RELATIONSHIP OF THE TACTILE SENSE

TO LEARNING BY THE RETARDED

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RELATIONSHIP OF THE TACTILE SENSE TO LEARNING BY THE RETARDED

THESIS

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CHAPTER I

INTRODUCTION

All through the history of the field of mental retardation, there has been fluctuating emphasis on the education and training of the retarded. One of the teaching methods used has been that of the multi-sensory technique. The tactile sense (kinesthetic method) has been given a prominent place in teaching, and psychologists as well as educators have experimented in this area. Lockard and Sidowski (7) have stated, "A number of studies have indicated a relatively consistent trend for subjects to learn more efficiently when material is presented simultaneously to two sensory channels than when a single sensory input is used" (7, p. 262). Virtually all of the psychological studies have used the auditory and visual senses to the exclusion of the others.

The present study was designed to investigate the efficiency of a visual and tactile presentation of a design as compared to just a visual presentation to determine if the two-sense method helped the subjects in drawing the designs accurately in less trials.

Review of Literature

The stimulation of all the senses in teaching had its beginning in the methods of early educators. In the school

of Decroly as well as Montessori, this was an integral part of their method of instruction.

Decroly utilized the senses, but Montessori (10) used the sense of touch in much the same way as Fernald, who is the prominent name in the use of the kinesthetic method, which is of special concern here. Montessori stressed education of the senses as well as using the senses to teach reading and writing. Education of the senses was used to refine the biological function of the student. For example, for the sense of touch she used various textures of wood. For academic subjects, she had wooden letters and letters on cards; there was also a picture of an object that began with each letter. The student would trace the letter while making the appropriate sound. She used the senses to train her students in natural development as well as in social development.

Henry James (6) as early as 1890 cited cases of individuals who failed to recognize a word by the visual cue but who would more readily name it if they were allowed to trace the word as well as see it.

In 1921 the Clinic School at the University of California was established. Here Fernald (2) established her successful method for remedial reading. She worked with students with normal intelligence who had "alexia" (inability to read). She also stated that her method could have significant results

with the mentally retarded, but it would be a slower process. She discussed the importance of the sense of touch.

> If the material used for beginning reading is properly selected, the child already knows the meaning of the words he is expected to learn. What he does not know is the word form. Many children seem to learn to read more easily by some kinesthetic technique . . . . These methods may be eye, lip-throat or hand kinesthetic; the last being the one that most completely represents the word in terms of the individual's own movements (2, p. 27).

The Fernald method had the student choose a word and the word was written in crayola. The word was traced with the finger and pronounced, after which it was incorporated into a story. The word was then put into a word box; the student's vocabulary was built in this way.

Shea (13) elaborated in the classroom on Fernald's finger tracing by using clay and wire writing, finger writing on desk tops and tracing on flash cards.

Hegge (4) successfully used the Fernald method at the Wayne County School for the mentally retarded. He answered a criticism of the multi-sensory method: that the extra time spent executing this method could account for its value. He stated that improvement followed with any good method that provided individual attention, but that even more improvement was evident if the kinesthetic method was used.

Strauss and Kephart (14) have studied the brain-damaged child as to need and appropriate ways of teaching. By their explanation of the difficulty of this type of mentally retarded

student it could be readily recognized that a solution would be in the stimulation of the senses. They theorized that there is a lack of integration of perceptual and motor systems, accompanied by failure of the visual processes to provide substantial and clearly structural patterns for the motor actions to follow. In addition they discussed the merits of the kinesthetic sense. They concluded, "Vision allows a large number of stimuli simultaneously, audition requires a sequential perception" (14, p. 182). The addition of the kinesthetic sense made the two more compatible in that they were brought to the common denominator of serial patterning.

