

VERTICAL AND HORIZONTAL PRESENTATIONS AND REPRODUCTIONS
IN A VISUAL MOTOR TASK.

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CURRICULUM STUDIORUM

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TABLE OF CONTENTS

Chapter	page
INTRODUCTION.	vii
I.- REVIEW OF THE LITERATURE.	1
1. Definition of Handwriting	1
2. History of Teaching Handwriting	3
3. Sensory and Motor Theories of Perception	13
4. Sensory-Tonic Field Theory of Perception	14
5. Summary and Hypotheses	18
II.- EXPERIMENTAL DESIGN	21
1. Subjects	21
2. The Tools of the Experiment	24
3. Procedure	31
4. Statistical Treatment of Data	32
III.- PRESENTATION OF THE RESULTS	33
1. The Statistical Analysis	33
2. Observations of Subjects' Behavior	38
3. Acceptance and Rejection of the Hypotheses	41
IV.- ANALYSIS AND IMPLICATIONS OF THE RESULTS.	42
1. Analysis of the Results	42
2. Peripheral Teaching Practices	44
3. Central Teaching Practices	46
SUMMARY AND CONCLUSIONS	50
BIBLIOGRAPHY.	52
 APPENDIA	
1. MODIFIED <u>BENDER</u> SCORES FOR EAST GREENSBURGH KINDERGARTEN CHILDREN	54
2. MODIFIED <u>BENDER</u> SCORES FOR EAST GREENSBURGH FIRST GRADE CHILDREN	55
3. <u>ABSTRACT OF Vertical and Horizontal Presentations and Reproductions in a Visual Motor Task.</u>	56

LIST OF TABLES

Table	page
I.- <u>Bender</u> mean Scores by Age and Sex for Normative Population.	22
II.- Reliability Coefficients and Their Levels of Significance for Four Groups of East Greenbush First Graders Representing Various Combinations of Vertical and Horizontal Presentations and Reproductions of the <u>Bender Gestalt Test</u>	28
III.- Summary of Analysis of Variance of Modified <u>Bender</u> Scores for East Greenbush Kindergarten and First Grade Children in a Visual Motor Task.	34
IV.- "t" Scores and Levels of Significance Between Means of Modified <u>Bender</u> Scores for Kindergarten and First Grade East Greenbush Children Representing Four Combinations of Presentations and Reproductions of a Visual-Motor Task.	36
V.- "t" Scores Between Means of Modified <u>Bender</u> Scores for East Greenbush Kindergarten, First Grade, and Total Groups of Boys and Girls in a Visual-Motor Task	37

LIST OF FIGURES

Figure	page
1.- Two Dimensional Copy Board for use with the <u>Bender Gestalt Test.</u>	30

INTRODUCTION

This report is concerned with the relationship between kindergarten and first grade children's ability to make certain perceptual shifts and the initial teaching of handwriting.

The first part of the report discusses the various psychophysical aspects of handwriting and the role that perceptual shifts play in the handwriting process. A review of the literature on the teaching of handwriting reveals that no psychophysical basis is available to support current educational practice in the teaching of handwriting. A review of perceptual theory suggests the applicability of the sensory-tonic field theory of perception to teaching techniques. To serve appropriately as a basis for teaching methodology in handwriting it should be demonstrated that the tenets of the sensory-tonic theory operate developmentally and at a time when the teaching of handwriting is begun.

In order to test the usefulness of this theory, the Bender Gestalt psychomotor perception test is used as a measuring tool. The general method of administration of the Bender involves reproducing figures from one horizontal plane to a sheet of paper on the same horizontal plane. Reproducing configurations on various planes requires perceptual shifts that are not required in the usual method of presentation and reproduction. This multidimensional type of reproducing

symbols is expected of young children in a variety of ways, and particularly in the learning of handwriting.

A special copy board is described which provides vertical and horizontal presentation and reproduction of the Sender cards. The test protocols are scored according to the Koppitz Developmental Scoring System. Three specific hypotheses are developed regarding the results obtained from the measuring board.

Following the review of the literature, the experimental design of the study is reported including the selection of subjects for the experiment, the tools to be utilized, and the procedure used. Included in the experimental design is the report of a reliability study using the two-dimensional copy board utilized in the research. Consideration is then given to the statistical treatment of the data.

The results are presented and analyzed in view of the sensory-tonic theory. Central and peripheral teaching techniques are discussed in terms of their conformity to the theory and the results of the study. Suggestions are made for future research.

CHAPTER I

REVIEW OF THE LITERATURE

1. Definition of Handwriting.

Handwriting is a psychophysical process involving concept formation, visual perception, expression and projection of personality factors, and the ability to perform certain perceptual shifts.

Werner¹ refers to the ego function and concept formation aspects of this process by stating that, in early childhood, writing is seen by the child as a form of drawing the meaning of environmental objects, and of expressing his needs physiognomically or emotionally. Words have been studied in terms of this latter aspect with results indicating an emotional link between the feeling involved and its affectual referent; the word. Visual motor development and concept formation are discussed by Lurçat² in terms of the extension of the prior graphic activities involved in the drawing process, and it is asserted by the author that writing is the actual goal of the former graphic activity.

¹ Heinz Werner, Comparative Psychology of Mental Development, New York, Science Editions Inc., 1948, p. 263.

² L. Lurçat, "Evolution du Graphisme entre Trois et Quatre Ans, la Differentiation entre le Dessin et l'Ecriture", Revue de Neuropsychiatrie Infantile et d'Hygiene Mentale de l'Enfance, 13 Annee, N. 1-2, Janvier-Fevrier 1965, p. 31-44.

Bell³ states that handwriting is not simply peripheral manual movement, but the activity of the Gestalt which is called personality, and that the individuality in handwriting is an expression of the personality that creates the writing.

To eliminate the excessive need for perceptual shifts in the teaching of handwriting, as well as to utilize large muscle activity, Gray⁴ suggests that a clear copy of what is to be written be placed on the blackboard, and that the child be allowed to reproduce the writing at the board. This practice is apparently used with the assumption that the child learning to write, will have some difficulty shifting from the vertical plane to the horizontal plane as would be necessary in copying from the blackboard to the paper at the seat.

Of all the various functions involved in the handwriting process, this study is concerned with the last described; that of the child making certain perceptual shifts. The process of handwriting involves the making of vertical shifts from one area of the blackboard to another area of the blackboard on the same plane. When copying from the board to paper at the seat, the pupil makes a vertical to a horizontal shift. When copying from a model at his seat,

³ J.E. Bell, Projective Techniques, New York, Longmans, 1946, p. 292.

⁴ William S. Gray, The Teaching of Reading and Writing, Chicago, Scott Foresman and Co., 1961, p. 218.

the pupil must make a horizontal to horizontal shift. This study is concerned with the facility of young children to make these kinds of perceptual shifts, and the investigation of educational practice in this area in terms of psychological theory.

To investigate the role of perceptual shifts in the teaching of handwriting, a survey of the literature in the teaching of handwriting was completed.

2. History of Teaching Handwriting.

The history of the teaching of handwriting, of course, outdates psychology as an empirical science and therefore cannot be expected to have an early psychologically theoretical basis. In terms of the United States, handwriting according to Dougherty,⁵ has developed under five periods of influence. The Colonial period lasting roughly from 1600 to 1800 was marked by the use of English texts, using crude writing materials, and a good deal of the teaching time was spent in the preparation of the materials. The period 1800 to 1850 marked the development of better equipment and the influence of the French brought about a synthetic form of teaching breaking down the letters into individual strokes, learning the strokes correctly and then synthesizing them

⁵ Mary L. Dougherty, "History of the Teaching of Handwriting in America", Elementary School Journal, Vol. 16, No. 4, December 1917, p. 280-286.

into characters. The emphasis here was in copying models and attaining letter form perfection. The second part of the period was dominated by muscular movement writing where the manner of writing took precedence over form. It was stated that an easy flowing hand is only possible by ease in the motion of the member of the body executing the movement. The forms of letters were taught while the fingers were in a harness to force correct movement. It would appear that in this period of influence the educational theorists, if there had been any, would have supported a motor theory of perception, feeling that doing is prior to perceiving. The period from 1850 to 1870 emphasized the early synthesis of simple forms in addition to extreme arm and forearm movement. From France and Germany between 1870 and 1900 came the agitation for vertical writing, but was soon abandoned because it was inefficient from the viewpoint of speed and legibility. The last period described in this paper was from 1900 to 1915 when teachers of handwriting were trained in diploma schools. It was also during this period that the first step to scientifically evaluate performance in writing was developed. Thorndike and Ayres⁶ developed scales based upon samples of handwriting from fifty-six cities and produced standards for each grade level. The main limitation of the scales was their poor reliability due to the fact that they were based upon

⁶ Ibid.

