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The Letter Identification Training Requiring an Extra Motor Response

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THE LETTER IDENTIFICATION TRAINING
REQUIRING AN EXTRA MOTOR RESPONSE

by

Ali Uzunoz

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
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Ali Uzunoz

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THE PROBLEM AND ITS BACKGROUND

Early reading is a very highly valued skill in our society and the children who start reading before they enroll in elementary school are seen as "very intelligent children" and exposed to a great deal of adult social reinforcers. Further examinations of the history of these children enables us to see that they experienced training of pre-reading skills in their early childhood (Englemann, 1966). Conversely, the children who do not experience these training opportunities may not compete successfully for the adult social reinforcers in daily life and school situations.

Reading skills can be broken into major components and children can be trained in these skills (Duffy & Sherman, 1972). One of the basic components of pre-reading skills is letter discrimination. Davidson (1934, 1935) analyzed the types of errors in letter discrimination and noted that the letters that are the most difficult to distinguish between are the pairs of letters that are the reversal of each other, such as b-d and p-q. Letters that are the upside down inversion of others, such as b-p and d-q, are also difficult to differentiate but not nearly as difficult as reversals. Thus, some letters of the alphabet are more difficult to discriminate than others.

Various procedures have been used for letter discrimination training. Tawney (1972) found that if four year old children were given reinforcers when they responded to the critical features of letters, they learned the letter discriminations with fewer errors

than if they were given reinforcers when they responded to the non-critical features of the letters. Moore and Goldiamond (1964) studied the economy of procedures which minimize errors. They succeeded in teaching pre-school children how to discriminate forms by fading out one of the quantitative dimensions of the stimuli (brightness) with an almost errorless result. They concluded "Errors produce extinction trials which may make it more difficult to maintain the behavior being studied." (Pg. 272) Hively (1962, 1964) pointed out the necessity of devising apparatuses in order to facilitate multiple choice discrimination learning of pre-school children and concluded "the more errors the training procedure allowed children to make, the more they tended to go on making." (Pg. 297)

Some other procedures studied the facilitating effects of motor responses attached to the discriminative stimuli in discrimination training. Jeffrey (1958) found that when the pre-school children were presented with two figure cards, each presenting different directions, if the children pressed a button toward which a figure card was pointing, they identified right and left discriminations more readily than when they did not engage in performing button pressing responses. Fuller (1974) developed a novel reading method for severely retarded pre-school children. She instructed the children to construct letter like forms by having them manipulate circle, line and angle figures to produce letters. She found that even mongoloid children with IQ's as low as 35 could be successfully trained for letter discrimination with this procedure.

In the past, letter discrimination was taught to children with procedures which did not require the children to perform motor responses with the discriminative stimuli. In other procedures, it was hypothesized that performing certain motor responses in conjunction with the discriminative stimuli may facilitate the acquisition of discrimination skills. Therefore, children were required to perform motor responses with the discriminative stimuli. In both kinds of procedures, however, children acquired discrimination skills. The purpose of the present study was to make a comparison between the effectiveness of both kinds of procedures in order to determine the facilitating effects of motor responses in a two-choice letter discrimination.

METHOD

Children

Six children were trained to make correct letter identifications in the pre-elementary program of the Kalamazoo Learning Village which was established as a place for preventing behavioral deficits with disadvantaged children. These children had the lowest letter identification pre-test scores. They were considered "healthy" and "normal" children according to their Michigan Department of Public Health reports and scores on the Weschler Pre-school and Primary Scale of Intelligence. Their IQ scores ranged from 107 to 120 with a median IQ score of 113. But they were considered disadvantaged children, as all of them came from low-income families and their pre-school care was being paid for by the Department of Social Services. Their ages ranged from four years and six months to five years and three months with a median age of four years and nine months.

Setting

Letter identification training occurred in the reading room of the pre-elementary program in the morning between 9:30 and 11:00 a.m., Monday through Friday. In each session, letter cards, letter stamps and the container of back up reinforcers were available on the classroom table.

Materials

Letter stamps were rubber letter stamps which contained a holder. The approximate size of a letter on a rubber stamp was 3 cm.

Letter cards were approximately 8 x 8 cm. cards, each containing a letter of the alphabet printed by using the rubber letter stamps.

Generalization test-letter cards were 14 x 21 cm. cards. The approximate size of a letter printed on a generalization test-letter card was 13 cm.

Pre-test letter blocks (also used for post-test) were wooden blocks, with a letter on one face. The approximate size of the letter on these blocks was 1.5 cm.

Back up reinforcers were M and M candies, bubble gum, pennies, stars, some cheap toys (wrist watch), and some social activities (going to the store or the park, etc.). These reinforcers were given upon the completion of a session by asking the child to choose one of them.

