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Simultaneous Presentation of Different Stimuli as an Assessment of Modal Preference

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SIMULTANEOUS PRESENTATION OF DIFFERENT STIMULI
AS AN ASSESSMENT OF MODAL PREFERENCE

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction
Faculty of Education
State University College at Brockport
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by

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Abstract

This study attempted to identify modality preferences through a simultaneous presentation of auditory and visual stimuli. To achieve this purpose, a new paradigm for modal preference testing was designed.

Thirty, second grade students, all experiencing some reading difficulty, were exposed to a total of three treatments. All the treatments visually presented a series of five numbers while at the same time five different digits were being presented auditorily. In treatment I, the subject was asked to recall any of the numbers. In treatment II, the subject was told to attend to the numbers he heard and recall them. In treatment III, the subject was directed to recall any of the visually presented numbers.

The results of this study showed that thirty percent of the sample had a slight preferred mode of learning. Almost thirty percent of the students did equally well in both visual and auditory presented material, which means that by second grade most children have the capacity to learn in either the auditory or visual mode.

Longitudinal studies are necessary to determine if modal preferences change as a person gets older.

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Chapter I

Statement of the Problem

In the field of education much debate still exists concerning the question of modality preference and learning. The teaching of reading is an area in which particular interest has been generated concerning this issue (Balmuth, 1968; Jones, 1972). Much of the research in this area has been criticized for failure to properly identify modality preferences. This is the situation with three modality tests: Ringler (1968), Mills (1970), and Baxter (1971). In each of these tests, words are presented to the subjects through different channels, but in each case there is some "spill-over" from one channel of input to another. A word presented in such a way that would emphasize the auditory modality might be processed by the learner through the de-emphasized channel, namely visual. To avoid "spill-over," this study simultaneously presented bimodal stimuli to the learner.

Purpose

The purpose of this study is to identify modality preferences within a group of second graders, who are poor readers, through simultaneous presentation of different stimuli. To achieve this purpose, a new paradigm for modality preference testing was developed. The paradigm, it is hoped, will serve to eliminate the impedance factors of extended time for administering and the possibility of the subjects utilizing a modality other than the one being

investigated. It is further hoped that this technique will be valid and take less time to administer.

Need for the Study

Research has not fully succeeded in specifying the particular characteristics of pupils which need to be considered in arranging the reading program. Many varieties of materials and teaching methods are available to the versatile teacher, but in making a choice among them for a particular child, the teacher is left with incomplete guidance. Thus there is continuing need for research which would specify the relationships between pupil characteristics and the various procedures for developing reading skills (Reynolds, 1941). With this new paradigm for modal preference testing, it is hoped teachers will be better able to select a reading program for a particular child who learns better visually or auditorily.

Educators have long been suggesting that defective perceptual functioning may contribute to reading retardation. Since reading involves the presentation of both auditory and visual information, any inability to process such stimulus information would be expected to reflect itself in learning problems. These difficulties might occur because of difficulties within the individual communication channels (intrasensory), or to the processing of visual and auditory stimuli in combination (intersensory). This study was an attempt to reveal modality preferences, and quite likely, modality difficulties.

Definitions

Poor Readers. All subjects employed in this study were experiencing some reading difficulty. Many of the subjects were reading approximately one year

below grade level. The classroom teachers and the reading teachers recommended all students to be tested.

Summary

This study attempted to identify modality preferences of second graders experiencing reading difficulties through simultaneous presentation of different stimuli. A new paradigm for modal preference testing was developed. By testing for modal preferences it is hoped that teachers might be better prepared when selecting a reading program and some of the causes of reading retardation could be avoided.

Chapter II

Review of the Literature

Many children show a preferred way for acquiring information. These ways of acquisition are labeled the "modalities of learning." This modality concept recognizes the individuality of development, and it recognizes the progression of learning, from recognition and imitation to comprehension, formulation, and use of verbal symbols (Wepman, 1971). The ability to learn by hearing, seeing and touching increases year by year; but significantly, each modality develops at its own rate.

