The Feasibility of Employing a Neurophysiological Approach to Learning Disabilities in the Public School

Betty M. Zelman

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THE FEASIBILITY OF EMPLOYING A NEUROPHYSIOLOGICAL APPROACH TO LEARNING DISABILITIES IN THE PUBLIC SCHOOL

by

Betty M. Zelman

A Thesis in Partial Fulfillment of the Requirements for the Degree Master of Science in the Field of Speech and Hearing Disorders

June 1965
Each person whose signature appears below certifies that he has read this thesis and that in his opinion it is adequate, in scope and quality, as a thesis for the degree of Master of Science.

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Betty M. Zelman
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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

I. INTRODUCTION

For several years parents and educators have been confronted by a large number of children who have difficulty in learning. They have been puzzled by the many bright children who have problems in learning language skills. Therefore, it has become increasingly important to explore the processes of learning and to seek methods for helping children in our school population improve their learning ability.

The literature indicates that there has never been a time in history when people have not had language problems of one kind or another. Through the centuries, these problems have been handled in many ways. According to some recent authors, there has been renewed interest in a theory de-emphasized in the past. This is the neurological approach to language disabilities. Methods employed for remedial problems in the past, according to Dr. Carl Delacato (1961), have been treating only the symptoms. He also claims that we must treat the basis of the problem, which is in the brain, the center of all learning.

The individuals who are in the public school setting are cognizant of misunderstanding that often arises when reference is made to the brain as the source of a problem. Popularly, any reference to the brain denotes native inadequacies and low mental potential. However, advantages of the neurophysiological concepts are not referring to
native inadequacy, but rather to a deficiency in integration of perceptual and motor skills. This deficiency is due to lack of mobile activity in the young infant and child. Lack of movement hinders myelination of the nerve which in turn is necessary for full maturation of the central nervous system.

The purpose of the project was to investigate the feasibility of a neurological approach to the selection of methods used in the public schools remedial language program.

The experiment was carried out in several schools in the Rialto Unified District. The study is not yet completed at the termination of this paper.

II. REVIEW OF LITERATURE

Gestalt psychologists suggest that responses to a stimulus are not elicited by one factor but by a total constellation of developmental factors concerned with and stemming from the neurophysiological, genetic, environmental and psychological aspects of the organism. The implications here seem to be that in human learning there are variances depending on one's maturation and experiences. It is important, therefore, to recognize these differences in each child, as each child has contributing factors peculiar and unique to him as an individual.

In the past, reading and speech problems have been approached from a peripheral psychological and environmental role. Today we find that research is investigating the core of these problems through the neurophysiological approach. Steuart states:

The neurophysiological approach includes activating eyes, ears, speech, touch, and motion in a simultaneous or in an
interrelated way to establish concepts for objects, for words, and their parts, or for ideas. It concerns the integration of the parts and the whole (Steuart, 1963, p. xiv).

Because of the rapid growth of knowledge, it behooves educators and school personnel to be cognizant that modern research continues to reveal avenues of exploration in the causes and diagnosis of faulty language development. A keen understanding and knowledge of the various new methods of testing and treatment are important in evaluating erroneous judgments of children with language disabilities. The poor reader, for instance, estimated as being lazy, mentally retarded, stupid, emotionally disturbed or having unhealthy attitudes, may in fact have specific defect in the neurological organization of the central nervous system.

The child with minor or severe language problems is often a child with high mental ability, but whose learning has been thwarted by some factors related to physical, neuro, genetic, or environmental elements. Schubert says:

Physical factors may often be involved such as visual anomalies, auditory handicaps, confused dominance, endocrine disfunction and physical immaturity, and prove inimical to reading progress. Mental, emotional and social immaturity also play dominant roles in reading retardation, and in addition, a child's home and school background are part of the total picture (Schubert, 1957, p. 6).

Everything a child knows is learned. The child learns to crawl, walk, talk, smile, and taste through sensory and motor function. Even though he is born with the facility to learn, a definite sequential pattern must be followed or must take place in orderly fashion from spinal cord and medulla, to pons, to mid-brain, to cortex, and finally to hemispheric dominance, which is man's unique development
to neurological organization (Delacato, 1964; Kephart, 1959; Orton, 1927). This complete development of hemispheric dominance is necessary for well-functioning language skills according to these writers.

Dr. Carl Delacato (1961) explains this phenomenon as Neurological Organization. He claims that:

The orderly development in humans progresses vertically through the spinal cord and all other areas of the central nervous system up to the level of the cortex . . . If a low level is incomplete, all succeeding higher levels are affected both in relation to their height in the central nervous system and in relation to the chronology of their development. . . . The final progression must become dominant and must supersede all others (Delacato, 1964, p. 194).

To explain these levels this paper will describe the rationale of neurophysical maturation beginning with the Pons level, as children in the schools very seldom are found to have problems involving levels below the Pons.

**Pons**

1. At the Pons level, the tonic neck reflex is used for propulsion while the body is dragged along with arms and legs in a homolateral position. The eye follows the hand. This is the first stage of hand-eye coordination.

**Mid-Brain**

2. At mid-brain, the child creeps; this takes place at approximately the ninth month. Mobility is manifested by creeping in a cross-pattern fashion. The eyes follow the forward hand. This reinforces sensory-motor stimulation.

At this level is the development of tonal discrimination. The child should be bombarded with music, stories, songs, and vocal play.
Children who have speech problems or problems in phonetic elements would profit by a great deal of tonal stimulation.

Bilateral activities are advocated at the mid-brain level. Children undergoing training in this stage may often become calmer, and show greater skill in concentration.

Visual training includes both monocular and binocular acts. The child holds his own target, while following the target with one eye at a time, and later with both eyes in unison.

Cortex

3. Development of the cortex takes place at approximately one year of age, and is manifested in cross-pattern walking, binocular vision, depth perception, laterality of one side, and language. These functions according to DeHirsch (1963) are usually perfected by the age of four to eight.

When cortical development is complete humans can show skill in mobility, use of language, manual and tactile competence, visual and auditory functions; he is now ready to perceive, integrate, and express his whole being with competency.

Cortical Hemispheric Dominance

4. Kephart (1962) found that one-sidedness dominance is a prerequisite for complete language ability. This is termed Cortical Hemispheric Dominance, and is referred to as laterality of eye, foot, hand, and hearing, which means that each member is on the same side of the body.

A program for mixed dominance depends upon the situation that
is found in the mixture. Delacato (1964) claims that it is easier to re-train an eye than a hand. However, by introducing some of the lower level skills, particularly to young children below eight years of age, it is hoped that some preference for sidedness will have been made. There are many ramifications to eye change that should be left to the discretion of the doctor and therapist, as well as to the student and parents.

If for one reason or another the sequence has not followed this orderly progress, it is felt that language disabilities can result. Children exhibiting language problems under these conditions are referred to as children with Specific Language Disabilities (S.L.D.).

Such a child has a condition Dr. Orton (1937) described as congenital word blindness, or word deafness as "the ability of the patient to recognize and interpret objects, pictures, and so on, but unable to comprehend the written or spoken word" (Orton, 1937, p. 37).

In 1962 Marion Steuart wrote a compilation of the twenty-year study she has done on children with S.L.D. Her description is as follows:

This condition constitutes a language disability. In this case, reading, spelling, speaking and writing problems are specific. The child with this disability can learn, but learning through reading, or sometimes by writing, is disproportionately difficult for him. He is the one who may say he could learn if someone would read to him; or if someone would listen to him "say back" his lesson, rather than require him to write it down. It is easily understood that his language gives rise to emotional problems which are secondary to the primary problem of S.L.D. (Steuart, 1963, p. 17).

The characteristics of S.L.D. are poor visual perception and
memory for words, reproduction of words, poor auditory memory for words or for individual sounds in words, reversals and confusion in direction, oral mix-up of sentences, mirror writing, transposition, poor recall for reproduction of simple figures, confusion of laterality, poor coordination, clumsiness, poor ability to reproduce rhythm sequences, and speech disorders. These children also often show symptoms of hyperactivity and perceptual confusion. Not all named symptoms will be found in any one individual.