REVIEW OF THE LITERATURE

subjective judgments. Freeman⁷ suggests that at about this time laboratory tests were beginning to break down the dogmatic beliefs and rigid approaches to the teaching of handwriting. So up to the dawn of the first attempts to provide an experimental basis for handwriting, the history of its teaching in the United States could be characterized by a fairly consistent evolution from Spencerianism to the arm or muscular movement writing. This consistent evolution was dealt a heavy blow by the brief dominance of vertical writing at the turn of the century. After the first world war, the training of teachers in the teaching of handwriting began to decline and the teaching of handwriting in elementary schools fell into a "confused and disorganized condition."⁸ This condition marked the beginning of the development of a variety of commercial handwriting systems. These published programs of which King⁹ lists fourteen have developed increasing popularity since the 1930's. In a survey report by Noble¹⁰ 34.5 per cent of 166 respondents in 1946 were using

⁷ Frank N. Freeman, "Trends in the Teaching of Handwriting", Childhood Education, Vol. 13, No. 9, May 1937, p. 416-419.

⁸ Ibid.

⁹ Fred M. King, "Handwriting Practices in Our Schools Today", Elementary English, Vol. 38, No. 7, November 1961, p. 483-493.

¹⁰ J.K. Noble, "Handwriting Programs in Today's Schools", Elementary English, Vol. 40, No. 5, May 1963, p. 506-512.

their own handwriting systems. In contrast, a 1959-1960 survey indicated that only 4.2 per cent of a large number of respondents were using their own as opposed to commercially prepared materials. In a 1962 survey of an Eastern state, eighty-five out of the state's one hundred school systems responded and all but one reported a formal system was being used. Since the teaching of handwriting has not been a part of the curriculum at teacher-training institutes for some time, it would appear that elementary schools are attempting to develop a consistent and stable program in handwriting to ensure some kind of instruction. There is no mention in the literature as to why teachers are no longer trained in this area, but it may be that school superintendents do not see this as a necessary adjunct to the other skills that a teacher brings to the classroom. For example, King¹¹ surveyed 600 superintendents in cities of over 2,000 population in four midwestern states and asked if they required teachers to have a course in the teaching of handwriting. Only nine per cent required any formal training in this area. Enstrom¹² states that this attitude involves three general misconceptions. First, many educators apparently feel that although handwriting is a sensory-motor skill, it can be learned incidentally.

11 King, Op. Cit.

12 E.A. Enstrom, "Misconceptions Regarding the Teaching of Handwriting", Education, Vol. 84, No. 3, April 1964, p. 503-504.

Secondly, that it will teach itself and, finally, that teachers need no preparation for the teaching of handwriting. Beale¹³ feels that teachers themselves are puzzled about effective methods of teaching this subject. Both teachers and children appear to be either tense or indifferent about their writing. At the present time teachers, pupils, and parents are seen as looking for a solution.

An attempt to locate any psychological basis for the teaching of handwriting was fruitless. The educational psychology of handwriting appears to be non-existent in the literature. Anderson¹⁴ states that over seventy per cent of the handwriting articles reported in the literature are of a non-technical, descriptive nature. Most articles are in the nature of a general discussion, suggestions and aids to teachers. In a later publication, Anderson¹⁵ states that the research in general concerns itself with investigations in manuscript versus cursive writing, style of holding a pen, type of materials used, the time that cursive writing should be introduced, problems of speed and quality, teaching

¹³ B.P. Beale, "Trends in Handwriting", Baltimore Bulletin of Education, Vol. 36, No. 2, November 1956, p. 33-38.

¹⁴ D.W. Anderson, "Handwriting Research, Movement and Quality", Elementary English, Vol. 42, No. 1, January 1965, p. 45-53.

¹⁵ -----, "Handwriting Research: Style and Practice", Elementary English, Vol. 42, No. 2, February 1965, p. 115-125.

left-handed children, and a number of instructional suggestions based mostly upon experience and opinion. Hahn¹⁶ comments that of all the elementary school subjects, handwriting is the last to be interpreted in terms of modern psychology. In fact, in practice it is still within the stronghold of tradition.

It is asserted by Horn¹⁷ that all the changes in handwriting systems from Spencerian to vertical to medium slant and manuscript have never been supported by adequate evidence, and that to this day there has been nothing written regarding the influence of perception. Anderson¹⁸ maintains that after fifty years of research, the latest suggestion is that means should be developed to control basic variables, and further that handwriting is not even generally conceived of in the literature as a visual-motor operation.

Although there appears to be no psychological foundation for the teaching of handwriting, it is interesting to note that many articles have been published which seem to touch on the periphery of a perceptual framework. That is to say, that consideration of color, position, posture, use of

16 H.H. Hahn, 'Psychologizing Handwriting', Nebraska Educational Journal, Vol. 23, No. 4, April 1943, p. 114.

17 E. Horn, "Questions for Research in Handwriting", Elementary School Journal, Vol. 62, No. 6, March 1962, p. 304-412.

18 D.W. Anderson, "Handwriting Research", Education Digest, Vol. 34, No. 9, May 1965, p. 42.

REVIEW OF THE LITERATURE

chalkboard and other stimulus conditions are frequently mentioned even though no basis for their use is reported. It may well be that experts in the handwriting field see in a concrete and observational way what others see in a theoretical context. Whereas a theoretical psychologist might talk about the role of kinesthetic stimulation and motor coordination, Cole¹⁹ claims that handwriting is like an athletic skill; that handwriting involves the same basic skill as does hitting a ball, rolling a hoop, or jumping a rope. Thomas²⁰ could be making reference to an organismic approach when he states that discussions of how to hold a pencil have been going on for forty years with no solution in sight. He contends that there appears to be some question as to whether it makes any difference at all as long as the writer is comfortable. Again the organismic concept is alluded to by Freeman²¹ when he suggests that any act or skill can be performed more easily and accurately when certain body positions are assumed. Writing is no exception to this rule. He then goes on to deny the ability of the learner to make appropriate adjustive changes by saying

19 H.W. Cole, "Reflections on the Teaching of Handwriting", Elementary School Journal, Vol. 57, No. 2, November 1956, p. 95-99.

20 A.C. Thomas, "Trouble with Handwriting", Grade Teacher, Vol. 72, No. 9, May 1951, p. 51.

21 Frank H. Freeman, "Teaching Handwriting, What Research Says to the Teacher", Bulletin No. 4, National Education Association, 1954, 33 p.

that the pupil cannot be safely left to himself to assume the best position. Organismic adjustments are observed by Freeman²² when he refers to the fact that when the paper is tilted it is seen that students commonly twist their heads in order to bring their eyes parallel to the line of writing. It is further asserted, however, that students can be trained how to hold their heads; thus, the rigid approach continues, violating the organismic concept. This postural rigidity is further illustrated by Enstrom's²³ instruction to teachers to draw stickmen on the chalkboard showing the best body position desired. The chair is moved away from the desk, writer leaning forward with the upper part of the body touching neither the back of the chair nor the front edge of the desk, feet on floor, and pencil pointing back over the shoulders. More in keeping with the kinesthetic approach was a practice surveyed in Wampanoag County schools²⁴ where it was found that in eighty-seven per cent of the schools, writing is taught by forming letters in the air, tracing letters with fingers, and using the blackboard.

