which indicated that the traditional method of teaching by trial-and-error was unsuccessful when teaching some conceptual tasks to handicapped children. More importantly, the errorless learning procedures succeeded in a noteworthy manner by reducing or eliminating errors.

Statement of the Problem

Numerous studies (Terrance, 1963a, 1963b, 1966; Moore and Goldiamond, 1964; Schusterman, 1966, 1967; Sidman and Stoddard, 1966, 1967; Touchette, 1968, 1971; Egeland, 1975; Johnson, 1977; and others) have provided a great deal of information regarding errorless learning procedures with a variety of subjects. Etzel and

LeBlanc (1979) defined five errorless learning procedures identified in research: (1) fading; (2) stimulus shaping i.e., changing the topography or configuration of the stimulus; (3) time-delayed cues; (4) superimposition and fading; and (5) superimposition and stimulus shaping. However, little research has been conducted on the use of time delay as an errorless learning procedure with the severely and profoundly retarded.

Research concerning time delay has focused on isolated studies which demonstrate a single aspect of its use i.e., to increase language or facilitate generalization. It is important that educators have more knowledge of time delay, its functional application with various tasks, its advantages and disadvantages, and the populations with which it can be applied.

Purpose of the Study

The use of time delay as a form of errorless learning has been attempted with a few populations, most of whom were institutionalized profoundly retarded children (Halle, Marshall, and Spradlin, 1979). Furthermore, research has not provided a comparison of time-delay procedures to traditional trial-and-error methods of learning (Johnson, 1977).

This particular study was concerned with the use of the time-delay procedure with subjects residing in

a group home who had been diagnosed as moderately to severely retarded and/or severely behavior disordered. The purpose of this study was to investigate the effectiveness of time delay as an errorless learning instructional procedure with these individuals. The strength of time delay in comparison to traditional trial-and-error methods of learning was also investigated.

Definition of Terms

Snell et al. (1978) defined time delay as the addition of gradually increased amounts of time between presentation of the task stimuli (task request and materials) and a prompt over successive trials. The delay procedure is a simpler form of low error instruction that does not require multiple versions of task stimuli. It differs from other teaching strategies in many ways but, most importantly, it enables a teacher to practically eliminate student errors. The delay procedure provides for three basic types of responses: "anticipations" (unprompted corrects); "waits" (prompted corrects); and "errors". The waiting process allows the student to avoid making an error when he/she has not yet learned the correct response.

Errors are defined as responses to a stimulus not related to the reinforcement contingencies in a learning situation (Touchette, 1968) in that children can be

taught to respond to correct stimuli and not respond to incorrect stimuli.

Errorless learning procedures simply refer to no or relatively few mistakes that are made during discrimination training (Etzel and LeBlanc, 1979).

Statement of Research Questions

The research questions addressed in this study were:

(1) Does the addition of modelling to a 15-second delay increase the level of verbal responding as compared to delay used alone?

(2) Does the use of time delay as an errorless learning procedure increase the rate of acquisition as compared to the trial and error method?

Summary

Educators generally agree that instruction of the severely handicapped should occur with as few errors as possible. Several studies have shown that errorless learning procedures, by reducing errors, are a feasible method of instruction for classroom use.

This study investigated the effectiveness of time delay as an errorless learning instructional procedure with moderately and severely retarded behavior disordered children.

CHAPTER 2

Literature Review

In order for teachers to select appropriate instructional techniques to employ with their students, they must have an understanding of the various procedures which can be used, and more specifically which produce the best rate of learning. Therefore, teachers need to be aware of time delay as an instructional procedure, and how it compares to trial and error, fading, shaping, incidental learning, etc. Research with severely handicapped individuals will be described to illustrate the results of the delay procedure as a means of transferring stimulus control from motor or verbal imitation to verbal and visual stimuli.

Instructional Techniques

There has been much discussion of the value and even the necessity of errors in the process of learning (Holland, 1965). Errors have long been assumed to be a necessary part of the learning process. However, numerous investigators have demonstrated that discriminations can be learned without errors (Schlosberg and Solomon, 1943; Terrace, 1963a, 1963b; Moore and Goldiamond, 1964). Snell et al. (1978) noted that current instructional procedures employed with the

severely handicapped combine shaping with a prompt and a fading strategy. This technique enables the instructor to gradually increase the frequency of approximate responses while stimulus control is being transferred from prompt stimuli to relevant task stimuli. In addition, Snell et al. (1978, p. 1) state "Teaching literature describes a prompt progression ranging from total and partial manual assistance, used during early acquisition of response, to modelling and finally to verbal or pictoral instructions." The use of prompts can be employed singly or in combination. Similarly, fading may consist of providing less and less of the same prompt or transferring stimulus control from one prompt to a prompt higher in the hierarchy. It is understood that each prompt provides its own characteristic stimuli (tactile, kinesthetic, visual, auditory) while tapping different responses and abilities in the learner e.g., passive positioning, imitation, or comprehension.

The amount of error resulting from abrupt fading tends to cause slow learning. Laboratory research in errorless learning with severely retarded subjects has demonstrated the value of subtly changing task stimuli so that fading occurs with minimal error (Snell et al., 1978).

In a related study, Sidman and Stoddard (1966) reported that errors often create more errors. They suggested that in order to teach effectively, we must first prepare ourselves to learn from our children by allowing their errors to be a lesson to us. They also pointed out that children make mistakes because of the inadequacy of teaching techniques. As a result, by making successive revisions in their teaching program, the children in Sidman and Stoddard's study made fewer and fewer errors.

A significant number of severely retarded children fail to learn even simple discriminations despite carefully programmed contingent reinforcers (Touchette, 1968). According to Moore and Goldiamond (1964), Sidman and Stoddard (1967), and Powers, Cheney, and Agostino (1970), the instructional procedure of reinforcement and extinction usually entails errors. They emphasized that it is not the most efficient means of discrimination training.

Sidman and Stoddard (1967) compared a nonverbal teaching program combined with reinforcement and extinction (Program Group) with reinforcement or extinction alone (Test Group) in teaching retarded children to discriminate circles from ellipses. Fading techniques were used to transfer stimulus control from "bright versus dark" to "form versus no-form" and then to "circle versus ellipse". The results showed that

in the Program Group, seven of ten children learned the circle-ellipse discrimination, and while in the Test Group, one of nine learned. The stimulus-shaping techniques with the mentally retarded were more effective than technology which generates errors and depends only on the process of reinforcement or extinction.

According to Touchette (1968), retarded children who show no signs of learning a discrimination by trial-and-error can be taught by a program of graduated stimulus changes. He further noted that a history of trial-and-error training may interfere with acquisition and retention of a discrimination. These findings support and extend those of Sidman and Stoddard (1967).

Errorless Learning

Discrimination Learning

The ability to discriminate is a learned skill essential to much of what we do. This skill allows an individual to select the important stimulus from two or more stimuli. In comparison to normal individuals with equivalent mental ages, mentally retarded individuals have been found to be deficient in learning attention-discrimination skills (Westling and Koorland, 1979). Zeaman and House (1963), and Fisher and Zeaman (1973) theorized that this deficit is due to retarded persons' attentional processes, because they usually attend to only a limited number of dimensions.

Without considering attention limitations of mentally retarded children, teachers will often attempt to teach them to discriminate along two or more dimensions simultaneously before discrimination of individual dimensions has been adequately learned. In teaching discrimination skills to mentally retarded learners, initial learning will be achieved faster in two-choice situations. These situations allow the learner to receive more reinforcement because of higher probability of making correct responses. In order for the child to make a reliable selection, the targeted stimulus should be presented on every occasion along with one nontargeted stimulus that varies from trial to trial (Westling and Koorland, 1979).

It was further concluded by Westling and Koorland (1979) that the possibility still remains that discrimination learning cannot be learned without many errors. In some cases this may be true; however, in other cases it may be possible to develop "errorless" discrimination learning. What is meant by reducing errors, is that fewer trials will be required before correct performance is close to being constant. Errorless learning means the correct stimulus is always selected.

Errorless learning can be achieved through fading procedures and is possible without relying on previously learned discriminations by using a very gradual process of a slightly different nature. A limiting factor in

discrimination learning is the effect of novelty stimuli with mentally retarded individuals because it results in a burst of attention and selection of that object (Bilsky and Heal, 1969; Turrisi and Sheep, 1969).

A number of conclusions can be confidently made regarding factors which influence discrimination learning. In many instances, the same factors that have been found to influence verbal learning are also implicated in the discrimination learning process i.e., meaningfulness of the stimuli is related to learning rate in both situations (Baumeister, 1967).

