Relationship Between Perceptual Mode and Reading Ability in College Students Enrolled in a Reading Improvement Program

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RELATIONSHIP BETWEEN PERCEPTUAL MODE AND READING ABILITY IN COLLEGE STUDENTS ENROLLED IN A READING IMPROVEMENT PROGRAM

A Thesis
Presented to
the Faculty of the Department of Education
Central Washington State College

In Partial Fulfillment
of the Requirements for the Degree
Master of Education

by
Mildred Norene Higgins
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APPROVED FOR THE GRADUATE FACULTY

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

In the past decade there has been increased interest directed toward the study of perception as a function of reading. Although there has been intense investigation of the role of perceptual difficulties and perceptual divergencies in the reading problems of young children, there is only a sparse record of attempts to discern systematically if the same kinds of difficulties and divergencies also have a function in the reading difficulties at the college and adult level.

At Central Washington State College it was noted that a segment of the students who enroll in the reading improvement program fail to demonstrate appreciable benefit from the instruction provided. It was reasoned that the learning experiences were not optimal for these students.

Furthermore, it was noted that, while these students varied among themselves as might be expected, they had certain characteristics in common. First, all of these students had graduated from an accredited high school. Second, most of the students expressed dissatisfaction with their past reading ability. Third, most of the students had failed the reading examination given as part of
the screening procedure at C.W.S.C. before a student is admitted to the teacher education program at least once and sometimes twice. Therefore, it could be stated that the students enrolled in Central's reading program were generally low achievers in reading.

I. THE PROBLEM

Statement of the Problem. It was the purpose of this study (1) to determine the relationship between mode of visual perceptual discrimination and the ability to benefit from a college program in reading improvement and (2) to determine the relationship between mode of visual perceptual discrimination and ability to read prior to participation in the reading improvement program.

The null hypotheses were used as follows:
1) students who enroll in a reading improvement program do not differ in mode of visual perception from students not enrolled in such a program.
2) students who show the greatest gains in reading improvement while enrolled in a reading improvement program do not differ from those showing lesser gains in mode of visual perception.
Importance of the Study. Few are more aware of the value of efficient reading than the college student. Never before and perhaps never again is ability to read rapidly and with comprehension so essential to achievement in the tasks directly confronting him. In recognition of this need, colleges and universities are beginning to offer courses designed to aid the student in improving his reading skills. Unfortunately, most of these courses offer only limited diagnosis, if any, and most concentrate on three aspects of reading—rate, comprehension, and vocabulary—to the virtual exclusion of the other reading skills. That is, it is assumed that the student has mastered all the basic reading skills before he enters college.

Smith and Dechant point out that because reading is a perceptual process, whatever has been found true of perception in general should also hold true for reading. (20:438) They further note that facility in visual and auditory discrimination is at least as important as mental age in learning to read. (20:450) Since the development of reading skills is highly sequential and developmental, it is unlikely that the perceptually handicapped reader will simply outgrow his trouble, although he may learn to compensate, at least to a degree. On the other hand, there is little provision for individualized and systematic
perceptual training and testing on the college level. In this study an attempt was made to determine whether training and testing of this nature are warranted.

II. DEFINITIONS OF TERMS USED

Reading. Because of the complicated nature of the reading process, there are nearly as many definitions of reading as there are texts or studies on reading. For the purposes of this study, reading is defined as the process of receiving verbal communication through the perception of graphic symbols. As interpreted in this study, this skill is measured by total score obtained on the "Nelson-Denny Reading Tests." (18)

Reading Disability. A student has a reading disability when his reading skills are so inadequate that his academic achievement suffers. For the purposes of this study it is assumed that students whose scores on the Nelson-Denny Reading Tests places them in the lowest quartile for college students of the same year or who have failed to pass the teacher education screening test for reading have a reading disability serious enough to handicap them in their college careers.

Perception. Perception refers to the ability to recognize stimuli. Bruner states that perception depends
on the building of "a set of organized categories in terms of which stimulus inputs may be sorted, given identity, and given more elaborate, connotative meaning." (5:148)

In reading, the reader discerns the stimulus, a graphic symbol; discriminates its similarities to and differences from stimuli of a like order, other graphic symbols; and relates it to his own experiential background.

Perceptual Discrimination. Perceptual discrimination refers to the ability to recognize and differentiate a stimulus from other stimuli, i.e., the ability to recognize a simple figure within a complex configuration. The measurement of perceptual discrimination used in this study is the "Embedded Figures Test." (28)

Mode of Visual Perceptual Discrimination. Mode of perceptual discrimination or perceptual style refers to the style or characteristic pattern by which one discriminates between visual stimuli. Comparison of modes of perceptual discrimination in this study are on the basis of scores obtained on the "Embedded Figures Test," (14,28)

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

In Chapter II a brief survey of the relationship between perception and reading is presented, followed by a representative survey of recent research in the area of
perceptual training and testing. Also presented in Chapter II is a description of the methods and materials used in the reading improvement class at Central Washington State College. This class is offered through the joint auspices of the local school district's adult education program and the college. There is no academic credit given for participation in the class. Students who enroll must pay a fee of fifteen dollars. The class is held on campus, is taught by a member of the college faculty, and is required of those students enrolled in the teacher education sequence who fail to qualify on the teacher education reading examination.

