A STUDY TO DETERMINE WHAT CORRELATION, IF ANY, EXISTS BETWEEN THE SOFTBALL PITCH FOR ACCURACY AND READING ABILITY

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A STUDY TO DETERMINE WHAT CORRELATION, IF ANY, EXISTS BETWEEN THE SOFTBALL PITCH FOR ACCURACY AND READING ABILITY

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CHAPTER I

INTRODUCTION

Educators constantly strive to improve their methods of instruction and evaluation. Such methods have been the result of endless hours of research. Research provides the basis of education in the future.

I. STATEMENT OF THE PROBLEM

Many tests designed to measure reading ability are used in elementary schools, and these tests treat reading as a mental process alone. Recent studies have indicated that visual and kinesthetic perception, and motor ability are associated with intellectual functioning in reading, reading readiness, and intelligence quotient.¹,²,³

II. NEED FOR THE STUDY

A need exists to relate the physical processes used in performing certain motoric skills to those skills used


in reading, thereby introducing complementary methods of teaching reading. Teaching methods should begin to deal with reading as a perceptual process related to the functioning of the brain.¹

III. PURPOSE

The purpose of this study was to determine the degree of the coefficient of correlation, if any, between a student's skill in pitching a ball underhand accurately at a target and his ability to read as measured by a standardized reading test. More specifically stated, are the factors of kinesthetic perception, motor ability, and visual perception used in throwing a ball at a target related to reading ability?

IV. LIMITATIONS

The sample was limited to third-grade students, ages between eight and one-half and ten and one-half years, who attended the Crestview Elementary School of the West Des Moines Community School District in Iowa.

West Des Moines is a rapidly growing suburban community located on the western boundary of metropolitan Des Moines, the State Capitol of Iowa.

Crestview Elementary School is one of seven elementary schools in the district and has an enrollment of approximately 450 students represented in grades kindergarten through fourth.

Permission to conduct this research was obtained from the principal of Crestview Elementary School and the elementary curriculum coordinator of the school district.

V. DEFINITION OF TERMS

Kinesthetic perception. Kinesthetic perception "is the ability to perceive the position and movement of the body and its joints during muscular action."

Reading ability. Reading ability encompasses the rate at which an individual comprehends printed material.

Proprioceptor. A proprioceptor is a receiving center composed of nerve cells in the body that may be stimulated by pressure, stretching, or tension.

Kinesthesia. Kinesthesia is the awareness of a change in body position.

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3Ibid., p. 45.
Perception. Perception is an activity of the mind which gives particular meaning and significance to a given sensation and therefore acts as the preliminary to thinking.\(^1\)

Figure ground. Figure ground is the perceptual impression received from lines that are organized and integrated into figures or forms.\(^2\)

Perceptual-motor activity. Perceptual-motor activity is that activity in which the individual is required to move about in either a free or directed manner with a resultant feedback of movement and realization of body position.


CHAPTER II

REVIEW OF LITERATURE

Some of the earliest research related to kinesthetic perception was done in 1907 by Honzik. Honzik's research involved the use of a maze to be negotiated by rats and the results of this work seemed to indicate the only sense used by rats in learning the maze was kinesthetic in nature. Contradiction of the Honzik data arose in 1929, when Lashley and Ball demonstrated, through a similar experiment with rats, that elimination of kinesthetic impulses by spinal sections did not abolish the perfected maze habit. The rats were still able to negotiate the course.¹

From data of somewhat similar research, Ingebritsen contended that maze learning could take place without kinesthetic perception. In the study, Ingebritsen deprived his rats of their kinesthetic sense by spinal sectioning before they attempted the maze, but the rats were still able to solve the scientific puzzle. Lashley and Ball had used rodents that were already familiar with the maze before spinal sectioning occurred.²

¹C. W. Honzik, "The Role of Kinesthesia in Maze Learning," Science, LXXXIV (October 23, 1936), 373.
²Ibid.
Honzik resisted making the conclusion that kines-thesis has no role in the acquisition of the maze habit. He surmised that the smooth functioning of a well-learned motor habit or skill involved a kinesthetic element. Honzik conducted research which showed one movement led to another movement only after being based upon the other classes of stimuli from the previous movement. Kinesthesis was, therefore, essential to the acquisition of skill, but only in conjunction with other classes of stimuli and only after learning has begun on the basis of other stimuli. ¹

In stating that kinesthesis was essential to the acquisition of a new skill, Honzik explained why the animals used by Lashley and Ball were able to solve the maze without their kinesthetic perception. However, this explanation was not applicable to the Ingebritsen rodents which were able to learn the maze without kinesthesis.