Studies have found that perceptual abilities develop significantly during the first three years of school in a normal population and that these abilities progress individually along lines of modality preferences at differing rates within the same individual (Morency, 1967). In the field of education, much debate still exists on the question of modality preference and learning. The teaching of reading is an area in which particular interest has been generated concerning this issue (Balmuth, 1968; Jones, 1972).

Children should be studied as they reach school age to determine whether their auditory abilities have developed to the level that they can benefit from reading instruction based on a phonics approach. If children are not studied, an erroneous practice which approaches all children as though they learn equally well through the same mode will continue (Wepman, 1971).

Approximately twenty-five percent of the children entering school will

have one modality that is superior (Wepman, 1971). If these differences can be recognized then they can be taken into consideration when planning curriculum. Wepman also suggests that a child experiencing learning difficulty should be tested for modal preference and instructed accordingly. Testing for modal preference can provide productive methods for preventing serious reading problems or reading retardation.

There are many factors involved in reading retardation. Poor or slow development of intersensory transfer is but one. For the majority of children, proficiency in visual and auditory perception, and the integration of these two modalities, are essential to reading achievement (Strang, 1968). Birch and Belmont (1965) suggest that a child who reads poorly may experience difficulty in making same-difference discriminations between auditory and visual stimuli. If this difficulty can be detected and remedied, then perhaps one area of reading retardation could be minimized. Reading achievement and auditory and visual perceptual abilities appear to be related; however, it is difficult to draw definite conclusions because of the lack of uniformity in instrumentation and research design (Busby and Hurd, 1968).

Educators have long been suggesting that defective perceptual functioning may contribute to reading retardation. Since reading involves the presentation of both auditory and visual information, any inability to process such stimulus information would be expected to reflect itself in learning problems. These difficulties might occur because of difficulties within the individual communication channels (intrasensory), or to the processing

of visual and auditory stimuli in combination (intersensory).

Related Research

Interest in modality preference has been present for over eighty years. Much research has been conducted to determine if a person learns better through a dominant mode. Data have been compiled and findings show no consensus. Munsberg (1894) generated interest in modal preference when he compared visual and auditory modes with fifty men. Hawkins (1897) presented nonsense syllables both visually and auditorily to seventh graders and college students. His purpose was to determine what interaction, if any, of mode with age would result. It was found the younger subjects preferred auditory stimuli while college students were better with visually presented material.

Another study supporting the position that the visual mode of presentation was superior to auditory was conducted by Cooper and Gaeth (1967). This study used fourth, fifth, sixth, tenth and twelfth graders. Nouns were presented visually, then auditorily, as were consonant-vowel patterned words. It was noted that as the sample population got older, the more effective the visual mode became. Cooper and Gaeth (1967) concluded that this may have been caused by increased reading skills rather than a preferred mode.

Day and Beach (1950) summarized findings before 1950 to determine the relationship between mode of presentation and learning. Their conclusions were twofold: as the intelligence and reading level increase, the visual mode becomes more effective; the visual presentation was better than oral presentation for more difficult material.

One of the controversial issues in the field of communications concerns the value of presenting material through one channel as opposed to several channels. When one begins the reading process the primary task is to transpose aural language to the written form. While using a dominant mode or a fully-functioning combination of modes, a student might experience less difficulty mastering the task of reading.

Broadbent (1964) theorized how messages were received by the central nervous system and labeled it the Filter Theory. When two messages are simultaneously presented some central interference appears. For any meaning to be received, each message must have the interference filtered out. Broadbent's theory suggests a filter at the entrance to the nervous system which will pass some classes of stimuli but not others. This is an economical way of keeping down the amount of information passed through the main part of the mechanism.

Other research studies have assumed that a group preference or individual differences in modal preference occur. These include Henmon (1912), McGeoch and Irion (1952), and Witty and Sizemore (1958). In the studies previously conducted comparing bimodal with monomodal presentations, none of the experiments were designed to consider the preferred mode of the individual. Usually the experiments had three or more groups, one group for each type of presentation. After the tasks were given, scores were derived for significant differences. The conclusions were then drawn and stated with no mention that the findings were generalizable only to group situations.

