THE EFFECT OF TRAINING IN GROSS MOTOR AND FINE MOTOR SKILLS ON THE IMPROVEMENT OF READING IN A SELECTED GROUP OF GRADE ONE STUDENTS

by

DAVID E. WELCH

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Department of Physical Education and Recreation

The University of British Columbia
Vancouver 8, Canada

Date November 1, 1968
The purpose of this study was to investigate the effects of special motor training on a group of grade one pupils who were having difficulty in reading.

Ten grade one students were selected from the Sir Richard McBride Elementary School in Vancouver. These pupils were classed as potentially poor readers on the basis of the Metropolitan Reading Readiness Test and the Winter Haven Perceptual Copy Forms Test.

A matched group of ten pupils, which would act as a control group, was selected from the Annex to the McBride School. The two groups were matched according to age, sex, and the results of the reading readiness test and the perceptual form test.

The experimental group received sixteen weeks of special motor training which was carried on for one hour a day, five days a week.

At the completion of the training period all subjects were given the Stanford Achievement Test and the Winter Haven Perceptual Form Test. The differences between the means of the raw scores of the two groups were statistically analyzed. The t-test was used and the t required for significance at the .05 level of confidence was 2.10.
The t's obtained indicated a very significant improvement of the experimental group over the control group in reading ability. The following indicated the obtained t on each item of the reading test plus the perceptual form test.

1. Word Meaning  10.38
2. Paragraph Meaning  5.35
3. Spelling  5.83
4. Word Study Skills  4.04
5. Perceptual Form  11.11

There was no significant difference in vocabulary.

Because of certain experimental conditions which could not be controlled, it could not definitely be indicated that the improvement was due entirely to the motor skills program.

The apparent lack of direct relationship between levels of perceptual ability and reading achievement raises several questions. Further information is needed before the reason for apparent differences between improvement in perceptual and reading skills following a special motor training program can be understood.
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I would like to thank Dr. E.N. Ellis, of the Vancouver School Board, Mr. C.W. McLachlan, Principal of Sir Richard McBride Elementary School, and Mrs. E. Sharpe, the remedial reading teacher at McBride School, for their help.
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CHAPTER I

PURPOSE OF THE STUDY

The fundamental problem that causes the most concern among teachers, pupils and parents at the primary level is reading. At least ninety per cent of a pupil's study time consists of reading (1), and since advanced education is more in demand than ever before, a poor reader has difficulty in meeting the requirements for entrance into college or technical school.

Educators are concerned with students who never seem to acquire the basic fundamentals that will make them good readers. These are children with normal intelligence who do not succeed regardless of the efforts made by the teacher. They are usually labelled as slow learners, lazy, immature, emotionally disturbed, or spoiled.

The students falling into these categories are promoted not because of their academic standing, but because of their age. The older the child, the more aware he becomes of his failure and hence becomes more disturbed about himself. Because of his feelings of inadequacy, discipline problems develop. This frequently results in either a desire to leave school or enter an occupational program.

It is now believed that help can be given to some of these students. Many of them have specific learning problems that can be diagnosed and helped at an early
age. According to Kephart (2), Sutphin (3), and Getman (4) some children enter our public schools deprived of the motor experiences that are necessary for their physical and mental development. It was therefore, proposed to see what could be accomplished by giving special training in motor skills to a group of grade one students who had shown difficulty in readiness for reading.

In consultation with Dr. E.N. Ellis, assistant director of research for the Vancouver School Board, it was learned that Mrs. E. Sharpe, the remedial teacher at Sir Richard McBride Elementary School, Vancouver, British Columbia, had selected a group of ten grade one pupils for a special program of remedial work. Finally, in consultation with Mr. C.W. McLachlan, principal of McBride School and Mrs. E. Sharpe, it was decided the project could proceed with this grade one group.

The hypothesis of the study is that by giving a special program of physical education in which emphasis would be placed on gross motor and fine motor training, a significant improvement would be made in reading ability. This specialized training is to be given to ten grade one pupils who scored low on the Metropolitan Reading Readiness Test Form R, and the Winter Haven Perceptual Copy Forms Test.
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CHAPTER II

JUSTIFICATION OF THE PROBLEM

Mere admission to the first grade on the basis of chronological age does not insure that the child is ready for reading instruction. This early admission for some children, results in a wide variety of conflicts between curriculum, child, teacher, and parent. In public schools the curriculum dictates that reading should start at the approximate age of six years. Few schools are able to provide a reading readiness program for those children who have not reached this state of maturity. The attempt is made to force reading upon all students. This frequently leads to a temporary or permanent maladjustment (1). The backward child soon becomes aware of his lack of success. This results in feelings of frustrations and failures which usually has an undesirable effect on his personality.

Reading is a complex achievement and it is only natural that children will find it so. Many children do not have sufficient command of the basic coordinations of eyes, hands, speech, perception, and comprehension at the age of six years. Gesell (2) makes the following statement regarding this point:

"It is most significant that many of the
early reading difficulties would vanish if the natural processes of maturation were given a chance to assert themselves. It is also significant that many of the graver cases of reading disability which call for clinical guidance and special therapy appear in children of high intelligence."

W. E. Blatz (3) indicates that maturation describes changes which develop in an orderly fashion without direct influence of known external stimuli, but which are most certainly a product of the interaction of the organism and its environment. Maturation stages in children occur at different times. The individual has no control over this. Independent of training or teaching, certain patterns of behavior appear more or less at fixed ages in all children.

Early difficulties can frequently, although not always, be prevented through greater attention to the child's development. Even the child who is likely to have little difficulty with reading will get more enjoyment, more stimulation, and a greater degree of achievement from the school program if his parents give adequate attention to all phases of reading readiness (4).

Normally, a child develops in perceptual motor development during pre-school years. In many children however, the developmental process has broken down. At one of the earlier stages a child may either fail to
develop further or develop in an atypical manner. Such breakdowns in the developmental sequence may be the result of environmental deprivations, injuries or defects in the organism, or emotional pressures with which a child has been unable to cope. Many of these problems reveal themselves in the early elementary grades through difficulties in learning and low academic achievement. It has been established by Kephart (5), Slobodian (6), and Fuller (7) that perceptual motor difficulties are related to problems of school achievement.

Kephart (8) indicates that the early simple games of the child are intended to develop his sense organs and his motor system. The child experiments with things, looks at them, feels them from all angles, smells them, and taps them to produce sound. Such activities can be called acts of experience. By the manipulation of things and the movement of his body in relation to other objects, he is perfecting the sensory motor process and is learning to match sensory data to motor data. He is building up an adaptive perceptual motor process which will allow him to fit his behavior to the varied demands of the situations in which he will later find himself.

Children must learn the relationship of themselves to objects through information obtained from sensory data. They must learn to use this data as a basis for a motor
response which will change their relation to the objects. They must observe the relationships between things and how things operate together. They need much time experimenting on their own. However, in our present society there is a decreasing opportunity for children to experiment with these basic skills. This is because of two reasons. First, the modern home contains more technical objects. For example the electric coffee perculator and the electric clock have replaced the simpler models which formerly fascinated children. Kephart (9) and Getman (10) both mention the usefulness of allowing youngsters to play with the old coffee perculator. They can examine it, and attempt to determine how the parts would fit together. They could see the relationship between smaller and larger, inside and outside, full and empty, upside down and rightsieide up. The development of the electric perculator has now made this useful object almost obsolete.

Secondly, the risk of injury is far greater now than twenty years ago. Then, fire was one of the greatest dangers. A child learned to avoid a stove through senses of touch, sight, and sound. An electric light socket appears harmless to a child but may cause a severe shock or electrocution. If a child thirty years ago wanted to run he did so. Today, for many this is impossible because of the proximity of the houses and busy highways (11).
Nowadays, the child is kept in a play pen or some other means of confinement. In the play pen he will attempt to pull himself up. The creeping pattern has been omitted. Normal motor eye-hand coordination is often underdeveloped. Children who are not confined are on the floor flexing their muscles, setting up counter balancing patterns and finally moving off across the floor toward a target, thus developing eye hand coordination. As they move with greater skill they establish a good cross patterning sequence of movement as nature intended (12).