Dr. Orton's research led him to believe remedial cases could be detected in very young children, pre-school or primary grades, and that they could be helped by certain sequential methods to strengthen their potential (Orton, 1927, p. 107).

In older children, according to Arlene Jones (unpublished paper):

We can obtain clues of remedial cases from students not working to potential, discrepancy between non-language disability, emotional problems, poor auditory discrimination, visual problems, hearing problems, speech problems, and some severe cases of mixed dominance and bilingual difficulties.
CHAPTER XI

TESTING PROCEDURES

In order to carry out remedial procedures it was necessary to assess the potential abilities of each child by a testing program.

The battery of examinations suggested for diagnosis and evaluation include direct and indirect examination. The evaluation media would consist of case history, autobiography, conferences, observations, physical examination, mental testing, performance tests, educational achievement tests, reading readiness tests, language, speech, and hearing tests. Also included for older students may be special ability, vocational, and personality screening.

Case History

The following is a format of information necessary for a case history. Histories can be revised to suit the situation.

I. General History
   A. Name
   B. Address
   C. Age in months
   D. Birthplace and date
   E. Siblings information
   F. Parents information
   G. Relative information

II. Birth History and Postnatal

III. Developmental History (turned, crept, walked, talked)
IV. Health and Consequential History
V. Present Physical Condition
VI. Coordination (small and large muscles)
VII. Mental and Educational Development
VIII. Pattern of Play
IX. Laterality
X. Language Development
XI. Home Picture
XII. Childhood Problems
XIII. (If Adult) Development
   Vocational
   Educational
   Sexual
   Social

Physical Examination—Adapted from Bakwin

Bakwin (1960) states that the physical examination should include, besides routine examination, motor status, mental status, handedness, and emotional status. (We hope these would include testing for vision, hearing, neurological and endocrinological examinations.) He also feels a personal interview with the child may reveal many aspects of his emotional status. For this the doctor can use pencil and paper tests as the Goodenough Draw-A-Person, Bender-Gestalt cards, and other techniques. Bakwin says that drawings are a valuable aid to elucidating the behavior problems of children and is a rapid way of measuring estimated mental age (Bakwin and Bakwin, 1960).
The Bender Visual-Motor-Gestalt Test measures (1) the visual function, that is, the reception of visual stimuli, (2) the integrative function—the ability to interpret the visual stimuli, and (3) the motor function, in which the visual percept is translated into the act of drawing. The application of the Bender-Gestalt is based on interpretations at different stages of maturation and varies with the maturation level and with how the individual sees the forms. This test can be used from ages 4 to 11. However, this test is used with all ages. Primitive responses include scribbles, loops for dots, lines for dots, loops in massed relationship, perseveration, verticalization of horizontally placed figures and oblique lines. These may indicate brain damage, delay or interference with maturation, reading disability, nervous disease states, and schizophrenia.

The Goodenough Draw-A-Person test is useful beyond that of mental testing. It is an index of the child's conception of himself. Perceptual and personality problems, problems in control of motility, fears, rigidity, withdrawal or aggression tendencies can be detected. It may also be used as a projective technique. In organic brain disease the drawings often show a disorganized figure, with pulls to one side or the other.

**Intelligence Tests**

There has been a great deal of discussion about the correlation of intelligence based on chronological age versus mental age for reading readiness. Conclusions are that intelligence quotients are not always reliable indicators of potential reading. Mental age has recently been used with the feeling, by most investigators, that
a child should be between the mental ages of six and six and one-half to deal with printed symbols and words. DeHirsch (1962, p. 963) prefers to use "developmental age" as she has found that many well adjusted and able children show less social and physical maturation than their peers, and says "these children suffer from what Bender calls a 'developmental lag'" (Bender, 1958, p. 925).

Intelligence tests widely used are an over-all measurement of the child's intellectual potential. Most tests measure in general terms learning, memory, special aptitudes, reasoning, abstraction, adaptability, judgment, and so on.

Wechsler Intelligence Test for Children (WISC) is one of the most popular tests. It is valuable with young children as it has sections on verbal and non-verbal performance and enhances the opportunity for the language-handicapped child. The scales test performance in:

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<td>5. Vocabulary</td>
<td>11. Coding (Mazes)</td>
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**Achievement Tests**

Achievement tests are used with older children and are an index to measure the efficiency of the individual in certain specific respects, particularly those that require training. For instance, Ainsworth states that Achievement tests are used in speech correction primarily for discovering whether or not a child's educational
retardation is due to the influence of his speech defect or his poor reading skill (Ainsworth, 1948).

Two excellent batteries for achievement evaluation are the Stanford Achievement Tests and the Unit Scales of Attainment, but these, according to Ainsworth (1948), should be supplemented by the diagnostic reading tests of Gates and Monroe.

Reading Readiness Tests

With younger children, reading readiness tests are often employed to determine ability.

Anastasi said that reading tests are essentially aptitude tests, and are used to measure those abilities believed to be of greatest importance in learning to read. In lower grades they are used to find out whether a child is ready to start reading. It measures the ability to distinguish forms and to recall sequences. As previously stated, reading readiness tests are similar in their functions and may be substituted for a general intelligence test for younger children (Anastasi, 1955).

The functions usually covered by reading readiness tests are visual acuity, auditory discrimination, motor control, verbal, comprehension, range of vocabulary, and general information. Some of the later tests include alphabet and sound recognition, component parts of words and laterality.

Reading readiness tests include: Gates Reading Test, Metropolitan Readiness Test, Frostig-Developemental Test of Visual Perception, Spache, Durrel, and Sullivan.
A common problem found in S.L.D. children is reversals, due to poor visual perception. The inability to control the muscle balance and train the eye to move from left to right is also a factor in poor reading. Some authorities feel there is some correlation between reversals and laterality.

It is becoming more apparent that sight is not a simple physical process of the eye structure alone. Spencer reports that sight and vision are not the same. Sight is what goes on in the eye and what the eye sends on to the brain. Vision or visual perception is what the brain makes of sight impulses from memory images (Spencer, 1963).

Information gleaned from Kephart suggests that vision is structured for space discrimination, and gives clues which can be used to interpret visual distance and location in space (Kephart, 1962).

Good vision depends upon coordination between nerves and muscles which must be trained, and that good school achievement is dependent on proper visual skills, namely, acuity, accommodation, and fusion.

Eye exercises may aid in the performance to read with flexibility; they often improve the situation of fixations, and help produce effective span.

The following explanation and description of visual skills necessary for adequate reading has been adapted from Vision Conservation Institute.
Visual skills:

**Acuity** is the ability to recognize certain size letters, figures or characters at a given distance. Acuity is one of the important visual skills and is measured with each eye separately and with both eyes together. Testing is usually done for: (1) Far-point—the ability to see properly with each eye separately and both eyes together at a distance of twenty feet or more. This is important for seeing adequately indoors and outdoors. (2) Near-point acuity, where eighty per cent of school activities are accomplished, and is usually in the distance where a child reads. This phase is often missed in the regular school eye evaluation. (3) Binocular coordination, which is the ability to make the two eyes work together. Also tested is field of vision and this is used to determine how much of an area one takes in while focusing on a small spot. This is important in reading, as it determines how much of a word, phrase or sentence one sees at a glance. Common terms often heard to describe the acuities are myopia (nearsightedness), hyperopia (farsightedness), and astigma (lack of point focus).

**Accommodation** is the ability to adjust the curvature of the lens within the eye so that objects at varying distance can be brought into sharp, clear focus. A low accommodation is a low nerve energy reserve or poorly developed pattern of nerve control in the brain. Accommodation can be increased by vision training.

**Fusion** is the ability to line up the two eyes so they both point directly at the object at which you wish to look. Each eye sends its individual sensations to the brain and two pictures are created. If both eyes are fusing normally, the word or picture will be bright and clear and perfect, as this is how the brain perceives them.

Depth perception, distance judgment, speed of recognition, and field of vision depend on good fusion. Poor fusion is one of the principal causes of poor reading learning ability. **Strabismus** is the term often heard to describe poor fusion.