In general, procedures with distinctly different stimuli enhance the rate of acquisition of the response. One can promote distinctiveness and thus decrease difficulty. This can be done by either increasing the number of relevant cues or by increasing the disparity between stimuli. Evidence has indicated that cue distinctiveness can be achieved by requiring the subject to make a particular motor response in relation to each cue. Previous experience in discrimination learning is an important factor. Naturally, the more practice a subject has the better he/she performs (Baumeister, 1967).

Transfer of Stimulus Control

Many studies have reported on the errorless or nearly errorless transfer of stimulus control (Terrace, 1963a, 1963b; Moore and Goldiamond, 1964; Schusterman, 1966, 1967; Touchette, 1968; and Westbrook and

Miles, 1970). Terrace's (1963) study demonstrated errorless discrimination procedures with pigeons and eventually errorless training procedures were applied to human discrimination learning. In this procedure, the discriminative stimulus was supplemented with a salient cue which was gradually removed or faded during the course of training. Additionally, Touchette (1971) noted that variables that affect the point at which a subject comes under control of the terminal stimuli is of considerable interest since they relate to the refinement of instructional techniques.

One of the most reliable criteria for distinguishing between discrimination performances, following acquisition of the discrimination, with and without errors, is the rate or latency of the response to reinforcement (Terrace, 1963a).

Procedures for the rapid acquisition of a complex discrimination by transferring control from one stimulus dimension to another have been demonstrated in pigeons (Terrace, 1963a, 1963b), normal children (Moore and Goldiamond, 1964; Gollin and Savoy, 1968) and retardates (Sidman and Stoddard, 1967; and Touchette, 1968). In each case the procedure consisted of superimposing the new stimulus dimension under which responding was already controlled and gradually fading out the original stimulus.

Egeland (1975) stressed that errorless discrimination has value as a technique when used with a preschool/kindergarten level and offers a promising approach to teaching children letters of the alphabet. However, he also presented evidence that not all studies using errorless training have been successful in transferring stimulus control from the salient cue provided during training to the final stimulus to be discriminated in a criterion or transfer task.

Errorless discrimination learning challenges the prevalent view that stimulus-response learning can be described as a process of error elimination (Sidman and Stoddard, 1967). Skinner (1961) also questioned the need for trial-and-error instructional procedures. He identified an important factor of which all educators should be aware. He suggested that if a subject can learn without making errors, it is reasonable to infer that errors are simply secondary phenomina or products of teaching methodology, rather than of the learning process itself.

The term "transfer of stimulus control" refers to the acquisition of stimulus control by a set of stimuli that has been paired with an unrelated set of stimuli that already controls the response (Terrace, 1963b; Touchette, 1971). As indicated earlier, the literature has numerous studies reporting errorless or nearly errorless transfer of stimulus control. Striefel,

Bryan, and Aikins (1974) claimed that such a procedure required that the behavior already exist under the control of some stimulus. Transferring stimulus control to a set of stimuli that previously does not control the behavior becomes the task. By gradual stimulus change, responding to the initial stimuli is eliminated and responding is transferred to new stimuli. Limitations of previous studies involving human subjects in the transfer of stimulus control applied specifically to a visual dimension e.g., circle ellipse (Sidman and Stoddard, 1967) and picture words (Corey and Shamow, 1972). These findings suggested that in order for transfer of stimulus control to occur, both of the stimuli must control the measured response simultaneously at some point (Schusterman, 1967; and Ray and Sidman, 1970). Stimulus control transfer procedures such as those used by Terrace (1963b) and Schusterman (1966, 1967) command training with both sets of stimuli present at their maximum value.

The three most viable conceptions of how a neutral stimulus acquires strength based on its relationship to primary reinforcement appear to be the following: (1) the pairing hypothesis which states that the simple pairing of a stimulus with a primary reinforcer imparts conditioned reinforcing strength to that stimulus; (2) the delay reduction hypothesis which states that the strength of a stimulus as a conditioned reinforcer

is a function of the reduction in time to reinforcement correlated with the onset of that stimulus; and (3) the uncertainty reduction hypothesis which states that the strength of a stimulus is a function of its informativeness about primary reinforcement i.e., how much uncertainty reduction it provides about reinforcement (Fantino, 1977).

Hively (1962) suggested the following analysis of the failure of stimulus control transfer during fading.

> No matter how carefully one designs a sequence of correlations between the occurrence of stimuli and the availability of reinforcement, the actual contingencies of reinforcement in a given case depend upon what the subject observes, which in turn depends upon the individual subject's history. (p. 292)

The point is also made that in the facilitation of the transfer of stimulus control, immediate history is very important. Skinner (1966) notes the following:

> No two organisms embark on an experiment in exactly the same condition nor are they affected in the same way by the contingencies in an experimental space. (p. 20)

Shaping and Fading

In alleviating any deficit in behavior, the most time consuming task is the teaching of new topographies

of behavior. When a child's repertoire does not include a particular behavior and the child cannot be taught by customary methods, training can be executed through the behavior modification technique called shaping. This procedure involves the long and intricate process of reinforcing behaviors which resemble the desired terminal behavior, and then, in successive steps, shifting the reinforcement to behaviors which more and more closely resemble the terminal behavior. Once the terminal response is obtained, the response can then be shifted to imitative control by imitation training (Risley and Wolf, 1967). In applying shaping techniques to facilitate the learning of new responses, the teacher starts by reinforcing behavior that the learner already has or can easily acquire and then gradually restricts the application of reinforcement to behavior that more closely resembles the performance of the desired behavior (Sidman and Stoddard, 1967).

Terrace (1966) used the term "fading" to indicate a gradual change in the intensity or other dimensional characteristics of a stimulus when stimulus control is shifted from one dimension (such as light-dark) to another stimulus dimension (such as hue). The fading procedure resulted in a reduction in time and errors in the learning of a series of elementary number facts. Also, the results indicated an improvement in learning

and retention over more conventional study and drill procedures. The subjects in these experiments had a history of failure when the typical drill procedures were used.

In two separate experiments with normal children, the process of gradually covering the answer to a number fact with cellophane or tracing paper (fading) was contrasted with regular drill or study procedures. In both cases the fading procedure produced fewer errors and better retention (Huapt, Van Kirk, and Terraciano, 1975).

Corey and Shamow (1972) demonstrated that a fading procedure may be profitably applied to a reading situation in that it produces fewer errors and has proven to be more efficient than a superimposition procedure over a wide range of testing intervals. Typically, a fading procedure is continued until the subject makes an error, at which point the controlling stimulus is reintroduced at a higher intensity. They have also stated that this procedure would be more likely to result in nearly errorless acquisition than the present procedure and would be more appropriate when dealing with children who differ greatly in their rates of acquisition of the discrimination.

The effectiveness of using a fading procedure to facilitate the acquisition of a discrimination has been

demonstrated by Hively (1962), and Moore and Goldiamond (1964) with normal children, and Sidman and Stoddard (1967) with mentally retarded children. The superiority of the fading procedure over the non-fading method is consistent with previous findings (Dorry, 1972; Shamow, 1971) with normal children, and permits generalization to the institutionalized retarded population in a smaller mental age range.

While the cost of implementing a fading procedure is greater than standard methods, both the advantages to be gained from its use and the fact that it can be faded out after a limited period, recommend its applicability and utility. The practical educational implications of the effects i.e., better initial acquisition and transfer to later training, are potentially great (Dorry and Zeaman, 1973).

Dorry and Zeaman (1975) have shown a fading procedure to be more effective than a standard paired associate method in teaching a simple reading vocabulary to retarded children. Corey and Shamow (1972) have shown the same effect with nonretarded children. Later, Dorry (1976) successfully used a fading procedure for simple reading vocabulary acquisition. As reported by Dorry and Zeaman (1975), the fading procedure utilized in their experiments was accomplished by also presenting a word and picture simultaneously, but gradually fading-

out the picture with repeated pairings, while the word remained fully visible. No well established reason has been accepted for the effectiveness of fading, but Dorry and Zeaman (1975) offer three possible explanations: principle of stimulus generalization; mixed contingent and noncontingent training; and attention. Of the three possible mechanisms proposed and tested by Dorry and Zeaman (1973, 1975), the attention hypothesis was judged to provide the best explanation for the superiority of the fading procedure on training and transfer. The attention hypothesis explains the effectiveness of fading by assuming that as the stimulus (picture) gradually fades out over trials its salience decreases, increasing the probability that the subject will attend to the new stimulus (word) as well as the original stimulus (picture) thus facilitating learning.