22 Frank H. Freeman, "The Contributions of Scientific Investigations to the Teaching of Handwriting", School and Community, Vol. 17, No. 3, October 1931, p. 374-380.

23 E.A. Enstrom, "Visual Aids Make It Easy to Teach Handwriting", Grade Teacher, Vol. 32, No. 3, April 1965, p. 63.

24 R.N. Soltis, "Handwriting: The Middle R", Elementary English, Vol. 40, No. 6, October 1963, p. 605-607.

So it would appear that the history of the teaching of handwriting is marked by fads and changes lacking objective evidence to lend them support. Accompanying these fluctuations has been a gradual decrease in teacher training in this area and a stronger dependence upon prepared commercial systems for teaching.

The older method of teaching consisted of watching the teacher at the blackboard and copying the movements on paper at the seat as letters and words were written on the board. The teacher, after initially starting the lesson in this manner, would move about the room and give help to the pupils at their seats.

The Palmer²⁵ method, one of the early commercial systems, instructed the teacher to begin the lesson by having the pupils practice vertical and circular strokes on paper at their seats copying the teacher's model from the board. This practice was so integral to the system that it was continued even in the intermediate grades after writing had been taught for several years. Later systems, such as that of Zaner-Slozer²⁶ proposed less teacher involvement, suggested drawing activities as pre-writing practice rather than practicing

25 Clyde C. Lister, Writing Lessons for Primary Grades, New York, A.M. Palmer Co., 1912, 64 p.

26 Frank N. Freeman, Primary Teachers' Manual, Columbus, Ohio, The Zaner-Slozer Co., 1948, 112 p.

specific movements, and in the actual teaching stage had the pupil follow dotted lines of models given in the workbook. Finally, the learner could compare his letter models to those shown on the work page. The two systems outlined here vary considerably in terms of the amount of rigidity required of the pupil as well as conception of how learning takes place.

There seems, therefore, to be some question as to whether or not the pupil should be taught in a strongly rigid fashion or allowed to develop individual style and body position. This somewhat controversial issue poses the real basic problem of a lack of a psychophysical theory to support educational practice. Even action research in the field of handwriting is scanty, and after fifty years of investigation, basic controls and evaluative criteria are still lacking in the research.

Since handwriting is clearly a psychophysical process involving visual motor perception, concept formation, and personality dynamics, and since the opinions of experts in the field deal with various aspects of perception, it would appear that the investigation of perceptual theory is in order to attempt to provide a psychophysical basis for educational practice in the teaching of handwriting.

3. Sensory and Motor Theories of Perception.

Perception is described by Garner²⁷ as a cognitive process involving knowing, understanding, comprehending and organizing. To perceive is to give meaning to that which is sensed. The concept of perception has undergone considerable change since first used in classical psychophysics.

Early sensory theory held that perception was dependent upon the structure and intensity of external stimuli. This approach did not account for individual differences within the organism and treated the perceptual field as isolated from the organism as a whole. Fundamental to this approach was the notion that individuals would in general respond to a given perceptual field in like manner, thus discounting individual differences. Koffka,²⁸ for example, concluded that the sense of vertical is a direct result of the visual field in that it is dependent upon the main contours of the visual field such as walls, floors and ceilings. Hence, the Gestalt position is that perception is prior to action and assumes that the maintaining of bodily equilibrium is first a matter of perceiving and then a matter of acting. An individual's concept of vertical would therefore be a result of the perceived spatial Gestalt or framework.

²⁷ W.R. Garner, "To Perceive is to Know", American Psychologist, Vol. 21, No. 1, January 1966, p. 11-19.

²⁸ Kurt Koffka, Principles of Gestalt Psychology, New York, Harcourt-Brace, 1935, ix-720 p.

Gibson²⁹ states that in the motor theory of perception the behavior theorist would see action as prior to perception. From this viewpoint one must first stand up in order to sense the vertical and that the perception of vertical would be secondary and a direct result of assuming a posture and of the physiological cues inherent in the assumed posture. In this viewpoint as with that of sensory theory, there is no interactive or equivalent relationship between the individual and the perceived object, nor among the sense modalities. The main difference in the viewpoints is that of priority between sensory and motor data.

4. Sensory-Tonic Field Theory of Perception.

Since neither the sensory nor the motor approach to explaining perception would account for the interacting and equivalent aspects of perception, Werner³⁰ developed a new conceptual framework which he referred to as the "Sensory Tonic Field Theory of Perception." In this approach he cites the shortcomings of the earlier points of view in that they fail to explain the role of the organism as a whole in

29 James J. Gibson, "The Relation between Visual and Postural Determinants of the Phenomenal Vertical", Psychological Review, Vol. 59, No. 5, September 1952, p. 370-375.

30 Heinz Werner and Seymour Papner, "Sensory-Tonic Field Theory of Perception", Journal of Personality, Vol. 18, No. 1, September 1949, p. 88-107.

perception, and more specifically in the role of "wholistic" perception. The essence of his position is stated thusly:

Our theory assumes that perception is basically a 'sensory-tonic' event. This means that the factors contributing to perception are tonic as well as sensory. Tonus is used in its wide connotation. It includes the state of organismic tension as evidenced by the visceral as well as by the somatic (muscular skeletal) reactivity. It refers to the dynamic (action) and the static (posture) status of the organism.³¹

Werner³² contends that the validity of the theory can be tested by showing that tonic factors interact with sensory factors in forming percepts, and that sensory and tonic factors are dynamically equivalent. Only if these factors are demonstrated can it be stated that there is a perceptual process which is prior to and greater than either the sensory or motor factor.

In terms of sensory-tonic interaction Werner³³ cites studies which tend to support his contention. In one investigation strong illumination of one eye caused a one-sided increase in body tonus to the side receiving the illumination. Since no tonic stimulation was present, the resulting increase in tonus could be attributed to sensory tonic interaction. The same type of result was obtained using auditory stimuli.

31 Ibid.

32 Ibid.

33 Ibid.

In the Clark University Laboratory³⁴ subjects were asked to adjust a luminescent rod to the vertical while unilateral electrical stimulation was applied to the neck. The results show that the subjects made a vertical tilt of the rod to the side opposite that being electrically stimulated. It was thereby demonstrated that visual perception can be affected by muscular change which supports the contention of sensory-motor interaction.

Dynamic equivalence is described by Werner³⁵ as an equivalence between sensory and tonic functions in that they may act as substitutes for one another with respect to an end product. According to Werner³⁶ this could roughly be conceived of as similar to the concept of sublimation in the psychoanalytic framework. This could be demonstrated if, for instance, kinesthetic stimulation could affect sensory perception, or sensory stimulation affected posture or motor change. This is described as vicariousness of function. Wapner and Werner³⁷ asked subjects in a dark room to adjust

34 Seymour Wapner, Heinz Werner and Kenneth Chandler, "Experiments on Sensory-Tonic Field Theory of Perception: I. Effect of Extraneous Stimulation on the Visual Perception of Verticality", Journal of Experimental Psychology, Vol. 42, No. 5, November 1951, p. 341-345.

35 Werner and Wapner, Op. Cit.

36 Ibid.

37 Seymour Wapner and Heinz Werner, "Experiments on Sensory-Tonic Field Theory of Perception: I. Effect of Body Status on the Kinesthetic Perception of Verticality", Journal of Experimental Psychology, Vol. 44, No. 2, August 1952, p. 126-131.

a luminescent rod to the vertical position under various conditions of head and body tilt. It was found that the mean position of the apparent vertical of the rod was rotated to the left when the head and body tilt were rotated to the right. The results indicated that the organism as a whole tends to accommodate stimulation of one modality by vicariously adjusting another modality. In this case the perception of the vertical was seen as off center left to accommodate for kinesthetic stimulation to the right.