Chapter III is concerned with descriptions of the subjects and instruments used in this study. Chapter IV contains a description of the techniques used in the experiment and an analysis of its results. In Chapter V are found the conclusions drawn from the results of the experiment along with recommendations for further research.
CHAPTER II

REVIEW OF THE LITERATURE

Perception and Reading. Forgus defines perception as "the process of information extraction," (9:3) and notes that the process of perception involves both learning and thinking. (9:3-5) The organism receives information through the sensory channels; this information is interpreted through the process of discrimination based on concepts learned previously and the information is interpreted and given meaning.

A consideration of the structure of reading reveals that essentially the same perceptual process is involved. Suppose, for example, a reader is given the stimulus "The horse was in the house." In order to interpret this sentence and give it meaning, he must have refined discriminations. He must have a concept of "The" and "the" as an abstract designation of which one; "was" as an abstract of a past state of being; "in" as referring to an interior; "horse" as belonging to a set of elements having horse characteristics; and "house" as belonging to a set of elements having house characteristics.

In addition, these discriminations must be formed through the representation of graphic symbols as the stimuli.
It requires accurate visual acuity to discriminate between "house" and "horse" and yet it makes a great deal of difference whether the horse is in the house or the house is in the horse. Furthermore, these graphic symbols are representative of sounds which themselves are representations of the concepts.

In Figure I on the following page, a Venn diagram is used to illustrate this structure. D, graphic symbols, are included within and a definite part of B, the sounds of language, and C, ideas or meanings, both of which are, in turn an integral part of A, the spoken language. All of which is included in the universal U, the individual's experiential background upon which is based the conceptualization of the symbols.

There is a definite functional unity between the fields of reading and perception. The reader must precede learning to read with the perceptual discrimination of graphic symbols (20:26) and categorize these as representations of the language. It is reasonable, therefore, that skill in visual and auditory discrimination has been found to be highly correlated with the development of vocabulary. (13:380) As evidence, it should also be noted that it is among people who have aphasia that there is the most striking evidence of a relationship between inability to learn
FIGURE 1
VENN DIAGRAM OF THE STRUCTURE OF READING

\[ D \cap (B \cap C) \cap A \]
and perceptual aberrations. (21:11) The fact which Blake and Ramesey note of perception that it is largely the selective manner in which the receptor, central, and effector nervous systems of an individual are determined by his experiential background. (2:3) This may also be said of the process of reading. In other words, in both processes the meaning given to the stimulus is largely determined by the experience which is brought to the stimulus.

Veridicality of perception is relative with the dynamic environment, (2:5) and it is through perception that the written word achieves its meaning as a means of communication. (20:28) It stands to reason that ability to make perceptual discrimination and the mode or style with which one perceives, influences one's ability to read.

Strang, McCullough, and Traxler note that there is a pattern required in the visual perception of sentences in order to derive adequate meaning:

(1) the ability to identify whole words by configuration, outstanding letters, initial syllables, or the irregular upper half or skyline of words; (2) the skill to recognize simultaneously both the outline and the details of words; and (3) the ability to focus on key words in four to six fixations per line while simultaneously using context to infer the whole meaning of contiguous phrases from the words thus clearly perceived. (23:7)

They further note that proficiency is influenced by cognitive factors and personality and social manifestations. (23:17)
The mode by which one perceives and the mode by which one reads are clearly of the same nature.

Perceptual Training and Testing and Reading.

Coleman used the non-verbal portion of the Alpha Form of the "Otis Quick-Scoring Test" to obtain perceptual ages of retarded readers and compared these scores with mental ages. He found that most of the retarded readers were also retarded perceptually. (6) Coleman's subjects ranged in age from eight to forty-six. He counted as children those who were under thirteen and as adult those who were thirteen and older. (6:498) All were of average intelligence and all were apparently free of disabling physical defects. (6:498)

He concluded that perceptual retardation tends to be cumulative, but that it tends to play a more important role in the reading disability of children than of adults. He based these conclusions on his findings that of the children tested, perceptual development was an average of two and a quarter years behind general intelligence; and, of the seven adults tested, four were perceptually retarded from nine to fourteen months. (6:501)

It is interesting to note that Bowman in a study of flexibility, defined as the ability to read faster when asked to do so, and reading gains in a college reading improvement course at San Francisco State College found gain
in comprehension to be significantly related to reading flexibility. (4:22) As a matter of fact, she found that the experimental group, all poor readers, was inflexible as a whole. (4:23) In an earlier study Laycock concluded that reading flexibility, also defined as the ability to read faster when asked to do so, bears a causal relationship to perceptual and motor patterns. (16:329) These two studies appear to indicate perceptual style and perhaps flexibility of perceptual style in particular as important factors in reading at the college level.