Jester and Travers (1966) investigated the effects of varying speed of presentation of meaningful material upon listening comprehension. Using two hundred and twenty college juniors and seniors, meaningful stimuli were presented in three modes: audio, visual, and audiovisual. They were also presented at five different speeds. The materials for auditory presentation were taped and compressed mechanically and the visual materials were typed on slide frames. A mean score for performance was found. Analysis of variance, efficiency scores and standard deviations were presented. It was found that a multi-channel presentation was superior to either auditory or visual presentation when using meaningful materials. However, when receiving a simultaneous multi-channel presentation of any kind of material, interference may result. Until researchers consider the best learning mode for each individual in their experiments, the question of the superiority of bimodal or monomodal presentations of verbal materials will remain unanswered.

Buktencia (1969) conducted a three year study which attempted to predict reading achievement through the third grade level, establish data for a non-verbal discrimination test, and develop screening devices to assess perceptual abilities and identify potential learning disabilities. Using one hundred and forty children, all of average intelligence and all being exposed to the same reading program, group administered auditory and visual perceptual tests were given. It was found that a significant difference occurred which showed that reading achievement can be predicted through the third grade. Predicting the dependent variables was determined with a step-wise multiple regression

analysis. Reliability was also determined. The Test of Non-Verbal Auditory Discrimination gave the highest correlation between predictors and achievement variables. The correlations among the tests of nonverbal auditory and visual perception and reading achievement remained significantly high over the three year period. The results stated that by using group administered, nonverbal auditory and visual tests, it is possible to identify children's potential in reading achievement and thereby develop special instructional methods for children with perceptual problems.

Dauzat (1970) and Cooper (1970) tested seven year old students to determine the presence of one single preferred mode. Dauzat, using the Learning Methods Test, attempted to answer three questions: do disadvantaged children prefer one particular method of learning word recognition tasks; do the learning methods of disadvantaged children differ from nondisadvantaged children; comparing race with socio-economic status, is there a difference when learning the same task? The sample consisted of five hundred and twenty-nine students and a two-way classification analysis of variance was used to analyze the data. It was found that the visual mode was significantly more effective than kinesthetic or phonic methods, regardless of socio-economic status, race or sex. There was a significant difference in word recognition ability between the disadvantaged and nondisadvantaged student.

Cooper's study (1970) was highly controlled but no single mode was found to be dominant. The results of this study were not easily generalizable to the classroom situation and it showed that children of seven could work in

either the auditory mode or the visual mode.

Waugh (1971) tested one hundred and sixty-six second graders to see if a relationship existed between a modality preference and performance. The Illinois Test of Psycholinguistic Abilities was administered to classify the students as auditory or visual learners. Four controlled instructional procedures were presented and the students were to recall the words. Neither pronouncing the words nor knowing their meanings was necessary. T tests were computed. The results state that children entering kindergarten have a greater ability to receive and process visual information but that this ability changes to an auditory one probably as the result of contact with the classroom setting.

Donovan (1978) worked with one hundred and seven first graders to determine if any significant relationship occurred between a modality preference of a student and a reading program using the preferred mode. It was found that pupils whose modality preference was congruent with the primary reading instruction scored significantly higher on all measures of reading behavior.

It has been suggested that research be conducted to help match a child's ability with the method of teaching (Durkin, 1970). Miccinati (1978) states that identifying modality strengths and weaknesses and determining the ability of poor readers to integrate information has value. Once the identification of these abilities has been made, then teaching strategies can be developed which will meet the student's needs. An interaction between the student's characteristics and the methodology appears to exist but with inconsistency.

Therefore this area needs to be explored further. Generalizations from the findings are difficult to draw since researchers define learning and modal preference in different ways and use different measures and tasks to assess the same skill or ability. Although many studies have been conducted over the past eighty years to determine the existence of a more effective mode, there have been no universal findings which indicate one method over another. Once educators could say, with assurance from research, that younger subjects were oral learners and older students were visual. This can no longer be held as completely true.

Present Tests of Modal Preference

There are several modality tests available to the classroom teacher, such as the Illinois Test of Psycholinguistic Abilities (ITPA), Mills Test (1970), Kolson's Quick Modalities Test (KQM), Baxter Test (1971), and the New York University Modality Test (1968). The ITPA must be administered individually by a trained examiner and takes approximately 1½ hours to give. It has undergone extensive item analysis, factor analysis and standardization process to assure reliability and validity.