Response Definitions

Correct identification of a letter was defined as the child's acceptable verbal labeling of a letter in response to the experimenter's question, "What letter is this?"

One trial was defined as the experimenter's question, "What letter is this?", and the child's answer plus the experimenter's correct consequence for that answer.

The experimenter randomly paired all the letters of the alphabet and divided the paired letters into three blocks, two containing four

pairs of letters and one containing five pairs. The letters which were correctly identified by any child in the study in the pre-test were put into the last two pairs of the third letter block, except for those identified by child 6 since she was included in the study after the termination of another child in an earlier phase of the study. The letter training progressed from one pair of letters to another within a letter block and continued until all the letters of a block were correctly identified by the children on the generalization test.

The experimenter collected the data in the form of the number of sets of trials performed by a child in order to reach the response criterion. Response criterion was defined as the correct identification of the letters of a pair without making an error within a set of trials. A set of trials was defined as the random presentation of each letter of a pair two times. When the child made an error in identifying one of the letters in a pair, a new set of trials was initiated upon the completion of that set of trials. Initiation of a new set of trials was continued five times for each child (i.e., 20 individual trials) in each session. Back up reinforcers were given to the children contingent upon the completion of a session. It was important to keep the children working in the classroom, because they very often wanted to leave the classroom before finishing sessions. When one of the children wanted to leave the classroom, the experimenter showed the back up reinforcers and said, "When you are done I am going to give you one of these and you will leave the

classroom". Also, maintaining the children's letter identification behavior with descriptive verbal praise was considered more equivalent to the grade school situation in which the teacher maintains student performance with verbal praise. Thus, making verbal praise an effective reinforcer for pre-school children was crucial in preparing them for grade school situations (Becker, Englemann and Thomas, 1971).

Procedure

Before beginning this study, a pilot study was conducted with each child to find an appropriate response criterion and allow the children to become accustomed to both the experimenter's questions and the two different letter identification training procedures of the study. As discrimination training stimuli, numbers were taught to the children in this pilot study.

The experimenter called each child to come to the classroom and began to train him by initiating the first set of trials. When the response criterion was met for a pair of letters, that session was terminated. Before the next session, if the child met the response criterion in the previous session, the generalization test was given. At the beginning of the training of each letter block, the generalization test included only one pair of letters (the first pair). As training was completed for each pair of letters, that pair of letters was added to the generalization test. After two pairs had been trained to the criterion, the generalization test consisted of four letters; after three pairs, it consisted of six letters, and so on.

Therefore, at the end of the training of an entire letter block, the generalization test included all the letters (i.e., eight or ten letters) of that block. If, on the generalization test, the child correctly identified the letters just previously taught, training was begun on the next pair of letters. However, if the child failed to correctly identify either of the letters just previously taught, training of those letters was continued. If other letters taught earlier were incorrectly identified on the generalization test for a letter block, training was repeated for the incorrectly identified pair until these letters were correctly identified on the generalization test. When retraining was completed (i.e., when the letters were correctly labeled on the generalization test) training was begun on the next pair of letters which were missed on the generalization test. Training of a letter block was terminated when each letter of a block was correctly identified on the generalization test. Training of the next letter block was initiated in the same manner.

Letter stamping. This procedure required the child to perform a motor response in order to produce the training stimulus which would be learned by him. First, the experimenter gave the rubber letter stamp to the child and asked him to stamp it on a card. Then, the experimenter asked the child, "What letter is this?". If the child gave the correct answer, the experimenter praised the child descriptively (e.g., That is good. That is letter "K"!). However, if the child's answer was wrong or he failed to answer, the experimenter corrected the child and asked him to repeat the correct answer.

Letter presentation. In this procedure, the child did not engage in performing a motor response in order to produce the letter stimulus which would be learned by him. First, the experimenter presented the letter (already printed on a card) and asked the child, "What letter is this?". Then, if the child gave a correct response, the experimenter descriptively praised him. However, if the child's answer was wrong or he failed to answer, the experimenter told the child the correct answer and asked the child to repeat the correct answer.

It is important to note that the basic difference between the two letter identification procedures was that, in the letter stamping procedure, the children were required to perform a motor response in order to produce the letter stimuli before they were exposed to the letter identification problem. However, in the letter presentation procedure, children did not engage in performing motor responses in order to produce the letter stimuli.

Experimental Design

In order to control the order effect of the training procedures, the removal and the introduction of both training procedures among the four children (child 1, 2, 3 and 4) were arranged in a counter-balanced order with regard to the time and letter pairs taught under a specific training procedure. These four children were matched two by two according to their pretest scores. A multiple baseline was used across each set of two children.