Witkin and his associates at the State University of New York have made an extensive study of perceptual mode. He contends that "the way in which each person orients himself in space is an expression of more general perceiving which, in turn, is linked to a broad and varied array of personal characteristics involving a great many areas of psychological functioning." (29:1) This is expressed in perceptual modes or patterns which tends to be self-consistent and which exhibits stability over time. (29:4)

According to Witkin, individuals exhibit modes of perception which may be placed on a field dependence-independence continuum according to greater or lesser degree of psychological differentiation. He defines this
continuum as

... an association among characteristics of greater or more limited differentiation, identified in the comparison of early and later functioning in each of several psychological areas: degree of articulation of experience of the world; degree of articulation of experience of the self ...; and extent of development of specialized, structural controls and defenses. (29:16)

He maintains that field-independent people tend to be more autonomous, (29:3) formulate experiences in an articulated manner; have the ability to perceive stimuli as distinct from their backgrounds, or to reorganize a field and to impose a structure. (29:14)

In contrast, field-dependent people are visualized as less likely to structure ambiguous stimuli; have rather less ability to locate a simple figure hidden in a complex design; tend to be relatively poorer on closure; do not readily discern alternate uses for familiar items; are more guided by the surrounding visual field; are better at recognizing people, social inclined and more likely to be popular with their peers; and more likely to change attitudes in the direction of established authority. (29:2-3)

He notes that verbal skills show limited relation to mode of perception; concluding that the growth of some kinds of verbal skills may follow a different route than the development of field-independence. (29:203) He tentatively concluded that high versus low level of differentiation may not necessarily be associated with such aspects
of verbal functioning as vocabulary, comprehension, or information, (29:197-8) and that field-dependent people are not significantly different from field-independent people in the ability to learn new material. (29:2)

From an analysis of Rorschach tests administered to 309 retarded readers between the ages of six and fifteen, Vorhaus found four distinct patterns of response which occurred in seventy-two percent of all the test results. These were (1) repression of inner drives, lack of spontaneity; (2) lack of emotional responsiveness to the external world; (3) lack of outlet for felt creativity, submissive; and (4) reacts to stimulation, but represses feelings of anger. (25:1-19) It is notable that these distinct patterns of response or perceptual modes were so consistently revealed in retarded readers.

Frostig states that the period of maximum perceptual development occurs between the ages of three and one-half years and seven and one-half years. She infers that perceptual retardation is predictive of reading ability only in younger children. (10:11) Along this line, she believes visual perception is an important function of academic achievement in the beginning school years, especially in learning to read, and thus remedial perceptual training should be given as early as possible to the child who is perceptually retarded. (10:12)
As a result of her investigations, Frostig has designed a complete program for training and testing the young child who is perceptually handicapped. The testing program purports to establish the child's level of performance in ability to perceive position in space, spatial constancy, spatial relationships, figure-ground relationships, and level of eye-motor coordination. (10:10) The training program is designed for use in a nursery school, kindergarten, or first grade, but it is recommended that training be implemented in remediation also. (10:85)

Delacato has established a neuro-psychological approach to the prevention and treatment of reading disability. He ascertained three categories of traits shared by disabled readers. (7:7-8) He listed these as "universal," "common," and "fairly common." The designation of commonality assigned to a trait was according to degree of prevalence among the male disabled readers chosen as subjects. Among those traits designated as universal, i.e., found in forty of the forty-five subjects, he found such characteristics as the ability to understand more words than the subject could read, a history of childhood thumb-sucking, some lack of unilaterality, and some evidence of perceptual confusion in spelling and reading. (7:8)

It is Delacato's contention that neural development in humans is on an interdependent vertical continuum. If a
higher level of development is incomplete or is not functioning, the lower levels are dominant. If a lower level of neural development is incomplete, the effectiveness of all succeeding levels is affected. (7:19) In other words, if the physiological development of the child's brain, and particularly those areas of the brain which control language skills is at a low level, then the child cannot acquire the necessary neurological unity to participate in skilled language activities.

Delacato lists and describes the relationship of neurological development with four specific applications to reading. (7:44-65) These four are sleep, brain injuries, handedness and footedness, and vision. According to Delacato, good readers have a specific pattern of sleep postures. (7:44) He further maintains that brain cells which are "newest on the evolutionary scale are the most easily damaged" as in birth trauma. He notes that boys' heads tend to be larger at birth than the heads of girls and that the delivery tends to be slower. He feels that this accounts for the four to one ratio of poor readers among males as compared to females. (7:46) He states that the early establishment of a dominant hand aids the child establish "proper visual dominance." (7:55) Finally he holds that the sighting eye should fall on the dominant side; the controlling
eye, the eye which controls binocular perception, should fall on the dominant side; and the most efficient eye, the eye which reads material best in a monocular situation, should also fall on the dominant side. (7:65)

Based on these postulates, Delacato has devised a neurological training program to precede remediation in reading. (7:68-79) His text serves both as test manual and as an outline for the training program.