Much of the research in the area of preferred modality has been criticized for failure to properly identify modality preferences. This is the situation with three of the mentioned tests: N.Y.U. Modality Test, Mills, and Baxter. In each of these tests, words are presented to the subjects through different channels, but in each case there is some "spill-over" from one channel of

input to another. A word is presented in such a way that would emphasize the auditory modality might be processed by the learner through the de-emphasized channel, namely visual.

The Kolson's Quick Modalities Test takes a short amount of time to administer, but what exactly does it measure? This test claims that within twenty minutes a teacher can test a class of thirty students for visual, auditory, kinesthetic abilities, tactile mechanism (if the student has any trouble distinguishing between regular and irregular tapping patterns), and also the integration of all these modalities. This test purports there is a way to determine if a person has a preferred mode between the visual and kinesthetic. The student is told to put a piece of paper on his forehead and write the word "cat." If he writes it forward, he's a visual learner; if he writes it backwards, he prefers kinesthesia.

Summary

Research has not succeeded fully in specifying the particular characteristics of pupils which need to be considered in arranging the reading program. Many varieties of materials and teaching methods are available to the versatile teacher, but in making a choice among them for a particular child, the teacher is left with incomplete guidance. Thus there is a continuing need for research which would specify the relationships between pupil characteristics and the various procedures for developing reading skills (Reynolds, 1941). With this new paradigm for modal preference testing, it is hoped teachers will be better able to select a reading program for a particular

child who learns better visually or auditorily.

The weaknesses of past research in the area of modal preference testing are: 1) the designs vary; some groups are random, some are controlled, and the data from each group are combined; 2) visual stimuli and auditory clues are not presented simultaneously; 3) a preferred mode cannot be identified; 4) the validity of existing modal preference tests appears lacking evidence; 5) there is a lack of longitudinal studies.

Chapter III

Design of the Study

The purpose of this study was to design a new paradigm for modal preference testing. Another task was to identify modality preferences of second grade students experiencing reading difficulties through simultaneous presentation of different stimuli.

Methodology

Subjects

Thirty second-grade students from two suburban schools were employed as the subjects. Each child was selected by the classroom teacher or the reading teacher and each was experiencing some reading difficulty. All the children were between the ages of seven and nine years old.

Materials and Procedures

A tape recorder presenting five, single digit numbers was used for the auditory stimuli. Flash cards with five different digits were used to present the visual stimuli. Answer sheets were provided for the subject to record his responses.

The test was given individually. A trial of five examples, to illustrate the procedure, was given to each child. The administered time varied between twenty and thirty minutes per child.

There were three treatments to this modality preference test: treatment I,

unprompted; treatment II, auditory; treatment III, visual. In treatment I the teacher says, "You will hear 5 numbers from this tape recorder and at the same time you will see 5 different numbers on a card. When I say 'now' write down on your sheet of paper any numbers that you remember. Don't worry about being confused." The teacher turns the recorder on and off by the microphone switch and at the same time holds up a card with the numbers on it. When both recorder and card are put down, the teacher will say "now." The teacher must make certain the student waits for the clue before writing any numbers.

Treatment II the teacher says, "Again you will hear 5 numbers from the tape recorder and at the same time you will see 5 different numbers on a card. But this time when I say 'now' you are to write down the numbers you hear." Paper is provided for each treatment.

Treatment III the teacher says, "You will hear 5 numbers from the tape recorder and at the same time you will see 5 different numbers on a card. When I say 'now' you are to write down the numbers you see."

Data Analysis

The students' responses for each treatment were recorded and divided into four categories: correct responses, auditory responses, visual responses, and incomplete or mixed responses.

Correct responses were the percentage of correct recalled numbers in a given treatment. Auditory responses will show the percentage of recalled numbers from the auditory stimulus. Visual responses will be the percentage of recalled numbers presented in the visual mode. Incomplete responses are

numbers recalled but not in the tested sequence. Mixed responses are numbers recalled, some visually given and some auditorily given. There will be eight questions posed concerning the individual and group responses. The terms of percentage, which will be listed, were arbitrarily chosen.