The Clark University studies are all supportive of the sensory-tonic theory and appear to be appropriately designed and executed except for sampling techniques in choosing subjects. In none of the studies is there any indication of how the subjects were chosen except that there were varying ratios of men and women with some reference made to undergraduate students. Since one of Werner's³⁸ original criticisms of early psychophysical research was its lack of attention to individual differences, it seems inappropriate that sampling techniques are not used in his work.

The area that appears in need of demonstration with respect to this theory is the development of perception. None of the studies in the literature has included children although Werner³⁹ cites animal studies which indicate

³⁸ Werner and Wapner, "Sensory-Tonic Field Theory of Perception", p. 88-107.

³⁹ Werner, Comparative Psychology of Mental Development, p. 60.

differences between animal and human development. In one study a dog was placed in a cage and trained to open a door by stepping on a small board placed horizontally on the floor of the cage. However, as soon as the board was placed in a vertical position, the dog was helpless. In another study a dog, which sitting at rest, could not discriminate between a circle and a triangle, until it was allowed to run freely about the room. Both studies indicate that the involvement of the total organism affects visual perception. One could then question whether or not the dynamics described here and seen with adults in the Clark University studies would operate in young children. The results of this study have some bearing upon this question.

The sensory-tonic theory of perception can be applied to the problems involved in learning certain school skills. It may apply particularly in the area of learning handwriting as this is a sensory motor skill involving considerable perceptual feedback.

b. Summary and Hypotheses.

To serve appropriately as a psychophysical basis for the teaching of handwriting, it should be demonstrated that the sensory-tonic principle of organismic behavior holds as a developmental function and that it operates at the age range in which writing is initially taught. This study investigated

the ability of kindergarten and first graders to make perceptual shifts using the Bender Gestalt Motor Test as a measuring tool.

A special copy board was constructed which allows the dimensions of presentation and reproduction of the Bender figures. With this board they can be presented and reproduced in the following combinations: horizontal-horizontal, vertical-vertical, horizontal-vertical, and vertical-horizontal. Using this procedure in order to investigate Werner's organismic principles, the question was raised as to whether or not subjects could make adjustments in terms of perceptual shifts between horizontal and vertical fields. In other words, with motor and sensory feedback, would the prior organismic principle to which Werner refers operate in such a way as to cancel out differences in Bender reproductions without consideration to the orientation of the stimulus field? The question was also raised as to whether or not this is a developmental principle dependent upon general maturation. Stated in terms of the null hypotheses, it was asserted that

1. There is no significant difference between the mean scores of any two of the four combinations of presentations and reproductions of the Bender Gestalt Motor Test in a group of kindergarten pupils.
2. There is no significant difference between the mean scores of any two of the four combinations of presentations and reproductions of the Bender Gestalt Motor Test in a group of first grade pupils.

3. There is no significant difference between the mean scores of kindergarten and first grade pupils for any one of the four combinations of presentations and reproductions of the Bender Gestalt Motor Test.

The next chapter outlines the general experimental design of the study. This includes a discussion of the subjects, tools, procedure, and treatment of the data.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter is concerned with the design of the study which includes the selection of subjects, the rationale for the use of the tool selected, the procedure used including the statistical techniques of analysis, and a reliability study of the tool and the procedure.

1. Subject..

The population from which the sample was drawn is in a central school district with a total enrollment of slightly over 4,000 pupils. It is largely a combination of rural and suburban homes in the towns of North Greenbush, East Greenbush, Schodack, and Lake, and Nassau, in the County of Rensselaer, and the State of New York. The pupils attend five elementary schools located several miles apart. The kindergarten class numbered 367, and the first grade population was 293. A random sample of twenty-four boys and girls was taken from the kindergarten group, and another like sample from the first grade group by drawing names from a box. This age range was selected because it involves a time when the greatest amount of perceptual growth occurs as measured by the Bender and reported by Koppitz in the following table. As can be seen from the table, five-year olds are just beginning to develop competence in the visual motor task

Table 1.-^a

Bender Mean Scores by Age and Sex for Normative Population.

Age	Boys	Girls	All Subjects
5	14.3	13.0	13.6
5½	10.6	8.3	9.6
6	8.3	8.0	8.4
6½	5.2	6.6	5.4
7	5.3	4.2	4.8
7½	4.9	4.4	4.7
8	3.9	3.6	3.7
8½	2.6	2.4	2.5
9	1.5	1.8	1.7
9½	1.6	1.5	1.6
10	1.5	1.7	1.6
10½	1.4	1.5	1.5

^a Elizabeth H. Koppitz, The Bender Gestalt Test for Young Children, New York, Grune and Stratton, 1964, 1-145 p.

involved in the Bender, whereas the seven year old has become relatively proficient. Ilg and Ames¹ also state that the five year old is just beginning to develop the ability to print his name, whereas the seven year old stands on surer ground having eliminated reversals, substitutions, and has the ability to criticize and correct his own productions.

Since the Bender norms show no real differences between the scores of boys and girls, separate groups were not selected on the basis of sex for this study. The results of their test data are reported separately, however.

The mean age for the kindergarten sample in this study was five years and 2 months with a range in age from four years and 9 months to five years and 10 months. The mean age for the first grade children was six years and 5 months, with a range of age from five years and 11 months to seven years and 10 months. One of the boys in the first grade sample was repeating the grade which might help account for the fact that the first grade group was three months older than the one year expected age span.

¹ Frances L. Ilg and Louise Bates Ames, School Readiness, New York, Harper and Row, 1964, p. 47.

2. The Tools of the Experiment.

The nine Bender Gestalt cards together with a two-dimensional plywood stand comprise the tool for research. The stand is described in detail after consideration is given to the selection of the Bender Gestalt test.

Bender,² in developing her test, adapted nine figures from a group designed by Wertheimer as being sensitive to perceptual change, both from a developmental and pathogenic point of view. In her monograph³ she indicates perceptual changes that occur as the result of normal development in children and changes that occur in various pathological deviations. Although this test did not become popular immediately after its publication by the 1950's, it ranked as the fourth most widely used clinical test in the United States.⁴ It still, however, was not used extensively with children until the advent of the rapid growth of school psychology. Psychologists working with young children found that the scoring systems developed for use with adults were not appropriate in evaluating children's Bender protocols, and that

2 Laretta Bender, "A Visual Motor Gestalt Test and Its Clinical Use", Research Monographs No. 3, American Orthopsychiatric Association, New York, 1938, vii-176 p.

3 ibid.

4 N.P. Sundberg, "The Practice of Psychological Testing in Clinical Services in the United States", American Psychologist, Vol. 16, No. 2, February 1961, p. 79-83.

using the test without an objective scoring system was not particularly productive. In 1964, Koppitz⁵ developed a scoring system standardized upon groups of children from ages five through ten. With the assistance of this scoring system the Bender has been used successfully by Koppitz and others⁶ for the long range prediction of school achievement for the study of specific learning problems, as a test of reading readiness, and as a rough measure of intelligence in young children.

The chief advantage of using the Bender in this study lies in the fact that it has an objective scoring system with normative data. As was mentioned earlier, other evaluative procedures have been developed for the measurement of handwriting reproductions, but they require a great deal of subjective evaluation in their rating. In addition to this, it has been shown by Lurçat⁷ and Prudhommeau⁸ that drawing and writing are developmental phenomena of the same general order, and that whereas drawing is the representation of the object,

5 Elizabeth W. Koppitz, The Bender Gestalt Test for Young Children, New York, Grune and Stratton, 1964, p. 1-195.

6 Ibid.

7 L. Lurçat, 'Evolution du Graphisme Entre Trois et Quatre Ans, La Differentiation Entre le Dessin et l'écriture', Revue de Neuropsychiatrie Infantile et d'Hygiène Mentale de l'Enfance, 13 Année, N. 1-2, Janvier-Février, 1965, p. 31-44.