Getman (13) indicates that retarded children rarely do any creeping in late infancy. This is evident in their general lack of coordination. It is also indicated by Getman that a very large majority of normal children who become crosseyed around the age of three, have by-passed the creeping stages.

It has been pointed out that in many cases the child of today begins school ill prepared for the difficult task of learning to read. It has also been indicated that one of the most important things lacking in this preschool period is training in perceptual motor development. In this study it is proposed to give special motor training to ten grade one pupils who were rated low in readiness to read, to see whether differences will be found in reading ability.
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2. Ibid., p. 313.


9. Ibid., p. 15.


CHAPTER III

REVIEW OF THE LITERATURE

Motor Development

Foundation to every intellectual activity of the human being is the skill of motor control and coordination. Movement and the efficiency of muscle use is a prerequisite for all knowledge and intellectual performance (1). The integration of all body movements is also a prerequisite for the refined motions so necessary to reading and writing. Movement patterns of a whole arm lead to lower arm freedom. Lower arm freedom leads to gross hand skills. Hand skills lead to finger coordinations (2). As arm hand finger controls are established, the feeling of straight line movements will contribute to the straight line action of eyes moving across a line of words and phrases on the printed page. If the gross motor control is lacking or inadequate, the more refined special movements will be restricted or inadequate. These children will usually have great difficulty following a line of printed words. They skip words or lines, and lose their places on the page because they have not developed the coordinated, rhythmical eye movements necessary for reading (3).

Radler and Kephart (4) indicate that motor devel--
Development is the basis upon which is built the child's ability to control his body.

"Each movement made by a developing child is in itself an experience which contributes to the basic store of information held by the brain. In other words movements are not only output; they are input as well. What a child does today affects what he will be able to do tomorrow. All behavior is movement of one kind or another and that the movements made by a developing child constitute learning units that contribute to his total store of knowledge."

The child first develops an awareness of his own body. Once he has learned to control and integrate its parts, he attempts to build up a picture of the world around. At first he relates all ideas of form to himself and his own body. The directions he learns first are towards himself and away from himself. This is followed by ideas of up and down, and left and right. This awareness of outside forms is fundamental to reading.

The child next becomes aware of the vast space outside himself. His first clue comes from the spot in which he is standing. The location of all external objects is related to his own location in space. Beyond the arm's reach of the child, space is essentially visual, and demands, left-right and up-down orientation, distance judgements, and even the visualization of areas that cannot be seen.
Laterality and Directionality

In motor development the need is to develop the muscles for purposes of over all usefulness of the child. However, for preparing a child for reading the concern is with the development of laterality and directionality (5, 6, 7).

There are no objective directions in space. The directions right and left, up and down, before and behind, are attributed to external space on the basis of activities which take place within the organism. The body does not receive from outside any direct information concerning direction. The first direction that seems to develop is that of laterality. This is because nature has made children bilaterally symmetrical. They have two eyes, two legs, two feet, and so on. Within the nervous system is a signal mechanism that relates which side of the body is alerted to action. There is a corresponding counter action on the opposite side. In other words, there must be this opposing corresponding action, a counter balance for every body movement that is made.

Laterality must be learned through experimenting with the two sides of the body, and with their relationship to each other. The best method of developing this laterality is through balance exercises. Only after much experimenting with the two sides of the body does the
child come to know left and right. However, the child may fail to sort out these directions within himself. He may make responses which appear adequate. For example, in one case his responses will be organized so that both sides of the body perform the same act at the same time. If a child is drawing on the blackboard the movements of the other hand will occur but on a much smaller scale. In another case, the child becomes almost completely one sided. In every activity the child performs with one side, the other side remains almost immobile. In these two cases the child has not gained an adequate appreciation of right and left within himself. Confronted with problems of right and left in external space, he will reflect his difficulties through reversals, inaccuracies, and failures. For example, he will read the letters d as b, and p as q. Some of the words that will be reversed are: was and saw, tar and rat, no and on, top and pot, and pan and nap. If there is no left and right inside the organism, there can be no projection of this left and right outside. Consequently, the differences between p and q disappear. Once the child has developed an internal awareness of right and left sides of his own body he can now project these directional concepts into space around him. To reach an object he must make a movement, for example to the right, through a number of such experiences
he learns to translate the right-left discrimination within himself into a right-left discrimination among objects outside himself. Thus he has developed an external awareness of direction which is directionality. Directionality is derived from the kinesthetic awareness in the body. As the kinesthetic awareness is taking place, spatial concepts are being built and visual information relating to direction is received.

Once having developed laterality and directionality the child now tends to develop one side as the dominant side. This will eventually lead to handedness, which normally develops in children after two years of age.

It has been indicated by Kephart, Getman, Sutphin, and others (8) that through training in motor development many of our slow learners will be able to achieve success in reading. The following are three recently conducted studies made in which the emphasis was placed on developing special motor skills in an attempt to improve reading ability.

Duggan (9) in doing a study for his master's degree investigated the effects of special training in motor ability skills on the reading ability of grade two pupils who were all poor readers. He selected thirty pupils and divided them into five groups of six each. Group one was the control group; group two received extra
instruction in motor skills and reading; group three received special training in motor skills; group four received extra reading instruction; group five received training in both reading and visual perception. All the groups but those in the control group received fifty minutes of training every day for thirteen weeks. At the conclusion of training the groups were tested and the results indicated the motor ability group showed no significant improvement in reading. However, it was shown that this group improved in reading ability as much as the control group and special reading group. In fact the t ratio was greater than all of the other groups.

Brown's study (10) consisted of an experimental and control group of forty-eight grade one pupils in each group. These students were reading below grade level. The youngsters in the experimental group were given sixty minutes of motor training a week throughout the school year. At the end of the year, the results of the Stanford Achievement Test indicated that there was not a significant difference in reading between the experimental and control groups.

McCormick and others (11) in their study used a control group, a second group that received extra physical education training and a final group that received perceptual motor training involving gross motor and fine motor exercises. They showed that this specialized training given to the third group produced statistically
significant gains in reading over the first two groups. Each group was made up of fourteen underachieving first grade pupils. The second and third groups received one and a half hours of training a week for seven weeks.

These studies indicate that more research is needed in this field of motor training.

There has been much research done to determine some of the other causes of slowness to read. The studies in reading ability and reading difficulties as reported in numerous publications and articles in education, medical, and psychological periodicals differ very considerably.

**Congenital Word Blindness**

Congenital word blindness is a medical term used to describe a weakness in reading. The errors in reading and spelling are of a special qualitative character. The child experiences difficulty in reading certain letters that are similar to one another, for example, b and d are confused and words such as was and saw appear reversed. It therefore appears that the child has not developed the sense of laterality and directionality. However, it is believed by the medical profession that this fault is the result of a serious pathological condition in children whose brains are otherwise normal and intact. General intelligence and the powers of observation and reasoning are normal or above normal in all actual
cases of word blindness. Hearing is also at least average (12).

Wallin (13) was one of the first to draw attention to the fundamental nature of reading disability. He differentiated between mild cases of disability which he called dyslexia and severe cases which he called visual aphasia. He classified them as word blindness because they were defects in the perception of words. He attributed them to originating congenitally or caused by birth injury.

Orton (14) indicated that word blindness was the loss of ability to read as the result of injury or disease in the parietal lobe of the major hemisphere.

In educational psychology less attention has been paid to cerebral pathology. It is held that the main causes of the underdevelopment in reading ability, in the great majority of cases should be looked for in another direction.