Strauss and Lehtinen (15), collaborating on a study of the psychopathology of the brain-damaged student, outlined methods which seemed best-suited for the academic instruction of this type student. They stressed an interesting point in regard to stimulation. Before this time, educators emphasized the use and need of all senses in teaching. Strauss agreed, but said that in the environment in which the child is to learn, the stimulation should be controlled. The sense channels should be attuned only to that which the subject is to learn. The following showed the ways in which Strauss and Lehtinen used the sense of touch in instruction. To teach reading the student had alphabet cards which he assembled while learning the appropriate sound. In writing he also said the name of the word (oral writing) while tracing it through onion skin paper.

Within the last ten years the use of the multi-sensory method with aphasic children has dominated literature in this field. Barry (1) explained that since auditory and visual perceptions were directly related to conceptualization, to language, and to behavior, training in perception would be of the most benefit to the student. She suggested activities in touching, listening, sorting, coloring, cutting, tracing and folding.

McGinnis (8) also instructed the aphasic child; her method of teaching was based upon a systematic association of motor skills and sensory capacities.

The ways in which the tactile sense is used in teaching have not changed moticeably from the Montessori School to the present, but the population that has been found to benefit from tactile instruction has changed. Initially, only the mentally retarded were taught in this manner; presently, however, reading failures as well as aphasics benefit from instruction utilizing the tactile sense.

Psychologists have done experiments which substantiate the hypothesis that learning is facilitated when a subject is stimulated through more than one sense. Studies to ascertain the value of using the tactile sense in teaching have also been conducted.

Lockard and Sidowski (7) gave a list of nonsense syllables to fourth and sixth graders to be learned by three modes of

stimulation: visual, auditory, and visual-auditory. Each list was presented for fourteen trials under all three conditions. Results indicated a significant superiority for the visual-auditory presentation. This reinforced the belief that learning through the use of two senses is superior to learning through the use of only one sense.

In connection with the tactile sense in particular, psychologists have investigated various aspects of it. Some educators before Fernald had their students use pencils to trace letters of words in learning to read. Fernald, on the other hand, found finger tracing of letters of words to be a better technique in reading instruction. Miles substantiated Fernald's findings as a result of his maze experiment. Blindfolded subjects were to find the solution to a maze. Some subjects used their fingers to trace the pathways, while other subjects used pencils. Miles found that the subjects who used their fingers to solve the maze needed half the amount of trials to complete the maze as the subjects who used pencils.

Husband (5), in explaining Miles' results, said that the finger tip in direct contact with the pattern secured important cutaneous experiences in addition to the kinesthetic cues. Also the finger covered the whole pathway in the maze and no possible pathway could be missed.

Roberts and Coleman (12) also conducted experiments concerning some of the assumptions of Fernald. The hypotheses that these psychologists proposed were that reading failures would be lower in perceptual acuity than normal readers, that reading failures would be less efficient in learning if the visual sense mode was dominant, and that reading failures would be more efficient if both the kinesthetic and visual senses were used.

There were fifty-six subjects: twenty-seven poor readers and twenty-nine average readers. Each subject was required to learn ten nonsense syllables under two separate conditions: (1) visual presentation alone and (2) visual and kinesthetic. In the visual and kinesthetic presentation the subjects traced the syllables, making finger contact with the written word. It was found that

> 1. As a group, reading failure cases were significantly inferior to normal readers on a test of visual perception.
> 2. As a group, reading failure cases were very significantly less efficient than normal readers when learning new material by means of visual cues only.
> 3. As a group, reading failure cases were significantly better able to learn new materials by methods which included kinesthetic components than those which employed visual stimuli only.
> 4. As a group normal readers were not significantly aided in learning new material by the addition of kinesthetic elements to visual ones.
> 5. Reading failure cases who achieved normal scores on the test of visual perception did not profit appreciably from the addition of kinesthetic to visual cues in learning.
> 6. Normal readers who achieved lower than average scores on the test in visual perception did learn faster with the addition of kinesthetic to visual cues (12, p. 450).

The results provided experimental justification for the use of kinesthetic methods in remedial reading programs. They also suggested the value of adding kinesthetic cues to the visual learning situation for those with deficiencies in visual perception.