8 M. Prudhommeau, "Les Premières Etapes du Graphisme: Dessin et Écriture Chez l'Enfant", Enfance, Premier Année, 1948, p. 117-125.

writing becomes the sign of the representation of the object. It also is advanced by these authors that writing is the goal of the graphic process and that there is an orderly development from scribbling through drawing behavior to writing.

Various reliability studies have been done with the Bender using different scoring systems and lengths of time between test and retest. Addington⁹ found a reliability coefficient of .71 with a schizophrenic group and a coefficient of .76 with a normal group after two-week intervals. Pascal and Suttell¹⁰ retested normal subjects after twenty-four hours and reported a .71 correlation between test and retest scores. Koppitz¹¹ considers reliability both in terms of the amount of agreement among scorers and in terms of test-retest reliability among subjects. For scorer agreement the range of scores was .88 to .96. For test-retest reliability after a four-month period the average coefficient for kindergarten and first graders was .61: all coefficients were significant at the .01 level of probability. The reliability of the Bender appears to be greater with adults; however, it is difficult to judge as the coefficients

9 H.C. Addington, "A Note on the Pascal and Suttell Scoring System of the Bender-Gestalt Test", Journal of Clinical Psychology, Vol. 3, No. 3, July 1962, p. 312-313.

10 G.R. Pascal and Barbara J. Suttell, The Bender Gestalt Test: Its Quantification and Validity for Adults, New York, Grune and Stratton, 1951, 274 p.

11 Koppitz, Op. Cit.

reflect two different scoring systems. It would be expected though that various changes would occur within a four-month period for children of this age as this time encompasses the period of most rapid perceptual growth.

Since there was no reliability study using the various combinations of horizontal and vertical presentations and reproductions to be utilized in this study the following one was devised. A random sample of forty-two children was chosen from a total group of 126 first grade children in one East Greenbush elementary school. The age of the group ranged from six years and 1 month to eight years and 1 month, with a mean age of six years and 7 months. Four combinations of horizontal and vertical presentations and reproductions of the Bender Gestalt cards were used, each child being subjected to only one of the four combinations. A retest was done for each child after twenty-four hours and the protocols were scored using the Koppitz developmental scoring system. Spearman's rank-difference method of correlation was used and the resulting correlation coefficients and levels of significance are listed in Table II.

The low test-retest correlation for the horizontal presentation and the horizontal reproduction was somewhat surprising since this was the usual manner of administration. Since the size of each group was approximately ten, this could have been a sampling error. An investigation of the

Table II.-

Reliability Coefficients and Their Levels of Significance for
 Four Groups of East Greenbush First Graders Representing
 Various Combinations of Vertical and Horizontal
 Presentations and Reproductions of the
Hender Gestalt Test.

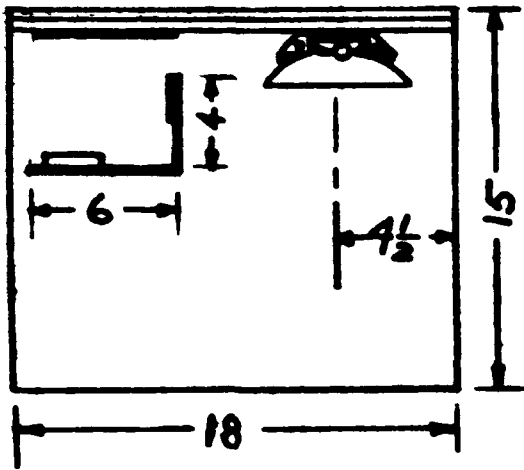
	Vertical Reproduction		Horizontal Reproduction	
	r	p	r	p
Vertical Presentation	.90	.001	.94	.001
Horizontal Presentation	.83	.01	.52	.05

children in this group revealed, however, that four out of the ten children had serious learning disabilities, the genesis of which was in the emotional area. Evaluations of their Bender protocols indicated grossly inconsistent reproductions from one day to the next. The other reliability studies mentioned before are based upon this traditional manner of presentation and reproduction and indicate adequate stability.

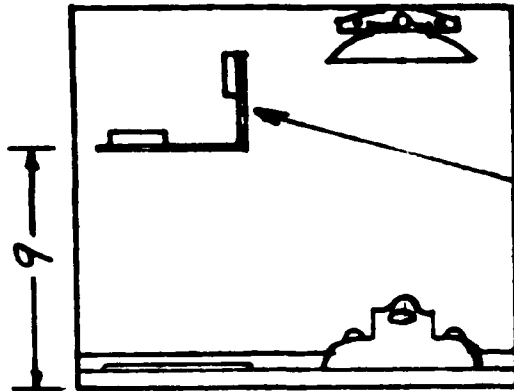
A rank difference correlation for the entire group of forty-two subjects was computed and resulted in a correlation of .86 which was significant at the .001 level of confidence.

A copy board which was utilized in the reliability study was constructed of one-half inch plywood good on both sides. It was designed to be eighteen inches wide and fifteen inches long on each dimension in order to accommodate a regular-sized sheet of paper and the Bender card to be copied. Two standard clips from ordinary clipboards were used to secure the sheet of paper in place. One-quarter round moulding was used to strengthen the juncture of the two boards and improve the appearance of the board. One-eighth inch pieces of pine were used to hold the cards in place. The board was varnished three times and sanded twice to ensure a smooth and regular surface. An illustration of the copy board is given on the following page.

TOP



FRONT



GLUE HOLDER
IN PLACE

END

CLIPBOARD CHIP
2 REQUIRED

$\frac{1}{4}$ ROUND

NAIL &
GLUE JOINT

BENDER COPY BOARD

DATE 1-10-67 DRAWN BY E.R.S. APPROVED

SCALE $1\frac{1}{2}'' : 1''$ REVISED

TITLE

NUMBER

Figure 1.- Two Dimensional Copy Board for use with the Bender Gestalt Test.

3. Procedure.

Each group consisted of a random sample of twenty-four kindergarten pupils and twenty-four first grade pupils. Twenty-four tags were made up and placed in a box. These tags represented each of the possible orders of the four combinations of presentations and reproductions used.

The subjects were asked to come to the examining room one at a time and were seated at the copy board. A tag was then drawn from the hat that determined which order of combination was to be used for that trial. The following instructions were given to each subject:

We are going to play a drawing game. These cards have drawings on them. I will show them to you one at a time and ask you to make a drawing on your paper like the one on the card. Make one like this.

The subject then made a pencil copy of the Bender figure on a plain sheet of paper eight and one-half by eleven inches. An eraser was not provided as erasing is almost impossible for young children on the vertical plane without wrinkling the paper. The rooms used for the testing were undecorated offices of modern design with adequate lighting. The seating arrangement was not controlled as it was important for the subject to be able to make postural adjustments in accordance with the organismic theory. The same desk and chair height were used in each testing situation. After the data was

collected, the protocols were scored according to the Koppitz developmental scoring system.¹²

4. Statistical Treatment of Data.

The significance of differences of mean scores among the groups was tested using the analysis of variance. A two-by-two-by-two model was used involving age, presentation and reproduction, with repeated measures on the last two factors. All components were fixed.

The following chapter presents the results of the study with a discussion of their meaning in terms of the hypotheses presented.

¹² Koppitz, Op. Cit.

CHAPTER III

PRESENTATION OF THE RESULTS

The results of the study are presented and discussed in this chapter in terms of both statistical and observational data. This material is viewed in terms of its conformity to the previously presented hypotheses.

1. The Statistical Analysis.

The Bender protocols were scored according to the Koppitz¹ Developmental Scoring System. The raw scores represented the number of errors accrued for each individual subject for each treatment.

The raw data was treated by applying a two-by-two-by-two analysis of variance with all factors fixed, and repeated measures on the last two factors. The repeated measures model was used as the same subjects were utilized in four separate treatment conditions and therefore acted as their own controls. The summary of the analysis of variance is shown in Table III.