Honzik did not attempt to refute the study of Ingebritsen, and accepted the fact that the rats were successful in the maze. A plausible explanation lay in the fact that Ingebritsen failed to use a control group in his experiment. Honzik felt that Ingebritsen's rats probably could not have run through the maze with the speed and skill possible to normal rats. ²

¹Ibid. ²Ibid.
It is important that kinesthetic perception not be thought of as being general in nature. Johnson and Nelson report that studies of kinesthetic tests and research by Cratty, Scott, and Start, indicate kinesthetic perception probably involves numerous specific factors.¹

Steinhaus, discussing kinesthesia and its importance to man, feels that man can survive without his eyes, ears, and sense of smell; however, without muscles and the messages that they send from proprioceptors, man could not talk, walk, breathe or follow the printed line while reading.²

The eyes contribute only what they are able to see. The sense organs of muscles and joint structures report movement and position of body parts as well as being informed or susceptible to tension on all sensory experiences. Muscles, unlike the eyes, do much more than just receive information; they also send this information back, almost instantaneously, to initiate the next movement. By providing the motor power to move the complex current of stored sensorimotor experiences called conceptual thinking along the correct pathways, the muscles actually see more than

¹Johnson and Nelson, op. cit., p. 193.

Steinhaus has explained why the separation of the mental from the physical is impossible. Learning and perceiving are related, and perceiving is possible only through the senses and the muscles. Since several factors influence learning, many related conditions contribute to difficulty in reading. Very few cases of reading difficulty involve only one factor, such as the eyes.\(^1\)

In Bond and Tinkers' book, Bond provides insight to reading problems and reading proficiency:

Proficient reading depends upon the acquisition and versatile application of several intricately coordinated skills. These skills or abilities are acquired only through long, motivated practice under good guidance. Because the reading process is so complex, there are many opportunities for unfortunate complications to impede its growth. Various factors, operating singly or more often together, may hold up further progress in reading. It is the task of the diagnostician to discover these factors so that they can be eliminated or so that corrective instructional procedures can be devised to adjust to, or circumvent their bad effects.\(^2\)

Some of the physical conditions associated with and influencing reading ability are identified by Bond as visual acuity and speech difficulties; faulty motor adjustments; glandular deficiencies; poor general health; brain

\(^{1}\text{Ibid.}, \text{ pp. 40-41.}\)
\(^{2}\text{Guy L. Bond and Miles A. Tinker, Reading Difficulties, Their Diagnosis and Correction (New York: Appleton-Century-Crafts, 1957), p. 34.}\)
\(^{3}\text{Ibid.}, \text{ p. 85.}\)
damage; and lateral dominance.¹

Physical conditions affecting reading ability, with the exception of auditory and speech difficulties, should also affect the ability of an individual to accurately throw a ball at a target. However, an exception to motor ability proficiency and throwing accuracy may arise. A student may possess an inadequate motor foundation and still be capable of developing a high degree of skill in one motor area, such as throwing a ball. An example of this situation is the individual who participates in activities of the Little League Baseball Program and learns to throw a ball well. Consistent practice may improve his accuracy, but if no other skill is learned, he may still possess faulty motor adjustments. For the purpose of validity, third-grade students were utilized, since at this grade level few have actively participated in organized baseball.

The belief that reading difficulties could stem from inefficient kinesthetic perception, motor ability, and visual perception led researchers to further study in these areas. Delacato reasoned that if reading was not a perceptual act and merely conceptual or intellectual, students who could not read, could not speak.²

¹Ibid.

