

THE UNIVERSITY OF MANITOBA

A COMPARISON OF THE EFFECTS OF NOVEL
VERSUS NON-NOVEL STIMULI IN TEACHING
READING TO CHILDREN WITH READING DEFICITS

by

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ABSTRACT

In controlled laboratory studies, novel stimuli have been shown to attract and maintain attention better than non-novel stimuli. Several investigations with children with reading deficits indicate that novel stimulus materials may also produce better reading performance than more traditional materials, but research on this specific problem is lacking. The purpose of the present study was to compare the relative effects of novel reading materials (in the form of changing colours, shapes, and pictures) and non-novel, paper-and-pencil stimuli (i.e. no colours or pictures, and only oblong and square shapes) on the reading performance of three second grade males. Procedures and reinforcement conditions were held constant for the two conditions.

The study employed an intrasubject design in which each S was exposed to both conditions twice (i.e. four phases), in varying order. Initially, the Ss all made errors on three aspects of reading. They received training related to two of these errors, while the third error functioned as a control. As a measure of the effectiveness of the types of training given, after every session the Ss were required to read three lists of words (generalization lists),

each one related to one of the three errors (i.e. two training lists and one control list). Form A of the Silvalori Informal Reacting Inventory (SIRI-A) and the reading portion of the Wide Range Achievement Test (WRAT) were administered before training and after each phase, as further tests of generalization. The Ss were also tested on the Comprehension, Similarities, Vocabulary, and Block Design subtests on the Wechsler Intelligence Scale for Children (WISC) at all these periods, except the one after the third phase.

It was found that all the Ss improved at significantly greater rates during the novel than the non-novel condition, on both training lists. In addition, for all Ss, the rates of improvement were significantly greater on both the training lists than on the control list, for both the novel and the non-novel conditions. The Ss learned approximately twice as many words on the training lists as on the control list. Generalization occurred not only to the training lists, but also to the other two generalization tests; however, the Ss did not perform significantly better on these tests after the novel than the non-novel condition. The WISC subtest results indicated that reading gains were not simply a function of increasing intelligence.

It was concluded that novel stimuli produce better reading performance than non-novel stimuli,

but that both these conditions are more effective than no training at all. Methodological and practical aspects of this investigation are discussed, and suggestions are made for future research.

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CHAPTER I

INTRODUCTION

The term "reading disability" has been applied in a variety of situations to cover a number of different behaviors. Generally speaking, however, a child with a reading disability is characterized as having average or above intelligence, and yet is performing well below his estimated ability. Also, he does not suffer from any sensory loss, physical disability, or mental retardation. Typically, such a child will exhibit problems such as short attention span (i.e. attending to a task for only a brief time period) and difficulties in reading, such as reversing words (e.g. "saw" and "was") or letters (e.g. "b" and "d"), or responding to only parts of the word (e.g. "set" in "settlement"). Frequently, other disabilities (e.g. difficulties in spelling and writing words, lack of self confidence) are also exhibited when the child finally comes to the attention of authorities. Although these other behaviors are undoubtedly related to reading disabilities, this discussion will focus only on reading problems.

Reading disorders have commonly been attributed to various neurological abnormalities. Such

explanations, however, have very limited empirical support and typically either fail to provide any suggestions for remediation, or else recommend indirect methods that frequently do not succeed (Martin and Gelfant, 1970). In addition, there has tended to be an overconcern among professionals with definition, diagnosis, and labeling, all too often to the exclusion of actual treatment considerations. The most common approaches, their shortcomings, and related research have been described by Martin and Gelfant (1970).

In contrast to such viewpoints, behavioral approaches tend to focus mainly on remediation of the reading disability, which is conceived of as a reading deficit. Definitions, classification, and labeling are, for the most part, ignored, and the actual behaviors of the individual in question are given primary attention, as has been advocated by Lovitt (1969).

From a behavioral standpoint, a complex behavior such as reading is under environmental control and can be altered by manipulating the relevant environmental conditions, regardless of whether or not neurological damage is thought to exist. In their review of the literature on teaching reading by behavioral methods, Goldiamond and Dyrud (1966) stated that it is necessary to develop "an appropriate reading program and an appropriate procedure for maintaining and

guiding behavior through it (p. 115)". They specified further that a behavior modification program should, therefore, involve the following goals:

1. to rearrange existing consequences for certain behaviors (e.g. to provide reinforcement for correctly read words)
2. to bring certain behaviors under the control of specific stimuli (e.g. to teach the child to say "cat" when presented with a written form of the word "cat")
3. to establish new, complex responses not previously in the child's repertoire (e.g. to teach the child to read sentences, paragraphs, stories, etc., when he initially has difficulty reading individual words)

Such an approach accepts and begins with the existing level of performance of the child and then gradually alters it, through a sequence of small steps, to produce the desired behavior. As treatment progresses, reinforcement is gradually made contingent on closer and closer approximations to the goal behavior.