Kephart conceptualizes on sensory-motor coordination, ocular control, and form perception and on their relationships to reading specifically and learning in general. (15) He reports that a closed system, involving feedback control, is operative in the perceptual process, (15:55) and that the perceptual-motor process is an integrated totality which must be taught through integrative activities. (15:62-65)

In reference to memory and learning, he asserts that the integrative process cannot be separated from the total activity of the organism. Impinging stimuli are integrated into the organism through interaction with categories produced by past experiences and modes of perceiving present stimuli are affected by experiential background. (15:65)

Stated below are those elements of Kephart's theory of the development of form perception which are especially
pertinent to this study. The reader is referred to his text for a more extensive explanation of his postulates. (15)

a. Globular forms are said to be the first perceptual impressions recognized by the child. In the infant, such impressions tend to be an amorphous mass, refined through learning and development. (15:72)

b. The next stage is "signal differentiation", the development of which begins in infancy and continues into adult life. The person develops the ability to note distinguishing characteristics of stimuli which he uses as signals to recognize and categorize stimuli. (15:73-74)

c. The establishment of "constructive forms" takes place as the number of signal elements increases. Rather than individual consideration of each element in the stimulus, a large number of elements are considered at a given time. The initial stage of perception is considered to be innate, the constructive form is learned. (15:75)

Many children have difficulty differentiating elements from the globular mass. They are either confused by many details or they experience difficulty in integrating the elements into a construct. Either details remain unrecognized or the figure is incoherent. (15:79) A perceptually deficient child working on word analysis either has trouble recognizing the differences in word elements
(horse / house) or he has trouble categorizing the wholes, either into sounds or concepts (horseness / houseness).

(15:86)

Limitations of Previous Studies. Although Frostig states that "assessment of visual perception cannot be predictive of reading ability in the higher grades," (10:11) other studies emphasize the autochthonous nature of perception and reading. Also, of the seven "adults" tested by Coleman, four demonstrated perceptual retardation. Admittedly seven is not a statistically significant figure; but it is the basis for his conclusion that although perceptual retardation tends to be cumulative, it tends to play "a more significant role in the reading disability of children than of adults." (6:501)

In view of such studies as that of Laycock and of Bowman, it would appear that mode of perception, at least, may play a significant role in the reading ability of adults and children alike. The pattern by which an individual perceives and categorizes his perceptions and the flexibility of the mode, and its relationship to reading skill needs to be investigated.

It is interesting to note that Delacato and Kephart have constructed two related if extrinsically different theories of psychoneurological development and perceptual development. These bear an analogous form to Maslow's
theory of the hierarchy of needs, although both appear to be based on less empirical evidence than the latter. It is possible that the former investigators are, in reality, treating symptoms and not true causes. It should be interjected here that there is nothing intrinsically wrong with treating symptoms (as many a cancer victim can attest!), but the difference should be noted.

**Methods and Materials Used in the Reading Improvement Program at Central Washington State College.** As stated earlier, in Chapter I (page 6), this course is offered through the adult education program of the local school district, but it is taught by a reading specialist on the college faculty and is conducted on campus, using campus facilities. No credit is offered, and a fifteen dollar fee is charged. Among the student body the class is generally considered to be remedial, or to use the college vernacular, "bonehead."

Enrollment is listed as voluntary. On the other hand, students who are in danger of academic probation are often "strongly advised" to enroll for the course and students who have twice failed to obtain minimum scores on the tests given for teacher education reading skills qualification, must take the course as a prerequisite to student teaching and the continuation of their professional sequences.
The class is offered once each quarter of the academic year. Those enrolled are largely students who have volunteered with one of the "pushes" described above along with an occasional member of the local community or a student who has a felt need to increase his reading ability, or both.

A variety of materials are used in the instructional sequence of which a brief description is included here with the instructional implementation. A complete bibliography of materials is given in Appendix A.

Diagnosis and evaluation are based on the results of the Nelson-Denny Reading Tests, Forms A and B, given as pre-tests and post-tests, respectively. Diagnosis of reading skill level and the instructional needs of the student is on the basis of an analysis of the percentile ranks obtained from the scores on Form A and on conferences scheduled with each student. Evaluation is based on the difference, if any, of the percentile rank obtained on the pre-test and that obtained on the post-test.

It is reported that the instructor assigns each individual to a program of instruction based on the former's evaluation of the individual's instructional needs. This may include any or all of the following: work in the "Controlled Reader" using filmstrips and study guides; work in the "Craig Reader, Advanced Program A;" work in the Science
Research Associates "Reading Laboratory IVa" and "Reading for Understanding"; practice with hand tachistoscopes; practice with reading pacers; or work from various texts and/or workbooks.