Intelligence and Reading Ability

Vernon (15) indicates that a child with low intelligence is handicapped in learning to read. His vocabulary is smaller than that of the child of normal intelligence and therefore, he may not know the meaning of the words he is trying to read. However, there are a considerable number of average intelligent and above average intelligent children which suffer from reading
disabilities.

Tinker (16) indicates that the most important determinant of reading ability is without doubt, general intelligence.

Lennon (17) emphasizes the importance of taking into consideration the great differences in the correlation between reading ability and intelligence which occur at various grade levels. In his investigations he found continuously increasing correlations from the second grade to the eighth grade.

Durrell (18) in a study of one thousand, one hundred and thirty children in the sixth grade, attempted to find out whether success in reading is related to the child's intellectual capacity, and whether reading ability influences to a significant extent, the results of intelligence tests. The results of Durrell's studies show that the intelligence quotients which were obtained by means of group tests appeared to vary to a significant degree with the reading ability. He also considers that the presence of a reading factor in the intelligence tests is the cause of many children being classified as dull, who in reality are normal or highly intelligent.

Bond and Fry (19) found that children in the fourth, fifth, and sixth grades, whose reading age was below their mental age, tended to be handicapped by their
poor reading ability with regard to items on the Stanford-Binet Tests, which were of a verbal nature.

In conclusion, one can see that it is difficult to determine the intelligence of a youngster by administering a verbal test. Therefore, it is not surprising that a close correlation exists between verbal intelligence and reading performance.

**Importance of Proper Environment at Home for Reading Progress**

Sheldon and Carrillo (20) in a study of eight hundred and sixty-eight pupils from eight schools, showed a positive relation existed between interest in reading in the home expressed in the number of books the child possessed, and the interest he displays at school. "As the number of books in the home increases, the per cent of good readers increases and the per cent of average and of poor readers decreases." The same study showed also a positive relation between the formal educational level and the occupational status of the parents and the success of their children in reading at school.

Malmquist (21) verified the following points as being significant in the relationship between reading disabilities and home background. The following are the points: joint taxable income of the parents; father's education; mother's education; parent's social status;
number of books in the home; size of the dwelling; child's disposal of his own room.

The child's reading successes and satisfactions are enhanced if he is living in a home where reading is not occasional fun only, but an essential feature of family living. If the child is to become an eager reader the parents must invest some effort in the enterprise. **Reading Disabilities Related to Visual Defects**

One of the reasons why a child may have difficulty in learning to read may be due to some kind of visual defect. Much research has been concentrated on investigating the relation between visual defects and reading disability.

Park and Burri (22) found a positive correlation between reading disabilities and visual defects in their studies of an unselected population of two hundred and twenty-five school children in grades one to eight.

Eames (23) working with a group of one hundred and fourteen cases of reading disabilities, and a control group of one hundred and forty-three, found that the visual acuity of the group with reading disabilities was somewhat less, than that of the control group. He found that there was a definite tendency for poor readers to have a greater degree of exophoria both for distance vision and at reading distances.

Dalton (24) studied five thousand school children
in grades three to twelve. She came to the conclusion that there was either no relation or only slight relation between visual difficulties and failure in succeeding at school.

Edson, Bone, and Cook (25) working with one hundred and eighty-eight children in the fourth grade from four schools found no significant differences in reading between children with normal vision and those with defective vision.

In some cases there is an indication that visual defects may prevent the development of reading ability. Consequently, vision should be examined at an early stage in each individual case where reading disabilities occur.

Reading Disabilities Through Auditory Defects

In Malmquist's study (26) of three hundred and ninety-nine subjects in grade one, only three were regarded as cases of auditory defects. These three belonged to the group of medium readers. A follow up study of two hundred and two children of this group, who were now in grade three, was made. The results showed only five had auditory defects to any appreciable extent. These five were distributed in the reading groups as follows: two boys and two girls in the group of medium readers; one girl in the group of good readers. There were no pupils with auditory defects in the group of poor readers.
Reynolds (27) in a study of one hundred and eighty-eight grade four pupils, the same group that Edson, Bond, and Cook used, found that there was no significant relation between hearing and reading ability.

Wallin (28) in his study of eighty-five word blind children was not able to find any significant differences between this group and normal readers as regards auditory defects.

These three studies indicate that the relationship between reading disabilities and auditory defects is relatively unimportant.

**Right and Left Dominance**

Harris (29) indicates that the relationship of lateral dominance, or sidedness to reading disability has been a problem in research for years. In his studies he found that at the age of seven, poor readers showed much greater confusion in identifying left and right than did good readers. He also noted that children with reading disabilities developed much slower in being able to distinguish between left and right and to develop a clear preference for one hand, than other children with normal reading ability.

Balow (30) on the other hand working with three hundred and two grade one children found the following to be true. The group of children with mixed hand domi-
nance scored equally as high as the group with consistent hand dominance, on each measure of reading achievement administered. He also found that having the dominant hand and eye on the same side of the body, on opposite sides of the body, or having mixed hand dominance had no significant effect on reading achievement. In conclusion he states that the children who were confused about right and left at the beginning of the year achieved as much in reading as the children who knew right and left.

Hildreth (31) found that in her studies the right dominant person compared to the left dominant person is less apt to have reading, speech, and spatial orientation difficulties.

It appears that there is considerable controversy over whether the difference between right and left handedness effects reading ability. Nevertheless, it would seem to be advisable to pay some attention to questions connected with this problem of handedness when studying individual children with special reading disabilities.

**Sex Differences**

Another fact relating to reading disability is its apparently greater incidence in boys than in girls. The records of reading clinics and special classes for children with reading disabilities show that practically without exception, the majority of cases are boys (32).

Wallin (33) indicated in his study of two thousand
one hundred and sixteen school children there were four times as many boys as girls among the cases of word blindness.

Anderson, Hughes, and Dixon (34) in a study of one hundred and forty-two boys and one hundred and seventy-five girls found that girls tended to learn to read earlier than boys.

Samuels (35) found in a group of grade ones, a significant difference in reading readiness in favour of the girls. At the end of the grade one year, the girls were on the average about four months ahead of the boys.

The preceding studies on sex differences indicate that girls mature earlier than boys and therefore, are able to develop reading skills more quickly. To compensate for this it would seem advisable to separate the boys and girls in the primary classes so that the boys could be given additional training.

There are many factors which govern the ability of a child to be able to read. However, training in motor development is believed to be a very important contributing factor towards improving a child's performance. It was with this belief that this research was conducted.
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32. Malmquist, op. cit., p. 305.

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CHAPTER IV

METHODS AND PROCEDURES

From the McBride Elementary School, ten grade one pupils were selected for special motor training. They had scored low on the Metropolitan Readiness Test Form R. (1). This test was administered to all grade one students at the school. It is a standard reading readiness test for children entering grade one.

These ten students were given the Winter Haven Perceptual Copy Forms Test (2). This test was administered individually to each student. The results indicated a low standard of readiness to read. The mean of the raw scores is listed in Table I, Chapter V. Manus (3) states that "the odds are approximately six to one that if a child in the five to seven age group scores below sixty he is a low achiever and will have one or more poor visual motor skills".

The test consists of reproducing seven geometric figures: the cross, circle, square, triangle, divided rectangle, vertical and horizontal diamonds. Radler and Kephart (4) indicate that drawing geometric figures is a good indication as to whether the child has developed laterality, directionality and hand-eye coordination. They state that in order to draw a square the child must
have hand-eye coordination. He must have developed the inner and outer awareness of right and left, up and down, forward and backward, and so forth. In order to draw the square he must know that two of the lines in the square go up and down, while the other two go left and right. The child requires considerable muscle coordination in order to change direction in getting around a corner. If the child draws a corner as a bulge, an arc, or an inverted loop, his eye-hand coordination is incapable of reproducing the right angled turn. Another indication that the child perceives the shape but is unable to duplicate it in the drawings is the repeated trials he makes which is indicated by signs of much erasing. If the child draws circles with flat sides or moves his paper while drawing any of the figures the indication is that he has not yet learned to cross the mid line of his body and therefore, has not developed an awareness of left and right.