Children 1 and 2. These children had correctly identified one letter in the pre-test. In the baseline condition, the first and second child were trained with the letter stamping procedure. For the first child the letter stamping procedure was removed after the training of the first four pairs of letters and the letter presentation procedure was introduced for the last nine pairs of letters. For the second child, the letter stamping procedure was removed after the training of the first eight pairs of letters and the letter presentation procedure was introduced for the last five pairs.

Children 3 and 4. These children had correctly identified two letters in the pre-test. The third and fourth child constituted a multiple baseline across subjects also and the introduction of the experimental phases was in the reverse order that of the first and second child. In the baseline condition, the third and fourth child were trained with the letter presentation procedure. For the third child, the letter presentation procedure was removed after the training of the first four pairs of letters and the letter stamping procedure was introduced for the last nine pairs. For the fourth child, the letter presentation procedure was removed after the training of the first eight pairs of letters and the letter stamping procedure was introduced for the last five pairs.

Children 5 and 6. Child 5 had not correctly identified any letters. Child 6 had correctly identified three letters. These two children were exposed to only one procedure. The fifth child was trained with the letter presentation procedure throughout the experiment.

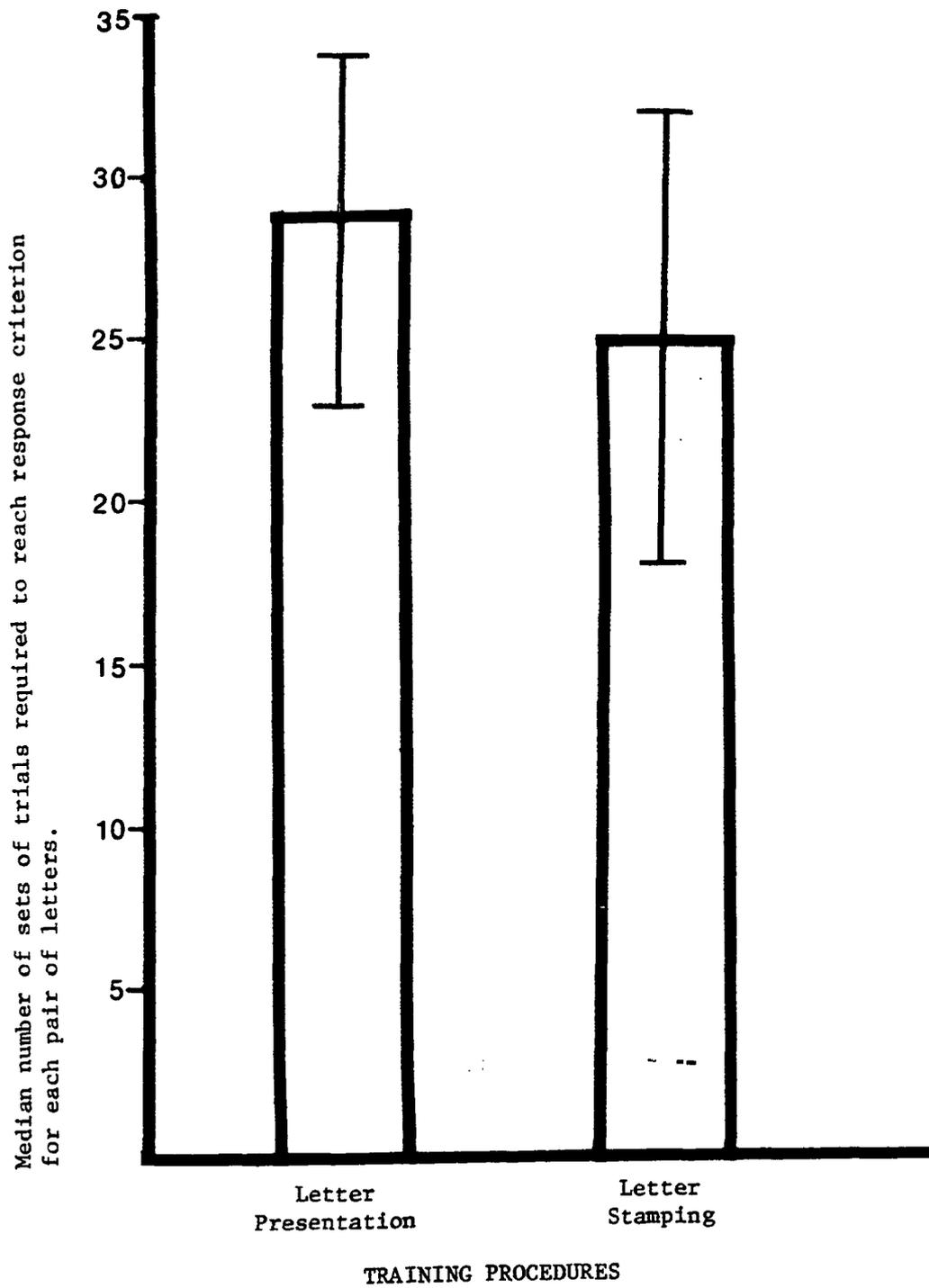
RESULTS

In all the data to be presented below, data for letter pairs where one or both of the letters were known by the child on the pre-test have been excluded.