²Delacato, op. cit., p. 10.
Delacato felt reading problems did not start in school but that they occurred long before children entered school. The school experience merely points out these reading problems. Pre-school perceptual training, therefore, becomes important to enhance reading ability.\(^1\)

Research by Delacato involving ninety-two individuals ranging from five to twenty years in age indicated that those experiencing severe reading problems differed in cortical dominance from the subjects who were reading normally. Six per cent of his experimental group exhibited consistent laterality or cortical dominance, a dominant eye, hand, and leg on the same side of the body. The remaining ninety-four per cent of the group experienced crossed dominance.\(^2\)

A study conducted by Delacato during the summer of 1964 with eighty-four children of kindergarten age produced an increase of 221 per cent in reading readiness by the experimental group over the control group. The control group was not given motor movement patterns experienced by the experimental group.\(^3\)

Delacato's research demonstrated that if a child's brain circuits are not properly developed to handle

\(^1\)Ibid., p. 29.
\(^2\)Ibid., p. 49.
\(^3\)Ibid., pp. 51-53.
perception through the eyes, the child will have difficulty in reading and writing. His results also indicated that a child's learning ability can be improved by patterns of exercise that will develop his neurological system (author's underscore).

The nature of reading and its implication for education, is based upon the understanding that "reading is a perceptual act and is a function of the human nervous system."  

In support of Delacato's work, Rutherford found that kindergarten children given directed play activities designed to develop perceptual-motor coordination made significantly greater gains in ability for reading readiness.

While the role of perceptual-motor development in reading is not recognized by all educators, the use of the eye in reading is self-evident. With identification of perception as an important factor in developing reading ability, researchers began to see the need to implement educational programs with motor activities that would develop kinesthetic perception as well as visual perception and acuity.

1Delacato, loc. cit.

2Delacato, op. cit., p. 5.

Pointing of the eyes is controlled by twelve muscles, six for each eye. Focusing is involuntary. No muscular connection exists between the eyes, each operates separately.¹

Kadler suggests using a motor skill to develop muscular control of both eyes and to improve eye-hand coordination. A ball, suspended from a point above, and between instructor and student is swung in different directions in front of the student as the instructor observes his lateral and convergent eye movements; any movements of the eye that are not smooth are easily detected and further exercise is indicated. As the child concentrates upon moving only his eyes and not his head to follow the ball, the instructor directs the student to strike the ball on command. The student must be able to perceive the speed of the ball and its distance from his body in order to intercept it accurately along its path.²

Paul Smith, feeling that reading is a perceptual skill involving bi-lateral movement, conducted a study of kindergarten children in the Shoreline Public Schools of Seattle, Washington. Kindergarten children participated in perceptual-motor movement patterns an average of three days per week for twenty-five weeks during the 1968-1969

¹Kadler and Kephart, op. cit., p. 19.
²Ibid., p. 101.
school year. Teachers devoted twenty minutes per day to project lessons. Students were taught movement skills involving visual, audio, and tactile stimulation requiring specific, directional positioning. Children in the classes were asked to do certain movements which were explained by the teacher as up, down, forward, backward, or right, left.¹

In Smith's study, movement patterns and directions were also designed to develop concepts and relationships to written symbols. Ball skills served to develop bilaterality and improve eye-hand coordination and timing.²

Upon termination of the twenty-five week unit, the second form of the Metropolitan Reading Readiness Test was administered to all kindergarten students. The same test in an alternate form had been administered prior to the start of the perceptual-motor movement unit. Results showed thirty-five per cent of the children were ready for first grade work.³

Another implication for perceptual-motor development and its influence upon reading is made by Hope Smith. Her research suggested that figure-ground seems to have no


²Ibid.

³Ibid.
relationship with visual acuity; rather, it involves perceiving a simple figure or object embedded in a complex background.¹

Figure-ground problems present difficulty to the reader as he is unable to differentiate between the print and the spaces between the print. Since Miss Smith attributes this to a lack of visual perception, not visual acuity, exercises designed to increase perception should aid in the elimination of this difficulty.

McCormick and others conducted a study in Lisle, Illinois with forty-two underachieving first-grade students matched for age, sex, intelligence quotient, and reading grade level as measured by the Lee Clark reading grade level test. The children were divided into three groups; one group received perceptual-motor training, the second received exercises through their physical education program, and the third group served as a control and received no perceptual-motor training or physical education. The group receiving perceptual-motor training in forty-five minute periods twice a week, for seven weeks, produced statistically significant gains in reading achievement over the other two groups.²


Perceptual training, like motor activities, has been found to be not only influential in developing reading readiness and reading ability, but has also aided in improving the intelligence and achievement test scores of a group of young mental retardates in a study conducted by Chansky in 1964. Chansky used as a basis for his study, Kephart's theory that learning rests upon the adequacy of a child's perceptual-motor skills. ¹

Chansky worked with 172 third-grade children and found they experienced their greatest gains in language intelligence quotient following treatment periods of visual perceptual training in which the students worked with puzzles and blocks. ²