One of the most urgent needs is for eye examination, particularly in the school situation. Anastasi (1955) contributes this information:

When children with dyslexia were reviewed, visual problems were in abundance. Proper visual testing, diagnosis, and treatment is a must to assure adequate performance in visual memory, visual comparison, visual projection and visual imagination, also in visual localization, and visual discrimination of likes and differences which are all employed in every meaningful activity (Anastasi, 1955, p. 395).
**Visual screening tests.** The visual screening tests are the Telebinocular, Ortho-Rater, and Sight-Screener. Each of these three instruments provides measure of near and far acuity, depth perception, lateral and vertical phorias, and color discrimination. According to Anastasi, the Ortho-Rater is somewhat superior to the Sight-Screener. The Telebinocular, which was the earliest of the three, appears to be the least satisfactory.

**Visual discrimination or perception.** Dellirsch explains what a child with immature visual apparatus sees:

For some children nothing on the printed page stands out—in Gestalt terms the "figure" and the ground are fused, and as a result, the printed page looks like an undifferentiated and meaningless design (Dellirsch, 1963, p. 59).

**Auditory**

The fact that poor hearing may be a possibility in the impaired reader is often missed. Many children who are tested with a pure tone audiometer in the school situation and passed as normal hearing children are in actuality handicapped by some form of impaired hearing. In general, reading disability and hearing disability are not necessarily related. Instruction in reading usually involves a large oral component and the child needs to make rather fine auditory discrimination between certain words, and to use auditory techniques in word analysis. The child who does not hear satisfactorily will be handicapped in these activities.

The fact that each person has a different threshold for sound is significant in poor readers. Children with a high frequency or perceptive loss may have never heard the high frequency sounds, or the children with conductive difficulties may not be able to distinguish
sounds of low frequency. At conversational levels high frequency content of speech is weaker than the sounds of the middle and low frequencies.

At the conclusion of her paper to the Claremont Reading Conference, Kennedy (1963) wrote the following:

In conclusion we may say that aural readability is dependent upon many factors. The stimulus pattern must be clear. The receptive and transmission systems (spoken or with symbol) sensory, brain and motor systems adequate. Even when these conditions are met, words unfamiliar to the reader are very likely to be misunderstood. The error most likely to occur is the substitution of a familiar word for one which is unfamiliar. The substitutions are more likely to involve the end of the word than the beginning, especially when low intensity-high frequency sounds are more involved (Kennedy, 1963, p. 120).

The school program should be one which recognizes the fact that more than a pure tone audiometric test is essential for any child with dyslexia. These children should be referred for a complete hearing evaluation.

Tests

**Auditory word discrimination**—ability to recognize similarities and differences in the auditory form of a word.

- Monroe Auditory Discrimination Test
- Wepman Discrimination Test
- Murphy-Durrell Diagnostic Reading Readiness Test
- Peabody-Picture Vocabulary Test

**Simple hearing evaluation tests.** These are for quick evaluation, not accurate.

Watch tick
Tuning forks
Whispered speech

Audiometeric. Standardized test for pitch, loudness, threshold, and ability to hear speech or the spoken word. These tests are best determined by an otologist or audiologist.

Auditory blending—ability to perceive the temporal distribution of sounds in a pattern, to put given sounds together in a word.

Gates Reading Diagnostic Test
Spache
Monroe

Sound matching—to match one sound with a related one, this tests sounds at the beginning and the end of words.

Gates
Monroe

Word meaning—finding words to illustrate pictures.
Durrell-Sullivan

Speech Evaluations

Speech Therapists should not be committed to one method of evaluation. This limits the scope of investigation, leaving many problems undetected.

Evaluation techniques should include: tests for sound discrimination, articulation, structure of speech mechanism, and hearing evaluations. However, to get the full picture, supplementary information is deemed necessary. This added information could include
school performance, mental potential, language background, motor coordination, sound discrimination, and pertinent personality factors.

Many excellent diagnostic speech tests are available from publishing houses and university centers. The foregoing is a sampling of the different types:

- Bryngelson colored cards
- Hygeia black and white cards
- Tempelin-Darley book form

It is also advisable for the therapist to devise his/her own individual "on the spot" technique for diagnosis, to take care of unexpected incompetences.

**Laterality**

Lateral dominance refers to the consistent preference for using one side of the body, which is the ideal situation. Children who have trouble establishing a lateral preference are often children with language problems as well as problems of balance (Delacato, 1961).

Cross-dominance is a general expression applied to people who are left-handed with a dominant right eye, right-handed with a dominant left eye or who have no definite preference as to handedness or eye dominance. Therefore, the student who is left-handed and right-eyed may find it difficult to establish a unilateral hemispheric dominance without practice. Orton has mentioned that faulty dominance is found in poor readers or children with "word blindness" (Orton, 1937).

Although the relationship between language problems and lateral dominance is still debatable, the fact remains that findings
between poor readers and mix-dominance is abundant and as Jean Ayres states, "Although this syndrome of laterality is still a puzzle to me, I hope to investigate it further" (Ayres, 1965, p. 113). (Miss Ayres is at UCLA for a year on this project of investigation.)

Tests

Tests are gross, many and varied, and can be improvised by an administrator who understands the implications of hemispheric dominance and laterality.

- Preferred hand in writing and drawing
- Preferred hand for general use
- Foot used for hopping
- Foot used for kicking
- Foot used for balance or turning
- Eye-ear preference tests
- Telescope
- Hole in card
- Funnel
- Finger ring test
- Watch tick

The tests mentioned in this paper were prepared to identify impairments in the basic sensory and motor skills of children with language problems. If these skills are lacking, the whole complex of perception may be impaired. Identification of the problem may lead to a correctional or remedial program for the child with dyslexia.
Perception

Correlation between the inability for children to perceive similarities and differences in auditory-visual configuration of words, in blending a sequence of sounds into a word pattern and in isolation and matching initial and final sounds of words would, according to Silver (1957-1962), indicate an impairment in perceptual acuity.

Bender-Gestalt

Frostig

Avery

Ayers
CHAPTER III

PROGRAM AND PROCEDURES

I. PROGRAM

The project was carried out in the Rialto Unified School District, Rialto, California. Children involved were from remedial speech and reading classes, special classes, kindergartens, and some primary classes.

Procedures selected were considered in terms of (1) chronological age of children, (2) the extent to which these procedures could be employed in the public school, (3) the qualifications and interest of personnel to employ the procedures, (4) the availability of other personnel to be used in a team approach, (5) the efficiency of the procedures in the evaluation and treatment of language and learning disorders, and (6) the requirement for cooperation in the home in order to employ the procedure program.

Each child was seen individually for speech and laterality testing by the Speech Therapist. If the child was found to have mixed-dominance and had other language problems, he was further evaluated.

In speech classes, each child was instructed in the neurological development program.
II. PROCEDURES FOR NEUROPHYSICAL DEVELOPMENT

Pons

Mobility. In first interview, pupil was put on the "flip" and crawling to establish coordination skills. The child was instructed to lie prone in homolateral position. This position is at the Pons level and is in preparation for crawling. He turns head facing either right or left hand with thumb in front of face. The leg on same side of body is flexed upward toward elbow. On the word "flip" child reverses position to opposite side. Counting may be varied or surprise call such as 'flip', 'flop' may be given. Children enjoy this act and revel in their improved coordination. Child with poor body image, poor motor coordination, faulty directionality may be discovered during this practice. This is done from two to five minutes a day, twice a day. This position is also advocated for sleeping (Delacato, 1964).

From this exercise, the child automatically progressed into the crawl. Instead of flipping in place, the call of "pull" is given; child then pulls himself forward on flexed side, pushing with toes and pulling with forward hand. Head moves in appropriate position so that eye is focused on forward hand. Directions are for ten minutes a day, twice a day.

Therapist advises children that this position and motion is performed by soldiers, firemen, and policemen in their training to crawl under obstacles. From reaction of children, it was felt that this type of explanation would enhance their enthusiasm.

Visual pursuit. Visual pursuit at the pons level consists of using one eye at a time following a moving target which is held in
child's hand. The child is instructed to hold pencil, light, or interesting object in right hand, to cup left eye with left hand and to follow figures of right hand with right eye. (Left eye should not be suppressed from moving.) The procedure is then reversed. Movements are circular, square, and oblique. Practice is for one minute twice a day.