The work done by psychologists on the tactile sense had been performed from the standpoint of active touch. Touch can also be passive, but few experiments have been conducted to explore the possibilities of this aspect of the tactile sense. Gibson (3) executed an experiment illustrating both aspects of the sense of touch. Active touch referred to that which is commonly known as touching. When the impression on the skin is brought about by the perceiver himself, this is active touch. In passive touch the impression on the skin is brought about by some outside agency. In the experiment six different shapes of cookie cutters were used. The objective was to see which type of touch would be the most helpful in identifying the shapes. By the active touch method, the subjects could manipulate and explore the object with their hands. In passive touch the experimenter moved the object in the subjects' hands. The active touch method was significantly more helpful, at the .002 level of confidence. The above experiment was cited because in this present study, passive touch was employed. The subject had the design traced on his back by the experimenter.

In conclusion, Reeves (11) expressed the feeling of psychologists and educators who have worked in this area. She stated, "Working through mind and sense, there is a more complete integration of a person's power--the pattern becomes dynamic" (11, p. 10).

Statement of Problem

The present study was conducted to show the superiority of using two senses in learning a task rather than using one sense. The visual sense and passive touch were the two senses employed by some subjects, while other subjects used only the visual sense. The visual-tactile group would see a design and also have it drawn on their backs, while the visual group was allowed only to see the design that they were to draw. It was proposed that the visual-tactile group would draw the design in fewer trials than the visual group.

Statement of Hypothesis

The following hypotheses were formulated:

1. The group that feels the designs as well as sees them will perform significantly better in their drawing than the group that just sees the designs.

2. The brain-damaged group that sees and feels the designs will perform significantly better in their drawing than the brain-damaged group that just sees the design.

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CHAPTER II

METHOD

Subjects

The subjects for this study were thirty-eight subjects from the Denton State School. Fourteen of the thirty-eight were female and twenty-four were male. The subjects were divided into two groups containing nineteen each. In the two groups of nineteen each, one had four brain-damaged subjects and the other contained six; the rest were familial. Groups were formed by mental age (MA) assessments obtained from previous intelligence tests. Evidence of brain damage was obtained from the records at the school. The remainder of the subjects were diagnosed as familial by the medical staff at the Denton State School. The visual group had a mean MA of 6-6 years, with a chronological age (CA) range from 7-7 to 13-9 years; the visual-tactile group had a mean MA of 6-5 years with a CA range from 7-2 to 14-4 years. Table I gives a description of the two groups with information on the brain-damaged subjects included. Mental ages were of prime importance here because in the scoring method used, the child could not have a mental age above ten years in order that the scoring be valid.

TABLE I

MEANS OF MATCHING VARIABLES

Group	Number	Mean MA in Years and Months	MA Range in Years and Months	CA Range in Years and Months
		Familial		
Visual	19	6-6	5-0 to 8-9	7-7 to 13-9
Visual-Tactile	19	6-5	5-1 to 8-4	7-2 to 14-4
		Brain Damaged		
Visual	6	6-4	6-4 to 7-8	10-0 to 13-9
Visual-Tactile	4	6-6	5-1 to 8-4	9-5 to 13-6

Pilot Study

A pilot study was conducted to decide which of the designs of the Visual Motor Gestalt Test by Bender to use, in order to eliminate those figures that would be too difficult and those which would be too easy for the subjects to reproduce. Also it was necessary to establish the amount of trials a subject would need to draw the designs successfully; without a set maximum limit for trials, some subjects could continue indefinitely without success. For this pilot study, four subjects were given Figures A, 4, 6, and 8 of the Bender Test, with six as the maximum number of trials on each. When the subject received a score of zero on The

Developmental Bender Scoring System for Young Children by Koppitz (2), the design had been drawn correctly. The four subjects were divided into two groups with two subjects in each, having a familial and brain-damaged in each of the groups. One group looked at the drawing and then attempted its reproduction; the other group saw the design and also had it drawn by the examiner on their backs and then were instructed to draw it. Drawings four and six were selected to be used in twelve trials as a maximum, six trials for each design. In addition, this initial study established the length of time that a child would be attentive to the task without losing interest.