Kephart, whose theory provided motivation for Chansky, directed individual and group research projects in which twelve children of subnormal intelligence quotients were given visual training over a period of eighteen months. Results of the study produced an average increase in intelligence quotient of over fifteen points for each member of the group. Another study by Kephart found visual training also increased normal and high intelligence quotients. ³

Research has shown motor development also plays a

¹Chansky, *loc. cit.*
²Ibid.
³Hadler and Kephart, *loc. cit.*
part in indicating intelligence. Malpass determined that the Oseretsky Motor Development Scale differentiated at highly significant levels of confidence between mentally retarded and normal children. The ages of these subjects ranged from nine to fourteen years.¹

The review of literature has shown motor ability tests can be used to differentiate between levels of intelligence as well as improve intelligence quotient. Visual perception and kinesthetic perception combined with motor activities can aid in developing reading readiness and reading ability. The results of these studies have strong implications for the reading readiness and reading program in the school.

¹Leslie Malpass and others, Responses of Retarded and Normal Children to Selected Clinical Measures (Carbondale: Southern Illinois University microfiche copy, EDO02805, 1959), p. v.
CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

All subjects received training in softball skills during thirty minutes of physical education twice per week for five weeks. The eighty-three students comprised four separate third-grade classes.

The skills unit consisted of learning the proper method to throw, catch, field, hit, and pitch a twelve-inch softball. The subjects were also taught fundamental rules, as well as strategy, associated with the game of softball.

Students were administered the underhand pitch for accuracy test developed by the Minnesota Department of Education after completing the five-week softball unit. The test has a coefficient of reliability for third grade boys of .85 and .75 for girls. The test measures accuracy in throwing a softball underhand a distance of twenty-five feet; this skill represents the basic underhand movement pattern with accuracy as a goal.

The student is required to utilize his perceptual skill as well as his motor coordination. The author recognized the influence activities of the Little League Baseball Program on elementary age boys and the consequent improvement upon their ability to throw a ball accurately using an overhand motion. This early practice in throwing
not only would serve to develop throwing accuracy through repeated practice and perhaps result in a splintered skill, but also produce a marked advantage over elementary age girls not afforded this opportunity or motivation for practice.

Therefore, the underhand pitch for accuracy test was selected since most third-grade students have had very limited experience in pitching a softball underhand.

The target consists of five concentric circles that are one, two, three, four, and five feet in diameter; the five foot circle is one foot above the ground. Each circle is drawn a different color and numbered consecutively from the center circle, five, four, three, two, and one (see Appendix A).

Each subject was given twenty throws; a rest period was required after the first ten throws. This rest period was not timed but was determined by the amount of time the next student used in completing his ten throws. The author recorded the results of each throw, five points for the center circle and the corresponding points for the other circles. A ball striking a line was recorded as the higher score.

The total of the twenty trials was matched with corresponding percentile rank according to sex in the accompanying Minnesota Department of Education test booklet. Norms were established using the scores from 124 boys and
129 girls in third grade.

The percentile obtained from the pitching accuracy test was correlated with the percentile achieved by each student on the paragraph comprehension battery of the Stanford Achievement Test, using the Pearson Product-Moment Coefficient of Correlation technique.

Two standardized tests measured reading ability at the test school, the Stanford Achievement Test and the Scott-Foresman Reading Ability Test. The latter test was eliminated since it is an ability graded test in which all students are not administered equivalent tests. Advanced readers are given a more difficult test than slower readers. The test also coincided with a specific reading book which differed in degree of difficulty for designated reading groups. In addition, the test is not administered to all students at the same time of year; it is administered upon completion of the reading test.

Since the definition of reading, as used in this study, is the comprehension of printed material, it was the feeling of the author and the remedial reading teacher at the test school that the paragraph comprehension battery of the Stanford Achievement Test be used as a measurement of reading ability. The coefficient of reliability for the test is .81 and .92 based on a single grade computed by the split-half method. The Stanford Achievement Test was administered to all third-grade students by their classroom
teachers in February, 1971.

The correlation between the underhand pitch for accuracy and reading ability for the eighty-three students was .24, not a meaningful correlation. A correlation of the male subjects' scores produced a low .04 correlation while the correlation of the girls' scores was .42.