Summary

Thirty students were asked to look at and listen to a series of five, single digit numbers, at the same time. Each subject had ten series of numbers and three separate treatments. In the first treatment, no cues were given as to what numbers the subject was to remember. In the second treatment, the subject was told to attend to the auditorily presented numbers. In the third treatment, the subject was to direct his attention to the numbers presented visually.

Chapter IV

Descriptive Data Analysis and Implications

Purpose

The purpose of this study was to identify modality preferences of second grade students experiencing reading difficulties through the use of simultaneous presentation of different stimuli.

To achievement this purpose a new paradigm was developed for modal preference testing.

Analysis of Data

The responses of the thirty second-grade students are shown below. Each treatment has been broken down into percent correct, percent auditory, percent visual and percent incomplete or mixed.

<u>Subject</u>	<u>I</u> <u>Unprompted</u>	<u>II</u> <u>Auditory</u>	<u>III</u> <u>Visual</u>
1	70% auditory 30% mixed	70% correct 30% mixed	60% correct 50% mixed
2	100% visual	100% correct	80% correct 20% mixed
3	10% visual 90% mixed	90% correct 10% mixed	60% visual 40% mixed
4	40% auditory 30% visual 30% mixed	90% correct 10% mixed	50% correct (1st 5) 50% auditory
5	30% auditory 30% visual 40% mixed	100% correct	70% correct 30% mixed/incomplete
6	100% auditory	100% correct	70% correct 30% mixed
7	10% auditory 20% visual 70% mixed	90% correct 10% mixed	60% mixed 40% correct
8	100% auditory	80% correct 20% mixed	60% correct 40% mixed

<u>Subject</u>	<u>I</u> <u>Unprompted</u>	<u>II</u> <u>Auditory</u>	<u>III</u> <u>Visual</u>
9	40% auditory 60% mixed	90% correct 10% mixed/incom	90% correct 10% mixed
10	0% auditory 60% visual 40% mixed	60% correct 40% mixed	30% correct 70% mixed
11	0% auditory 10% visual 90% mixed	100% correct	70% correct 30% mixed
12	30% auditory 20% visual 50% mixed	70% correct 30% mixed	50% correct 50% mixed
13	100% mixed/ incomplete	70% correct 30% mixed	90% correct 10% auditory
14	0% auditory 70% visual 30% mixed	50% correct 50% mixed/incom	80% correct 20% mixed
15	0% auditory 70% visual 30% mixed	0% correct 90% visual 10% mixed/incom	100% correct
16	0% auditory 70% visual 30% mixed	100% correct	100% correct
17	30% auditory 40% visual 30% mixed	90% correct 10% mixed	70% correct 30% mixed
18	80% auditory 0% visual 20% mixed	70% correct 30% mixed	80% correct 20% incom/visual
19	0% auditory 50% visual 50% mixed	90% correct 10% mixed	20% correct 10% auditory 70% mixed
20	0% auditory 60% visual 40% mixed	90% correct 10% mixed	60% correct 40% mixed
21	100% auditory	100% correct	80% correct, 20% mixed
22	50% auditory 50% visual	100% correct	70% correct 30% incomplete
23	0% auditory 70% visual 30% mixed	70% correct 30% mixed	70% correct 30% mixed
24	60% auditory 40% visual	100% correct	80% correct 20% mixed

<u>Subject</u>	<u>I</u> <u>Unprompted</u>	<u>II</u> <u>Auditory</u>	<u>III</u> <u>Visual</u>
25	0% auditory 80% visual 20% mixed	10% correct 50% visual 40% mixed/incom	60% correct 10% auditory 30% mixed
26	50% auditory 30% visual 20% incomplete	90% correct 10% incom/visual	90% correct 10% mixed/visual
27	100% auditory (9 & 7's reversals)	100% correct	60% correct 40% mixed
28	0% auditory 100% visual	80% correct 20% mixed	90% correct 10% mixed
29	30% auditory 20% visual 50% mixed	20% correct 30% visual 50% mixed	10% correct 20% auditory 70% mixed
30	20% auditory 30% visual 50% mixed	70% correct 30% mixed/incom	80% correct 20% mixed

When analyzing the results of this test, individual and group questions were posed. There was no pooling of responses to demonstrate a preferred mode existed, as has been done in other studies.