This treatment of the data indicated that significant differences occurred only when age was a factor in the interaction. There were significant differences between the two

¹ Elizabeth M. Koppitz, The Bender Gestalt Test for Young Children, New York, Grune and Stratton, 1964, 1-195 p.

Table III.-

Summary of Analysis of Variance of Modified Bender Scores for
East Greenbush Kindergarten and First Grade
Children in a Visual Motor Task.

Source of Variation	Sums of Squares	df	Mean Squares	F
Between Subjects	5,510.57	47	139.52	
A (age)	5,204.35	1	5,204.35	183.31*
Subject Within Groups Error (a)	1,306.32	46	28.39	
Within Subjects	319.25	144	2.21	
B (Presentation)	.52	1	.52	.0011
AB (age and presentation)	1,036.32	1	1,036.32	23.55*
B X Subj. w. Groups Error (b)	2,255.56	46	44.24	
C (reproduction)	.00	1	.00	.00
AC (age and reproduction)	1,041.64	1	1,041.64	42.67*
C X Subj. w. Groups Error (c)	1,122.89	46	24.41	
BC	.52	1	.52	.0011
ABC	1,048.41	1	1,048.41	23.75*
BC X Subj. w. Groups Error (bc)	2,030.68	46	44.14	

* Significant at the .01 level of probability.

age groups, but no significant differences were seen in terms of combinations of presentations and reproductions for either age group alone. The method of presentation whether horizontal or vertical had no significant effect upon the number of errors found in the reproductions. The dimension of reproduction, whether it was vertical or horizontal, also failed to show any significant effect upon score.

In order to study the effect of age in the areas where significant differences were found by the analysis of variance, "t" scores were computed between the means of each of the kindergarten and first grade groups for the four combinations of presentations and reproductions. The resulting "t" scores are presented in Table IV along with their levels of significance. These scores indicate that wherever age was a factor, there was a significant difference between mean scores.

Although separate groups were not selected on the basis of sex, the random sample of subjects was composed of ten girls and fourteen boys in both the kindergarten and first grade groups. Since the analysis of variance indicated that there was no significant difference among subjects in terms of treatment conditions, "t" scores were computed between boys and girls on the basis of the means of the total scores including all four treatments. Table V presents the "t" scores based on these means and indicates that there was

Table IV.-

"t" Scores and Levels of Significance Between Means of Modified Bender Scores for Kindergarten and First Grade East Greenbush Children Representing Four Combinations of Presentations and Reproductions of a Visual-Motor Task.

Grade	Combinations of Presentations and Reproductions			
	H-H	H-V	V-V	V-H
Kindergarten	M=17.33 t=2.50***	M=16.07 t=2.36**	M=16.41 t=2.25*	M=16.41 t=2.90***
First	M=7.37	M=7.58	M=6.87	M=7.33

- * Significant at the .05 level of probability.
- ** Significant at the .02 level of probability.
- *** Significant at the .01 level of probability.

Table V.-

"t" Scores Between Means of Modified Bender Scores for East Greenbush Kindergarten, First Grade, and Total Groups of Boys and Girls in a Visual-Motor Task.

	Kindergarten	First Grade	Total
Boys	M=73.38 t=1.14	M=30.05 t=.075	M=52.11 t=.30
Girls	M=59.30	M=29.50	M=44.50

no significant difference between the mean scores for boys and girls at either the kindergarten or first grade level. This also held true when both groups were combined; that is all boys and all girls.

2. Observations of Subjects' Behavior.

In addition to the statistical data obtained, the investigator noted the verbal and non-verbal behavior of the subjects while they reproduced the figures. These observations indicated that differences existed between kindergarten and first grade children.

Many of the kindergarten children verbalized meaning in the Bender figure that they were drawing. For example, one child said of card number six: "This looks like two snakes." Another kindergarten girl said that card number three looked like a Christmas tree. This type of physiognomic behavior is described by Werner² as part of the meaningful graphic development in children. The kindergarten children generally took a quick look at the Bender card presented to them and did not look back while they completed their reproductions. Several of the kindergarten children traced the stimulus Bender card with a finger while making the reproduction. These children did not appear able to carry the percept

² Heinz Werner, Comparative Psychology of Mental Development, New York, Science Editions Inc., 1943, p. 263.

through the perceptual integration phase to the actual reproduction. The vast majority of the children were able to carry the percept well, however, even though it might have become somewhat distorted.

The general observation that could be made about the kindergarten children was that they quickly viewed the Bender card and carried the percept to the reproduction without corrections.

The observed behavior of the first grade children presented a somewhat different picture. They appeared not only to be concerned with the reproduction of the stimulus percept, but also with the motor coordination involved in making the reproductions accurate. In this latter regard, they would continually check back to the stimulus card in order to make appropriate motor accommodations in their efforts. They were also considerably more critical of their work in terms of verbal comments about their reproductions than were the kindergarteners. A self-consciousness and an awareness of appropriateness was characteristic of the first graders. Motor control appeared to be more important to first graders than to kindergarteners. In this regard it is interesting to note that according to Table IV the level of significance was lowest whenever a vertical reproduction was involved. Although the perceptual shift was made with facility, errors in fine motor coordination may tend to cancel out differences in score as chronological age increases.

Comments were made by children in both age groups regarding the treatment in which the reproductions were on a vertical plane. In these cases many children said that it was difficult for them to draw the figures. Since there were no significant differences in mean scores for these treatments, it would appear that although greater effort may have been required to work in this postural condition, it did not affect performance.

In terms of postural approaches to the task presented, there was no common denominator in terms of body position used in any one of the four combinations of presentations and reproductions. Each subject appeared to attempt to find a comfortable position in which to draw. This appeared to be very much an individual matter.

Finally, the investigator was surprised to find that although five and six year old children were asked to reproduce the same nine figures four separate times requiring an attention span of twenty to twenty-five minutes, in no case was there any observable indication of lack of motivation. This attentiveness to the task might be accounted for by the value that young children place upon a game-playing type of situation in a one-to-one relationship with an adult.

3. Acceptance and Rejection of the Hypotheses.

On the basis of the statistical treatment of the data by the analysis of variance, hypotheses one and two were accepted because of the lack of evidence of difference due to treatment conditions. Hypothesis number three was rejected which indicated support for significant differences in mean scores due to increased age.

The next chapter is concerned with an analysis of the results in light of the sensory-tonic theory and the implications that the results of this study have for the teaching of handwriting.

CHAPTER IV

ANALYSIS AND IMPLICATIONS OF THE RESULTS

This chapter deals with the analysis of the results of the study in view of the basic tenets of the sensory-tonic theory, and considers this theory in light of its appropriateness as a useful basis for educational practice in the teaching of handwriting. Peripheral motor practices in the initial teaching of handwriting are discussed with respect to their conformity to the results of this study and the organismic viewpoint. Finally, suggested activities of a central nature are given which conform with the results of this study and the sensory-tonic theory.

1. Analysis of the Results.

The two basic tenets of the sensory-tonic theory as were discussed previously, involve the concepts of sensory-motor interaction and dynamic equivalence. The results of this study indicated that five and six year old children were able to make perceptual shifts from one dimensional plane to another with relative facility. These shifts involving the basic tenets of the sensory-tonic theory support this theoretical approach. Comments made by the subjects while reproducing the configurations regarding uncomfortable feelings in making vertical reproductions also support organismic unity and the tendency of the individual to seek postural

adjustments. As further evidence that writing is an organismic task, there was ample evidence of physiognomic behavior exhibited by children who read individual meanings into the configurations and formed meaningful percepts for themselves.