Few theorists have speculated on the efficiency of fading, except Terrace (1963a, 1963b). He has shown that pigeons could be efficiently taught a difficult discrimination in successive stages. Initially, an easy discrimination was taught. Next, the cues of the hard discrimination were superimposed upon those of the easy discrimination, such that the subjects (pigeons) made no errors in the presence of the redundant displays of hard and easy discrimination cues. Finally, the easy cues were gradually faded out

leaving just the hard cues which were then learned. According to Terrace, the efficiency of this procedure derives theoretically from the prevention of errors during the discriminative training.

Time Delay

The timing of instructions has been demonstrated to be a powerful tool for teaching discriminations with few or no errors (Etzel and LeBlanc, 1979). Time delay is considered an alternative instructional procedure which was first operationalized by Touchette (1971), although employed earlier by Risley and Wolf in 1967 with autistic children and object naming. Resembling the stimulus shaping and fading procedure, the time delay procedure begins by pairing the controlling stimuli (or prompt) with the new stimuli. However, rather than systematically fading the controlling stimuli, its presentation is simply delayed. Therefore, over successive trials, or blocks of trials, gradually increased amounts of time are inserted between presentation of the new stimuli (task request and materials) and the controlling stimuli (prompt) until stimulus control is transferred from the prompt to the task request and materials. A delay procedure is a simpler form of low-error instruction that does not require multiple versions of task stimuli, and it differs from other instructional teaching procedures in many

ways. Most importantly, it enables a teacher to practically eliminate student errors (Snell et al., 1978).

From the above descriptions some of the differences between a delay procedure and other teaching procedures should be obvious. First, the student never needs to make an error. When the student has not learned the correct response, he/she can wait for the instructor to provide delayed instruction. The delayed instruction is actually serving the purpose of a prompt that serves to evoke the correct response. The prompt may be a touch cue, a word to be imitated, or even physical guidance. Second, the instructor who uses delay has a systematic means of eliminating the prompt without causing much error, will have few errors, if any at all. The amount of delay provided after the task request and stimuli are presented and before the prompt is carefully increased over trials will gradually be increased from: (1) no delay at all when first teaching a new task (prompt given simultaneously with task request and stimuli); to (2) a delay of approximately 4 seconds (or however long it takes the student to anticipate). It is this gradual increased delay in the provision of the prompt that allows the teacher to fade or eliminate the prompt by transferring stimulus control from the prompt to the task stimuli. As the delay approaches 4 seconds, students tend to anticipate

rather than wait for the prompt (Touchette, 1971). When the student is at this point, he/she shows evidence of learning the task. If the student continues correctly anticipating rather than out-waiting the delay, it may be said that he/she has learned the task. The range of application possible for a delay procedure is very extensive i.e., money recognition, verbal instructions, object recognition, imitational tasks, and expressive and receptive language concepts (Snell et al., 1978).

Evidence also has been given to support the use of progressively delayed cues. A powerful tool for teaching discriminations with few or no errors has been the manipulation of the timing of instructions (Etzel and LeBlanc, 1979). By using a delayed cue technique, Touchette, 1971; Radgowski, Allen, Ruggles, Schilmoeller, and LeBlanc, 1978 taught English speaking children to respond receptively and expressively in French. For most children, the progressively delayed cue procedure resulted in learning with few or no errors. Etzel and LeBlanc (1979) concluded by stating that the use of the procedures that decrease errors in learning should be tried for the purposes of increasing the effectiveness of the total learning environment.

Risley and Wolf (1967) implemented a time delay procedure with echolalic children in order to develop a transition from imitation of responses to naming the

picture/object. Once reinforcement for imitation produced a high probability of successful imitation of the verbal prompt alone, a picture or object was presented together with the verbal prompt, and the child was reinforced for imitating the name. Then the imitative prompt was faded out while the child continued to receive reinforcement for labelling the picture/object. Once the child's attention was acquired, the time between the question "What is this?" and the prompt was gradually lengthened to more than 5 seconds. A correct response was followed by a social consequence such as "right" or "good", and the partial prompt was immediately repeated. If the correct response did not occur within 5 seconds or more, the complete prompt was presented. By utilizing the time delay technique to facilitate the task of naming the picture/object, language skills were successfully acquired.

Risley and Wolf (1967) report of a time delay procedure which was implemented by parents to establish appropriate verbal responses to questions with their child. Their son displayed echolalic speech in which case he often repeated words or phrases over and over with gradually increasing volume until it climaxed with piercing shrieks and crying. The parents were requested to record the instances of chanting and to send him to his room for 5 minutes whenever the chanting

developed into shrieking and crying. This was only partially successful. Finally, the parents withheld reinforcement by looking away until their son called their names. The parents then waited, while looking at him, until he gave a complete sentence. The stereotyped chanting soon decreased to zero as the child began to indicate more appropriate requests.

Spiro and Shook (1973) successfully utilized an avoidance procedure to reduce the long latencies of verbal responding with a mentally retarded, emotionally disturbed adolescent. They demonstrated that shortened latencies could be maintained by a reinforcement procedure. With motivational variables they suggested that one possible solution to the problem could be to produce short latencies deliberately by prior training and then, after one has established the fact that the latencies are as short as they can be, or at a reasonable level, to go into the regular testing.

Many experiments have been conducted investigating the effects of using delay procedures in behavior modification techniques (Fowler and Trapold, 1962; Tarpy, 1969; Tarpy and Koster, 1970; deVillers, 1977; and others). Several studies were performed which measured the results of varying delay of negative reinforcement. Fowler and Trapold (1962) conducted a thorough study of delay of escape in a straight runway with rats. The delay of

voltage reduction in the goal box varied over 5 values between 1 and 16 seconds for groups of 5 rats each. The observed relation between running speed in the runway (100/time in seconds) and immediacy of escape (1/delay in seconds) in the goal box accounts for 92.6% of the variance in running speed being accounted for. Later, Tarpy (1969) implemented another experiment utilizing delay of escape with rats in which the rats escaped electric shock by pressing either of two levers in a discrete-trial procedure. The main purpose was to investigate preference as a function of differential delays between a press on either level and shutting off the shock. However, when a test was made of the data on the delay of escape, results were the same for both levers; 89.5% of the variance in response speed (100/latency in seconds) for 5 delays between 1 and 16 seconds (excluding the 0-delay condition) was accounted for. Tarpy and Koster (1970) performed a similar study using a varied delay of discrete-trial escape from electric shock by rats responding on a single lever. The results accounted for 94.6% of the variance in response speed.

There have also been numerous studies conducted which measured the effects of a delay of positive reinforcement. The most comprehensive data on the delay of reinforcement in a single response situation come

from Pierce, Hanford, and Zimmerman (1972). In their investigation, four rats responding on a variable interval (VI) 1-minute schedule for food experienced delays of reinforcement varying from .5 to 100 seconds. A cue light was used during the delay, however, responding to the illumination had no programmed consequences. The results of the Pierce et al. study accounted for 96.1% of the variance in mean response rate, and was similar to other studies on the delay of reinforcement. The Perin (1943) experiment is noteworthy, because it measured latency to lever press in a discrete-trial procedure as a function of delay of reinforcement. In both experiments, rats were used as subjects and food as the reinforcement.

The application of a matching relation with immediacy of reinforcement (1/delay) was investigated by Chung and Hernstein (1967). Using pigeons, Chung and Hernstein devised an experiment utilizing a variable interval reinforcement schedule. Basically, this was a study of choice between different immediacies of reinforcement. The amounts of delay were varied from 1 to 30 seconds during the standard key and experimental key. During the delay of reinforcement the experimental chamber was blacked out. The results were measured by relating ratios of responses to ratios of immediacy of reinforcement on the two keys. This study showed that both functions (8-second delay versus 1 to 30

second delay) were close to perfect matching. Earlier, Chung (1965) studied the choice between immediate and delayed reinforcement in equal concurrent VI schedules. Chung and Hernstein (1967) demonstrated that if a small constant (1.6 second) was taken as the actual delay interval for what was nominally immediate reinforcement, Chung's pigeons were actually matching the relative reciprocal of delay on each key. The constant represents the amount of time taken for the pigeon to lower its head to the feeder and begin eating.

In a similar study, Herbert (1970) used a single VI schedule and assigned the reinforcements with equal probability to the two keys which were developed by Chung and Hernstein's experiment. In Herbert's experiment, reinforcement for each key was delayed by a blackout, as in Chung and Hernstein's study. Two relative delay values besides equality were examined and the short 1-second changeover delay (COD) or the single tape procedure could account for the undermatching observed.

In summary, although there appears to be no direct correlation between animal and human studies, research involving time delay with these subjects has proven to be quite fruitful. The utilization of animals as subjects in new research is common due to the need for experimentation. Additionally, delay used as a form of errorless

learning is such a novelty, few studies are available for comparative purposes. It should also be mentioned that these studies utilizing animals as subjects have been included due to the newness of the information.