Thus far, behavioral investigations in this area (e.g. Gray, Baker, and Stancyk, 1969; Ryback and Staats, 1970; Staats and Butterfield, 1965; Staats, Minke, Finley, Wolf, and Brooks, 1964) have been

directed primarily toward determining appropriate reinforcing conditions and training procedures. Undeniably, these variables are of utmost importance, but there is also another variable which should be, but has not yet been thoroughly studied by behavior modification researchers--antecedent stimulus conditions. Many stimuli set the occasion for the child's response; these range from the room in which the sessions are held to the reading materials used. As Staats and Staats (1962) have noted, adequate attention to the stimulus materials is prerequisite to the acquisition of reading behavior. Shaping procedures for increasing attention span have been described (e.g. Martin and Powers, 1967). However, it is probable that attention may also be enhanced by making changes in antecedent stimuli.

In laboratory experiments with humans, a number of stimulus properties have been shown to have an effect on the attention paid to stimuli. Using previous animal studies (e.g. Berlyne, 1950a) as a point of departure, Berlyne has conducted a series of experiments with humans. Two major dependent variables were involved: either the choice the subjects (Ss) made between stimuli, or the amount and direction of fixation on one, rather than another stimulus. A number of stimulus variables have actually been investigated, but only one of them will be discussed

here--the novelty, or stimulus change element.

Berlyne (1960) has distinguished three meanings of the word "novelty". A stimulus may be new, or novel, in relation either to an individual's total experience (complete novelty) or to stimuli occurring during a limited time period, such as a few weeks (long-term novelty), or to what has immediately preceded it (short-term novelty). It is the latter type toward which experimental efforts in controlled laboratory settings have been directed. Absolute and relative novelty have also been differentiated. "An absolutely novel stimulus would be one with some quality that had never been perceived before, while a relatively novel stimulus or stimulus pattern would possess familiar elements or qualities in a combination or arrangement that had not been met with in the past (Berlyne, 1960, p. 19)." It has been suggested (e.g. Berlyne, 1950a; Piaget, 1936) that relatively novel stimuli seem to be more effective in attracting and maintaining attention than completely novel stimuli. That is, loosely speaking, adding a "new twist" to things may be a more powerful attention-getter than trying something completely different. However, this notion remains to be substantiated by research. Existing studies on novelty have typically employed what appear to be relatively novel stimuli, but it is difficult in practice to specify precisely what would

constitute a completely novel stimulus in these situations.

The investigations have been conducted with both adults and children. Beginning with the adult studies, in 1951 and 1957(a), Berlyne's apparatus consisted of a vertical board with four square openings in a line and a telegraph response key. It was found that the Ss tended to respond to novel colours (1951) and to novel colours and shapes (1957a). Then in 1958 (a), Berlyne presented the Ss with two figures simultaneously, one remaining the same for a number of trials and the other changing on each trial. The results indicated that the fixation time for the varying stimuli progressively increased over trials, while the recurring stimulus was fixated less and less.

Similar results have been obtained with children. Lewis, Goldberg, and Rausch (1967) found that 3 $\frac{1}{2}$ -year-old Ss spent less and less time looking at a given figure, the more it was repeated, but fixated much longer when a novel stimulus was introduced after a number of trials with a recurring one. It was possible to maintain attentive behavior in the laboratory setting for approximately 30 min. by varying the stimulus input periodically. It has also been found that novel toys are consistently preferred to familiar ones by 12-month-old infants (Ross, Rheingold, and Eckerman, 1972) and by preschoolers (Endsley, 1967).

The preceding experiments, demonstrating that stimulus novelty has an important positive effect on attention, have all been conducted in controlled laboratory settings and have involved relatively simple responses. When a complex behavior such as reading is examined in the natural environment, using children with reading deficits as Ss, the stimulus situation becomes much more complex, and measurements such as fixation time are not only more difficult to make, but also somewhat impractical; actual reading performance is of much greater importance. It would therefore be more useful (although perhaps also more indirect) to determine the effect of novel stimuli on variables such as number of correct responses.