In Appendix E will be found some examples of the results of the perceptual form test.

A control group of ten grade one pupils were selected from the Annex of McBride Elementary School. The Annex is a separate building situated approximately one half mile from the main school. An attempt was made to match the two groups as closely as possible by age, sex, the results of the Metropolitan Readiness Test and the
Perceptual Form Test. Table I in Chapter V summarizes the results of these tests. Table III, Appendix E indicates the individual scores.

In order to select a group that would be matched with the experimental group it was necessary to test all the students in the three grade one classes at the Annex. This meant testing approximately ninety pupils. As a result, members of the control group were selected from the three classes.

The experimental group received sixteen weeks of special training in gross motor and fine motor activities, for approximately one hour a day, five days a week. The training began on November 6, 1967 and continued to March 1, 1968. There was no training given from December 22, 1967 to January 3, 1968 since this period was the Christmas holidays. Mrs. E. Sharpe, the remedial reading teacher at McBride School instructed the group on Tuesdays and Thursdays. The writer did the instructing on Mondays, Wednesdays and Fridays. This was the only remedial work given to the experimental group. They took all the other subjects in the normal way with their individual classes.

The ten pupils in the control group received no extra motor training.

The program for the experimental group included:

(1) developing skills on the trampoline, agility equip-
ment, balance beams, balance boards, and tumbling mats; (2) exercises using rhythm balls, hoops, bean bags and ropes; (3) formal exercises and games; (4) fine motor exercises which included template tracing and the use of pegboards and puzzles.

An outline of a lesson and the description of all the exercises used is found in Appendix C. Plans for the construction of a balance beam, balance board and a jumping board will be found in Appendix D. The jumping board can be used if a trampoline is not available.

At the completion of sixteen weeks, the experimental group and the control group were given the same perceptual form test as was given to them at the beginning of the experiment. They were also given a reading achievement test. This test was the Stanford Achievement Test, Form W, Primary I Battery (5). The individual scores are found in Appendix E, Table IV. The summary of the results of these tests are found in Table II of Chapter V. The statistical treatment used is outlined in Appendix A.
REFERENCES


CHAPTER V

RESULTS

The information obtained from testing the control group and the experimental group is summarized in Tables I and II. The statistical calculations used to analyse the results of the scores are outlined in Appendix A.

The assumption can be made that one method is superior to another when the difference in means in the performance of the two groups is greater than might be accounted for on the basis of chance fluctuations. If the difference between means is said to be attributed to chance, it is said to be non-significant. In cases where factors other than chance are involved in producing large differences, it is said to be significant. The t-test was used in determining the significance of the differences between means. The five per cent level was used to determine significance.

Table I summarizes the means and standard deviations of all the raw scores of the reading readiness test and the perceptual form test. The means of the student's ages are also indicated. The t-score indicates that the experimental group scored significantly higher in word meaning and the control group scored significantly higher in information, otherwise the groups are very closely
matched.

### TABLE I

DIFFERENCES BETWEEN THE CONTROL AND EXPERIMENTAL GROUPS ON AGE, READING READINESS AND PERCEPTUAL FORM TEST, BEFORE MOTOR TRAINING

<table>
<thead>
<tr>
<th></th>
<th>CONTROL GROUP 10 PUPILS</th>
<th>EXPERIMENTAL GROUP 10 PUPILS</th>
<th>DIFF. M1-M2</th>
<th>S.E. D</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE (MONTHS)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76.6</td>
<td>3.50</td>
<td>77.2</td>
<td>-6</td>
<td>.64</td>
<td>.94</td>
</tr>
<tr>
<td><strong>1. WORD MEANING</strong></td>
<td></td>
<td></td>
<td>-1.7</td>
<td>.57</td>
<td>2.98*</td>
</tr>
<tr>
<td>11.3</td>
<td>3.61</td>
<td>13.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. SENTENCES</strong></td>
<td></td>
<td></td>
<td>-1</td>
<td>.39</td>
<td>.26</td>
</tr>
<tr>
<td>8.8</td>
<td>2.25</td>
<td>8.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. INFORMATION</strong></td>
<td></td>
<td></td>
<td>1.2</td>
<td>.44</td>
<td>2.73*</td>
</tr>
<tr>
<td>11.3</td>
<td>2.63</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. MATCHING</strong></td>
<td></td>
<td></td>
<td>-.2</td>
<td>.49</td>
<td>.41</td>
</tr>
<tr>
<td>12.3</td>
<td>3.92</td>
<td>12.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL (1-4)</strong></td>
<td></td>
<td></td>
<td>-.8</td>
<td>1.68</td>
<td>.48</td>
</tr>
<tr>
<td>43.7</td>
<td>10.91</td>
<td>44.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PERCEPTUAL FORM</strong></td>
<td></td>
<td></td>
<td>-.4</td>
<td>1.43</td>
<td>.28</td>
</tr>
<tr>
<td>51.5</td>
<td>10.81</td>
<td>51.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* t required for significance at the .05 level of confidence is 2.10.

* significant
TABLE II

DIFFERENCES BETWEEN THE CONTROL AND EXPERIMENTAL GROUPS IN READING ACHIEVEMENT AND PERCEPTUAL FORM TESTS AFTER SIXTEEN WEEKS OF MOTOR TRAINING BY THE EXPERIMENTAL GROUP

<table>
<thead>
<tr>
<th></th>
<th>CONTROL GROUP 10 PUPILS</th>
<th>EXPERIMENTAL GROUP 10 PUPILS</th>
<th>DIFF. $M_1-M_2$</th>
<th>S.E.D</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WORD READING</td>
<td>10.0 3.33</td>
<td>18.1 7.11</td>
<td>-8.1</td>
<td>.78</td>
<td>10.38*</td>
</tr>
<tr>
<td>2. PARAGRAPH MEANING</td>
<td>7.6 4.77</td>
<td>13.0 8.97</td>
<td>-5.4</td>
<td>1.01</td>
<td>5.35*</td>
</tr>
<tr>
<td>3. VOCABULARY</td>
<td>15.1 3.25</td>
<td>15.3 3.50</td>
<td>-.2</td>
<td>.47</td>
<td>.43</td>
</tr>
<tr>
<td>4. SPELLING</td>
<td>3.1 2.28</td>
<td>6.6 5.59</td>
<td>-3.5</td>
<td>.60</td>
<td>5.83*</td>
</tr>
<tr>
<td>5. WORD STUDY SKILL</td>
<td>23.2 4.87</td>
<td>27.2 8.77</td>
<td>-4.0</td>
<td>.99</td>
<td>4.04*</td>
</tr>
<tr>
<td>TOTAL (1-5)</td>
<td>59.0 13.31</td>
<td>80.2 31.68</td>
<td>-21.2</td>
<td>3.40</td>
<td>6.24*</td>
</tr>
<tr>
<td>PERCEPTUAL FORM</td>
<td>56.9 7.16</td>
<td>68.9 8.20</td>
<td>-12.0</td>
<td>1.08</td>
<td>11.11*</td>
</tr>
</tbody>
</table>

$t$ required for significance at the .05 level of confidence is 2.10

* significant
In Table II the results of the reading achievement test and the perceptual form test have been summarized. The experimental group showed an increase in means in all categories of the test except in one. There was no significant difference in the vocabulary test. A very significant difference occurred in word reading where the obtained $t$ was 10.38. The experimental group showed a marked increase in perceptual form with an obtained $t$ of 11.11. Other marked differences between the two groups were spelling, paragraph meaning, and word study skills. The overall obtained $t$ indicated the experimental group was superior to the control group.