There are many studies involved with experimental techniques that implement a time delay procedure in relation to operant conditioning (Staddon, 1977). Risley and Wolf (1967) applied the operant behavior modification techniques of shaping, fading out verbal prompts and the transfer of stimulus control, and extinction and time out from reinforcement in the development of speech in echolalic children.

In most operant conditioning experiments using animals, a single aspect of behavior such as a key peck or a lever press is selected as the instrumental response. Although a reinforcer will not ordinarily follow every instance of the response it follows some, usually immediately, and does not occur other times. However, there are departures from this rule such as the delay of reward procedures, but it is so common, and seems so close to the "natural" contingencies of the animal's wild environment that it has become the norm (Staddon, 1977).

Some important work grew out of Rescorla's (1967) theoretical discussion of the appropriate control procedures for Pavlovian conditioning. He suggested that

conventional procedures did not allow for the measurement of appropriate baselines against which to assess accurately the strengths of a conditioned response developed by Pavlovian procedures. Rescorla (1967) argued that traditional control procedures failed to provide an unconfounded measure of the effects of the experimental contingency between the stimuli. He suggested that the only way in which this could be achieved was by means of what he termed a "truly random" control procedure.

Touchette (1971) used a time delay procedure to shift stimulus control from a red key to responding to a specific black figure (inverted E). His procedure might have been considered an errorless fading procedure if sequential time delays were considered fading steps. Touchette's procedure involved not only establishing a transfer in stimulus control, but it also determined the point in time at which stimulus control occurred. He trained subjects to respond to a red key but not to a white key and then superimposed black figures on the lighted keys. On the next trial, there was a 0.5-second delay between the presentation of the black figure and the appearance of the red light. Gradually, the time between presentation of the red key increased. Eventually, the subject responded to the black figure before the key turned red. This was defined as the moment of stimulus control transfer.

Touchette (1974) has also developed an errorless learning procedure called the "four-second-delay" which can be primarily used in one-to-one teaching situations to teach both normal and retarded children a wide variety of skills. Touchette's four-second-delay procedure was successfully used to teach a multiply handicapped adolescent to correctly identify animal cards, geometric shapes, and math problems.

Striefel, Bryan, and Aikens (1974) used a transfer of stimulus control procedure to teach three profoundly retarded adolescents a series of specific responses to specific verbal instructions. After imitative control of a behavior was established, a verbal instruction was presented immediately before the behavior was modelled. Each correct response was followed on the next trial by inserting a delay between the verbal instruction and the modelling of the behavior. The delays increased from trial to trial. Transfer of stimulus control was indicated when a subject responded correctly on five consecutive trials before the behavior was modelled. Results showed that all three subjects responded correctly to each verbal instruction after that item was trained in a multiple-baseline order. Transfer of stimulus control generally occurred for all three subjects on the first trial where a time delay (roughly 0.5-seconds) occurred between the verbal instruction and the modelling of the behavior. The results of Striefel

et al. (1974) allow for the extension of Touchette's (1971) procedure to the area of instruction following behaviors. The errorless fading procedures used to transfer stimulus control between visual dimensions (Terrace, 1963a, 1963b, 1966; Sidman and Stoddard, 1967; and Corey and Shamow, 1972) have now been demonstrated to extend across sense modalities (visual-auditory).

As described by Touchette (1971), the delay procedure makes it likely that unmeasured behaviors will come under the control of the transfer stimuli since those stimuli precede the onset of the stimuli that control the measured response. The delay procedure, like fading, only encourages transfer of stimulus control.

Altogether, there have been many applications of time-delayed instructional procedures. These tasks included motor imitation, comprehension of object and picture names, responding to verbal instructions, and tabletop instructions common in classrooms for the severely handicapped e.g., matching, functional use of objects, etc. (Snell et al., 1978).

Time Delay and Language

Speech and language disorders are one of the most prevalent characteristics of retarded populations. Therefore, many studies have been documented that attempt to modify the speech and language-related skills of such

populations (Johnson, Copobianco, and Miller, 1960; Baer, Peterson, and Sherman, 1967; Bricker and Bricker, 1970; and McLean, 1970).

It is not uncommon to find mentally retarded children exhibiting autistic-like behaviors, especially those in the severe/profound range. The process of language acquisition, if it occurs at all, seems to be quite different for an autistic child. It appears that in such a child, the mechanism underlying the normal active scanning, checking, and classifying of experience is either absent or severely limited. Consequently, if words are acquired at all, they are learned passively by operant conditioning, instead of as an integral part of an active processing of experience (Ricks and Wing, 1976).

Striefel, Bryon, and Aikens (1974) pointed out that many of the initial attempts to modify language skills of institutionalized subjects have focused on motor imitation or the correct production of speech. However, for the institutionalized retarded, environmental contingencies are organized so that reinforcement is more likely to occur for behaviors such as being able to follow instructions. Yet, verbal behavior is not typically required of residents in an institution for the retarded, but the ability to follow instructions is (Spradlin, 1963).

A study by Halle, Marshall, and Spradlin (1979) successfully utilized a time delay technique to increase language use and facilitate generalization in 6 severely retarded children living in an institution. Children were required to pick up their food trays and return to their seats. To evoke meal requests, Hall et al. (1979) delayed giving food trays for approximately 15 seconds. The use of the 15-second delay at mealtime was enough to evoke speech in the retarded subjects. In addition to the demonstrated effect of the delay on meal requests, it appeared likely that the use of incidental modelling, though not manipulated, was partially responsible for the changes that occurred.

Summary

The purpose of this study was to investigate the effectiveness of time delay as an errorless learning instructional procedure with mentally retarded and behavior disordered children residing in a group home setting, and make a comparison to trial and error learning.

The research question addressed by this study was: Does the use of errorless learning time delay procedures increase the rate of acquisition as compared to the trial-and-error method? This question was asked due to educators' need for information regarding time-delayed instructional learning procedures and its

advantages, disadvantages, applicability, etc. It was hypothesized that time-delayed instruction would increase/improve the level of responding as compared to trial-and-error procedures.

Several investigations have demonstrated that discriminations can be learned without errors (Schlosberg and Solomon, 1943; Terrace, 1963a, 1963b; Moore and Goldiamond, 1964).

Furthermore, Sidman and Stoddard (1966) reported that errors often create more errors. They pointed out that children make mistakes because our teaching has been inadequate. The children in Sidman and Stoddard's study made fewer and fewer errors as a result of making successive revisions in their teaching program.

According to Touchette (1968), a significant number of severely retarded children fail to learn even simple discriminations, despite carefully programmed contingent reinforcers. In addition, Moore and Goldiamond (1964), Sidman and Stoddard (1967), Powers, Cheney, and Agostino (1970) report that the instructional procedure of reinforcement and extinction usually entails errors. They emphasized that this is not the most efficient means of discrimination training.

Touchette (1968) also noted that retarded children who demonstrated no signs of learning a discrimination by trial and error could be taught by a program of

graduated stimulus changes. He further suggested that a history of trial-and-error training may interfere with acquisition and retention of a discrimination.

A number of conclusions can be confidently made regarding factors which influence discrimination learning (Baumeister, 1967). He reports that in many instances the same factors that have been found to influence verbal learning are also implicated in the discrimination learning process, i.e., meaningfulness of the stimuli is related to learning rate in both situations.

Numerous studies have been conducted which report on the errorless or nearly errorless transfer of stimulus control (Terrace, 1963a, 1963b; Moore and Goldiamond, 1964; Schusterman, 1966, 1967; Touchette, 1968; and Westbrook and Miles, 1970). These studies incorporated shaping, fading, superimposition, etc.

The effectiveness of using a fading procedure to facilitate the acquisition of a discrimination was demonstrated by Moore and Goldiamond (1964) and Hively (1962) with normal children, and by Sidman and Stoddard (1967) with the mentally retarded.

As reported by Dorry and Zeaman (1973), the cost of instrumenting a fading procedure is greater than standard methods, but the advantages to be gained from its use and the fact that it can be faded out after a limited period recommend its application

and utility. They further suggest that the practical educational implications of the effects, better initial acquisition and transfer to later training, are potentially great.

Finally, Terrace (1963a, 1963b) has concluded that the efficiency of a fading procedure derives theoretically from the prevention of errors during the discriminative training.

An important factor which all educators should be aware of has been identified by Skinner (1961). He suggested that if a subject can learn without making errors, it is reasonable to infer that errors are simply secondary phenomena or products of teaching methodology rather than of the learning process itself.

Snell et al. (1978) stressed that time delay procedures are considered an alternative instructional procedure. They believe it is considered a simpler form of low-error instruction that does not require multiple versions of task stimuli, but most importantly, it enables a teacher to practically eliminate student errors.