In order to assess the experimenter's ability to correctly present the letter stimuli according to the appropriate steps of the training procedures, to correctly respond to the children's answers and to correctly record the children's letter labeling responses, an independent observer recorded the experimenter's and the children's behaviors for at least three sessions of each phase of the study for each child. The experimenter and the independent observer recorded letter presented, experimenter's question, child's response, consequence presented and child's repetition of the correct answer. If the experimenter and independent observer agreed on all recorded behaviors within a trial, that trial was considered in agreement. If there was any disagreement within a trial, the entire trial was considered to be in disagreement. Inter-observer reliability was computed by dividing agreements by the total number of trials and multiplying by 100 for each session. For the entire study inter-observer reliability ranged from 80% to 100% with a mean of 91.6%.

The combined data for all children are presented in Figure 1. The children trained with the letter stamping procedure reached the response criterion in a median of 25.2 sets of trials (Range: 18 to 32). When trained with the letter presentation procedure, they

FIGURE 1



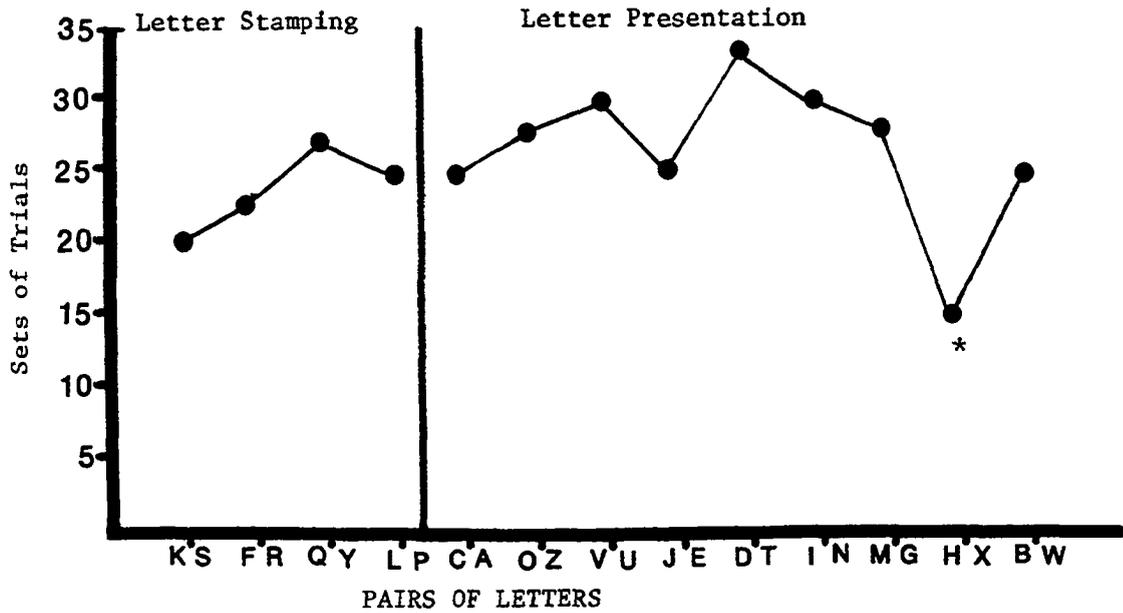
reached the response criterion in a median of 28.9 sets of trials (Range: 23 to 34).

The data for child 1 and child 2 are presented in Figure 2. When training child 1 with the letter stamping procedure, the response criterion was reached in a median of 24 sets of trials (Range: 20 to 27). When trained with the letter presentation procedure, he reached the response criterion in a median of 28 sets of trials (Range: 25 to 34). When child 2 was trained with the letter stamping procedure, he reached the response criterion in a median of 22.5 sets of trials (Range: 18 to 30). When trained with the letter presentation procedure, he reached the response criterion in a median of 29 sets of trials (Range: 25 to 32).