Therefore, the indication is that the motor training received by the children was instrumental in bringing about a significant change in reading ability.
CHAPTER VI

DISCUSSION

The results of the analyses of the statistical reliability of the differences between means makes it possible to accept the hypothesis that there was a real difference between the control group and the experimental group at the end of the experimental program. There were, however, certain difficulties in assigning an exact cause to this effect due to an inability to control certain conditions under which the experiment was conducted. The following differences in experimental conditions between the experimental and control groups may have influenced the results.

**Number of teachers instructing the two groups**

Each child in the experimental group received instruction from two other people, Mrs. Sharpe and the writer, in addition to receiving regular instruction from their classroom teachers. The children in the control group received instruction only from their classroom teachers. No additional help was given to the members of the experimental group by their teachers.

**Hawthorne effect**

The Hawthorne effect states that an increase in
performance results from the stimulus of receiving special attention over a period of time (1).

One method of determining whether or not there was such an effect and the extent of its influence upon the scores, would have been to compare reading achievement scores of the two groups again at some later period of time following the experiment. The writer hoped that a grade-wide reading achievement test would be administered to all the grade one students at the conclusion of the year. However, upon checking with Mr. McLachlan, the principal of McBride Elementary School, the writer was informed that no such tests were administered. By observing the results of these tests it could have been noted whether the experimental group was still as advanced in reading skills over the control group, as they were when tested at the completion of the experiment.

It would seem possible that at least some of the observed improvement in performance seen could be due to the Hawthorne effect.

Experience of teachers

The two teachers in charge of the classes from which the experimental group was selected were older and more experienced than the three teachers in charge of the classes from which the control group was chosen. The
writer interviewed the classroom teachers of both groups at the conclusion of the experiment and found that although the teachers in charge of the control group were less experienced, their enthusiasm and interest in their work was equal to the more experienced teachers. On some occasions the writer entered the classrooms of both the experimental and control teachers, while classes were in progress, and found the atmospheres to be similar. It would be difficult to indicate what influence this difference in experimental conditions would have on the results of the experiment.

The teachers of the classes from which the experimental group were selected arranged their lessons in such a way that these children did not miss any training in the core subjects. This time was taken up with art work.

Part of the Stanford Achievement Test included an arithmetic test. The results of this test are included in the following table. This test was given to both the control and the experimental groups at the conclusion of sixteen weeks of special training to the experimental group.
### TABLE III

**INDIVIDUAL SCORES, MEANS, AND STANDARD DEVIATIONS BETWEEN THE CONTROL GROUP AND THE EXPERIMENTAL GROUP OF THE STAND­FORD ACHIEVEMENT TEST IN ARITHMETIC**

<table>
<thead>
<tr>
<th>CONTROL GROUP</th>
<th>EXPERIMENTAL GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE</td>
<td>SCORE</td>
</tr>
<tr>
<td>EDWARD C.</td>
<td>32</td>
</tr>
<tr>
<td>RITA D.</td>
<td>16</td>
</tr>
<tr>
<td>MICHAEL H.</td>
<td>7</td>
</tr>
<tr>
<td>BRIAN M.</td>
<td>13</td>
</tr>
<tr>
<td>GEORGE M.</td>
<td>15</td>
</tr>
<tr>
<td>HEINZ</td>
<td>13</td>
</tr>
<tr>
<td>DEBBIE U.</td>
<td>8</td>
</tr>
<tr>
<td>SHARON V.</td>
<td>22</td>
</tr>
<tr>
<td>SHIRLEY W.</td>
<td>16</td>
</tr>
<tr>
<td>BRUCE W.</td>
<td>14</td>
</tr>
</tbody>
</table>

Mean = 15.6
Standard Deviation = 7.14

Mean = 15.9
Standard Deviation = 7.40

Difference in Means = .3

Standard Error of the difference between the Means = .04 (not significant)
In summarizing these results the writer concluded the following:

1. The classroom work that was missed by the experimental group while they were taking their remedial program did not affect their arithmetic skills.
2. The remedial program did not help in improving the skills in arithmetic.
3. The Hawthorne effect did not apply in the case of arithmetic skills.
4. Having more experienced teachers as classroom teachers of the experimental group did not make any difference in the arithmetic results.

Characteristics of the students in the experimental group

David Bo., whose age was ninety-two months and Barbara, age eighty-eight months, the two oldest in the group made very good progress.

David Be., Shawn, and Inez were keenly interested and progressed favourably.

Michael was very immature and required constant supervision and individual help.

Susan and Richard both appeared to be very lazy and uninterested. Many times they refused to participate in the program.

Patricia had much difficulty developing skills
on the trampoline and the balance beam. Her coordination was extremely poor. Although much improvement was made, Patricia, still requires much additional individual help in developing motor skills.

Steven, is a new Canadian of Chinese origin. He speaks very little English. His coordination and balance developed considerably during the sixteen weeks of the program. This is reflected in the results of the perceptual form test.

Although it has been indicated that there were a number of conditions that favoured the experimental group, the writer feels that the program was successful in another way. In consultation with the classroom teachers of the experimental group, they were of the opinion that these children became better adjusted to the school environment. Therefore, their general overall attitude to the school improved, which resulted in a better behavior pattern in the classroom.

Influence of individual scores upon group means

The scores of the final testing in reading achievement and perception are to be found in Appendix E, Table IV. It will be noted that out of all subjects in both groups only four of the experimental group scored fairly high in reading achievement.
The variability of the experimental group total scores in reading readiness was very much greater than the variability of the control group. Four pupils had scores from nineteen to sixty-seven points above the highest score for the control group. These high scoring pupils were enthusiastic participants in the experimental program.

The contribution of the individual reading achievement score of these pupils to the mean score was of a considerable magnitude and thus had a large influence on the t-test of reliability of differences between means in favour of the experimental group. This focuses attention away from the t-test towards the wide differences between individuals in the experimental group.

These differences seem too great to be due to unreliability and it is most unlikely to be due to difference in interest and in capacity to benefit from the experimental program.

Innate drives towards motor activity may differ in different individuals and when opportunity presents itself for release of these drives there may be a release of enthusiasm for the activity which may be carried over into other school activities. This may be one explanation why four enthusiastic pupils scored so high in reading achievement.

Reasons why some of the children were not motivated
to do well might be because of parental attitude towards the school, home environment, intelligence of the child, or a conflict of personalities. Further reasons for individual differences in amounts of improvement shown may be complex.

The apparent lack of direct relationship between levels of perceptual ability and reading achievement raises several questions. Either there is no relationship or it can be attenuated by several factors which destroy the correlation. Lack of reliability in one or both tests could be one of these factors. Further information is needed before the reason for apparent differences between improvement in perceptual skills and reading skills following a motor skills program can be understood.
REFERENCES

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to determine the effect of a special program consisting of gross motor and fine motor exercises on a group of grade one pupils who were having difficulty in learning to read.

The subjects consisted of an experimental group of ten pupils from McBride Elementary School in Vancouver, British Columbia. These students were considered backward in readiness to read according to the results from a standard readiness test and a perceptual form test.

Another group, the control group, consisted of ten grade one pupils selected from the Annex of the McBride School. The groups were matched according to age, sex, and the results of the Metropolitan Readiness Test Form R, and the Winter Haven Perceptual Copy Forms Test.

At the completion of sixteen weeks of specialized training given to the experimental group, both groups were administered the Stanford Achievement Test, Primary I Battery, Form W, and the Winter Haven Perceptual Copy Forms Test.

The difference between the means of the achievement test and the perceptual form test were subjected to
statistical analysis. The t-test was used and the t required for significance at the .05 level of confidence was 2.10. The obtained t's showed that the experimental group was far superior to the control group after it had been subjected to sixteen weeks of special motor training. The following illustrates the t scores that were obtained from items on the reading test.

1. Word Meaning  
   10.38

2. Paragraph Meaning  
   5.35

3. Spelling  
   5.83

4. Word Study Skills  
   4.04

5. Perceptual Form  
   11.11

There was no significant difference in vocabulary.