An errorless learning procedure called the "four-second-delay" was developed by Touchette (1974). Used primarily in one-to-one teaching situations, the procedure was considered feasible for both normal and retarded children with a wide variety of skills.

Touchette's four-second-delay procedure was successfully used to teach a multiply handicapped adolescent to correctly identify animal cards, geometric shapes, and math problems.

As described by Touchette (1971), the delay procedure makes it likely that unmeasured behaviors will come under the control of the transfer stimuli since those stimuli precede the onset of the stimuli that control the measured response.

Snell et al. (1978) reported that there have been many applications of time-delayed instructional procedures. They have pointed out that these tasks include motor imitation, comprehension of object and picture names, responding to verbal instructions, and tabletop instructions common in classrooms for the severely handicapped (e.g., matching, and functional use of objects, etc.).

Time delay instructional procedures have successfully been utilized with normal English speaking children (Touchette, 1971; Radgowski, Allen, Ruggles, Schilmoeller, and LeBlanc, 1978), junior-high students (Hall and Broden, 1977), severely retarded institutionalized children (Halle, Marshall, and Spradlin, 1979), a multiply handicapped adolescent (Touchette, 1974), and a mentally retarded, emotionally disturbed adolescent (Spiro and Shook, 1973).

In conclusion, research has indicated that time delay is a viable means of transferring stimulus control because it eliminates or reduces errors. Time delay has been regarded as a good alternative to trial-and-error discrimination methods and has been demonstrated as being useful in teaching a wide variety of populations.

CHAPTER 3

Methodology

This study attempted to compare a total of four instructional techniques with two separate responses utilizing a multielement design. In this chapter, the specific methodology of the research is discussed in terms of the setting, the subjects, the procedures, and the research design.

Setting

This study occurred in a group home for mentally retarded, behavior disordered children between the ages of 6-16. This group home was part of the Outreach Division of a state institution. There was a maximum of four children residing in this group home as a result of the intensive behavioral programming required as well as the need for one-to-one instruction.

This study was conducted for five days per week over a five week period during lunches in the dining room of the group home. The dining room facilities were typical of a regular home furnished with a family size table and six chairs. Meals were prepared by teaching parents and were usually placed either on a small food cart or on the dining table. Two or three staff members (two teaching parents, plus a classroom

teacher, a secretary, or the director) supervised mealtime activities for the group home.

Subjects

Three children residing in a group home for mentally retarded and behavior disordered were selected as subjects for this investigation. The selection was based upon the need to increase language development with emphasis on expressive language skills. Although the participants in this study demonstrated some mode of expressive language skills, the environment lacked planned opportunities for functional speech in the most functional of settings--mealtime. The children ranged in age from 8 years, 6 months to 13 years, 9 months. All the children had been diagnosed as severely or moderately retarded in measured intelligence and moderately retarded based upon their adaptive behavior. These diagnoses were determined during their annual evaluations conducted by a psychologist, physician, and/or educator (Table 1).

Selection Criteria. In order to be selected as a subject for time delay instructional procedures, the subjects were required to meet the following criteria: (1) It was necessary that a strong reinforcer was identified for each student. Reinforcers consisted of edibles, verbal praise, privileges, tokens, points, etc. It was important that an effective reinforcer was

Table 1

Subject Characteristics

Ss#	Name	Sex	CA	MI[a]	AB[b]	Length of Stay in Group Home (Yrs.-Mos.)
1	Ben	M	13-9	moderate	moderate	0-9
2	Danny	M	8-6	severe	moderate	4-3
3	Toni	F	10-0	severe	moderate	1-0

[a]Measured Intelligence

[b]Adaptive Behavior

selected. (2) It was necessary that the student demonstrate the ability to sit and interact with the instructor for at least 5 minutes without making interruptions. The following behaviors were considered appropriate interactions: toy play, motor imitation, matching games, or other simple tasks. (3) It was necessary that each student demonstrate the ability to do one of the following, depending upon which type of prompt was used: to be manually prompted or "put through" a response, to imitate simple actions or vocalizations, to match to a sample, or to follow verbal commands. For example, if a pointing prompt was to be employed, the student must have been able to touch his/her finger to a piece of paper, an object, or a specific place on a page after the instructor had done so. (4) Finally, it was necessary that the student wait for a prompt from the instructor for increasingly longer periods of time, from one half second to at least four seconds.

Procedures

The average number of persons at each meal, staff and residents combined, was seven. The manner in which the food and drink was normally dispensed was dependent on the functioning level of the individuals. Basically, two procedures were adhered to: (1) a staff member served the food and drink to the child as he/she

remained seated at the table; or (2) a staff member called the child to the table and waited for him/her to serve him/herself.

Response Definitions

During the experimental phase (B), the target behavior of this study was the production of "complete meal requests" at lunch by each subject. Complete meal requests were defined as occurring whenever a subject verbalized "want" before or "please" after the following words: "plate", "food", or "eat". The use of manual sign language and verbal approximations of requests were acceptable. A "partial meal request" was defined as occurring whenever a subject said only one of the two words in a complete meal request e.g., "eat", or "please". A subject's substitution of the name of a particular food item constituted a "specific-item request"; however, these responses also required an accompanying "want" and/or "please". "No response" was defined as occurring whenever a subject did not make a gestural or verbal response or approximation.

During the experimental phase (C), the target behavior was the production of complete drink requests at lunch by each subject. The level of response i.e., complete, specific, partial, or no response was the same as in phase (B) with the substitution of the word "drink" for the words "plate", "food", or "eat".

However, in phase (C), the production of the word "milk" by a subject could be considered a partial or specific-item request. In this case, the level of response recorded was the highest score for this subject, and was therefore scored as a specific item request.

A final definition includes four-second-delay. Four-second-delay provides for three types of responses: "anticipations", "waits", and "errors".

Anticipations, Waits, and Errors. This delay procedure is different from other teaching procedures in several ways. Generally, a teacher is concerned with two types of responses: correct responses and errors. The difference is that the delay procedure provides for three basic types of responses: anticipations, which are unprompted correct responses; waits, which are prompted correct responses; and errors. Waiting allows the student to avoid making errors when he/she has not learned the correct response. Consider the following example: teaching objective is to teach the student to identify four objects (toy, car, ball, doll, and a hat). An instructor sits down at a table with the student, says "Touch the ball", and then (in this particular instance) waits 4 seconds. If during the interval the student has neither touched the ball nor made an error (by

touching one of the other three stimuli), the instructor touches the ball. The diagram of this procedure is seen in Table 2. The student's response, as seen in Table 2, would be considered a wait because he/she has waited for the instructor to provide the delayed prompt of touching the appropriate object. If the student had correctly touched the ball before the 4 seconds were up, this response would be called a correct anticipation or simply an anticipation because the student anticipated the instructor's delayed prompt. If the student incorrectly chooses one of the other stimuli either before or after the delay, this would be considered an error. A trial with an error might go like this: Instructor says, "Touch the ball" and begins timing 4 seconds. Before the 4 seconds are up, the student touches the car. The instructor stops timing, says "no", and ends the trial. Should this type of error occur repeatedly, the student probably needs to be taught to wait.

Methodology

The staff member who called the subjects to the table served as the primary observer and trainer. The trainer stood on one side of the table and recorded the level of the response made by the subject between the time of arriving at the table and receiving the plate of food. A second observer assessed reliability in

Table 2

Example of 4-Second Delay

New Stimuli	Delay	Controlling Stimuli	Response	Reinforcement
"Touch the ball". Objects	0 sec. 0.5 sec. 1 sec. 2 sec. 3 sec. 4 sec. 5 sec. etc.	Instructor touches ball	Student touches ball	Token, "Good, that's the ball!"

approximately one-half of the sessions. The reliability observer stood at the head of the table to the right of the primary observer and also recorded the level of the response made by the subject within the given time frame.

Reliability checks were conducted by comparing the data sheets of the two observers for agreements and disagreements, then totaling the number of agreements and dividing that total by the number of agreements plus disagreements (Hersen and Barlowe, 1976).

Data collection was based on a single-subject diagram with each experimental condition graphed to demonstrate results of the procedures. During lunch, the level of response was recorded as being a complete request, specific-item request, partial request, or no response. In addition, the number of seconds required to respond was recorded in each experimental condition.