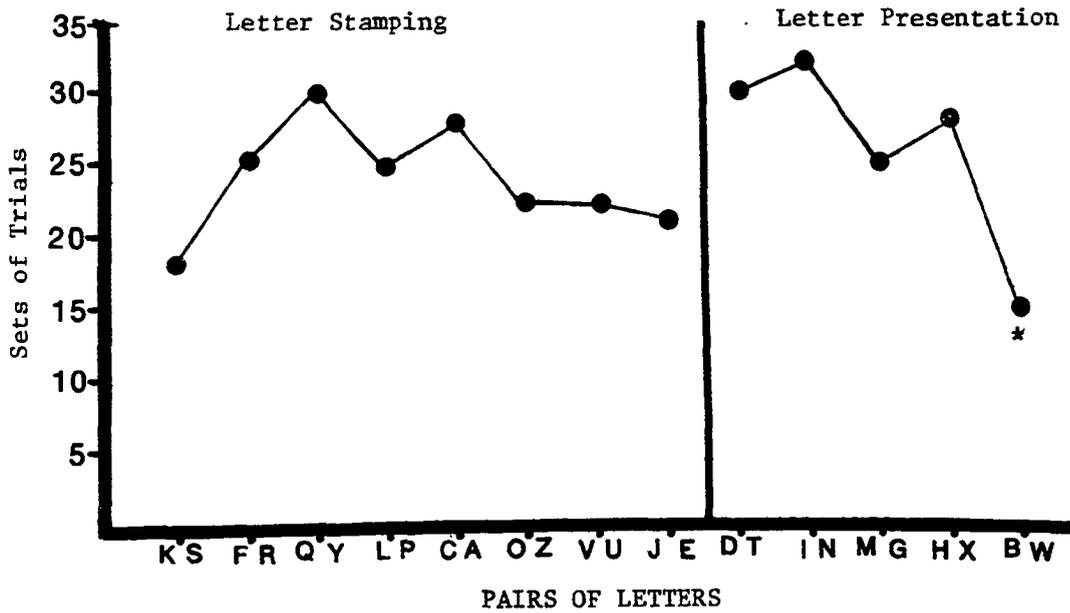
The data for child 3 and child 4 are presented in Figure 3. When child 3 was trained with the letter stamping procedure, he reached the response criterion in a median of 27 sets of trials (Range: 18 to 32). When trained with the letter presentation procedure, he reached the response criterion in a median of 29 sets of trials (Range: 29 to 34). When child 4 was trained with the letter stamping procedure, he reached the response criterion in a median of 26.5 sets of trials (Range: 20 to 30). When trained with the letter presentation procedure, he reached the response criterion in a median of 29.3 sets of trials (Range: 23 to 31).

The data for child 5 and child 6 are presented in Figure 4. Child 5 reached the response criterion in a median of 28.5 sets of trials (Range: 27 to 33). Child 6 reached the response criterion in a median of 25.5 sets of trials (Range: 20 to 30). Child 5 was