Conclusions

The result of the study indicates that the differences between means were not due to chance. Therefore, it might be said that one possible reason for the increase in reading skills by the experimental group is the training they received in gross motor and fine motor activities. However, it was not possible to assume that this difference in reading ability of the two groups was unequivocally due to training, because of certain experimental conditions which could not be controlled.

Children with learning disabilities need many
types of special help, not just extra motor training. However, this study has indicated that the physical educator should be an important member of a team devoted to improving the reading ability of youngsters. The child who cannot bounce or catch a ball; walk a straight line; recognize the right and left side of his body; copy geometric figures; skip; or who has poor eye-hand coordination will probably have difficulty with reading. If a program of special motor training can be given to these children before the problem is compounded by school failure then many a potential failure and dropout may be thwarted.
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Vancouver Sun, April 24, 1968.

APPENDIX A

STATISTICAL TREATMENT

The testing of the two groups was carried out in the following way.

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Tests</strong></td>
<td><strong>Initial Tests</strong></td>
</tr>
<tr>
<td>Reading Readiness</td>
<td>Reading Readiness</td>
</tr>
<tr>
<td>Perceptual Form</td>
<td>Perceptual Form</td>
</tr>
<tr>
<td><strong>Special Motor Training Exercises</strong></td>
<td><strong>Training Exercises</strong></td>
</tr>
<tr>
<td><strong>Final Tests</strong></td>
<td><strong>Final Tests</strong></td>
</tr>
<tr>
<td>Reading Achievement</td>
<td>Reading Achievement</td>
</tr>
<tr>
<td>Perceptual Form</td>
<td>Perceptual Form</td>
</tr>
</tbody>
</table>

The raw scores from these tests were taken and the two groups were compared to see if the differences between the means were significant. This was accomplished by using the following formulae: (1)

1. Number of subjects: \( N \)
2. Mean Score: \( M = \frac{\sum X}{N} \)
3. Standard Deviation of small samples for the purpose of determining the Standard Error of the difference
between two means: \[ \sigma = \sqrt{\frac{\sum x^2}{N-1}} \]

4. Difference between the Means: \( M_1 - M_2 \)

5. Standard Deviation when two small samples are pooled:
\[
S.D. = \sqrt{\frac{\sum (x_i - M_1)^2 + \sum (x_i - M_2)^2}{(N_1-1) + (N_2-1)}}
\]

6. Standard Error of the difference between means in small samples:
\[
S.E._D = S.D. \sqrt{\frac{N_1 + N_2}{N_1 N_2}}
\]

7. Calculation of the t ratio:
\[
\frac{M_1 - M_2}{S.E._D}
\]

8. Degrees of Freedom: \( df. = N-1 \)

For the results to be significant the t-score was required to reach above the .05 level of confidence. For eighteen degrees of freedom at the .05 level of confidence the t had to show a score above 2.10 to be significant. (2)
REFERENCES


2. Ibid., p. 461.
APPENDIX B.

WINTER HAVEN PERCEPTUAL FORM TEST

The Winter Haven Perceptual Form Test was administered in October 1967, and again after sixteen weeks of special motor training. Copies have been made of ten tests to illustrate the difference between the first and the final testing. The tests are arranged in pairs, each pair belonging to the same child.

The Winter Haven Perceptual Form Test consists of copying seven geometric figures which are similar to the following.

![Geometric Figures](image-url)
APPENDIX C

OUTLINE OF EXERCISES USED, AND EXAMPLE OF A LESSON PLAN (1,2,3,4)

The following pieces of equipment were used in the research: balance beam, balance board, trampoline, and agility equipment. Other equipment used were rhythm balls, tumbling mats, hoops, bean bags, puzzles, pegboards, skipping ropes, and templates of geometric figures.

The following exercises were used in the research to develop laterality, directionality, body image, posture, balance and coordination.

Exercises on the trampoline

One of the most important contributions of the trampoline is the development of total bodily coordination throughout the gross muscle systems.

The following sequence of techniques is in approximate order of difficulty.

1. Bouncing and stopping

Let the student first walk around the top of the trampoline to feel its flexibility. The student next stands in the center of the bed, directly over the center mark, with feet about shoulder-width apart. He jumps up and down, permitting the elastic bed to add to the force of his jump and therefore lift him higher off the surface.
Repeated bouncing in the same center spot is most impor-
tant. Stop control is also important. This is accom-
plished by bending the knees and keeping them bent on the
downward movement. The pupil should stop in a well bal-
anced crouch. A sequence of five to ten bounces followed
by a full stop was practiced. The movement of the arms
is important. They should swing up when you go up and
swing down as you return to the bed of the trampoline.

2. Knee drop

The pupil bounces a few times on his feet to
get good rhythm and height of bounce, then lands on the
bed in a kneeling position and bounces right back up to
the standing position where he again bounces a few times
before dropping to his knees again. Contact point with
the trampoline is the knees, shins, and instep. The
body is kept directly above the knees when landing.

3. Seat drop

Begin as before with a few standing bounces,
then land on the bed in a sitting position with enough
bounce and control to spring back up to standing position.
The child lands on the bed in a sitting position with
the legs fully extended forward so that the entire backs
of the legs contact the canvas simultaneously. The trunk
is slightly inclined backward from the vertical. Hands
are flat on the bed six to eight inches in back of the
hips. The fingers are pointed towards the feet and the arms are slightly bent.

4. Combined knee-seat drop

Begin with a bouncing sequence of feet, knees, feet, seat, feet, knees, feet, seat and so on, with steady rhythm and high bouncing, always on the center of the trampoline. As proficiency develops bounce directly from knees to seat without bouncing on feet.

5. Bouncing and turning

With each bounce make one quarter turn clockwise so that with each bounce the child lands facing a different way. Repeat in counterclockwise direction. Next try half turns instead of quarter turns, then full turns.

6. Mark time

Alternate bouncing on one foot, for example left, right, left, right, and so on in slow giant like steps. Bounce only once on each foot, then change to other foot, always landing on center mark.

7. One foot

Bounce ten times on preferred foot, always on the center of the trampoline. Finish on two feet.

8. Double step

Bounce two times on each foot, for example left, left, right, right, left, left, and so on. Every bounce
must be on the center mark. Stop as usual with two feet in a crouch.

9. Front Drop

This drop is first developed by landing on hands and knees and bouncing back upon feet. When this is done easily, with body always centered on the bed, bounce from hands and knees to prone position and back to hands and knees. When landing in prone position extend arms forward with elbows bent out and palms downward. The palms, forearms, abdomen, and thighs should all strike the bed simultaneously. Bouncing from hands and knees to prone position should be done with a steady rhythm. When this is mastered bounce from standing position to hands and knees to prone position, back to hands and knees and back to standing position and repeat. When steady rhythm and good centering is apparent eliminate the hands and knees position, bouncing back from standing to prone position and back.

10 Back drop

The child lands on the bed in the supine position with legs straight and feet slightly higher than hips. Hands are placed on the sides and front of the thighs just above the knees and not on the bed. The chin must be kept on the chest during this stunt. This stunt is first attempted from the standing position by raising
one leg straight out and forward and falling backwards, bouncing and springing back to standing position.

11. Combination of the drops
12. Skipping while bouncing

Exercises on the balance beam

A diagram of the balance beam is to be found in Appendix D. On this piece of equipment the child can develop balance, posture, laterality, and spatial orientation. The following are the exercises used on the flat side of the beam. Once the exercises are mastered on this side they then can be performed on the narrow side.

1. Forward walk

Walk slowly heel-to-toe, with toes pointed straight ahead. Placing hands on the hips help give the child balance. Have some object put at eye level so that the child can keep his eye on it while he walks.