Experimental Design

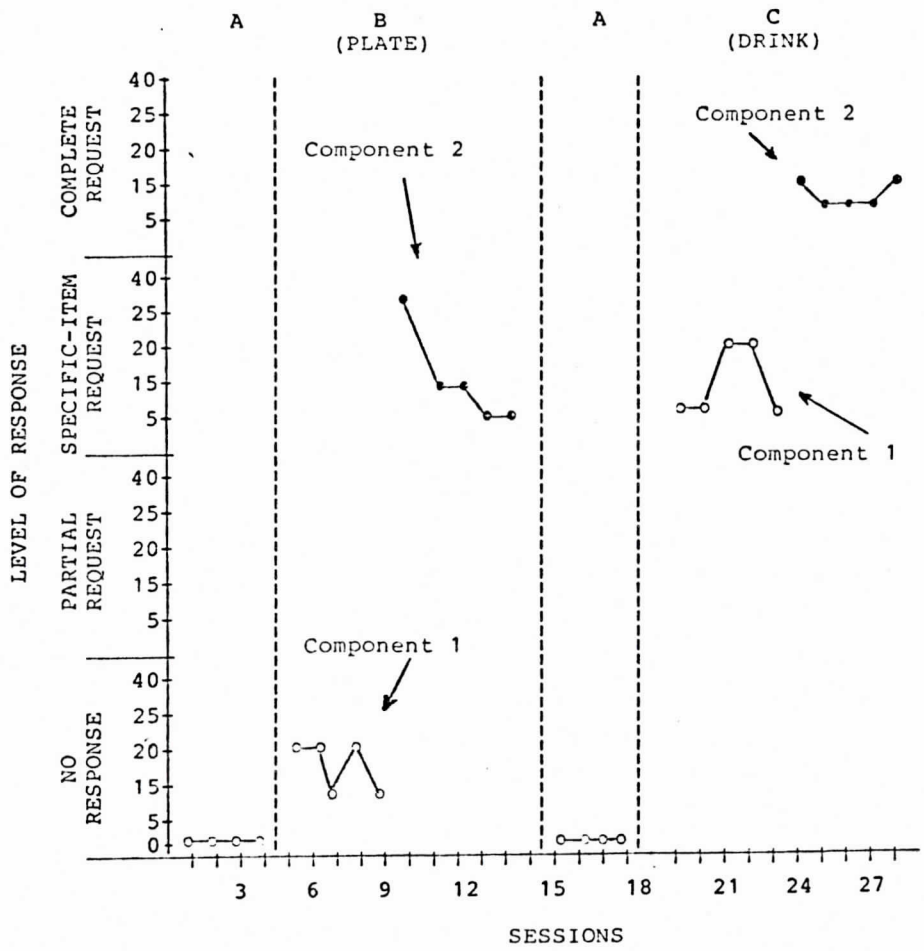
This study incorporated a multielement design across two responses with a single-subject diagram (Hersen and Barlow, 1976). The experimental phases were labelled A-B-A-C (see Figure 1).

Baseline (A)

During the baseline condition (A), no alterations were made in the group home environment except that

Figure 1

Example of Multielement Design



the staff member, who called the children to the table, became an observer and recorded what the children said. The plates and drinks were placed on the food cart, children's names were called one at a time, and the staff member waited until each child picked up the plate and drink and returned to his/her seat at the dining table before calling the next child's name.

Response #1-Plate (B)

The first experimental procedure (B) compared a 15-second delay used singly to a 15-second delay + modelling (Table 3). Both procedures were concerned with the same response--plate requests. In the 15-second delay condition, when the child reached the food cart, the staff member held the child's plate for 15 seconds or until the child made a complete meal request. Any complete food request was immediately reinforced by presentation of the plate. If no request, or only an incorrect request was forthcoming, the plate was handed to the child at the end of the 15-second delay. If a partial request was made, the item or items requested were handed to the child immediately, but the request was recorded as incorrect. The remaining part of experimental phase (B) was time delay + modelling. In this condition, at the end of each 15-second delay, the staff member modelled a request, "Plate, please", for the child.

Table 3

Illustration of Experimental Phase B:

Time Delay; Time Delay + Modelling

(First Experimental Condition)

15-Second Delay

1. Call subject to dining room table
2. Subject approaches table
3. Trainer holds food plate out but does not give and does not say anything (plate serves as stimulus)
4. Trainer waits 15 seconds or until subject makes a complete meal request, e.g., "Eat, please", then he/she immediately receives plate of food. If no request or only a partial request was made, trainer gives the tray to the subject at the end of the 15-second delay.

Total= 15 seconds

15-Second Delay + Modelling

(Repeat steps 1-4).

5. At end of 15-second delay, trainer models complete request for subject and waits 5 seconds. Again, complete requests would receive plate. If no response, incorrect response, or partial response is made, then,
6. Trainer repeats same model second time and waits 5 seconds. If needed,
7. Trainer repeats same model third time and waits 15 seconds. If a correct response has not been made at end of this 40 second period, then subject receives plate.

Total+ 40 seconds

If the child imitated the model, the plate was given to the child immediately. If not, after 5 seconds, the same phrase was modelled a second time. Again, if no response, or only an incorrect response occurred within 5 seconds, a third and final model was provided. At this point, the child was allowed 15 seconds after the final model to respond with an imitation or any acceptable request. If no response occurred, the child was given the plate at the end of this final 15 seconds.

Baseline (A)

A return to baseline conditions followed phase (B) to serve as a probe. This return also permitted a comparison of results with the following experimental phase.

Response #2-Drink (C)

The second experimental procedure (C) compared a trial-and-error method of learning to a 4-second errorless learning time delay procedure. Here, both procedures were concerned with the same response--drink requests. Each subject had received his/her plate of food prior to the application of the stimulus for the drink request. In the initial portion of phase (C), the traditional trial-and-error procedures were applied. Each child was called to the dining room individually, as before, however, the experimenter gave a verbal cue, "What do you want?" If the child

responded to the verbal cue with a complete drink request or if the request made was incorrect, the experimenter repeated the verbal cue a second time. If the correct response occurred, the child immediately received the drink. If an incorrect response was made or no response, then a correction procedure was applied. In the correction procedure the experimenter said, "No, (child's name)", and modelled the response for the child. Again, correct responses or complete drink requests were immediately reinforced. If an incorrect response occurred, the experimenter corrected it and the training session was terminated and the child received the drink. The remaining part of experimental phase (C) was a four-second delay. In this condition, the use of time delay was used entirely different. Each child was called to the table as before, and the staff member held the child's drink out which served as the new stimulus. At this point, the staff member silently counted off 4 seconds and immediately after this delay, presented the controlling stimuli (prompt) which in this case was the model of "Juice, please". The staff member then recorded the response of the child. If the child waited for the modelled prompt and imitated the model, this was considered a complete drink request and was therefore rewarded or reinforced. If the child

responded incorrectly before the 4-second delay, then he/she was told "no" and the trial ended. Extended sessions ending in error necessitated training the child to wait as the prerequisite skills outlined (see Table 4).

Table 4

Illustration of Experimental Phase C:

Trial and Error; Four-Second Delay

(Second Experimantal Condition)

Trial and Error

1. Call subject to table
2. Subject approaches table
3. Trainer gives verbal cue "What do you want?" If complete request is made then trainer gives subject drink.
4. If incorrect response was made, trainer repeats verbal cue second time. If correct response occurred, subject immediately receives drink.
5. If incorrect response was made again or no response, trainer should use correction procedure and say "No, (Child's Name)", and model the response.
6. Trainer uses correction procedure again if incorrect responses is made and terminates training session.

Four-Second Delay

1. Call subject to table
2. Subject approaches table
3. Trainer holds out cup of juice, milk, etc. to child but does not give and does not say anything.
4. Trainer immediately counts off 4 seconds.
5. If no response is given by the end of 4 seconds, the trainer gives the prompt of modelling the response to the child which would be "juice, please".
6. Trainer records response.
7. Should an error occur before the 4-second delay period, the trainer says "No" and ends the trial. Too many errors should not occur after the prompt if the prerequisites for using delay have been met.

CHAPTER 4

Results of the Data

Data was collected for three subjects utilizing a multielement design across two responses, with a single-subject diagram, in an A-B-A-C pattern. Subjects were numbered 1-3 and their overall performance is represented in Figures 2, 3, and 4, respectively. Total reliability for all three subjects was 99%. Baseline conditions were the same for all three subjects yielding no lunch requests. The first experimental phase (B) was concerned with complete meal requests. Two different components were administered during phase (B)--a 15-second delay, and the same 15-second delay + modelling. The 15-second delay alone did not result in any increase in complete meal requests for any subject. The only improvement over baseline was noted when subjects #1 and #2 made two partial meal requests.

