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ERRORLESS TRAINING OF LETTER DISCRIMINATIONS
WITH PRESCHOOL CHILDREN

by

Stanley V. Kruschwitz

A DISSERTATION

Presented to the Faculty of
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ERRORLESS TRAINING OF LETTER DISCRIMINATIONS

WITH PRESCHOOL CHILDREN

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PREVIEW

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PREVIEW

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CHAPTER 1

INTRODUCTION

In recent years preschool education has received fresh and vigorous attention from governmental and public sectors, as well as from researchers in education and the social sciences. The "Sputnik Era", beginning in 1957, precipitated a host of questions concerning the quality and quantity of education in the United States. The Russian technological "victory" led to a detailed scrutiny of our educational system to determine whether or not children were learning the right things, early enough, fast enough, and well enough.

Another impetus for renewed debate and study of preschool education was the "War on Poverty" initiated during the Johnson Administration in 1965. One outcome was the establishment of a federally financed preschool system (Project Head Start), designed to provide poverty-stricken children educational, medical, and social services. With respect to educational services, program consultants assumed that many poverty children were educationally deficient when compared with their middle-class counterparts. Further, it was predicted that a concentrated preschool experience would help eliminate those deficits.

One of the primary focuses of early education has been the acquisition of reading, which has become increasingly essential for individuals competing for status in our highly complex society.

Reading deficiencies are also a common concomitant of academic failure in elementary and secondary education. Of particular importance in the realm of preschool education are questions regarding the beginning reading skills prerequisite to reading success in elementary school.

Alphabet letter knowledge is considered an important prerequisite skill to reading acquisition. In an analysis of seventeen studies on letter knowledge and/or letter-sound relationships, Chall (1967) concluded that knowing the names of letters before learning to read assists in the initial stages of learning to read. A series of studies on reading in first and second grades showed that letter recognition before reading instruction was one of the best predictors of reading achievement in both grades (Bond and Dykstra, 1967; Dykstra, 1968). Fries (1963) has also stressed the importance of letter knowledge in reading acquisition.

As a consequence of this evidence, Staats (1968a) has investigated alphabet reading in preschool children. The assumption is made that alphabet reading is learned and that early acquisition of that skill will increase the probability that children will succeed in subsequent reading instruction. Some researchers and theoreticians do not share the view that academic training for preschool children is relevant to later success in school. Elkind (1969) has suggested, for instance, that there are no demonstrated long-term effects of preschool instruction and that the crucial time for training is from ages six through twelve. Whether or not such skills as reading, writing, and number concepts should be systematically taught to preschool children, and if so, how they should be taught, are questions of extreme importance. The stakes are high, for the directions that are taken

may greatly influence future success or failure for many children growing up in a society that places a high premium on academic achievement.

Research on the acquisition of reading with preschool children is a challenging and necessary area of research. It promises fruitful returns in terms of gaining additional knowledge about the learning principles involved in the acquisition of complex human behaviors. It can also have important social implications, as new information is applied to the solution of existing problems associated with education and poverty. Etzel has stated in a straightforward manner the challenge and urgency for researchers and educators in this area.

It would seem that if we continue to leave to chance, happenstance, or coincidence the preacademic behavior of children in our preschools we will be committing a public atrocity. In essence we will be sentencing approximately a quarter of our child population to future academic difficulties no matter whether they are middle class or target area population. And if we were taken into court we could be tried on the basis of premeditation. Why? Because the techniques or procedures for acquisition and modification of intellectual skills are either known or readily developed now. (1969, p. 6)

Purpose

The purpose of this investigation was to examine the effectiveness of two instructional procedures, each with two conditions, on the acquisition of alphabet reading with preschool children. The alphabet reading tasks included two upper-case letter pairs. The two procedures were based on the theoretical positions of traditional discrimination learning and errorless discrimination learning, respectively. In the traditional procedure, subjects responded to a reinforced positive stimulus (S+) and a nonreinforced negative stimulus (S-) until responses to S- extinguished. The errorless

procedure consisted of a stimuli sequence designed to reduce the probability that subjects would respond to S-. The duration of S- was slowly increased at the same time that filters initially reducing the intensity of S- were gradually withdrawn.

Within each procedure, half of the subjects learned a dissimilar letter pair prior to learning a similar pair and half learned the similar pair first. The investigation was designed to examine:

(1) whether or not errorless discrimination procedures were effective in teaching alphabet reading, (2) whether or not the two procedures had differential effects on alphabet reading acquisition, (3) whether or not learning a dissimilar letter pair prior to learning a similar letter pair had a facilitating effect on learning the latter, (4) the relative effects of the training method on retention and generalization.

Theoretical Background

One explanation for the acquisition of reading has been propounded by Skinner (1957) and expanded upon by Staats and Staats (1963). Alphabet reading is considered to be dependent upon multiple letter discriminations. Visually presented verbal stimuli come to control various textual responses, i.e., speech responses. Reading responses are controlled initially by both visual and verbal stimuli and ultimately by visual stimuli alone. This involves imitation of letter sounds in the presence of visual stimuli, after which different speech responses become solely under control of different letter stimuli. The control of a printed letter over a speech response is increased through reinforcement of the appropriate response to a letter and nonreinforcement of the same response to other letters.