There are also a limited number of activities designed for the group as a whole. Near the beginning of each class meeting, there are three minute timed exercises in the SRA Reading Laboratory; there are intermittent exercises with speed of perception worksheets (see Appendix B); and the instructor holds occasional short lectures or discussions concerning reading and study skill techniques.

Classes are held three times each week during the quarter. In addition the student may use the facilities of the lab any time the room is free.

College reading improvement programs are widely diverse in organization, in content, and in methods used. (23:55) Central's program is probably roughly comparable to that offered in most colleges, however.

Strang, McCullough, and Traxler (23:55-63) have described distinguishing features of college reading programs. For purposes of comparison, these characteristics are summarized below.

1. "Ten Minutes at the Beginning of the Period." This is usually reading instruction given as part of the
freshman English sequence.

2. "First Semester Courses in Reading for All Students." A mandatory course in reading as part of the college curriculum.

3. "Focus on Functional Vocabulary." This program, used at Cornell University with significant success, stresses accurate interpretation of both the literal and the inferential meanings of words.

4. "Focus on Meaningful Reading of Long Assignments." While including instruction on the mechanics of reading, this kind of reading course centers upon extracting the main idea and important supporting details from difficult college material.

5. "Accent on Machines." This kind of reading program depends largely on individual and group work with films and various mechanical devices.

6. "Emphasis on Group Discussion and Group Work." Most of the aspects of 5 combined with group discussion of mutual problems are included in this program.

7. "Group Psychotherapy Applied to a College Reading Program." In this type program reading instruction is combined with group therapy sessions with promising results, both in reading skill development and in personality factors.

8. "Classes for Students Having Reading Deficiencies"
Most of these programs utilize a multiple approach, a reading laboratory, or a program geared to the college curriculum and aimed at helping the student adjust to the more difficult and abstract nature of college reading assignments. (23:56-60)

Strang and her associates further evaluate college reading programs as follows:

On the whole, college reading programs have been more adequately appraised than those on the lower educational levels. Every program seems to get results . . . However, very few of these studies measure the continuing effect of the course, six months or later; few measure adequately all the possible outcomes; few compare the gains of the reading class with a properly controlled group.

. . . At the present time most college reading courses should include these three features: (1) the teaching of the reading and study skills that all the students need, either in a scheduled course or in each of the content fields; (2) special reading classes or laboratories for those who come to college deficient in reading ability; and (3) individual counseling on reading and study problems. (23:62)

It can be seen that Central's reading program most closely resembles a remedial program (Type 8 above) and contains feature number two of those described immediately above.
CHAPTER III

THE MATERIALS USED AND THE GROUPS STUDIED

The Groups Studied

The nature of the experimental design dictated the selection of the subjects and the designation of the experimental groups. Two groups were needed: one whose members were enrolled in a college reading improvement program and one whose members were more representative of college students as a whole.

The Reading Improvement Group. The twelve subjects who comprised the reading improvement group were all enrolled in the reading improvement program at Central Washington State College during Winter Quarter, 1967. Of these, eleven were in the teacher education sequence and, in one way or another, had been "strongly advised" to take the class. One subject, a forestry student, was enrolled to improve his reading rate. There were seniors, juniors, sophomores and freshmen in the class. After the collection of data, this group was further divided into a high group (H), those who made appreciable gains and a low group (L), those who did not make appreciable gains.

Normative Group. The subjects who made up the normative group were taken from an undergraduate psychology
class. As in the first group, these students were also in the teacher education sequence. They were all sophomores and juniors, none of whom had taken the reading improvement class or who had failed the teacher education screening test in reading.

Materials Used
Two instruments were used in this study. The Witkin Embedded Figures Test was used as the measure of mode of perceptual discrimination. The Nelson-Denny Reading Test, Forms A and B, was used as the measure of reading skill.

The Witkin Embedded Figures Test. The WEFT is a variation of the Gottschaldt figures and consists of a series of eight simple figures and twenty-four complex figures. One of the simple figures is incorporated in each of the complex figures in such a way as to be obscured perceptually. (28:2) The simple figures are in black and white; the complex figures, with one exception, are in color. A sample of these figures is reproduced in figure 2.

This instrument was designed to measure individual differences in ease of perception of embedded figures, (28:1) that is, the pattern or mode by which individuals perceive a part within a field. One important aspect of
FIGURE 2

EXAMPLES OF STIMULUS CARDS USED IN THE
WITKIN EMBEDDED FIGURES TEST
the test is the ability to articulate a perceptual field. (17:296) Tyler notes that the task requires the ability "to analyze a complex configuration and then respond to some parts of it ignoring others," and that such ability is related to personality factors as well as general intelligence. (25:211) Others have discovered that performance on the Embedded Figures Test is related to flexibility of closure, spatial relations and verbal knowledge. (14:190-191)