Results indicated that for two of the three subjects, subject #1 and subject #2, the addition of modelling to the 15-second delay procedure was sufficient to obtain complete meal requests. Subject #3 required the more intensive special training procedure involving extended delays combined with

Figure 2

Subject #1

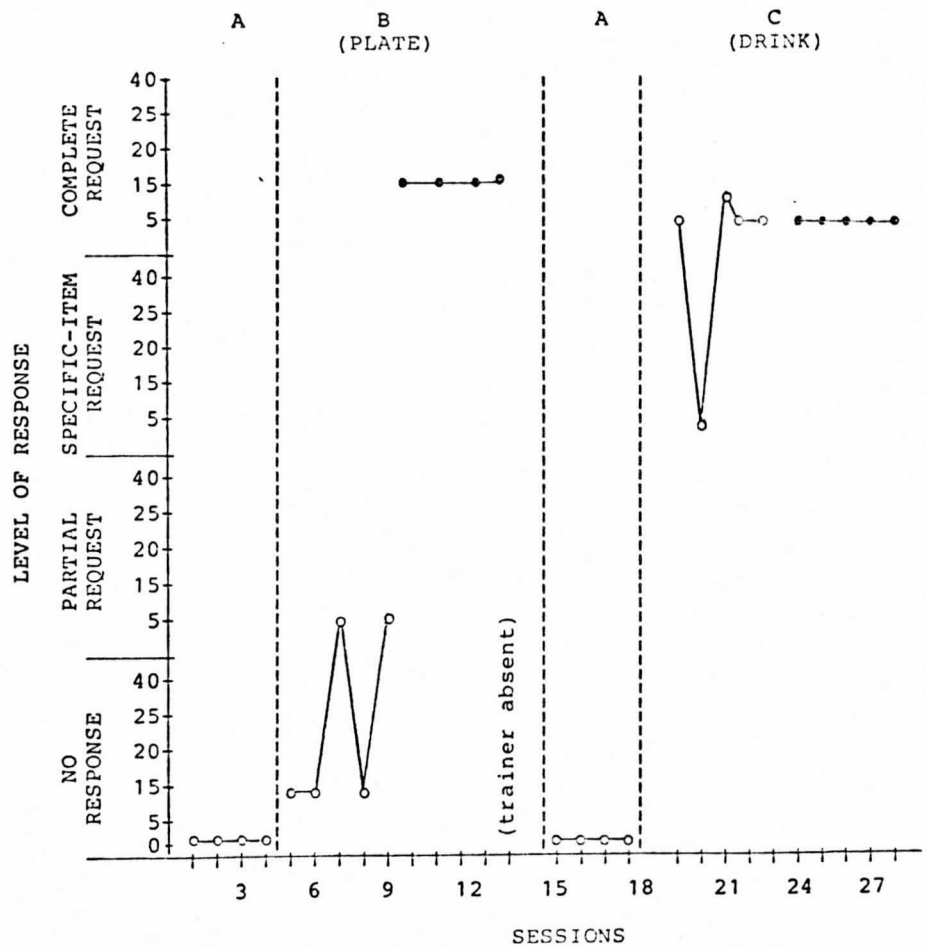


Figure 3

Subject #2

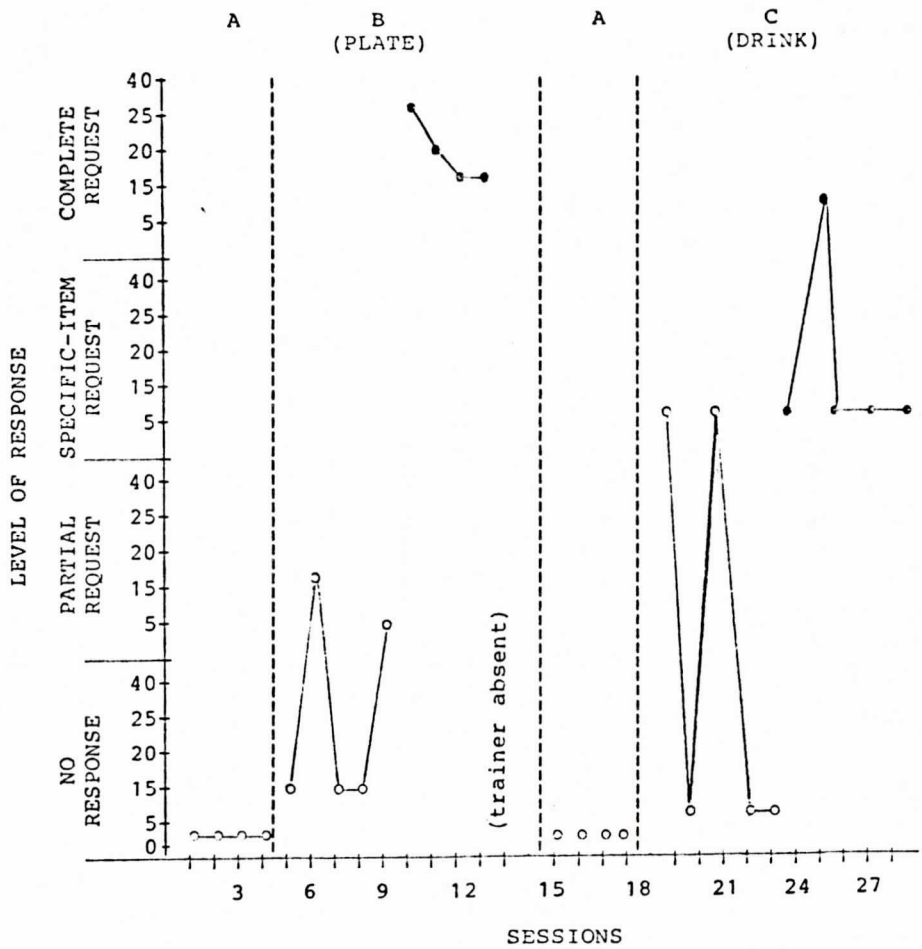
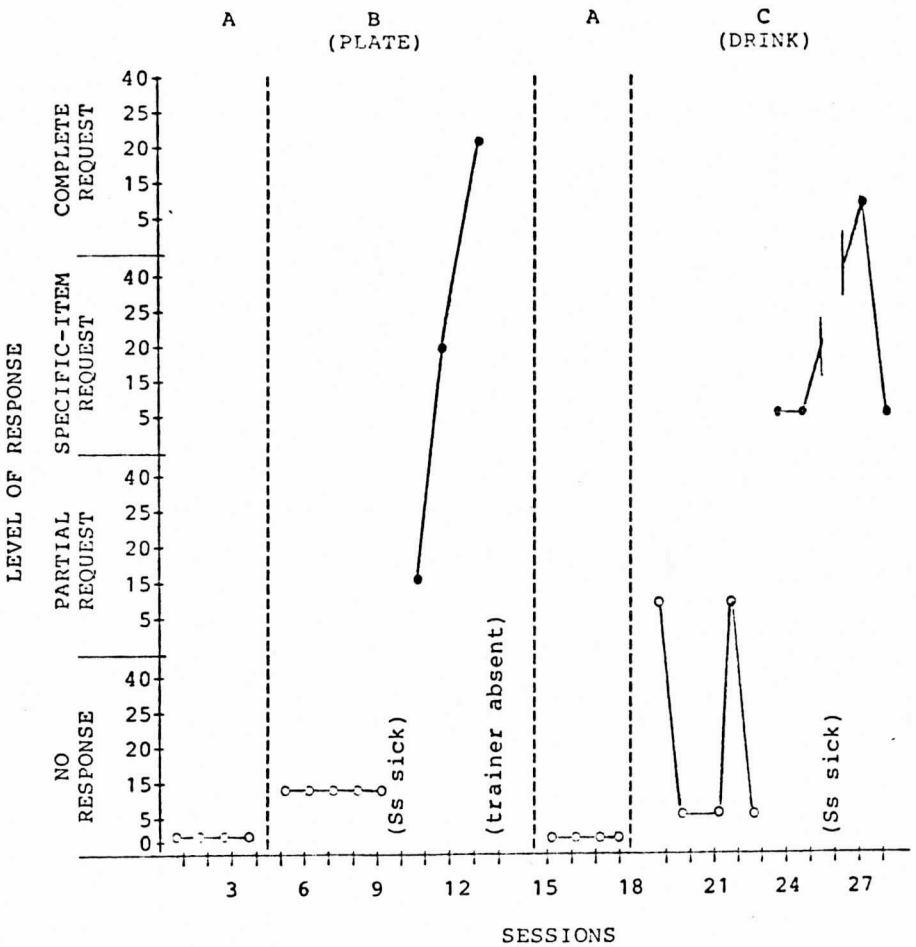


Figure 4

Subject #3



modelling. The extended delays resulted in several partial requests (which was an improvement) but only one complete meal request.

In phase (B), when the target response was the production of a complete meal request, the 15-second delay alone was ineffective in producing meal requests. Results indicated that the addition of modelling the correct response to the 15-second delay, was sufficient in producing complete meal requests. Therefore, it appears that delay + modelling was more effective and influential than the delay procedure without the modelling.