Task and Procedure

The task was composed of numerous trials on presentation of designs four and six of the Visual Motor Gestalt Test by Bender. The designs are shown in Figure 1.

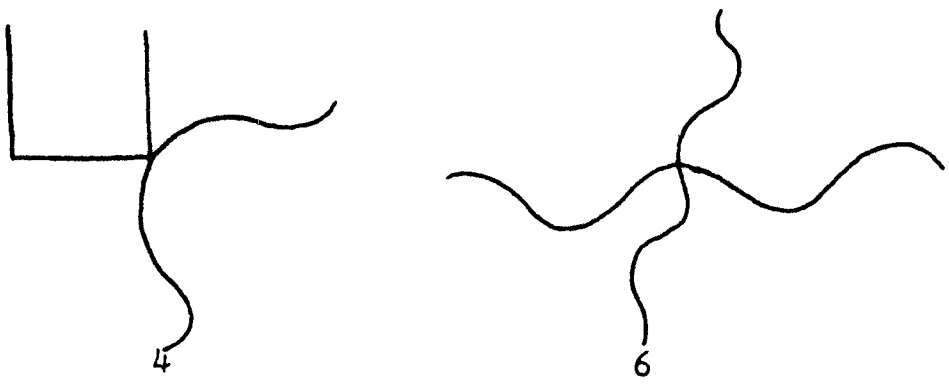

Fig. 1--Designs involved in the task

A trial consisted of the presentation of one of the designs which the subject was asked to draw. The scoring method developed by Koppitz was used to judge the accuracy of the drawings. If the subject received a score of one or two, it indicated that certain types of mistakes had been made. The subject had to obtain a score of zero to be recorded as successful in his drawing of a Bender design.

Nineteen subjects were put into one group (visual-tactile), with four of these with an etiology of brain damage and the remainder classified as familial. On the back of the subject was placed and fastened around his chest a white cloth 14½ x 9 inches on which was drawn, in red ink, one of the two Bender designs. Design four was selected as the one to be used first in the experiment. The Bender card with design four was placed in front of the subject. While he looked at this design, the examiner traced with his finger the outline of design four, which had been placed on the subject's back. The same procedure was followed for design six. The design on the cloth is shown in Figure 2.

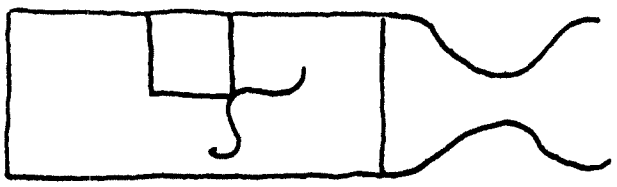

Fig. 2--Picture of design on the cloth that was placed on the back of the subject.

The outline of each design was drawn twice in this fashion by the examiner to assure that the subject felt the tracing and also that he realized that the design on the card was the same figure that had been drawn on his back. Then the subject was told to draw the picture just as he had seen it before him and as he had felt it. The child was encouraged to do his best and to take his time.

The second group (visual) contained nineteen subjects including six brain-damaged. In this group the Bender design was placed in front of the subject. The subject was then told to reproduce the design that he saw on the card on a piece of paper that was provided for his use. This group saw the design on the card but did not have the design traced on their backs. They were also instructed to be as accurate as possible and to take all the time that was needed. This group, then, was stimulated only through the visual sense.

The trial in which the student performed the task successfully was recorded; the total number of trials of both designs was kept. The primary objective was to see if the group that was stimulated tactually as well as visually would draw the designs successfully in fewer trials than the group that merely saw the Bender cards.