Using this paradigm, Staats and Staats (1963) described how a reading response can be taught. One must present the written verbal stimulus to the child, say the letter aloud, and have the child emit a response matching the sound - an echoic response. Assuming the response is reinforced, the visual stimulus alone will soon come to control the speech response. Correct response to one textual stimulus, however, does not constitute reading in the true sense. A child trained to respond correctly to the textual stimulus "A" is likely, because of stimulus generalization, to respond to other letters with an "A" response. Since alphabet reading involves multiple discrimination learning, the child must learn to discriminate between all letters of the alphabet with appropriate responses to each.

The traditional explanation for the acquisition of a simple discrimination is that an organism comes to respond more frequently to a stimulus correlated with reinforcement (S+) than to a stimulus correlated with nonreinforcement (S-). The differences between the probabilities of responding to S+ and S- are brought about by extinguishing responses to S- (incorrect responses) and reinforcing responses to S+ (correct responses). The repeated nonreinforcement of responding to S- is presumed to cause the development of inhibition, conditioned to S- (Spence, 1936; Hull, 1950).

In contrast, Terrace (1963a, 1963b) has developed procedures by which pigeons were taught simple discriminations with few, if any errors. His results have prompted him to hypothesize that responding to S-, and the subsequent extinction of responding to S-, is not a mandatory condition for learning a discrimination. The differences between error-trained and errorless-trained pigeons have been summarized

by Hilgard and Bower (1966). Of particular importance to this study is that the errorless discrimination performance of pigeons is superior, in terms of fewer errors, to that of error-trained pigeons.

Several other differences between error-trained and errorless-trained pigeons have been found, but are not specifically related to the purposes of the present study. Error-trained pigeons, for example, display much emotional behavior in the presence of S- while errorless-trained pigeons do not. Injection of a tranquilizing drug "releases" many responses to S- error-trained pigeons, but not in errorless-trained pigeons. Finally, behavioral contrast and peak shift occurs in error-trained pigeons, and not in errorless-trained pigeons. Behavioral contrast is a reduction in response rate to one stimulus through a reduction in reinforcement and an increase in response rate to another stimulus, even though that stimulus is maintained on a constant condition of reinforcement. Peak shift occurs when the maximum rate of responding on a generalization gradient is produced not at S+ but at a value displaced from S+ in a direction away from S-.

The theoretical positions of both traditional and errorless discrimination learning deal with simple discriminations in lower animals. Presented with two stimuli, the organism is trained to respond in the presence of one stimulus and not to respond in the presence of the other stimulus. Additionally, errorless discrimination learning with animals typically involves a free operant setting, i.e., the rate of responding in the presence of S+ is the dependent variable. In contrast alphabet learning is considered to be a more complex form of learning - multiple discrimination learning (Gagné, 1970). Each letter of the alphabet must be discriminated from every other letter

and an appropriate verbal response must be learned for each letter. The dependent variable in this case becomes single appropriate verbal responses in the presence of various letter stimuli.

In the present investigation, errorless training techniques similar to those developed to teach simple discriminations to pigeons were applied to teaching a complex behavior to humans. To the extent that laboratory results with lower animals can be generalized to humans, Terrace's research suggests that errorless learning could result in fewer errors and faster learning. If experimental evidence indicates that errorless training procedures are more effective than traditional procedures for teaching alphabet reading, there may be implications for improved instructional methods in school settings. All other considerations aside, the lack of emotional side effects in errorless-trained pigeons is suggestive of benefits to be derived in human learning.

This study asked several questions regarding the relative efficacy of traditional and errorless training procedures for preschool children.

- I. The majority of research on errorless discrimination learning has dealt with simple discrimination learning in lower animals and children. Will errorless discrimination procedures be effective in teaching a complex human behavior, i.e., alphabet reading?
- II. Are the two procedures differentially effective in letter reading training?
 - A. Will subjects in the errorless groups make fewer errors than subjects in the traditional groups?
 - B. Will subjects in the errorless groups learn the discriminations with fewer trials than subjects in the traditional groups?
 - C. Within each procedure, will a highly similar letter pair be learned with fewer trials to criterion, and with fewer errors, if the dissimilar letter pair is learned first than if it is learned with no prior letter training?

- D. Will subjects taught the letter pairs with errorless conditions be more likely to remember them over a specified period than will subjects learning the pairs with traditional learning conditions?
- E. Will subjects learning the letter pairs with errorless conditions be able to generalize correct textual responses to new letter combinations better than subjects learning with traditional conditions?

PREVIEW

CHAPTER 2

REVIEW OF LITERATURE

The research literature on reading to be reviewed in this chapter includes experimental studies, operant in nature, which have dealt with teaching reading to preschool children. Studies of errorless discrimination, the major concern of this investigation, will also be reviewed. This research involved lower animals and children.

Operant Reading Studies

Operant research techniques have been applied to the problem of reading acquisition only within the last decade. A relatively limited number of such studies have appeared, the bulk of which were conducted by Professor A. W. Staats and his associates.

The first of a series of experiments on reading investigated the effects of reinforcement variables on reading acquisition (Staats, Staats, Schultz, and Wolf, 1962). Six four-year-old children were initially taught words from a program of 27 words. A child was verbally prompted to say a word as he looked at it, after which reinforcements were administered. After he had learned to respond correctly to single words he was required to read the same words which were now combined into sentences and short stories. Three subjects were trained with a no-reinforcement-reinforcement condition in which correct responses were initially followed by social reinforcement from the