2. Backward walk

Start the child at one end of the beam with his back toward it, and the board extended out behind him. The child steps up on the beam and walks backwards toe-to-heel. Head up with eyes focused on an object at eye level. The exercise should be done without the child looking where he is going.

3. Sidewise walk

Start the child at one end of the beam facing
at right angles to it so that the beam extends to the right. The child steps up on the beam and walks sidewise to the other end. He should move his right foot to the right and bring his left foot up to it. When he has progressed to the end of the beam he is to walk back sidewise, moving to his left. A problem may arise here in that some children will be found who can walk the board in one direction but not in the other. It is thought that these children are accustomed to avoiding the laterality and directionality problem by using only one side as a leading side.

When the children have learned these three basic procedures they are taught to turn on the board. They are asked to walk across the board and, without stepping off, to turn and walk back sidewise. When they have mastered the half turn, they are asked to walk forward, across, turn, and return walking forward. The more difficult task can then be performed in which the child walks backwards across the board, turns, and returns walking backward. Variations and combinations of these routines can be introduced to maintain interest and also to reduce anticipation. The ability to maintain balance under conditions which are not predictable can be further cultivated by asking the child to walk to the center of the board, turn, and walk back. All combinations of directions
and turns can be repeated in the center of the board. Here the spring of the board becomes an additional factor which must be considered in maintaining balance.

**Balance board**

A diagram of the balance board will be found in Appendix D.

The child is instructed to step on the board, with the largest center post, feet placed about twelve inches from the center, and rock by shifting weight. Rock in the right-left direction and in the fore-aft direction. When perfect balance can be maintained, the middle sized post, then the smallest post, should be used.

Activities on the balance board include the following: bouncing a rhythm ball on the floor in front, catching it again or continued bouncing; throwing bean bags at a target; catching a rhythm ball with a partner; doing simple calisthenics; touching parts of the body on command.

**Jumping board**

The plans for the construction of a jumping board will be found in Appendix D. In this research a trampoline was available. However, in cases where one is not available a jumping board will prove quite satisfactory.
for bouncing on the feet and turns as outlined under trampoline.

**Agility equipment**

This equipment consists of ropes and ladders for the children to climb on. Horizontal ladders to hang from and climb along. The youngsters make up their own games on this. Relays were also used in which they had to climb through or over some parts of the equipment.

**Tumbling mats**

Exercises performed here were the forward roll, backward roll, walking on the knees, and the head stand.

**Rhythm balls**

In bouncing the ball the child should cup his hand so that the fleshy part of the fingers make contact with the ball. Skill in bouncing with both hands should be attempted. Many variations to the straight bouncing can be introduced such as the following: bounce clap hands; bounce and catch; bouncing using alternate hands; bouncing from a kneeling position, either on one knee or both knees; bouncing the ball in a hoop, and many others.

In tossing and catching, the children are shown how to hold the ball with both hands and toss underhand. In catching, the children are taught to hold hands out
for the ball and draw them back as ball is caught. For
catching above the head the children should have the
thumbs together. Catching below the waist the little fin­
gers are together. Many catching games can be played.

Bean bags

The following activities were performed with the
bean bags.

1. Bean bag toss

The students attempted to score points by throw­
ing bean bags through holes.

2. Bean bag passing relay

In teams of about five players which are lined
up in a straight line, the bean bag is passed from the
front to the back. The last person on receiving it brings
it up to the front of the team. It is then passed down
through the team again. This continues until the whole
team has finished. There are many variations to this
passing, such as: pass and receive with the right hand;
pass and receive with the left hand; pass through the
legs; touch the floor and pass through the legs; pass
over the head and so on.

3. Bean bag circle pass

Players form a circle, with every other player
given a bean bag. On command, the bean bags are passed
to their right, they receive them in their left hand. Change direction and pass to the left. More bags can be added as the skill develops.

Other activities with the bean bag included:

1. Throwing and catching.
2. Walking with bean bag on the head.
3. Walking along a chalk line and balance beam with bean bag on the head.
4. On the knees get up on to the feet with bean bag on the head.
5. Squatting with bean bag on the head, get up.
6. Sitting with bean bag on the head, get up.

Rope skip

Start with the rope stretched on the floor. Have the children jump back and forth over the rope, starting at one end and continuing down to the other end. Next, raise one end four inches from the floor and the other end about eighteen inches. Children jump over the rope back and forth, starting at the low end and going as far as possible toward the high end. Next, with the rope at the usual skipping height, swing it back and forth while the children jump across. When this is accomplished turn the rope with the child standing in it. When the children can skip in this way with the rope turned in either direction, the children should try running in.
The youngsters should work with individual skipping ropes, skipping on their own.

**Hoops**

Activities with the hoop included the following: hopping in and out; bouncing balls in and around the hoop; making their bodies fit into the hoop while on the floor; and twisting their bodies in an attempt to keep the hoop revolving around them.

**Puzzles**

Students spent much time putting together simple puzzles of the jigsaw or cut out type.

**Pegboard**

A good pegboard can be constructed from acoustic ceiling tile using golf tees as pegs. These tees should have about half of the end clipped off.

Two boards and two sets of pegs were provided, one for the instructor and one for the child. The pegs were of a color contrasting with the background. In this way, the form was made to stand out more sharply against the background, and the difficulty of the task was kept reasonable. Simple figures such as squares and triangles were outlined and the child was shown this and asked to make one like it on his board.
There are two stages in the training activity. In the first stage, the board with the model figure on it is left in full view of the child. He may consult it whenever he has difficulty, and he may constantly compare his production with the model. In the second stage of training, the model figure is shown to the child only briefly. When the child begins to work, the model is removed and the child is asked to complete the activity with no further reference to the model.

The first task, that was taught the child, was to draw horizontal and vertical lines completely across the pegboard. These lines were constructed along the edges first. When they accomplished this, lines were then constructed towards the center of the board. Shorter lines were then constructed. This was followed by the construction of squares, rectangles and diagonal lines. After these basic simple forms were mastered, the form perception problem was increased in difficulty by presenting two forms on the board at once. These forms were either adjacent or interlocking.

**Templates**

The templates used were the circle, square, rectangle, and diamond. The first activity was performed at the blackboard where the template was held against the board by the instructor. The child was asked to place his finger inside the cut-out template and to run it
around the edge of the form. The child in doing this was obtaining tactual and kinesthetic clues to the required movement. This was followed by giving a piece of chalk to the child who then ran the chalk around the edge of the template in the same way in which he ran his finger around its edge.

For practice of perfecting the geometric forms the child continued at his desk as at the blackboard, doing the figure twenty times on paper, then freehand, and comparing with the template figures.

Emphasis was placed on posture. The practice periods were of short term because the children tired quickly.

**Imitation of movement**

The children stand widely spaced, about eight to ten feet in front of the teacher. They are asked to perform the exercises outlined in Figure 1. The teacher begins with pattern No. 1 and moves the arms through each of the patterns indicated. Observations were made of the children's movements in going from one pattern to the next. These patterns are so designed that unilateral, bilateral and crosslateral movements are required. The sequence may be varied as long as all three of these basic types of movements are included.
Identify body parts

While standing, children are commanded to touch on their own bodies different features such as nose, ear, eyes, mouth, back, shoulder, knee, ankle, hip and so on. They respond quickly and accurately with one hand at first and then both hands. The children repeat the commands verbally after they are given. Students later work in pairs touching the indicated parts of their partners.

![Diagram showing positions of arms for seventeen items of the imitation of movement task.](image)

**FIGURE 1**

Positions of the arms for seventeen items of the imitation of movement task. To move from each position to the next requires one of the following types of movement: U = unilateral movement, B = bilateral movement, C = crosslateral movement.
Fall Recovery

Children fall to the floor and are told to get up using any method. They fall again and get up using only one hand. Next time they try getting up without using any hands or they may attempt getting up keeping the legs straight but using the hands.