A return to baseline conditions was the next step in the experimental phase. Results were reproduced from the original baseline conditions as all three subjects produced no response.

In the final experimnetal phase (C), the target response was complete drink requests. Two different procedures were compared during phase (C): a trial-and-error method of learning, and a 4-second, errorless learning delay procedure.

In the trial-and-error phase, the results were not consistent. Subject #1 demonstrated complete drink requests throughout the whole phase. However, subjects #2 and #3 did not produce any complete drink requests. The verbal cue of "What do you want?"

resulted in their production of specific item requests, no response at all, and partial requests. This phase produced more no responses than any other phase. In addition, more inappropriate behaviors of non-compliance and aggression were observed due to the subject not receiving the desired item until a correct response was made. During this phase, a partial drink request and a specific-item request were considered the same because several subjects would label the drink as milk, juice, or water and ask for it by name. Therefore, when the trainer said, "What do you want?" and the subject answered "milk", it was recorded as a specific-item request but not a complete drink request because it was not accompanied by "want" or "please".

The other component of phase (C), the 4-second delay, brought complete drink requests from only subject #1. After waiting for the trainer to model the response, subject #1 immediately responded with complete drink requests by using manual signs or verbalizations. Subjects #2 and #3 also waited for the modelled response but produced specific-item requests. Only one complete drink request was made by these subjects.

In comparing the results of the two components of phase (C), for subject #1, the trial-and-error procedure was equally effective as the 4-second delay.

However, the trial-and-error procedure was ineffective for the remaining two subjects. When the verbal cue was originally given, subjects #2 and #3 produced several specific-item requests. When the cue was repeated the second time, several partial responses occurred. When the correction procedure was finally applied, the subjects made no response and appeared to be frustrated.

The 4-second delay procedure produced all complete requests from subject #1 as it appeared that he learned to wait for the modelled response. Therefore, his performance matched that of trial-and-error learning procedures. With the remaining two subjects, improvements were noted when the 4-second delay was applied. After waiting for the modelled response, both subjects made specific-item requests for the drink by requesting "milk", or "juice" with "please".

Summary

Overall, in phase (B), results indicated that the delay + modelling component produced more complete meal requests than delay alone, and that the use of modelling was sufficient in obtaining responses.

Results of phase (C) demonstrated that the 4-second delay was more effective than trial-and-error methods due to fewer errors and more specific-item and complete meal requests being made.

CHAPTER 5

Discussion

This final chapter includes a summary of the study and implications drawn from results of the data. Limitations of the study are stated as well as questions for future research. Recommendations for further research are established and conclusions are made.

The results of phase (B) indicated a notable difference between a delay of 15-seconds and the same delay combined with modelling. The 15-second delay + modelling was proven to be more fruitful than the 15-second delay alone as was evidenced by a higher production of complete requests when modelling was incorporated. Results of phase (C) indicated that the trial-and-error technique was not as effective as the 4-second delay for two of the three subjects (Figures 3 and 4). The 4-second delay resulted in a higher level of responding and fewer errors. A significant difference was noted between the subject who combined manual sign language with verbalizations and the subjects who only responded with verbalizations. Subject #1 performed better overall as

he incorporated the Total Communication Approach in expressing himself.

It appears that these subjects responded better to modelling than they did to verbal cues. In the time delay + modelling component, modelling was incorporated with delay and the results were generally better. In the remaining experimental phase, trial-and-error utilized only a verbal cue statement which was repeated several times. This resulted in decreased performance in subjects #2 and #3 (Figures 3 and 4).

Basically, there are two forms of delay: (1) a delay with no specific time which is equated with experimentation or assessment purposes; and (2) a planned delay e.g., 4-second delay which would be a form of instructional delay which would also serve as a form of assessment. A delay technique used alone could not have evoked the two target responses unless they were already present in the child's repertoires--a likely outcome of the unintended modelling.

The 15-second delay incorporated in this study was not a specific stimulus. Actually, it was composed of numerous stimuli--the most salient being the tray withheld. Other cues included intermittent eye contact and a look of expectancy (i.e., head nods, arched eyebrows, etc.). It is unknown which specific stimulus evoked responses. Only a functional analysis

could determine exactly which stimulus or set of stimuli was responsible for the elicitation of a response.

Therefore, it is concluded that when using delay procedures with any population, the determining factor for the duration of the delay should be its overall efficiency and effectiveness. Naturally, the optimal duration would be the shortest possible delay which serves to evoke the desired response.

Limitations of the Study

A limitation of this study included the absence of generalization procedures in the methodology. Both generalization across trainers and across settings/ mealtimes would have increased or strengthened the results, either positively or negatively.

A second limitation involved the manner in which the delay was used. Previous studies have demonstrated a time-delay procedure being applied to language development, and in this study delay was again used on the single aspect of increasing language. Therefore, there remains the need to discover a broader use of time-delay.

The primary limitation, however, was that the intention of this study was to investigate the use of time delay as a form of errorless learning, and compare it to trial-and-error learning. Due to an insufficient amount of time, the errorless learning 4-second delay

(phase C) in this study was only tested over a one week period.

Finally, the results of this particular study can only be generalized with the same population--mentally retarded. Procedures do not permit generalization to all children.

Recommendations for Further Research

The following recommendations are made as a result of the present study:

1. Future investigations should include generalization procedures across trainers and across settings in order to improve the subjects' language development at all meals, and with any trainer.

2. Future investigations should compare only the errorless learning 4-second delay procedure against trial-and-error learning in order to gain a stronger comparison of the two techniques.

3. Further research might include a larger sample with a larger range of handicapping conditions i.e., deaf/blind, but also consider extending the use with the milder range of mental retardation.

Statement of Research Questions

The following questions should be investigated in future research involving time-delay:

1. How do time-delay procedures compare to errorless learning procedures that utilize a fading technique?

2. What populations might benefit from the use of time-delayed errorless learning procedures?

3. What other instructional tasks could a delay procedure be applied to?

Summary

The purpose of this study was to investigate the use of time delay as an instructional procedure with moderately and severely retarded, behavior disordered children in a group home. The effects of time-delay methods in comparison to traditional trial-and-error learning procedures were also examined.

Three children from the group home served as subjects and were tested with a multielement design across two responses, in a single subject diagram incorporating an A-B-A-C pattern. The three subjects were required to make complete meal and drink requests at lunch during two experimental phases. Each experimental phase implemented two separate components. The first phase involved a 15-second delay procedure, then the same delay + modelling. The second experimental phase involved a traditional trial-and-error technique and a 4-second delay procedure.

Results of phase (B) indicated that a single 15-second delay procedure was ineffective in the production of complete meal requests for all three subjects. For two of the three subjects in the other

component, the addition of modelling to the 15-second delay was sufficient in obtaining complete meal requests. Results of phase (C) indicated that trial-and-error techniques were ineffective in the production of drink requests for two subjects, but more importantly, the trial-and-error phase resulted in the largest number of no responses or incorrect responses. However, trial-and-error methods were effective for one subject in producing drink requests. During the other component of phase (C), the 4-second delay, mixed results were obtained. One subject responded well to the 4-second delay and made all complete requests. For the remaining two subjects, the 4-second delay resulted in many specific-item requests but only one complete request. All three subjects learned to wait for the modelled response during the 4-second delay.

Conclusions

The delay technique was used as an evoking device for severely or moderately retarded, behavior disordered children. These children were those who had previously learned the target response through prior experience or incidental imitation but chose not to display the ability due to interfering behaviors or some other unknown reason. In conclusion, the use of time delay is a simple, yet powerful, method of structuring the

environment to obtain increased opportunities for the development of expressive language skills.

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VITA

Richard Alan Cole was born in Gastonia, North Carolina on July 19, 1957. He grew up in Gaston County and graduated from Ashbrook High School in 1975. Two years later he received an Associate of Arts degree from Gaston Community College. In 1979 he received a Bachelor of Science degree in Special Education from Appalachian State University. In January 1980, Richard became employed at Western Carolina Center in Morganton, North Carolina. In August of the same year, he began part-time work on a Master's degree at Appalachian State University. This degree was awarded in 1982 in the field of Special Education.

Richard has been a member of the Kappa Delta Pi and Gamma Beta Phi Honor Societies, the Student Council for Exceptional Children, and an honor graduate.

Richard remains employed by Western Carolina Center at Kids Can Make It Group Home and will continue teaching there after graduation as an Educational Specialist.

Currently, Richard is residing in Burke County with his wife, Sue Grigg Cole, who also graduated from Appalachian State University. His parents are Mr. and Mrs. James B. Cole, Jr. of Gastonia, North Carolina.