At second interview, instructions were for continued "flip" but with more varied rhythms, also were instructions for child to relax for a few minutes in this position, which they enjoyed. They were now instructed to crawl from room to room throughout the house two times a day. Crawling is "flip" position in motion.

Visual pursuit was same as last lesson, added was to follow object with both eyes open with more varied shapes. Two minutes twice a day.

Mid-Brain

*Mobility.* At the third or fourth meeting, depending on the child's progress in the foregoing skills, child was instructed in cross-pattern creeping which is mid-brain function for mobility.

Pupil was told to get in creeping position, move right hand and left leg forward, at the same time to move head slightly toward right forward hand so that eye was looking at forward hand. Then he was to reverse process; left hand and right leg forward, head turned slightly to left with eye looking at forward hand. Precaution should be taken not to have legs touching each other or to scissor. Legs should be in path of hands, feet dragging along without toes turning in or out.

*Visual pursuit.* In visual pursuit, student watches target which
is held in someone else's hand. At this time, formations may be varied as to shapes, distances and rhythms, both eyes open simultaneously. Student enjoys these varied patterns. A resourceful individual may be quite creative. Games can be invented for this practice, as well as for the other practices. Caution: there should be no movement of head. Two minutes twice a day.

Cortex

Mobility. The child is now getting off the ground and standing. He is taught to cross-pattern walk. He steps out with one foot while pointing to that foot with the opposite hand, with eye watching the pointing hand. He then reverses the process and takes a walk around the room remembering to point at the forward hand. Often children will find it easier to twist a little from the waist when pointing. The act at first should be a pronounced and exaggerated one. As the walking becomes more proficient and organized, different rhythms may be introduced. Later the exaggerated movements may be deleted.

Visual pursuit. Stylized visual pursuits are no longer necessary, except to be sure that head is moved with sighting of eyes. Any motivation for visual pursuit is good that is used to stimulate far and near point, wide and narrow range. Free play is an excellent source for stimulation.

A great deal of discussion is advocated at this stage. This is the time when the little child between one and four enjoys experimenting with speech. Speech should be encouraged.
Cortical Hemispheric Dominance

**Motor skills.** In the mid-cortical period four to eight years of age, the child begins to show signs of lateralization. It is at this time that scrutiny of hand, foot and eye preference should be made, and encouraged accordingly. If the lateralization is incomplete, according to Delacato, the hemispheres compete for dominance and a stutter may be the result.

If the stuttering continues, strengthening of the preferred side is attempted. Also, according to Delacato, music and tonal activities should be deleted as the sub-dominant hemisphere is the seat for tonal activity and should not be encouraged. Music is deleted until stuttering is reduced.

Large and small muscle activities are now accomplished with facility.

**Visual pursuit.** If there is a question as to eye change, parents are advised to have an eye evaluation for the child including a Telebinocular test to determine if a change is feasible. If permission is given, the following program is proposed:

1. First work in the area of far point.
   a. Look at far point objects with dominant eye.
   b. Sight with dominant eye (telescope).
   c. Two minutes twice a day.

2. Near point.
   a. As there is no wish to suppress the sub-dominant eye, permission is asked of the vision specialist to use filtering with green and red cellophane. (Often the
b. Filtering is accomplished as follows: Student is asked to buy a pair of inexpensive glasses, remove the lens from the dominant eye, cover the sub-dominant eye with red patch, and cover the reading material with the green cellophane. Also, when writing, a red pencil is used with only the red cellophane over the sub-dominant glass is advocated. These methods allow light to get through to both eyes, which is necessary in order not to suppress the sub-dominant eye.

The stereo-reader is an instrument devised by which both eyes are uncovered, but where the material is fed directly to the dominant eye. The sub-dominant eye sees only a blank page. These instruments are excellent, but expensive.

Writing. Care should be taken to assure that paper is held in the correct position when writing. A 45 degree angle is advocated for the paper position. The right-handed child should tilt his head slightly to the left. The left-handed child tilts his head slightly to the right. The paper should be the distance between the elbow and first knuckle. These provisions place the dominant eye at its greatest advantage in relation to the writing hand.

III. PROCEDURES OF INVESTIGATION

Subjects. The subjects for this study were selected from among students enrolled in the Rialto Unified School District. Students
selected were among those seen regularly by the Speech Therapist. Only students who showed mix-laterality were selected. In addition, subjects were drawn from two other sources. The first of these were students enrolled in special classes of the school district. The remaining subjects were others referred by teachers for evaluation because of possible S.L.D., gross or minor motor incoordination, or suspected of perceptual impairment.

Evaluation of subjects. Evaluation of laterality and motor speech function was conducted for all subjects by the investigator.

Procedures described in Chapter II were employed for the evaluation of laterality and auditory discrimination. Speech motor function was assessed by physical examination of circumoral structures and determination of diadochokinesis, bilabial, lingual dental, and lingual palatal acts.

When possible, psychometrics measures were obtained for the subject by the school psychologists. Psychological evaluation of each subject included one or more tests selected from the following:

The Wechsler Intelligence Scale for Children
Frostig Visual Perception
Illinois Test of Psycho-linguistics
Reading Tests
Tests for Laterality
Tests for Visual-Motor Skills
Peabody Picture Vocabulary Tests

Other tests provided by school district included screening of hearing and vision. These were administered by the school nurse.
In order to obtain a comprehensive history for each child, a conference was held with one or both parents present. The order of the conference followed the outline indicated by the case history included in Chapter II. Parents were also requested to give their permission to include child in the study.

Information regarding hyperactivity, attention span, learning skills, problem handling, attitudes and peer relationships were obtained from school cumulation records of each child. Additional information from school records were academic performance and health records.

Students included in study were routinely referred for physical and neurological examination and professional assessment of visual acuity and function.

Management of subjects. Activities employed in treatment of subjects approximate activities used in evaluation procedures of neurological and perceptual skills and were carried on in conjunction with them. For this reason, no stereotyped treatment program was followed for all subjects. The general program followed represented utilization of activities described in an earlier section of the chapter. Each child was seen once a week for approximately a one-half hour period.

At the time of the parent conference, arrangements were made for continuing activities of the program at home. The general program was explained to parents, management exercises were demonstrated. This was followed by notes which were periodically sent to parents outlining activities to continue the program.
In order to determine the feasibility of employing procedures oriented to a neurophysiological approach in the language skills program of the public schools, the following questions were posed:

(1) To what extent will an administration of a public school district endorse and support the use of procedures oriented to a neurophysiological approach?

(2) Which of the procedures oriented to the neurophysiological approach can be employed in the public school?

(3) Are personnel qualified to employ procedures oriented to a neurophysiological approach when they are introduced to a school setting?

(4) To what extent does the chronological age of a student effect the applicability of procedures oriented to the neurophysiological approach when used in the school setting?
RESULTS AND DISCUSSION

In order to ascertain the feasibility of the application of a neurophysiological approach to the remedial language program of the public schools, procedures of orientation to the promotion of neurological development were introduced into the classroom of the Rialto Unified School District of Rialto, California.

A summary of the distribution of classrooms included in the study is shown in Table I.

**TABLE I**

SUMMARY OF CLASSES IN STUDY PROGRAM FROM SEVEN SCHOOLS, FOURTEEN CLASSES, PLUS SPECIAL STUDENTS

<table>
<thead>
<tr>
<th>Kindergarten Classes</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Classes</td>
<td></td>
</tr>
<tr>
<td>Elementary Level</td>
<td>7</td>
</tr>
<tr>
<td>Junior High Level</td>
<td>1</td>
</tr>
<tr>
<td>High School Level</td>
<td>8*</td>
</tr>
<tr>
<td>Others</td>
<td>40**</td>
</tr>
</tbody>
</table>

* Eight students
** Individual students in remedial speech classes not included in classes tested

School District Support

The support of Curriculum Superintendent and other school administrators was given to the investigator for conduction of the study. The investigator was permitted to carry out the activities needed for the study during the time that the procedures were employed in the
schools. Although the investigator was permitted to carry out the activities needed for the study, it must be pointed out that it is the intent of the school administration to take a critical look at the program before giving endorsement to continue the program in whole or in part. Additional support was provided by the school administration in permitting teachers to take time for activities of the program and in providing and supplying materials. The materials provided included two walking boards, one balancing board and at the time of this writing, other apparatus was being considered, including two additional walking boards and an obstacle course.