The mean percentile ranking on the pitching test was 46.8 for both sexes, while the mean for the boys was 45.3 and 45.9 for the girls.

It was the author's intent to use the underhand pitch to negate the experience, and therefore an advantage the boys usually have in the overhand throw. Few can dispute the influence baseball has upon boys and their learning to throw overhand before girls. Society encourages boys to pursue their hero image, who often is a baseball player. Girls are encouraged to pursue few activities which involve throwing and consequently, are at a disadvantage in overhand throwing due to lack of experience.

Neither sex had any appreciable experience in the underhand pitch as third-graders prior to the softball unit. Therefore, the difference in correlation between scores for boys and scores for girls was unexpected by the author. Perhaps an explanation of this difference is that coordination played a more important role in the test than perception. Third grade girls traditionally have had more coordination experiences than boys such as rope jumping,
skipping, galloping, dancing, and playing hop scotch. Since the distance from the throwing line to the target remained constant for both sexes, strength was not a factor; all students were able to hit the wall on which the target was drawn.

The pitching test indicated, to some extent, that the girls were better readers as a group than the boys as verified by the higher correlation. This fact becomes more evident upon examination of the mean percentile rankings obtained from the reading test. The mean reading percentile for the boys was 55.5 and 68.5 for the girls. The boys were considerably below the mean reading percentile score for the combined group, 62.3. (See Table I)

**TABLE I**

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<th>Pitching Test</th>
<th>Paragraph Comprehension</th>
<th>Correlation</th>
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<tr>
<td>Boys</td>
<td>45.3</td>
<td>55.5</td>
<td>.04</td>
</tr>
<tr>
<td>Girls</td>
<td>45.9</td>
<td>68.5</td>
<td>.42</td>
</tr>
<tr>
<td>Combined</td>
<td>46.8</td>
<td>62.3</td>
<td>.24</td>
</tr>
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indications are that the forty-three girls, as a group, were better readers than the forty boys. This
reading difference explains the higher correlation between the pitching and reading test for the girls.

Information from Table I indicates that the difference between the sexes in mean percentile ranking on the pitching test was .6, while the difference in the mean percentile ranking on the paragraph comprehension test was 12.9, which resulted in a .04 correlation for the boys and .42 correlation for the girls. The difference in correlation was the result of a smaller range between the two tests for the girls than the boys, hence, the higher correlation.
CHAPTER IV

SUMMARY AND CONCLUSIONS

The problem was one of relating the perceptual skills involved in reading with perceptual skills used in accurately pitching a softball underhand.

Eighty-three third-grade students, forty-three girls and forty boys were taught softball skills thirty minutes, twice each week, for five weeks in physical education. The students were administered a test designated to measure their underhand pitching accuracy developed by the Minnesota Department of Education upon termination of the five-week skills unit. Scores achieved by the subjects were recorded as percentile rankings.

The Stanford Achievement Test was administered to all third-grade students in February, 1971. All students took identical tests and, since the test is a series of batteries that measure areas other than reading, only the battery testing paragraph comprehension was used as an indication of reading ability.

Percentile rankings of the comprehension battery were correlated with the percentile rankings of the underhand pitch test which had been administered upon termination of a five-week unit of softball skills.

Using the Pearson Product-Moment Coefficient of
Correlation method, a .24 correlation for the eighty-three subjects indicates little relationship between the two testing devices for the combined group of boys and girls.

Correlation of the percentile ranks by sex resulted in a very low .04 correlation between the boys' scores indicating the test an invalid predictor of reading ability.

The positive correlation of .42 for the girls does suggest the possibility that factors involved in pitching underhand accurately and reading are related. The data, however, should not be interpreted as an indication that proficiency on one test will assure proficiency in the other.

The results of this study indicate a need for further research relating motor ability and reading ability. Further study should include a series of motor ability tests, rather than only one as used in this research.

Future study encompassing testing in all of the elementary grades could open vast possibilities for improved methods of teaching at each grade level resulting in better development of our most important natural resource, our nation's youth.
BIBLIOGRAPHY
BIBLIOGRAPHY

A. BOOKS


B. PERIODICALS


C. UNPUBLISHED WORKS


APPENDIX A.

WALL TARGET FOR UNDERHAND PITCH FOR ACCURACY

The five concentric circles are 1', 2', 3', 4', and 5' in diameter. The circumference of the outside circle is 1' from the ground; target is 25' from the restraining line.