Two case studies, while not specifically investigating the effects of stimulus novelty, have provided impetus for examining this variable more fully. Roberts (1971) conducted a study with a second grade male of normal intelligence with reading and printing deficits. The experiment was concerned with teaching these two behaviors simultaneously. The procedure for teaching reading involved the use of coloured words and a portable apparatus with lights, buttons, and windows (a simplified version of one developed by Staats, Finley, Wolf, and Brooks, 1964), while in the printing phase, paper-and-pencil stimulus materials were employed. It was found that the S

consistently performed much better on the reading than the printing task. Although procedural differences may have accounted for some of this inequality, it was suggested that the apparatus, which was a novel stimulus for the S, in relation to his previous reading experiences, may also have been responsible for the differential performance. Anecdotal information from the study tended to support this; the S's comments and eagerness to use the apparatus stood in marked contrast to his behavior during the printing phase (e.g. looking around the room, doodling). Stuart (1970) has described another novel, yet easily constructed and economical mechanical apparatus which he employed successfully in teaching visual tracking to a fifth grade boy with reading difficulties. Again, however, no data was collected on the effect of the stimuli used. These studies do, nevertheless, tend to suggest that novel materials may be valuable in initiating reading progress in children who have deficits in this behavior.

Novelty in these two case studies was closer to Berlyne's (1960) long-term or complete novelty definitions, discussed previously, than to the short-term kind employed in the controlled laboratory studies, although aspects of the latter type were incorporated in such components as changing colours (e.g. Roberts, 1971).

In everyday situations, long- and short-term novelty may be introduced into reading lessons in many other ways. A number of well-known techniques incorporate the novelty variable through a variety of sensory modalities. For example, Moore (1963) has developed a method to teach reading and printing simultaneously. He designed a talking typewriter which required the child to press electrical typewriter keys in response to a visual or auditory stimulus (e.g. a picture of a cow on the screen or a tape saying "cow"). The correct keys were initially illuminated, but after a period of training this prompt was gradually faded out. Fernald (1943) has introduced a method of teaching reading which employs visual, auditory, kinesthetic, and tactile (VAKT) stimuli. That is, the child sees the word, hears it, traces it, and writes it. Novel stimulus materials such as sandpaper letters have been used with this technique. A third example of a novel approach is Words in Colour (Gattegno, 1962), a program in which 48 phonetic sounds are colour-coded to facilitate reading (e.g. red is used for the short "i" sound in words such as "senate", "mountain", and "pretty"). More complete descriptions of these, and other novel approaches have been provided by Ebert (1970) and Money (1966).

Unfortunately, the originators and major proponents of these methods have not usually deemed it

very important to conduct research on the stimulus novelty variable, or any other aspect of their methods. This latter point introduces a general problem in the field of reading: there is a wide variety of theories and techniques of remediation, but very often the supporters of each one believe that their theory and method are obviously correct and that research to support their claim would be superfluous. This is unquestionably an unscientific approach to the problem of how to teach reading, and one which must be rectified in future work, if scientific advances are to be made.

Using, as a point of departure, the results and limitations of previous studies and techniques, as well as the absence of research in many cases, it is possible to proceed to an investigation of the efficacy of novel stimuli in a systematic behavioral program for children with reading deficits.

The problem of selecting appropriate stimulus materials for the study is an important prior concern. As has been previously noted, there are many different materials available for teaching reading. Some, however, are eliminated because of certain difficulties. For example, they do not involve stimulus novelty, do not teach the child to comprehend what he reads, are not systematic in nature, are too costly, and so forth.

The Programmed Reading Kits 1 & 2 (PRK 1 & 2) developed by Stott (1970) have not yet been employed in research, but are, nevertheless, used quite frequently by teachers and reading specialists to modify reading deficits. These materials would be particularly suitable for a study on stimulus novelty for a number of reasons.

First, they are being widely used without having any empirical basis for their efficacy, thus far. Second, this is a systematic reading program involving an orderly progression from learning simple sound-symbol relationships, through blending sounds, to reading words, sentences, and stories. Considerable practice is provided at each stage. The child may start at the beginning of the program, or at some point in the middle, and progress through to the end, or he may only work with the sections covering his specific deficits. Third, the PRK 1 & 2 may be viewed as a novel set of stimuli for children who have been taught with more traditional materials, since they contain repeatedly changing colours, shapes, and pictures. Short-term novelty is thus involved, and possibly long-term novelty as well, if the child has not been exposed to materials such as these for some time. The PRK 1 & 2 can also fit into the category of relatively novel stimuli, since they bear certain resemblances to more traditional materials. Fourth, many sections of the