Applicability of Procedures in School Setting

On the basis of teacher reports and observations of the investigator, it is felt that in general, procedures in neurophysical activities can be employed in a public school setting. In practice, however, it was found that there were limitations and factors which tend to discourage the use of some of these procedures. The procedures were found to be particularly applicable at the kindergarten level. It was also felt that the greatest limitation was that the classroom for the older student was not conducive to the activities required. Closely related to this was that the older student desired to wear gym clothes when engaged in the activities of the program. Desired by the students was the ready availability of showers following the activities.

Qualification of Personnel

The investigator carried the primary responsibility for conducting the evaluation and activities required for the program. She had had formal course work in which the philosophies and procedures of
neurophysical organization were considered as well as supervised training in the use of these procedures.

Throughout the period of the investigation, the investigator explained the activities to the classroom teacher, student and parents, as well as supervised in their use. It is the opinion of the investigator that school personnel and parents were able to learn and use the procedures employed.

Though physical and neurological examinations were requested for students included in the program, the response was less than desired. Factors which contributed to this were (1) the failure of the parent to obtain physical examination, and (2) the fact that the neurophysiological approach to learning problems is relatively unknown. Similar difficulties were experienced in obtaining satisfactory results for visual evaluation. It may be pointed out that the prevailing response by physicians when requested for permission to include student in program of activities was, "It can't do any harm, try it."

**Effect of Chronological Age**

Information given by classroom teachers and observation by the investigator indicates that the chronological age was not a major factor in determining the extent to which the procedures may be employed. It is felt that the attitude and degree of impairment of the individual students were deciding factors for participation in the program.

**Home Cooperation**

Though parents indicated interest in carrying out activities of program, students frequently reported that the activities assigned at
the previous period had not been carried out faithfully. Reasons given were, "There had not been enough time," "We were not home," "I had home work," "Johnny was sick," etc. On the basis of students' reports, it was felt that home cooperation would be considered minimal.

**Discussion**

The results of the present investigation indicate that procedures oriented to the neurophysical approach can be employed in the public schools. It is felt there are several factors that must be considered, however, before they can or should be universally employed.

For instance, the present study was a pilot investigation. It must be recognized that many of the results reported are of a subjective nature and thus must be considered tentative. For this reason it is recommended that this study should be repeated with provisions to obtain more subjective measures than available at this time.

Several limitations in the use of the neurophysical procedures have been indicated by this study. Probably the most important of these were related to the desirability to pursue the activities of the program in a gymnasium or in the physical educational program. This was felt to be particularly important for older students. This factor suggests the possibility of incorporating the activities in the physical educational program. Another study of this possibility is indicated.

Another factor which was considered a possible factor in the acceptability of the procedure was the social implications of selecting older students for the activities. The results, however, of the study suggested that this was of minor significance.
Another limitation observed during the period of the investigation was a breakdown in coordination for the program. Though it is beyond the scope of the discussion to pursue this factor, as well as specify the responsibilities of a coordinator, it is felt that the experience of the investigator in the course of this study indicates the need of a coordinator for a school program oriented to the neuro-physical approach.

The results of the study have indicated that the cooperation of medical and paramedical professions was less than had been desired. It is felt that this was due in part to a general unfamiliarity on the part of members of these professions with the specific information sought. During the final weeks of the project, members of these professions demonstrated a definite interest in the program and in how they may support it. As a result of this interest, it is anticipated that the contribution of these professions will be greater in the future.

Another factor influencing the degree of medical and paramedical involvement in the study was the extent to which parents followed the recommendation to have a complete physical and neurological examination, and comprehensive assessment of visual acuity and function. Some parents did cooperate in this respect, but by and large the response was poor. It is suggested that this limitation may be minimized more by both comprehensive coordination of the program and the improved understanding of the medical and paramedical professions involved.

Careful consideration must also be given to the efficacy of introducing these procedures into the school program. If, as is adva-
cated by some, these procedures serve a significant role in the prevention and management of language problems, it behooves educators to know that preventive and strengthening procedures can be included in the school program. Questions raised by this possibility are beyond the scope of this investigation and should be considered for further study.

A definite limitation of the program which was noted by the investigator was the lack of participation in the practice activities in the home setting. However, it is felt that this is the responsibility of the student and parent, and as far as a school program is concerned it would not necessarily reflect upon the feasibility of the activities of the program. Their lack of "home work" suggests the need for further study of means to instill a program that provides more reasons for motivating the students and parents.

In concluding this discussion, consideration is given to the response of teachers who were involved in the program. The response varied from skepticism to enthusiasm as the program was presented. As the school year progressed, it was felt that skepticism diminished and in general the teachers reported satisfaction with the results.

Further evidence of the interest teachers have taken in the program is seen in the number who are enrolled in courses dealing with the principles of the neurophysical approach to learning problems.
CHAPTER V

SUMMARY AND CONCLUSION

A program employing the procedures of the neurophysiological approach to learning skills was carried out in the Rialto Unified School District, Rialto, California, during the 1964-65 school year in order to determine the feasibility of such a program in the public schools. Results of the study indicated that:

1. The practices may be employed in public schools.
2. School administrators gave support for the program.
3. School personnel either are or may be trained to carry out the procedures.
4. Chronological age appears to have little influence on the effectiveness of the program.
5. Cooperation from the home cannot be expected to be extensive.
6. Further study should be given to public school uses of procedures oriented to the neurophysical approach.
BIBLIOGRAPHY


Vision Conservation Institute, 321 Security Bldg., 917-1/2 Pacific Avenue, Tacoma 2, Washington


APPENDIXES
APPENDIX A

SUMMARY OF DEVELOPMENTAL SCALE
<table>
<thead>
<tr>
<th>LEVEL</th>
<th>NORMALITY</th>
<th>VISION</th>
<th>HEARING</th>
<th>TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIAL AND</td>
<td>Non-Functional control behavior:</td>
<td></td>
<td></td>
<td>Training at this level for a child over six months of age is a clinical problem to be taken care of by a neurological specialist.</td>
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<tr>
<td>SPINAL CORD</td>
<td>1. Rolling over.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Birth to 20</td>
<td>2. Moving in a circle, or backward movements.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weeks</td>
<td>Functional crawling:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Crawling without pattern.</td>
<td></td>
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<tr>
<td></td>
<td>4. Crawling horizontally.  (Crab-like movements)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Crawling back-and-forth. (Arm and leg of same side move simultaneously)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>6. Crawling head-to-toe</td>
<td></td>
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<tr>
<td>FIRST</td>
<td>7. Crawling without pattern.</td>
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<tr>
<td></td>
<td>8. Crawling horizontally.  (Arm and leg of same side move simultaneously)</td>
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<td></td>
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</tr>
<tr>
<td>6 to 40 weeks</td>
<td>9. Crawling across-pattern.</td>
<td></td>
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<tr>
<td>MED-CRANEY</td>
<td>11. Crawling without pattern.</td>
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<tr>
<td>16 to 60</td>
<td>12. Crawling horizontally.  (Arm and leg of same side move simultaneously)</td>
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<tr>
<td>weeks</td>
<td>13. Crawling across-pattern.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>OUTER AND</td>
<td>A. Early Vertical Movement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORRECT</td>
<td>11. Cross sitting.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEUROTIC</td>
<td>(Holding and objects)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BORNED</td>
<td>12. Cross sitting. (Without help and without effort)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A. 40 to 100</td>
<td>13. Cross sitting.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B. Corrected</td>
<td>A. Early standing</td>
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<td></td>
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<td>BORNED</td>
<td>11. Cross sitting.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>BETWEEN 6 and</td>
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<tr>
<td>6 years</td>
<td>13. Cross-pattern sitting.</td>
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<tr>
<td>C. Improv.</td>
<td>A. Early standing</td>
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<tr>
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<tr>
<td>D. Slightness</td>
<td>A. Early standing</td>
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<tr>
<td>Training</td>
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<tr>
<td>MED-CRANEY</td>
<td>12. Cross sitting. (Without help and without effort)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>BORNED</td>
<td>13. Cross-pattern sitting.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>E. Anomalies</td>
<td>A. Early standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE III</td>
<td>11. Cross sitting.</td>
<td></td>
<td></td>
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</tr>
<tr>
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<tr>
<td>F. Abnormal</td>
<td>A. Early standing</td>
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<tr>
<td>TYPE IV</td>
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<td>G. Anomalies</td>
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<tr>
<td>H. Anomalies</td>
<td>A. Early standing</td>
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APPENDIX B