FIGURE 2
CHILD-1



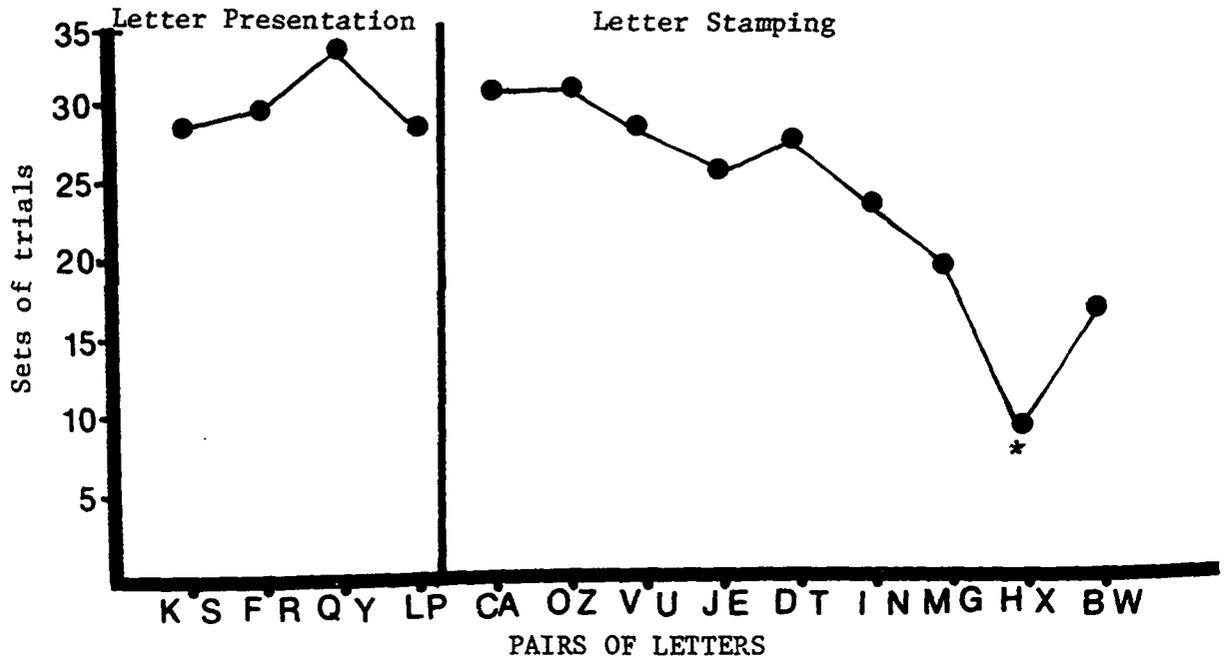
CHILD-2



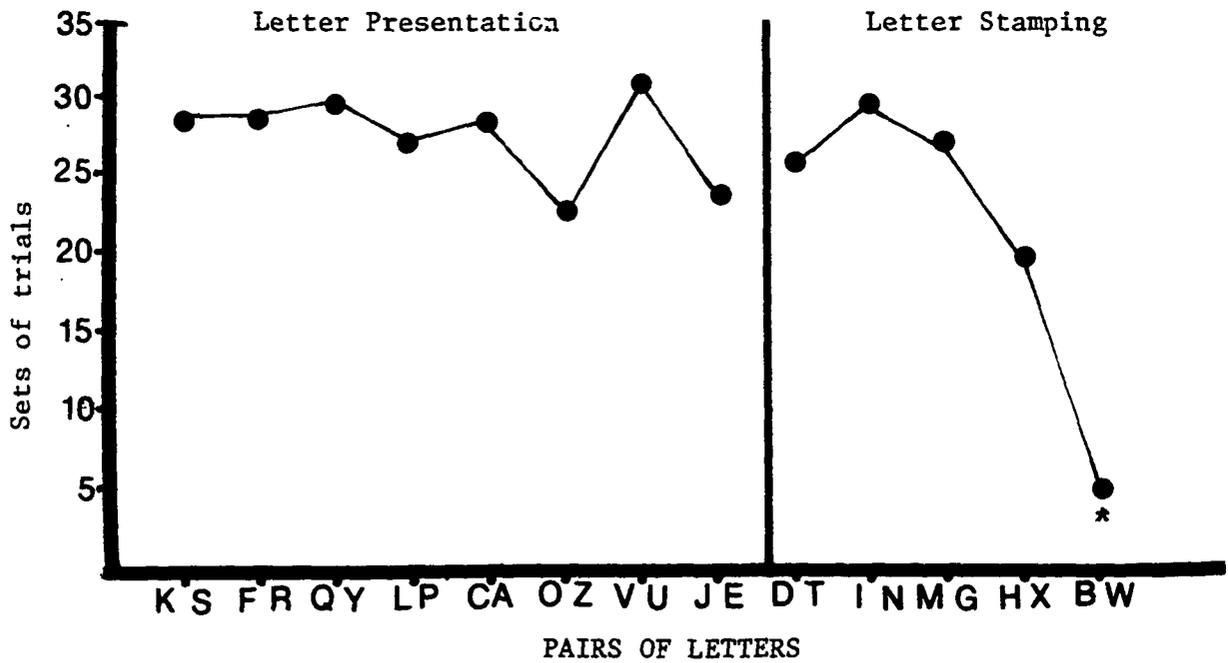
*One or both of the letters previously known