Gough states that the Witkin Embedded Figures Test is a cognitive measurement of basic significance, (12:210) but he also notes four basic difficulties which hinder the usefulness of the instrument. These are the absence of a manual, as such; the length and general unwieldiness of the test; lack of a parallel form; and lack of general agreement as to the exact nature of the qualities measured. (12:210-211) Gough notes that although Witkin contends "that this test assesses a cognitive mode (analytical structuring) while being more or less independent of general level of intellectual ability," he (Gough) does not believe this to be so. (12:210)

One aspect of the test which gives it, or a similar instrument, strong possibilities as a possible diagnostic instrument in adult reading difficulties, is its use as a measure of field-independency. Tyler points out that
field-dependent persons tend to be passive, anxious about control of body impulses, and have less well differentiated body images than those who are more field-independent. (25:212) In view of the studies by Vorhaus, Bowman, and Laycock (26, 4, 16) it is likely that such qualities are significant to adult retarded readers also. It is interesting to note that it has been found that the ability to solve the tasks presented by the WEFT is significantly related to aptitude and training in mathematics. (1:29-30)

The consensus is that the test has four major diagnostic implications. The test discriminates a general disposition to articulate and structure experience, cognitive clarity, an analytic global form of perception, and field-independence.

In this test, as in the Nelson-Denny, reliability was found to be high. Tyler reports that reliability coefficients of the WEFT were .89 or higher. (25:212)

Because the WEFT is unwieldy to administer, a group test, Cf: Flexibility of Closure, was administered to the normative group in the hope that it would bear a sufficiently high correlation with the WEFT to warrant its substitution for the latter. Although the correlation was significant at the 1% level of confidence, it was not considered that the coefficient of correlation ($r = .53$) was sufficient to allow the substitution. Because this test is
part of the Kit of Reference Tests for Cognitive Factors currently being investigated, it was felt proper to include the data collected on this test in Table IV, page 33, although the results were not a part of this investigation per se.

The Nelson-Denny Reading Test. The Nelson-Denny Reading Test, hereafter called N-D, is an advanced test with percentile norms adequate for grades eleven and above. (24:1080) The authors contend that the test serves "predictive, screening, and broadly diagnostic purposes."

There are two equivalent forms. The test is designed for grades nine to sixteen with special instructions for use with advanced adult groups. Normal working time is thirty minutes, plus time to collect and distribute materials. (18:3)

This test is one of the better of its kind for measurement purposes (19:1078) and scores are quite reliable. (24:1081) Reliabilities for the total score is given as in the low nineties. (19:1078)

The N-D contains two sections. The first section contains 100 items to measure vocabulary and the second contains 36 comprehension items with the latter given double weight in the total score.
TABLE I

SUMMARY OF DATA ON NORMATIVE GROUP

<table>
<thead>
<tr>
<th>Subject code no.</th>
<th>N-D (total)</th>
<th>N-D (vocabulary)</th>
<th>N-D (comprehension)</th>
<th>WEFT</th>
<th>Cf</th>
</tr>
</thead>
<tbody>
<tr>
<td>C26</td>
<td>134</td>
<td>74</td>
<td>60</td>
<td>2058</td>
<td>6.25</td>
</tr>
<tr>
<td>C27</td>
<td>133</td>
<td>65</td>
<td>68</td>
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<td>15.00</td>
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<tr>
<td>C23</td>
<td>114</td>
<td>54</td>
<td>60</td>
<td>255</td>
<td>19.75</td>
</tr>
<tr>
<td>C21</td>
<td>113</td>
<td>53</td>
<td>60</td>
<td>793</td>
<td>3.75</td>
</tr>
<tr>
<td>C36</td>
<td>104</td>
<td>46</td>
<td>50</td>
<td>503</td>
<td>16.00</td>
</tr>
<tr>
<td>C28</td>
<td>100</td>
<td>40</td>
<td>60</td>
<td>542</td>
<td>15.00</td>
</tr>
<tr>
<td>C25</td>
<td>99</td>
<td>49</td>
<td>50</td>
<td>1105</td>
<td>19.00</td>
</tr>
<tr>
<td>C31</td>
<td>98</td>
<td>40</td>
<td>50</td>
<td>864</td>
<td>19.00</td>
</tr>
<tr>
<td>C35</td>
<td>96</td>
<td>38</td>
<td>50</td>
<td>418</td>
<td>12.00</td>
</tr>
<tr>
<td>C5</td>
<td>96</td>
<td>42</td>
<td>50</td>
<td>274</td>
<td>14.75</td>
</tr>
<tr>
<td>C8</td>
<td>92</td>
<td>40</td>
<td>50</td>
<td>188</td>
<td>21.75</td>
</tr>
<tr>
<td>C37</td>
<td>89</td>
<td>45</td>
<td>50</td>
<td>1077</td>
<td>7.25</td>
</tr>
<tr>
<td>C29</td>
<td>87</td>
<td>35</td>
<td>50</td>
<td>3449</td>
<td>6.25</td>
</tr>
<tr>
<td>C6</td>
<td>86</td>
<td>35</td>
<td>50</td>
<td>555</td>
<td>14.75</td>
</tr>
<tr>
<td>C24</td>
<td>84</td>
<td>38</td>
<td>50</td>
<td>800</td>
<td>7.00</td>
</tr>
<tr>
<td>C34</td>
<td>83</td>
<td>33</td>
<td>50</td>
<td>2477</td>
<td>4.75</td>
</tr>
<tr>
<td>C30</td>
<td>82</td>
<td>32</td>
<td>50</td>
<td>565</td>
<td>7.00</td>
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<td>C16</td>
<td>80</td>
<td>34</td>
<td>50</td>
<td>1768</td>
<td>7.00</td>
</tr>
<tr>
<td>C9</td>
<td>79</td>
<td>35</td>
<td>50</td>
<td>2407</td>
<td>6.25</td>
</tr>
<tr>
<td>C7</td>
<td>77</td>
<td>35</td>
<td>40</td>
<td>4813</td>
<td>3.75</td>
</tr>
<tr>
<td>C4</td>
<td>77</td>
<td>39</td>
<td>38</td>
<td>12.75</td>
<td></td>
</tr>
<tr>
<td>C20</td>
<td>76</td>
<td>38</td>
<td>38</td>
<td>17.75</td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>74</td>
<td>34</td>
<td>38</td>
<td>14.00</td>
<td></td>
</tr>
<tr>
<td>C19</td>
<td>66</td>
<td>24</td>
<td>38</td>
<td>4.75</td>
<td></td>
</tr>
<tr>
<td>C33</td>
<td>56</td>
<td>26</td>
<td>26</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>43</td>
<td>23</td>
<td>20</td>
<td>22.75</td>
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</tr>
</tbody>
</table>