WHY JERRY CAN READ by Joan Berry

This material was adapted from an article printed in the Sunday Supplement of the Chicago Tribune, printed in September, 1963. The article has been out of print, but may now be obtained by writing to the Chicago Tribune, Chicago, Illinois.
Every teacher has children like Tommy, who cannot seem to learn as well as he should. There's Jack, who reads well for his age level, but not nearly as well as his math scores suggest he should. And Debbie, whose handwriting is illegible and who works so hard to memorize all the spelling words, only to forget them completely three days later.

Joe is still reading "was" instead of "saw".

George stutters painfully. Beth didn't talk at all until she was about 4. She's still hard to understand and immature in her speech patterns although she's in 4th grade.

Robbie may be assigned to a special education class instead of a regular public school because of his marked retardation in speech and reading.

Typically, such children are treated—if at all—by speech therapy and remedial tutoring, as if their problems were of separate types and as if their difficulties lay in their speech organs, their eyes, or the methods by which they were taught. Sooner or later most of them are diagnosed as having emotional problems, and the blame usually falls on their parents. And often they—and/or their parents—are sent to a psychologist, a counseling service, or a psychiatrist.

But speech therapy, phonics, psychology, and pep talks aren't enough to help the Robbies, and Beths, and Joes, and Georges, and Debbies very much. Typically, they limp along scholastically all through school. Although they try much harder than normal students, at least for a while, they seldom learn to read well or to enjoy reading. They often become behavior problems as elementary students, dropouts in high school.

Those who make it through high school graduation have found it difficult or impossible to get into college, and they seldom succeed in a job requiring language skills.

The reason: They have not been treated where their problem really is. So says Dr. Carl H. Delacato, director of the Institute for Language Disability, a division of the Institutes for the Achievement of Human Potential, in Philadelphia.

Doctor Delacato considers all of these problems—aphasia, delayed speech, stuttering, retarded reading, poor spelling and writing, and reading below mathematical ability—as nearly different degrees of the same problem—inadequate neurological organization. He has developed a neurological approach to helping these youngsters which is generating world-wide excitement because of its dramatic successes.

Dr. Delacato is the educator in the group of doctors, surgeons, and therapists, who began 20 years ago to find better ways of helping children with brain injury and brain-centered learning problems.

How does this new method of treatment help a child with learning difficulties? Jimmy McCarthy is a case in point.

Jimmy, now 7, was brought to the Institute last October.

In 1961 Jimmy had been diagnosed as mentally retarded, according to a referral letter from the McCarthy's family physician.

His I.Q. tested out at 70. The boy would never be able to go to regular public school, his parents were told. They were advised to seek out a special school for
Jimmy's basic problem, according to Doctor Delacato, was poor neurological organization. Somewhere, somehow, during the early months of his life, Jimmy's central nervous system had not developed fully and properly in the necessary sequences. Because of this, he could not learn normally and easily.

A normal baby goes through certain, definite stages of neurological development during the first six to eight years of his life, as specific areas of his spinal cord and brain develop. A great abundance of the proper sensory stimuli from a baby's environment is essential to full and proper development at each stage. The brains of children who are deprived of these stimuli—either because of brain injury or because of factors in the environment—do not develop fully. Such youngsters have difficulty in learning.

Mrs. McCarthy was asked for a complete history of the boy's birth and the preceding pregnancy. Spotting, illness, Rh factors, great weight gain, and severe infection in a mother during pregnancy may have a relationship to learning problems in a child. Length of labor, type and amount of anesthetic, and other details about Jimmy's birth and his condition immediately after he was born were noted to determine the possibility of oxygen deprivation or birth injury, both of which could affect his brain.

Did Jimmy ever have a high temperature during infancy or any problems with feeding, sleeping, or early activity, his parents were asked. How much freedom did he have to move around without restraint during the first six months of his life? When did he start to crawl and to creep? In what position did he creep and for how long before he started to walk? Did he have any head injuries during childhood, any high fevers, loss of consciousness or seizures? Did he ever have his arm in a cast or a patch on an eye? Any of these factors could influence the normal course of neurological organization, Doctor Delacato points out.

Then Jimmy was "programmed." His parents were given precise instructions about activities with which it was believed stimuli could be fed into under-developed areas of his brain. Typically, programming for a child with reading problems covers these areas:

1. Cross-pattern creeping. This is a way of creeping in which the left leg and right arm move forward simultaneously, as the head and neck turn slightly toward the right, or forward, hand. At the next step, the left hand and right leg move forward, as the head and neck turn toward the left hand.

A baby needs great opportunity to cross-pattern creep if his mid-brain area is to develop properly, theorizes Doctor Delacato. A surprisingly large percentage of children with speech and reading problems are not able to creep in this precise fashion without instruction and practice. Checking back, it's usually found that such a child did little creeping as a baby. His parents may have kept him confined in a crib or playpen for long periods. His mother may have believed the floor was not a proper place for a baby to roam. He may have had some injury that limited his movement at this crucial stage. Or, his parents may have pushed him into walking too soon.

Creeping helps the two separate sides of a child's brain to work together in a smooth operation of both sides of his body. Failure of a child to creep long and well enough can be reflected years later in reading problems, Doctor Delacato believes. It can also result in strabismus, or cross-eye movements—in contrast to vision itself—and it is the mid-brain which is stimulated by cross-pattern.
"If we stimulate the extra-ocular fibers at the mid-brain level, we can significantly affect eye movements," explains Doctor Delacato in his book, "The Diagnosis and Treatment of Speech and Reading Problems." The Institute for Language Disability now treats cross-eyed children with a program of activity to stimulate the mid-brain; of 287 youngsters with cross eyes who were treated at the Institute primarily for other problems, the condition was successfully corrected by these methods in 204 cases.

Jimmy's parents were told to have him creep on the floor, with hands flat, fingers together and pointed straight ahead, his head and neck turning toward the forward hand and lifting his knees but dragging his toes, for 30 minutes every day.

2. Cross-pattern walking. For 10 minutes daily, Jimmy was to walk precisely and rhythmically in bare or stockinged feet in this manner: As each foot moved forward, he was to point to its toes with the opposite hand. As he pointed, his head and body were to turn toward the forward foot and his eyes were to focus on the forward hand.

3. Sleep position. Jimmy was next taught a sleeping position he was to use when he went to bed every night. He was to lie on his stomach and on his left cheek, facing right. His right elbow was to be bent so that his right hand rested about 12 inches from his face, palm down. His right leg was to be flexed, with the knee opposite his right hip. Jimmy's left arm was to be placed down by his side, palm up, and his left leg stretched straight down. A right-handed child is taught to sleep in precisely the reverse pattern.

Of course no sleeping child retains a position very long. So Jimmy's parents were told to place him in this pattern once more every night, just before they themselves went to bed.

4. Visual pursuit. For two minutes each day, Jimmy was to hold a pencil in his hand 1 to 2 feet in front of his face and move it horizontally and vertically while he followed it with his eyes.

5. Emphasis on sidedness. Basically, Jimmy was meant to be a left-sided child, Doctor Delacato determined by tests. Not only should he use his left hand for all skilled tasks, he should also be left-footed, left-eyed, and left-eared. But Jimmy wasn't. He pitched a baseball with his right hand. He kicked a football with his left foot. He wrote, painfully and awkwardly, left-handed. But he used his right hand to brush his teeth. And his right eye seemed to be his dominant, or controlling eye.