FIGURE 3

CHILD-3

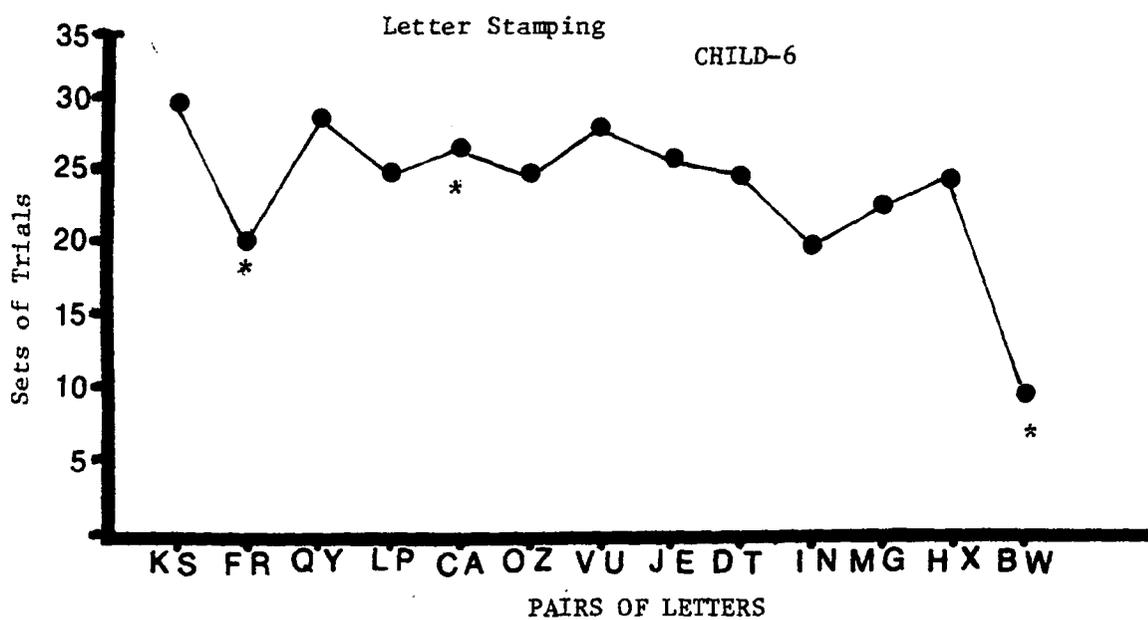
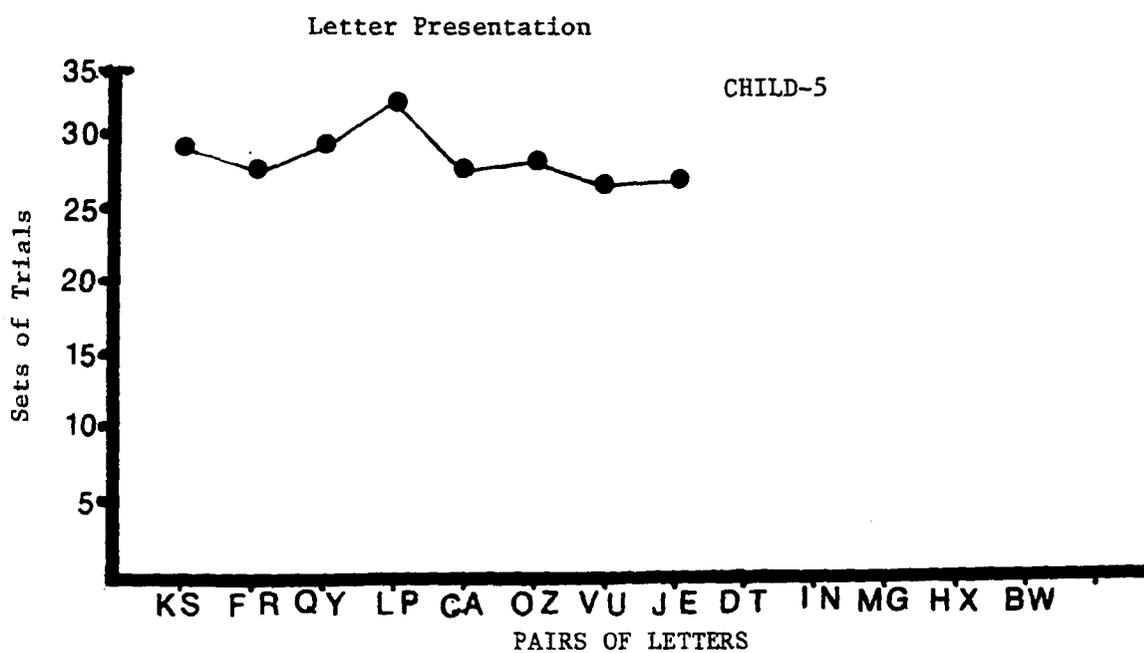