N = 27

N-D total

<table>
<thead>
<tr>
<th>CF</th>
<th>N-D total</th>
<th>WEFT</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.027</td>
<td>1179.49</td>
<td>1086.046</td>
<td>22.75 - 0.00</td>
</tr>
</tbody>
</table>

Range = 134 - 43; 188 - 4813
Form A was administered to the reading improvement group as the pre-test with form B used as the post-test after instruction in the reading improvement class. In order to derive equivalent raw scores, it was necessary to convert scores from form B to corresponding scores on form A. Form A only was administered to the normative experimental group B.
CHAPTER IV

TECHNIQUE AND RESULTS OF THE EXPERIMENT

The Reading Improvement Group. At the beginning of the regular academic quarter, N-D, form A, was administered to the students enrolled in the reading improvement class; form B was administered at the end of the quarter. Scores earned on form B were converted to equivalent scores on form A in order to give differences in total raw scores. Ss scores were then arranged into two groups composed of the top 50%, those who made the most improvement, and the low 50%, those who made the least improvement. (See Table I, located on page 31.)

Ss were administered the WEFT and these results were tabulated. Differences between groups on the variables reported was determined by applying the Fisher Exact Probability test to analyzing numbers scoring above and below the median on any criteria.

The data collected on the reading improvement group is summarized in Table II, located on page 34. The means, medians, standard deviations, and ranges are also reproduced here for the convenience of the reader. The significant differences are summarized in Table III, located on page 35.

Results of the test of probability revealed the following differences reported between the group which
TABLE II

COMPARISON OF H AND L IN READING IMPROVEMENT GROUP

GROUP WHO MADE MOST IMPROVEMENT IN TERMS OF (CONVERTED) RAW SCORES ON THE NELSON-DENNY READING TESTS DIFFERENCES, TOTAL (H)

<table>
<thead>
<tr>
<th>code no.</th>
<th>difference</th>
<th>WEFT*</th>
<th>designation#</th>
</tr>
</thead>
<tbody>
<tr>
<td>B5</td>
<td>68</td>
<td>912</td>
<td>-</td>
</tr>
<tr>
<td>A12</td>
<td>37</td>
<td>1295</td>
<td>-</td>
</tr>
<tr>
<td>A5</td>
<td>23</td>
<td>204</td>
<td>-</td>
</tr>
<tr>
<td>A8</td>
<td>18</td>
<td>794</td>
<td>-</td>
</tr>
<tr>
<td>A2</td>
<td>13</td>
<td>1246</td>
<td>-</td>
</tr>
<tr>
<td>A16</td>
<td>11</td>
<td>5052</td>
<td>+</td>
</tr>
</tbody>
</table>

GROUP WHO MADE LEAST IMPROVEMENT IN TERMS OF (CONVERTED) RAW SCORES ON THE NELSON-DENNY READING TESTS DIFFERENCES, TOTAL (L)