It was demonstrated in this study that perception as measured by the Bender copy board improved considerably with increased age. However, since five year old children were able to make perceptual shifts from one dimension to another, it could not be determined at what age this ability begins to develop. Although the instrument used in this study was appropriate for testing the stated hypotheses, it would be of theoretical value to determine the maturational level at which perceptual shifting affects graphic reproductions. In a future study, three and four year old children could be utilized using geometric configurations appropriate to their age level such as circles, squares, triangles, crosses, horizontal and vertical lines. It would also be of interest to study perceptual shifts with young children shifting on the same dimensional plane with presentations in front of and next to the area of reproduction.

In terms of the present study, the sensory-tonic field theory of perception appears to have functional value as a psychophysical basis for the teaching of handwriting.

2. Peripheral Teaching Practices.

In viewing present-day teaching practices in terms of psychophysical theory, there appears to be considerable inconsistency in technique and a lack of theory supporting the techniques utilized.

With regard to the amount of structure and control given to the beginning writer, the variation runs almost a full continuum from centrally-originated activities to mechanized motor training activities.

The most structured and motor-oriented system reviewed was the Palmer¹ method wherein the student practices line upon line of vertical and oval strokes to prepare his muscles for writing. This system implies that writing is learned up through the arm. Spaulding² implies a similar frame of reference when it is suggested that if letters are made incorrectly, they are then pictured incorrectly in the mind. And again it is asserted that handwriting is a basic means of overcoming the confusions and reversals in reading from which so many children suffer. This type of thinking and subsequent practice tends to highlight the importance of

1 Clyde C. Lister, Writing Lessons for Primary Grades, New York, A.H. Palmer Co., 1912, 64 p.

2 Rosalda Bishop Spaulding and Walter T. Spaulding, The Writing Road to Reading, New York, Whiteside, Inc., 1957, p.82.

peripheral behavior, and gives priority to training muscle activities. The same frame of reference is used with respect to postural structuring. Freeman³ gives explicit directions for postural positions that the learner should take both at the blackboard and at his desk. Similar instructions are given by Spalding:

Sit with hips against the back of the chair. Put both feet on the floor but put no pressure on them, nor in the knees. Sit with the head pushed up as high as possible so as to have no weight on the arms as they rest on the desk. Tip the body forward but keep it about two inches away from the desk. Put both forearms on the desk, with elbows just off the front edge of the desk. Keep the side of the paper parallel to the writing arm. (Like a railroad track, the arm is one track and the edge of the paper is the other.)⁴

Exact instructions are given as to holding the pencil:

Hold the pencil between the thumb and the third finger. They are held opposite each other to form a vise. Round the index finger and avoid pinching the pencil. Hold it at the place where the point begins. The pencil should lie on the index finger just below the knuckle [...].⁵

Noble⁶ takes a middle-of-the-road approach by suggesting that beginning writers practice drawing stick figures, straight lines, and circles as writing readiness

³ Frank N. Freeman, On We Move Recorder, Columbus, Ohio, Zaner-Bloser Co., 1964, p. 1.

⁴ Spalding and Spalding, Op. Cit., p. 69.

⁵ Ibid., p. 69.

⁶ J. Kendrick Noble, Better Handwriting for Everyone. New York, Noble and Noble Inc., 1962, p. 2.

activities. At the same time, however, he suggests that the actual initial writing be begun on unruled twelve-by-eighteen inch newsprint, offering little structure to the pupil. This last activity is more in keeping with a wholistic view of the handwriting process.

3. Central Teaching Practices.

When the pre-school child begins to scribble and then draw no one insists that his hand be guided a certain way or that he assume a stereotyped postural condition. When he enters school, however, it is often insisted upon that his peripheral motor behavior in the writing process be highly structured. The results of this study indicate that graphic behavior is a highly individualized matter and that there is no common denominator of body position in its performance. There appears to be no right or wrong way in which to sit. Thomas⁷ has stated that arguments of how to hold a pencil have been going on for forty years with no end in sight. This present study would suggest that there is no "right" way to hold a pencil; this too is an individual matter.

The results of this study suggest the utilization of many current practices in the teaching of handwriting other than the rigid approaches previously mentioned. Formal

7 A.C. Thomas, "Trouble with Handwriting", Grade Teacher, Vol. 72, No. 4, May 1955, p. 51.

writing would most appropriately be begun in first grade based upon individual readiness. The Bender scores obtained by the kindergarten children in this study indicated relatively poor motor coordination and in general a lack of readiness for fine motor activities.

Since handwriting is an organismic function, activities which are basically central to the individual rather than peripheral would be stressed. The following activities selected from Headley's work seem appropriate as pre-writing experiences that would fit the sensory-tonic model for the kindergarten-aged youngster:

1. Finger painting and brush painting.
2. Pasting; cutting and tearing paper.
3. Drawing on paper and at the chalkboard.
4. Lacing shoes and tying knots and bows on shoes or on work aprons.
5. Buttoning and unbuttoning, zipping and unzipping, snapping and unsnapping, hooking and unhooking fastenings on their own clothes, on doll clothes, or on costume clothes.
6. Modeling with clay and other media.
7. Turning the pages of books.
8. Handling cards for matching games.
9. Posting pictures with thumbtacks or pins.
10. Arranging figures on a feltboard.
11. Handling, manipulating and even spelling out words with molded form letters.⁸

Other activities involving knowledge of body parts, self-concept, and directionality in terms of up and down,

⁸ Neith Elizabeth Headley, The Kindergarten: Its Place in the Program of Education, New York, The Center for Applied Research in Education, Inc., 1965, p. 77-78.

left to right, and the use of space, would also be appropriate as pre-writing activities.

The results of this study also suggest that the transition from drawing, painting, and modeling activities, to applying graphic symbols to these percepts should not be difficult once eye-hand motor coordination has matured to an appropriate level. According to the adaptation of the sensory-tonic theory to the process of handwriting, the importance in handwriting is not in being able to copy symbols, but in the physiognomic link of the symbol to the referent. Pease refers to this type of organismic approach in the following passage:

Ask the child what meaning, if any, he has attached to his symbols. Let him have the fun of explaining. Help the child to see the relationship between his 'symbol system' and any meaning that he has attached to it. (This is what we are all trying to do later as we teach reading and spelling.)⁹

The coordinational aspects of writing should develop with relative facility in accordance with visual-motor maturation, practice and appropriate models.

The results of this study would suggest a word of caution to those responsible for formulation of school programs. With the present crowded curricula of today's schools, it is important that efficient use be made of the time that

⁹ Don Pease, Creative Writing in the Elementary School, New York, Exposition Press, 1964, p. 20.

is available for instruction. It is increasingly important, therefore, that time not be utilized in attempting to teach visual-motor skills before the individual is ready for their performance.

SUMMARY AND CONCLUSIONS

Kindergarten and first grade children were asked to reproduce the configurations on the Bender Gestalt cards in four combinations of presentations and reproductions on two-dimensional planes. A special two-dimensional copy board was constructed for this purpose, and protocols were scored using the Koppitz Developmental Scoring System. Adequate reliability was established for this instrument by a test-retest reliability study.

The results of the study indicated that there was no significant difference for any two of the four combinations of presentations and reproductions for either the kindergarteners or first grade pupils. There were significant differences, however, for all combinations where age difference was a factor.

The findings of the study were discussed in terms of their conformity to the sensory-tonic field theory of perception, and found in keeping with its basic tenets. Five and six year old children were found to be able to make perceptual shifts in visual-motor fields with relative facility.

The sensory-tonic theory was discussed in terms of its appropriateness as a theoretical basis for educational practice in the teaching of handwriting. Using this theory as such a basis suggested certain kinds of Gestalt or wholistic activities for young children in their preparation

for handwriting. These activities were contrasted to peripheral and motor activities advanced by many commercial handwriting systems used in schools today. This study and the interpretation of the sensory-tonic theory advance the central or organismic types of activities as more meaningful and valuable to the young child than the motor activities with which they were compared. It was also asserted that the rigid postural positions advanced by the commercial systems reviewed were out of keeping with the developmental functioning of young children and were opposed to the organismic approach of the sensory-tonic theory.