Analysis of Data

The number of trials necessary for the two groups to complete the drawings correctly was the basic data for analysis. The *t* test was used to determine if the mean difference between the two groups (visual, visual-tactile) was significant. The .05 level of confidence was accepted. The source of suggestions concerning the statistical analysis of data was Johnson and Jackson (1).

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CHAPTER III

RESULTS AND DISCUSSION

In order to ascertain if a significant difference existed between the two groups in regard to the total trials needed to execute the designs, the data were analyzed and the results of the analysis are presented in Tables II and III. A significant difference was shown; thus the first hypothesis was confirmed. The experimental group that was stimulated tactually as well as visually did learn to perform the task in fewer trials than the other group.

TABLE II

COMPARISON OF MATCHED GROUPS ON THEIR TOTAL TRIALS USING BENDER DESIGNS

Group	Number	Mean	Standard Deviation
Visual	19	8	2.78
Visual-Tactile	19	5	2.40

TABLE III

Mean Difference	Standard Error of Mean Difference	df	t
3	.73	36	4.07*

*Significant at the .001 level of confidence.

The mental ages of the subjects were equated quite closely for each group, and the only difference in groups was the two different ways in which the designs were presented. The group that was stimulated tactually as well as visually drew the designs accurately in fewer trials than the other group. During the experiment the subjects were attentive when the design was drawn on their backs, and they expressed enjoyment as if it were a game. The following suggestions are put forth here as tighter controls for subsequent studies in this area.

The first suggestion was that several examiners instead of one should have scored the drawings. Koppitz's manual was used to score the accuracy of the designs. The manual contained illustrations of various mistakes in the designs that could be made and the score that was to be given for these mistakes. In this study, the examiner had to look at the subject's drawings and see if his mistakes were the same as those shown by Koppitz. The examiner then scored the drawings accordingly. If several examiners had scored the drawings, they would have had to agree on the accuracy of the designs. There would have been a consensus of opinion, and, therefore, the scoring would have been more valid.

Another point for consideration was that which concerned that subject who could perform both designs on the first trial. This subject obviously needed no help by this method,

so he was eliminated from the study. Some subjects in the study could draw one of the designs satisfactorily but not the other design. This type of subject was kept in the experiment, even though he only needed help in learning to draw one of the two figures. A better approach to this problem would have been to eliminate the subject who drew either design correctly.

The results on the brain-damaged sample were not as dramatic. There was a total of ten brain-damaged subjects in both groups, four in the visual-tactile group and six in the visual group. This type of mental retardation was included, even though the sample was small, because of the special difficulty that this group has in psycho-motor coordination with which this experiment was involved. This study does not support the addition of the tactile involvement as a means of facilitating the learning of children with brain damage. The difference does not reach the .05 level of confidence. Table IV pertains to the analysis of data on the brain-damaged.

TABLE IV

COMPARISON OF THE DIFFERENCE IN THE TOTAL TRIALS OF THE BRAIN-DAMAGED SAMPLE INCLUDED IN THE TWO GROUPS

Group	Mean Difference	Standard Error of Mean Difference	df	t
Visual	2	1.03	7	1.97*

*Significant at the .10 level of confidence.

During the experiment, it was noticed that the brain-damaged subjects repeatedly made the same errors in the designs. A study with a large sample of brain-damaged subjects needs to be conducted, with a greater number of trials as a maximum, before the visual-tactile method can be definitely excluded as a possibility of instruction with this type of mental retardation. This study showed the definite advantage of dividing mentally retarded subjects into familial and brain-damaged, since one group is definitely helped by this method and the other is not.

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CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The present study was initiated to compare the efficiency of a visual and tactile presentation of a design with a visual presentation only. Would the feeling of the outline of the design drawn on the back (touch) and also seeing the design help the subject to draw the design accurately in fewer trials than if the subject only saw the design?