Obstacle course

Sports equipment, chairs, hoops, tunnels, desks, and balance beams were used to make an obstacle course in which the children had to climb over, step or jump over, duck under, crawl under or squeeze through. The children were made to do extensive crawling in this activity.

Angels in the snow

The child lies on the floor on his back with the arms at the side and the feet together. In this exercise the arms are moved up over the head until they touch. In doing this, the child should push his wrists against the floor. Next the feet are moved apart making sure the heels are kept on the floor during the movement. The following are the sequence of commands,

1. Move just this arm, pointing to the right arm. Now back.
2. Move just this arm, pointing to the left arm. Now
3. Move just this leg, pointing to the right leg. Now back.
4. Move just this leg, pointing to the left leg. Now back.
7. Move this arm and this leg, pointing to the left arm and left leg. Now back.
8. Move this arm and this leg, pointing to the right arm and right leg. Now back.
9. Move this arm and this leg, pointing to the right arm and left leg. Now back.
10. Move this arm and this leg, pointing to the left arm and right leg. Now back.

The following stunts were used.

**Log Roll**

Each child attempts to roll like a log. Assistance is needed at first.

**Ball Roll**

The child holds knees to chest and attempts to roll.

**Bunny Hop**
Jumping with two feet together, first in an orderly pattern, then in relay patterns, and then randomly so that children must avoid obstacles and each other.

**Stork stand**

Stand on one foot with the other clear of the ground.

**Hopping**

Move around the room on one foot without putting the other one down. Touch a door, chair, or a desk, and return to the original spot. Do the same with the other foot.

**Walking reversals**

Walk quickly backwards, change directions on command of forward or backwards. An attempt should be made to make the children walk quickly in either direction without collisions, changing directions promptly on command.

**Shuffle**

Shuffle sideways, first the preferred direction, then the opposite direction. Change direction on command.

**Duck walk**
The child places his hands on his knees and does a deep knee bend. In this position he walks forward. His hands may also be placed behind him with the palms together and fingers pointing backward in imitation of a duck's tail.

**Rabbit hop**

The child places his hands on the floor and performs a deep knee bend. The hands move forward on the floor and the feet are brought forward, with a jump, between his hands. The hands are moved forward again and the process is repeated as the child moves across the floor.

**Crab walk**

The child squats down reaching backward and putting both hands flat on the floor behind him without sitting down. He runs along the floor in this position. The head, neck and body should be in a straight line.

**Measuring worm**

The child places his hands on the floor in front of himself and about shoulder width apart. The legs are stretched out straight behind with the weight of the body supported on the arms and toes. The arms are kept straight and the body held straight from head to heels. With the knees straight and the hands stationary, the child makes
little steps until his feet are as close to his hands as possible. Next, with feet stationary, he moves his hands forward with little movements until he has reached the starting position again. This series of movements is repeated as the child progresses forward across the room.

**Gallop**

The children run around with the same foot always in front and the other always behind.

**Remembering**

The children gather around the teacher who indicates to them that they are to touch a number of objects and return to their original position. They must touch the objects in the order that was mentioned.

The following games were used:

**Simon says**

The children are widely spaced about the floor. The teacher stands facing them. The children respond only when the prefix to the command is Simon Says. For example, on the command Simon Says sit down, the children should sit down. However, if sit down is the only command, the students remain in the position that they are in. If a mistake is made the student is out. The one remaining wins.
Cat and mouse

A circle is formed with the students holding hands. One student is selected to be the mouse, another student to be the cat. The cat chases the mouse. The students forming the circle allow the mouse to pass freely in and out of the circle. The cat is stopped whenever possible. As soon as the cat catches the mouse they reverse their positions. All students are given the opportunity of playing the cat or the mouse.

Dodge ball

The children form a circle with half of the children in the circle. Using one rhythm ball, the youngsters forming the circle attempt to hit those in the circle on the legs. Those that are hit become part of the circle. The last one left in the circle wins. The group that formed the circle now take up the position within the circle and the game continues as before.

Peg ball

The children form a circle. An Indian club is placed in the center. Using one rhythm ball the children attempt to hit the peg down.

Leader

The group is divided into teams of five or six
members. A youngsters from each group stands out a few feet to the side of the team. A rhythm ball is used. When the game starts he throws or rolls the ball to every member of the team. The next player comes out and he returns to the line. This continues until everyone has had the position of the leader.

Calisthenics
1. On tip toes, arms above the head and stretch for the ceiling.
2. Arms circling, small circles developing into larger ones and then getting smaller again.
3. Touching the toes without bending the knees.
4. Crouch, then spring into the air.
5. The child makes himself as tall as possible or as small as possible.
6. Sit ups. The children choose a partner. One child does sit ups while the other holds the feet on the floor. Children reverse their positions.

Relay games
Many relay games were played. These depended on the amount of equipment available and were not difficult to develop.

Of the exercises listed the following groups were used
specifically for developing body image.
1. Log Roll
2. Roll like a ball
3. Obstacle course
4. Fall recovery
5. Identify body parts
6. Imitation of movements
7. Bunny jump
8. Rocking board
9. Balance beam
10. Trampoline
11. Rope skip

The following activities were used specifically for developing laterality.
1. Gallop
2. Shuffle
3. Stork stand
4. Hopping
5. Trampoline

The following activities were used specifically for developing directionality.
1. Walking reversals
2. Shuffle
3. Gallop backwards
4. Ball roll
5. Bean bag toss
6. Ball toss
7. Ball bounce

SAMPLE OF A LESSON PLAN

Free activity

Students are permitted to play with hoops, bean bags, rhythm balls and skipping ropes for approximately five to ten minutes at the beginning of the training period.

Warm up exercises
1. Arm circling
2. Angels in the snow
3. Touching toes
4. Remembering

Trampoline, agility equipment and balance beam

The group is divided into three sections. One section exercises on the agility equipment, the second works out on the balance beam, the third works with the instructor at the trampoline. The group rotates clockwise when the whistle blows. Each group stays for approximately six to seven minutes at each station.

Trampoline
Each child will spend about two minutes on the trampoline.

1. Bouncing  
2. Stopping  
3. Knee drop  
4. Bouncing and turning  

Balance beam

1. Walking forward, sidewise, and backwards with bean bag balanced on the head. If there is more than one balance beam they can be joined together to form a triangle or a square.  

Agility equipment

The children make up their own activities.  

Game  

Cat and mouse. Approximately ten minutes were allotted for games.
REFERENCES


APPENDIX D

DIAGRAMS OF JUMPING BOARD, BALANCE BEAM, AND BALANCE BOARD

Bottom View

Side View

FIGURE 2
JUMP BOARD
FIGURE 3

END SUPPORTS AND BEAM OF BALANCE BEAM
FIGURE 4
BALANCE BOARD
APPENDIX E

AGES, AND THE INDIVIDUAL RESULTS OF THE READING TESTS, AND THE PERCEPTUAL FORM TEST OF THE CONTROL AND EXPERIMENTAL GROUPS

TABLE IV

AGES AND INDIVIDUAL RESULTS OF THE METROPOLITAN READINESS TEST AND THE WINTER HAVEN PERCEPTUAL FORM TEST OF THE CONTROL AND EXPERIMENTAL GROUPS, BEFORE MOTOR TRAINING

CONTROL GROUP

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Mo: MONTHS  
WM: WORD MEANING  
SEN: SENTENCES  
INF: INFORMATION  
MAT: MATCHING  
PERCEP: PERCEPTUAL FORM
TABLE V

RESULTS OF THE STANFORD ACHIEVEMENT TEST AND
THE WINTER HAVEN PERCEPTUAL FORM TEST, AFTER
SIXTEEN WEEKS OF MOTOR TRAINING BY THE EXPER­
IMENTAL GROUP

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SP: SPELLING
WSS: WORD STUDY SKILLS
PERCEP: PERCEPTUAL FORM