In terms of future research, it was suggested that since five and six year old children were able to make the kinds of perceptual shifts required of them in this study, it would be valuable from a theoretical viewpoint to ask three and four year old children to perform similar functions using geometrical configurations appropriate to their age level. This might establish the age at which these abilities generally develop. It would also be of interest to study perceptual shifts with young children shifting on the same dimensional plane with presentations in front of and next to the area of reproduction.

BIBLIOGRAPHY

Anderson, D.W., "Handwriting Research: Style and Practice", Elementary English, Vol. 42, No. 1, January 1965, p. 115-125.

A general review of handwriting practices, including styles, materials, and teaching methods. It is used here to demonstrate the lack of depth of the research in this field.

Dougherty, Mary L., "History of the Teaching of Handwriting in America", Elementary School Journal, Vol. 18, No. 4, December 1917, p. 280-286.

A description of the history of handwriting teaching in the United States from sixteen to nineteen hundred. This serves as a general background for the present status of research in this field.

Freeman, Frank H., "The Contributions of Scientific Investigation to the Teaching of Handwriting", School and Community, Vol. 17, No. 8, October 1931, p. 374-380.

Procedures used in the teaching of handwriting. The study is used here to illustrate the relationship between observations made by the author and the sensory-tonic theory.

Gibson, James J., "The Relation between Visual and Postural Determinants of the Phenomenal Vertical", Psychological Review, Vol. 59, No. 5, December 1952, p. 370-375.

This paper discusses the phenomenological viewpoint of perception in relation to the motor and sensory approaches. It lends background to the discussion of the sensory-tonic theory.

Horn, E., "Questions for Research in Handwriting", Elementary School Journal, Vol. 62, No. 6, March 1962, p. 304-412.

This presents a discussion of the transition of handwriting from one style to another without adequate evidence for a need of change. It is used here to further support the lack of evidence for the methodology of teaching handwriting.

Koppitz, Elizabeth M., The Bender Gestalt Test for Young Children, New York, Grune and Stratton, 1964, p. 1-195.

The principle contribution of this work is in supplying normative data for an objective scoring system. This scoring system is used in this study.

Lurçat, L., "Evolution due Graphisme Entre Trois et Quatre Ans, La Differentiation Entre Le Dessin et l' Ecriture", Revue de Neuropsychiatrie Infantile et d'Hygiene Mentale de l'Enfance, 13 Annee, N.1-2, Janvier-Fevrier, 1965, p. 31-44.

This article describes the development of drawing in the young child and its further sophistication as writing. In this study it is used to define handwriting and to tie together the drawing and writing process.

Wapner, Seymour, Heinz Werner and Kenneth Chandler, "Experiments on Sensory-Tonic Field Theory of Perception: I. Effect of Extraneous Stimulation on the Visual Perception of Verticality", Journal of Experimental Psychology, Vol. 42, No. 5, November 1951, p. 341-345.

Sensory motor interaction was demonstrated by this study which is one of the basic concepts of the sensory-tonic theory. It is used here to illustrate and support this theoretical approach.

Wapner, Seymour and Heinz Werner, "Experiments on Sensory-Tonic Field Theory of Perception: V. Effect of Body Status on the Kinesthetic Perception of Verticality", Journal of Experimental Psychology, Vol. 44, No. 2, August 1952, p. 126-131.

This piece of research was developed to demonstrate the concept of vicariousness as dynamic equivalence in that sensory accommodation was shown as the result of kinesthetic stimulation. This supports one of the basic tenets of the sensory-tonic theory.

Werner, Heinz and Seymour Wapner, "Sensory-Tonic Field Theory of Perception", Journal of Personality, Vol. 18, No. 1, September 1949, p. 88-109.

This article presents a conceptual framework to account for a total organismic approach to understanding perceptual behavior. It is used here as a basic framework for the study of perceptual shifts.

APPENDIX 1

MODIFIED BENDER SCORES FOR EAST GREENBUSH KINDERGARTEN
CHILDREN

APPENDIX 1

MODIFIED BENDER SCORES FOR EAST GREENBUSH KINDERGARTEN CHILDREN

Subjects	<u>Presentation-Horizontal Reproduction</u>		<u>Presentation-Vertical Reproduction</u>	
	Horizontal	Vertical	Horizontal	Vertical
A	19	19	21	13
B	18	18	17	20
C	18	19	19	21
D	21	20	17	19
E	13	13	16	16
F	10	8	7	9
G	16	15	12	13
H	19	16	17	20
I	26	18	20	18
J	18	18	15	21
K	14	13	16	14
L	14	17	13	16
M	12	11	12	12
N	17	18	20	15
O	23	22	22	22
P	23	24	24	23
Q	13	16	14	13
R	24	23	24	24
S	16	16	14	14
T	24	24	23	24
U	12	8	19	10
V	10	11	8	10
W	16	19	16	16
X	20	20	17	18

APPENDIX 2

MODIFIED BENDER SCORES FOR EAST GREENEUSH FIRST GRADE
CHILDREN

APPENDIX 2

MODIFIED BENDER SCORES FOR EAST GREENBUSH FIRST GRADE CHILDREN

Subjects	<u>Presentation-Horizontal</u>		<u>Presentation-Vertical</u>	
	<u>Reproduction</u>		<u>Reproduction</u>	
	Horizontal	Vertical	Horizontal	Vertical
A	7	9	7	8
B	6	7	6	7
C	7	6	6	6
D	5	6	5	6
E	6	5	5	5
F	3	10	6	9
G	2	4	4	4
H	6	7	7	6
I	7	7	7	7
J	6	6	6	7
K	7	4	6	4
L	7	8	9	9
M	12	10	11	11
N	10	10	12	12
O	7	9	6	6
P	11	9	14	11
Q	6	8	10	10
R	6	8	10	8
S	7	6	7	7
T	10	11	11	10
U	11	12	12	11
V	3	4	3	4
W	4	4	3	3
X	9	11	11	10

APPENDIX 3

ABSTRACT OF

Vertical and Horizontal Presentations and Reproductions
in a Visual Motor Task

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ABSTRACT OF

Vertical and Horizontal Presentations and Reproductions in a Visual Motor Task¹

A review of the literature on the teaching of handwriting indicates that there is neither a psychophysical theory to support educational practice in the field of teaching handwriting, nor is there a consistent approach in this area of teaching.

Perceptual theory was explored and discussed in terms of an appropriate psychophysical theory to support educational practice in this field. The sensory-tonic field theory of perception appeared to have value as a theoretical basis.

In order to investigate the usefulness of this theory, twenty-four kindergarten and twenty-four first grade children were selected at random and given the Bender Gestalt Test utilizing a specially-constructed copy board. This board was designed in such a way so that the Bender cards could be presented and reproduced both vertically and horizontally allowing for four combinations of presentations and reproductions. The question was raised whether or not kindergarten and first grade children could make certain perceptual shifts

¹ John F. Murray, doctoral thesis presented to the Faculty of Psychology and Education of the University of Ottawa, Ontario, February 1967, viii-57 p.

and postural adjustments when presented with geometric figures on various planes. The individual test protocols were scored according to the Koppitz developmental scoring system.

The data was analyzed using a two-by-two-by-two analysis of variance with repeated measures on the last two factors. Statistical analysis of the data indicated that both kindergarten and first grade children were able to make perceptual shifts from one plane to another. There was a considerable decrease in score from the kindergarten to the first grade which indicated that the type of perceptual development being measured in this study was operating as a developmental phenomenon. The results of the study were supportive of the sensory-tonic field theory of perception.

The sensory-tonic theory and the results of this study were explored as a basis for educational practice in the teaching of handwriting. Current teaching practices tend to fall into peripheral-motor types of teaching techniques and central or organismic activities. This study indicated that organismic approaches are more in keeping with the developmental functioning of young children.

Suggestions were made regarding future research in terms of establishing the age level at which multidimensional visual-motor perceptual shifting skills develop.