The human brain has two distinct halves, or hemispheres, the McCarthys were told. Each half controls the opposite side of the body. But language abilities are controlled by the dominant half of the brain. And unless one half of the brain is clearly dominant, the individual has difficulty with written or spoken language, or both.

To become completely left-sided, as Jimmy seemed intended to be, the right half of his brain would have to be helped to develop dominance. Establishment of hemispheric dominance is the final stage of good neurological development, Doctor Delacato told the McCarthys. Normally, it occurs in children sometime between the ages of 2 or 3 and 6 or 7, after they have achieved a good, balanced development of both brain hemispheres working together smoothly.
Brain injury, factors in the environment, or poor neurological development at earlier stages can result in confusion about the establishment of dominance, just as it did in Jimmy's case, points out Doctor Delacato.

Sidedness normally begins with a choice of hand, says Doctor Delacato. Instead of pushing food into his mouth with both hands, the child begins reaching for it consistently with his right (or left) hand. As he continues to use his right hand, it becomes more skilled and the dominance of the opposite side of the brain—the left hemisphere—is developed. Next, a controlling eye is usually evolved, typically on the same side of the body as the preferred hand. With continued use, it becomes the stronger eye. The same pattern follows the footedness and eariness.

Children stutter during the time when both hemispheres of their brain are in perfect balance, explains Doctor Delacato. Normally, this period lasts only a few days, until half of the brain becomes dominant. In children with poor neurological organization, however, the stutter may last for weeks, or longer, and such youngsters hesitate not only in speech, but also in vision, in moving, and in hearing.

"Children who are unable to become completely one-sided need much environmental help to aid in the establishment of dominance," says Doctor Delacato. "One-sidedness, which in turn reflects hemispheric dominance, is prerequisite to reading and complete speech.

"Left-sided children have the greatest difficulty at this level because they live in a right-handed world," explains Doctor Delacato. "Their environment is geared to the convenience of right-handed people who predominate numerically by a 9 to 1 ratio. As a result, the dominance of the left-sided 10 per cent of our population is constantly being challenged by the environment instead of being reinforced by the environment."

To help establish hemispheric dominance, Jimmy was told to use his left hand for everything he did—writing, pitching, eating, brushing teeth, drawing. Doctor Delacato made a point of teaching him how to pitch a baseball left-handed, starting with the proper stance and foot movements, and Mr. McCarthy promised to get his son a left-hander's baseball mitt.

6. Music. Music must be removed, temporarily, from Jimmy's environment as completely as possible, the McCartys were told. He was not to listen to records. He was to be discouraged from singing to himself. No one was to play the piano in Jimmy's hearing. Radio was to be kept at a background level, if turned on at all. TV was permissible, provided the picture was kept bright and the volume low.

Tonality, or music, is a function of the half of the brain which does not become dominant, Doctor Delacato told Jimmy's parents. During the time when dominance is being developed, music gives undesired stimulus to what is in the process of becoming the sub-dominant hemisphere.

As Jimmy progressed, other activities were added to his program, including:

7. Red-green reading. "You need a "boss eye" to go with your "boss hand,"" Doctor Delacato told Jimmy. "It has to be your left eye, too."

To help strengthen the left eye in relation to the right eye, Mrs. McCarthy was
told to buy Jimmy a pair of sun glasses, remove the lens and cover the right eye with transparent red paper. Then she was to place transparent green paper over the page. Jimmy was learning to read without Jimmy's being aware of it, this technique blocked out the print from his right eye, forcing him to read completely with his left.

8. Red, red writing. Wearing the same glasses with one red lens, Jimmy was assigned 5 to 10 minutes daily of writing or drawing with a red pencil. The effect was the same; without his awareness, he was using only his left eye.

9. Hand-paper position. Jimmy was also taught a precise position in which to write. His paper was to be placed at a 45-degree angle, with its bottom right corner pointing directly at his shirt button. His right arm was to rest on the table. His face was to be rotated slightly toward the right hand, so that his left eye would be in the most advantageous position for seeing.

More than 1,000 youngsters are now in active treatment at the Institute for Language Disability, the largest treatment center in the world for children with speech and reading problems. Most of them are improving dramatically. A few do not.

"When we make it, we make it big," comments Doctor Delacato. "How successful we are depends upon the age of the child, the genetic quality of his brain, and whether he has definite brain injury or just poor neurological organization."

The younger the child, the greater and quicker success usually comes, says Doctor Delacato. Seven and eight-year olds with reading problems do far better than 14 and 15 year olds. The Institute now seldom takes a boy or girl over the age of 16 because chances of success are limited.

"For most of the children who come here, it's the end of the line," commented Doctor Delacato. "They have had private tutoring. They've been in special opportunity classes. They have been sent to psychiatrists. They've had the works."

Children with reading problems do have emotional difficulties, Doctor Delacato recognizes. So do their parents. But emotional problems are the result—not the cause—of reading trouble, he believes. Turn the youngster into a skilled reader who is able to do well in school and the emotional upsets of both child and parent disappear.

The average child with a speech or reading problem comes to the Institute an average of only four times, over a period of about a year. Then typically, he is reading and talking at grade level, or above. Parents are charged $50 for the initial evaluation and programming and $25 for each re-evaluation and reprogramming.

A parent can help prevent learning problems in a child by almost the same methods the Institute uses to treat youngsters, says Doctor Delacato—by providing him with ample stimuli to develop every area of his central nervous system in proper sequence. In fact, given a neurologically ideal environment, it seems possible to "make normal kids unbelievably better, astonishingly better," theorizes Doctor Delacato.

He makes several important suggestions:

First, a child should have great opportunity to crawl and creep. He should be
dressed in clothes that don't hinder his movements, but protect his knees. His feet should be bare so he can use them freely. He should be placed on the floor for the largest part of his waking day. He should not be plopped into a playpen or kept in a crib for long periods.

A youngster should never be encouraged or pushed into walking before he is neurologically ready, insists Doctor Delacato. The longer and better he creeps, the more he will develop the vital mid-brain area, he explains. His crib should not be placed against a wall in such a way as to influence his choice of a sidedness.

Parents should not try to establish a toddler's sidedness until he has developed neurologically to this point. He should be permitted to feed himself with both hands, for example, rather than having a spoon placed in his right fist.

When, sometime between the ages of 2 and 5 a child begins to show a preference for his right- or left-hand, parents should begin enforcing this choice. At meals, for example, all of the child's silverware should be placed on his preferred side.

A youngster should be taught to throw, cut, use scissors, hammer, brush teeth, comb hair, pick up objects, gesture, draw, and color with his preferred hand. If he is left-handed, special care should be taken to help him overcome the influences in the environment which try to persuade him to use his right hand at least for some tasks. He should be encouraged to kick, start walking, and stepping with the foot on his preferred side.

Neurological research into the causes, treatment, and prevention of speech and reading problems is still far from completed. But so successful have Institute methods been to date that they are being used by school systems, clinics, and physicians in many parts of the United States and in several foreign countries.
APPENDIX C

EVALUATION AND PROGRAM USED BY WRITER IN THIS STUDY
Name

Date

Grade

School

Birthdate

Laterality & Dominance

Hard

Writing

Position

Finemanship

Reversals

Grasp

eye

Combing

Brushing

Poe

fold arms

Thumb sucking

small objects & direction comments:

block and peg

container with top

cards

FOOT

cross legs

step back

step forward

kick

hop

swing hammer

BIV
EYE

Monocular (both eyes through funnel)

- near
- far

Binocular (telescope)

- near
- far

Cover test (occluding eye)

- left
- right

Finger distance

Visual pursuits

Sports

- baseball
- tennis
- handball
- etc.