CHILD-4



*One or both of the letters previously known

FIGURE 4



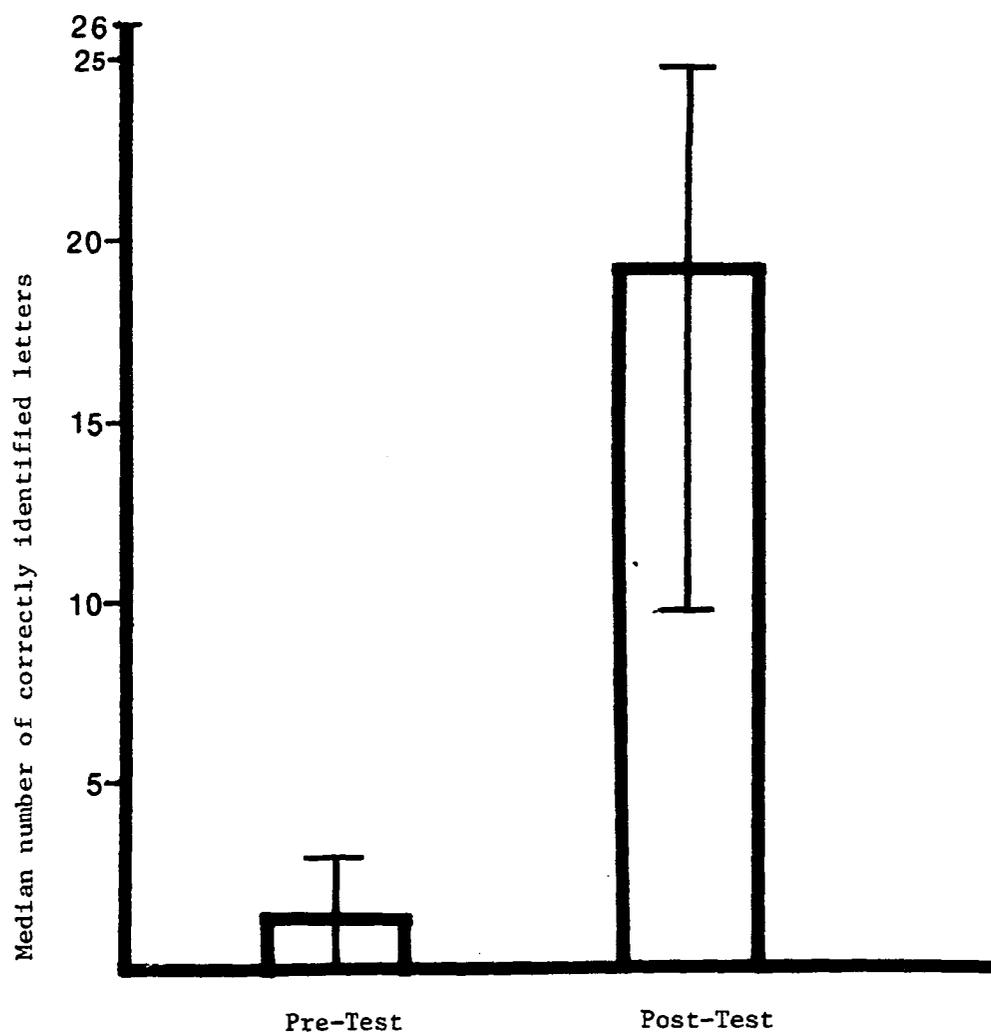
*One or both of the letters previously known

terminated after learning eight pair of letters due to her refusal to come to the training sessions. Therefore, the above median and range for child 6 included only the first eight pairs of letters that she did not know on the pre-test. Thus, the number of letter pairs for child 6 was equated with the eight pairs on which child 5 was trained.

Figure 5 indicates the median number of correct letter identifications on the pre- and post-test for all the children. On the pre-test the median number of correctly identified letters was 1.5 (Range: 0 to 3). On the post-test the median number of correctly identified letters was 19.5 (Range: 10 to 25).

In summary, the data indicated that in order to reach the response criterion, the children required fewer sets of trials when they were trained with the letter stamping procedure than when they were trained with the letter presentation procedure.

FIGURE 5



DISCUSSION

The purpose of this study was to make a comparison between two letter identification training procedures in order to detect the facilitating effects of motor responses in letter identification training. The results of this study showed that children correctly identified the letters of the alphabet in fewer trials when they were trained with the letter stamping procedure (which required the children to perform motor responses in order to produce the letter stimuli before they were exposed to letter identification problems) than when the children were trained with the letter presentation procedure (which did not involve those motor responses). This difference between letter stamping and letter presentation procedures was probably not due to some unknown variables. The letter presentation procedure was introduced into the training process for different pairs of letters at different points in time with the first set of two children (children 1 and 2), and the letter stamping procedure was introduced into the training process for different pairs of letters at different points in time with the second set of children (children 3 and 4). The order effects of the training procedures were controlled by counterbalancing the introduction and removal of both training procedures among the first four children. The effect of changing a training procedure was controlled with children 5 and 6 since they were trained with only one procedure. Also, in order to keep the stimulus dimensions constant across the training procedures, the letter cards which were

used in the letter presentation procedure were printed by using the same rubber stamps used in the letter stamping procedure. Therefore, there appears to be enough evidence to conclude that the difference between the median number of sets of trials to criterion for the two letter identification training procedures was due to the procedures themselves.

The results of this study suggested that combining a letter identification training procedure with motor responses was more advantageous than the procedure which did not involve those motor responses. This may be due to the fact that when children were required to perform motor responses, they were more actively involved with the learning process and may have paid much closer attention to the discriminative stimuli. Consequently, they were more likely to correctly identify the letters of the alphabet and to be exposed to the more positive consequences for their correct letter identification behaviors.

The results of this study demonstrated the advantageous characteristics of the letter stamping procedure which was a cheap procedure. The set of letter stamps cost 20 dollars. With this procedure children approximately required 15 trials less in order to make correct letter identifications. The cost becomes insignificant over time when we realize the amount of time saved when a group of children is trained with this procedure. Also, this procedure can be used with many children in pre-school programs before formal reading instruction begins in grade school. Finally, this procedure

can be made a part of a game for pre-school children. Thus, combining this procedure with a game format in order to develop a standard letter identification training procedure may be an interesting area for future curriculum programmers and evaluators.

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