It was hypothesized that adding the sense of touch to the visual sense would facilitate better performance on the drawings. Also in the two groups that received the different types of presentation of the material, there was included a sample of brain-damaged subjects. Since brain-damaged children have special difficulty with the execution of geometric designs because of poor psycho-motor coordination, it was of interest to see if the visual-tactile presentation would be helpful to them. The hypothesis was confirmed for the total sample, but not for the brain-damaged in particular.

The subjects used were chosen from the population of the Denton State School, Denton, Texas. There were two groups of nineteen subjects. The visual-tactile group included four brain-damaged, and the visual group had six brain-damaged.

The etiology was taken from the records of the school. The chronological age range for the subjects was from approximately seven years to fourteen years, with a mental age not exceeding ten years. The two groups were equated on sex, mental, and chronological age. Therefore, if one group did perform the designs in fewer trials, it must have been due to the certain way in which the designs were presented. The two ways were the visual-tactile presentation and the visual presentation. The number of trials necessary for the two groups to complete the drawings correctly was the basic data for analysis. The *t* test was used to determine if the mean difference between the two groups was significant.

Conclusions

The first hypothesis postulated was that the group who was stimulated tactually as well as visually would perform significantly better in the drawing of the designs than those who were stimulated by only one sense (sight). This hypothesis was confirmed at the .001 level of confidence. This was in agreement with Lockard and Sidowski (2), who stated that an additional sense facilitated learning, and with Fernald (1), who emphasized the usefulness of the sense of touch in particular.

The second hypothesis stated that the brain-damaged sample would be able to draw the designs in significantly fewer trials if stimulated tactually and visually rather

than by the visual sense only. This postulate was not confirmed by this study, as results did not reach the .05 level of confidence. This was not in agreement with Strauss (3), who found the utilization of the sense of touch to be successful in teaching the brain-damaged. The familial type of mentally retarded subjects was successful with the method used in this study, but the brain-damaged subject was not. Fernald stated that her method would be a slow process with the mentally retarded. Here it can be said that the method of instruction described in this study may be a slow process with a certain type of mental retardation: namely, the brain-damaged.

Recommendations

There are several recommendations for further study that are apparent due to the results of this research. One suggestion would be a replication of this study, but with several examiners scoring the designs. Also, it would be beneficial to do a complete study with a larger number of brain-damaged subjects using passive touch and giving them sufficient time to learn. A comparison of active and passive touch in a similar experiment would establish the efficiency of one method over the other in a learning situation.

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APPENDIX

LIST OF SUBJECTS IN STUDY ACCORDING TO GROUP WITH THE TOTAL NUMBER OF TRIALS NEEDED TO DRAW THE DESIGNS

Visual				Visual-Tactile			
Number	MA	CA	Trials (Total)	Number	MA	CA	Trials (Total)
1	5-1	9-4	7	1	5-0	11-1	9
2 (BD)*	5-1	13-2	7	2	5-1	11-5	7
3	5-1	7-7	12	3 (BD)	5-5	9-5	7
4	5-8	13-7	11	4	5-6	10-0	10
5 (BD)	5-8	13-5	9	5	5-5	12-0	7
6	5-9	10-9	9	6	5-8	11-2	5
7 (BD)	5-10	13-9	12	7	6-0	11-8	4
8	6-0	12-1	8	8	6-2	11-2	3
9	6-0	12-5	6	9 (BD)	6-4	9-0	7
10 (BD)	6-1	10-0	9	10	6-7	11-2	4
11	6-6	13-8	8	11 (BD)	6-8	11-2	7
12	6-7	10-0	8	12	6-8	14-4	3
13	6-8	12-0	11	13	6-9	13-10	4
14	7-1	12-10	6	14	6-10	10-0	3
15 (BD)	7-2	12-5	10	15	7-1	12-4	9
16	7-3	12-9	12	16	7-2	7-2	3
17	8-4	12-9	3	17	7-4	11-10	3
18 (BD)	8-4	12-8	4	18 (BD)	7-8	13-6	3
19	8-5	11-9	4	19	8-9	14-5	5

*(BD)--Brain Damaged

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