Balance

- hop on one foot (with eyes closed and open)
- walk straight line (eyes up, down, wall)

Kinesthesia

- finger to finger (eyes closed)
- finger to nose (eyes closed)

Tactile

- touch
- pinch

article
  (different
  same)
PROGRAM

I. Flip 10 min a day 1 week
   crawl
   scoop
   sleep pattern always

Vision
Visual pursuit
   occlude left eye, hold object in left hand follow figures
   occlude right eye, hold object in left hand follow figures
3-4 min. 1 day 2 weeks

Audition
   talk to child while moving around room
   talk to child when out of his sight

II. Creeping across pattern
    As much time to thin as possible
    left eye follows left hand
    right eye follows right hand

games
   Block building. Blocks placed at one end of room. Child at
other. Child goes back and forth to build tower, one block at a
time. (Oh my)
   Racing for objects tossed to other side of room or yard.
   Flip into box of some objects that have been placed across room.
   Matching cards which have been placed around room.
   Hide rewarding bits of food around room.
   Play keep-away with bean bags.
   Free play: roads, cars, etc.
   Tag and hide-and-seek.
   Red light green light.
   Going shopping from one store to another and home.

Vision

   3-4 min. 1 month
   Binocular both eyes open, holding object in own hand.
   Binocular both eyes open with other person holding object.
   This time area of exercise should be wide enough to make child
   move head.

Audition:

   Music and tonal discrimination and memory important
   Should listen to music a great deal; voice better than
   instrumental - such as folk songs. (Delacato) Children listen
   to such songs for 10 minute period three or four times per week.
Talking is important at this time. If child is listening to someone else, it is good to have the child doing some other type of work such as drawing or looking out of the window, not to watch reader's face. Contrast loud and soft reading and music. This can be done with T.V. Games requiring sounds and memory of sounds are also helpful.

III Cross-pattern walking

10 minute periods 2 times a day

- large muscle movements
- coordination
- free play

Delete music (it's dominance has not been established)

Visual

- far distance
- near
- ball games of varying distances
- targets
- push-ups
- target in own hand
- models
- close work
- writing
- trampolines very good
- jumping up and down or off of high places
- diving

IV For dominant foot (cross-pattern walk) (step pattern)

- picking up objects with toes
- barefoot
- trace with foot
- kick, hop, etc.
- games for one footedness

Hand-

- writing

- tracing sandpaper or objects that stimulate sensation
- copying figures in air and board-large letters on blackboard

- writing position very important
- small writing is brought into play, best in cursive writing games requiring two hands should be discouraged (drums, piano, models)
- good throwing, cutting, scissors, tools, picking small objects, writing

Visual

- Stereopsis-varying performances in all areas.
- Much practice in near point.
- Stereo-Reader

Reading Problems -- Gillingham and Orton
APPENDIX D

SAMPLE OF PRACTICE MATERIALS WHICH CAN BE USED IN CLASSROOM PARTICIPATION

Sample is for General and Basic Movements. Others to be compiled and used at a later date.
PRACTICE I

General and Basic Movements can be employed during physical education and music periods, also for rainy day, inside activities.

Basic Movements are: walking, running, marching, hopping, skipping, jumping.

Walking Board. Begin all activities with the walking board placed so that the broad side is up. If the child is very uncoordinated, it may be best to practice with a 4" strip of paper taped to the floor. Proceed to the board lying on the floor, then with it in the brackets.

1. Walking forward. Walk slowly and maintain balance at all times. Place feet squarely on the board with each step and so that both toe and heel make contact at each step.

2. Walking backward. May need help at first. May need to look back at first, but will soon see that it is easier if he keeps eyes on a target on the board or wall. May explore with toe before shifting weight to that foot. Again must learn to walk slowly and smoothly.

3. Walking sideward. Child stands with feet together, facing across the board and on the left end. He then moves his right foot out, shifts his weight, and moves his left foot until his feet are together again. This sequence is repeated until he has crossed the board. Reverses direction at the end and returns to the starting point. Again, move slowly and maintain balance at all times.

4. Learning to turn on the board is the next step. Walk across the board, turn, and walk back sideways. (Uses a $\frac{1}{2}$ turn.) Variations using the $\frac{1}{2}$ turn, then walk forward across the board, turn, and walk back, forward, etc.

Next, turning in the center of the board. As, walking forward to center of board, turning, and walking backward to the end.

Balance Board. The balance board is a square platform, 16" x 16". Underneath, and in the middle of the board, is a balance post. Three sizes are provided—5" x 5", 4" x 4", and 3" x 3". Begin with the biggest post. When the child can balance on that post without difficulty, change to the middle post, and then to the smallest. If the child has difficulty, pin up a picture or other visual target at his eye level and several feet in front of him. Ask him to keep looking at the picture while balancing on the board. Encourage the child to rock the board, both in the right-left direction, and in the fore-aft direction.

When the child has achieved skill in the simple balancing performance, ask him to perform other neuro-muscular tasks while balancing on the board. Bounce rubber ball on floor, work from large to small, both hands to dominant hand. Also may throw at a target, and do simple calisthenics.
Stepping Stones. Use 6" square pieces of red and black paper taped to the floor for the stepping stones. Tie red string on child's left leg, black on his right. Must match foot to same colored square. Vary the pattern so that the child meets several different tasks, such as long and short steps, crossing feet, hopping on one foot, etc. Start with simpler patterns and work up to more complicated.

Wheel Board. Provide a board about 11' x 18", mounted on four turning castors. The child may lie on the board on his stomach and propel himself by pushing with his hands. May be homologous movement by merely letting the child move himself using hands and feet as he can. Most children will be able to use hands together. Then move to homolateral pattern in which they push alternately with right and left hands.

May also pull self along a rope--hand over hand.

Child may sit on the board. Hold onto board with hands, and move it by his feet--left, right.

(There are few games that require homolateral movement, so this activity is not only popular with the children, but meets a real need.)

Use of playground equipment. Jungle-gym, horizontal ladder, ladder on slide, etc., useful to develop body image, and cross-pattern movement of hands and feet.

Creeping on hands and knees also good to coordinate body. Begin at whatever stage the youngster is now in--homologous, homolateral, or cross-pattern. Work toward good cross-patterning with eyes on the forward hand, head turned slightly in that direction, hand laid down straight, feet dragging, and legs straight--not "scissoring."

Obstacle Course. In which the child follows the trail over, under, around objects; body awareness; how much space is filled, how much is needed.

GENERAL MOVEMENT PATTERNS

All imitative activities which require change of normal posture and muscle tension are good. For example, walking like tin soldiers, being a floppy rag doll, and so on.

Follow-the-Leader games are good, too, as they require not only the motion but the ability to control the body, change quickly, and, in general, use good motor planning. For this reason, this is more difficult than the first activities suggested above. Children start walking, and continue until a change of directions is given. Use running, skipping, hopping on one or both feet, jumping, marching, walking on tiptoe, etc. Vary the length of time the children continue one pattern.

Combine various hand actions with the movement. Change hands action while continuing basic movement, and visa versa. Start with doing the action to which you want them to change, to get them started. Later use only verbal cues. May use other signals for changes.

All basic movements are used--marching, hopping, running, skipping, walking, and jumping.

Jumping rope is an excellent activity to learn coordination of the body. Give help to the children who have difficulty.
APPENDIX E

DELCATO NEUROLOGICAL MOBILITY ACTIVITIES

Copied with permission from: Developmental Scales Manual, by Carl H. Delacato and Glen Doman.
Flip and Homolateral Crawling.
Cross-Pattern Crawling.
Cross-Pattern Creeping

23
Cross-Pattern Walking
LOMA LINDA UNIVERSITY
Graduate School

THE FEASIBILITY OF EMPLOYING A NEUROPHYSIOLOGICAL
APPROACH TO LEARNING DISABILITIES
IN THE PUBLIC SCHOOL

by
Betty M. Zelman

An Abstract of a Thesis
in Partial Fulfillment of the
Requirements for the Degree Master of Science
in the Field of Speech and Hearing Disorders

June 1965
A number of procedures characteristic of the neurophysical approach to learning problems were employed in the Rialto Unified School District. This study was undertaken to determine the feasibility of their use in the public school setting.

The results of the investigation indicate that:

1. The practices may be employed in public schools.
2. School administrators gave support for the program.
3. School personnel either are or may be trained to carry out the procedures.
4. Chronological age appears to have little influence on the effectiveness of the program.
5. Cooperation from the home cannot be expected to be extensive.
6. Further study should be given to public school uses of procedures oriented to the neurophysical approach.

Areas to be considered for further investigation are also indicated.