There were eight questions posed at the end of this study; the first five concerned the group, the last three concerned the individuals.

The first question asked how many and which students scored seventy percent or higher in one pure mode in treatment I? There were thirteen out of thirty (43%) falling into this category: subjects 1,2,6,8,14,15,16,18,21,23, 25,27,28.

Out of those thirteen, which had a difference of thirty percent or more between treatment II and treatment III? There were four out of the initial thirteen: 6,14,25,27 (31%).

From the four mentioned in question two, we asked which had thirty percent or more in favor of a self selected mode? Fifty percent favored the auditory mode and fifty percent favored the visual mode.

Question four asked what was the mean percentage of correct responses in treatments II and III? The mean percentage was seventy-two and seven-tenths percent.

The last group question asked what percent of the sample were able to score eighty percent or better on both treatments II and III? Eight out of thirty had eighty percent or more on both treatments, which produces twenty-six and seven-tenths percent. Those eight students are 2,9,15,16,21,24,26,28.

There were three individual questions concerning this study. Which individuals showed a preference of seventy percent or more in treatment I and this strength was confirmed by a thirty percent or more difference between treatments II and III? There were five students in this category: 6,14,15,25,27 (17%).

Which individuals showed no preference in treatment I but showed a preference in treatments II or III? To show a preference between treatments a difference of thirty percent or more must occur between correct responses. There were three students: 3,4,7 (10%).

The last question asked which individuals showed a preference in treatment I, but this strength was not confirmed in treatments II or III? There were again three students: 1,10,20 (10%).

Conclusions

Research conducted over the past eighty years suggests that modality and perceptual skills are very important factors in the early stages of reading instruction. This study would indicate that thirty percent of the sample had a slight preferred pathway for acquiring information (treatment I). From this thirty percent, sixteen percent were confirmed by treatments II and III as actually having a self selected mode.

Almost thirty percent of the students scored eighty percent or higher in both treatments II and III. This suggests that by the second grade most children have the capacity to learn in either the auditory or visual mode. Ten percent of the sample showed no preference in treatment I but did equally well in treatments II and III when directions were given as to which mode to attend. Again this suggests that children can use one mode over another when told what to listen for or watch for.

Ten percent showing a self selected mode in treatment I did not have this preference confirmed in treatments II and III. Perhaps with the simultaneous stimuli the children could not discriminate between auditory and visual and also remember to which set of numbers they were supposed to attend.

Implications for Research

Some unanswered questions, and perhaps topics for further research in the field of modality preferences, are developmental factors. Do preferred modes change as a person gets older? Do modes become easier to perfect either through maturation or through learned techniques and skills? Is it possible to tune out

stimuli in one mode over another mode?

Might our environment influence our selection of mode preferences? Television provides visual and auditory stimuli oftentimes simultaneously. Newspapers and periodicals provide visual stimuli, while radio provides auditory. Perhaps a study could be conducted using subjects raised with different methods of exposure to stimuli, tested for modal preference and results compared.

Application in the Classroom

The classroom teacher will find this modality preference technique easy to administer. Directions are clear and concisely stated. Materials and equipment needed are a tape recorder, answer sheets, pencils, and number cards for each treatment. All of these are inexpensive to reproduce and simple to operate. The modality preference technique can be given by one person, which eliminates extra personnel and someone other than the familiar teacher who might make the student nervous or uncomfortable. There are five extra number cards and taped number sequences which allow practice examples for both teacher and child to bring up and answer any questions.

If the teacher allows a thirty minute block of time for administering the modal preference test, the student will not exceed the framework. It takes approximately ten minutes to score all three treatments for one student.

Summary

This study attempted to identify modality preferences of second grade students through the use of simultaneous presentation of stimuli through two

neurosensory modal pathways.

It was found that thirty percent of the sample had a slight preference for acquiring information. The results indicate also that by second grade most children have the capacity to learn in either the auditory or visual mode.

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