<table>
<thead>
<tr>
<th>code no.</th>
<th>difference</th>
<th>WEFT*</th>
<th>designation#</th>
</tr>
</thead>
<tbody>
<tr>
<td>A13</td>
<td>7</td>
<td>1548</td>
<td>+</td>
</tr>
<tr>
<td>A3</td>
<td>7</td>
<td>1025</td>
<td>-</td>
</tr>
<tr>
<td>A14</td>
<td>4</td>
<td>4148</td>
<td>+</td>
</tr>
<tr>
<td>A7</td>
<td>-6</td>
<td>1586</td>
<td>+</td>
</tr>
<tr>
<td>A18</td>
<td>-7</td>
<td>2211</td>
<td>+</td>
</tr>
<tr>
<td>B4</td>
<td>-13</td>
<td>3504</td>
<td>+</td>
</tr>
</tbody>
</table>

*WEFT scores are in terms of seconds to complete task

#plus designation is assigned on a basis of WEFT score above the median; minus designation is assigned on the basis of WEFT score below the median.

Gains made by H group: \( p < .05 \)

Gains made by L group: \( p > .07 \)

Gains made by total group: \( p > .05 \) but \( p < .06 \)
TABLE III
SUMMARY OF DATA ON READING IMPROVEMENT GROUP

<table>
<thead>
<tr>
<th>Subject code no.</th>
<th>N-D pre-test (total)</th>
<th>N-D post-test (total)</th>
<th>N-D pre-test (Vocabulary)</th>
<th>N-D post-test (Vocabulary)</th>
<th>N-D pre-test (Comprehension)</th>
<th>N-D post-test (Comprehension)</th>
<th>WEFT in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>B5</td>
<td>51</td>
<td>119</td>
<td>19</td>
<td>51</td>
<td>32</td>
<td>69</td>
<td>912</td>
</tr>
<tr>
<td>A12</td>
<td>103</td>
<td>140</td>
<td>49</td>
<td>72</td>
<td>54</td>
<td>65</td>
<td>1295</td>
</tr>
<tr>
<td>A5</td>
<td>73</td>
<td>96</td>
<td>35</td>
<td>46</td>
<td>38</td>
<td>50</td>
<td>204</td>
</tr>
<tr>
<td>A8</td>
<td>59</td>
<td>77</td>
<td>29</td>
<td>34</td>
<td>30</td>
<td>45</td>
<td>794</td>
</tr>
<tr>
<td>A2</td>
<td>56</td>
<td>69</td>
<td>28</td>
<td>33</td>
<td>28</td>
<td>35</td>
<td>1246</td>
</tr>
<tr>
<td>A16</td>
<td>40</td>
<td>51</td>
<td>28</td>
<td>30</td>
<td>12</td>
<td>18</td>
<td>5052</td>
</tr>
<tr>
<td>A13</td>
<td>56</td>
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<td>23</td>
<td>30</td>
<td>39</td>
<td>1548</td>
</tr>
<tr>
<td>A3</td>
<td>98</td>
<td>105</td>
<td>44</td>
<td>52</td>
<td>54</td>
<td>53</td>
<td>1025</td>
</tr>
<tr>
<td>A14</td>
<td>58</td>
<td>62</td>
<td>26</td>
<td>32</td>
<td>32</td>
<td>31</td>
<td>4148</td>
</tr>
<tr>
<td>A9</td>
<td>36</td>
<td>30</td>
<td>12</td>
<td>10</td>
<td>24</td>
<td>20</td>
<td>1586</td>
</tr>
<tr>
<td>A18</td>
<td>39</td>
<td>32</td>
<td>9</td>
<td>12</td>
<td>30</td>
<td>21</td>
<td>2211</td>
</tr>
<tr>
<td>B4</td>
<td>80</td>
<td>67</td>
<td>32</td>
<td>31</td>
<td>48</td>
<td>37</td>
<td>3504</td>
</tr>
</tbody>
</table>

N = 12

WEFT

<table>
<thead>
<tr>
<th>Range</th>
<th>N-D pretest total</th>
<th>N-D post-test total</th>
</tr>
</thead>
<tbody>
<tr>
<td>204 - 5052</td>
<td>103 - 39</td>
<td>140 - 30</td>
</tr>
<tr>
<td>M = 1960.416</td>
<td>62.416</td>
<td>75.916</td>
</tr>
<tr>
<td>SD = 1491.52</td>
<td>22.006</td>
<td>33.519</td>
</tr>
</tbody>
</table>
TABLE IV

COMPARISON OF H's AND L's IN READING IMPROVEMENT GROUP

ACCORDING TO SIGNIFICANT DIFFERENCES

<table>
<thead>
<tr>
<th>WEFT Scores</th>
<th>Are significantly different at .05</th>
<th>Not significantly different at .05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test scores on N-D (total)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pre-test scores on D-D (voc.)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pre-test scores on N-D (comp.)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Post-test scores on N-D (total)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Post-test scores on N-D (voc.)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Post-test scores on N-D (comp.)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
showed the greatest improvement in reading as opposed to the group which improved the least: (See Table III)

1. The two groups were significantly different in WEFT scores;

2. The two groups were not significantly different in terms of total reading scores on the pre-test;

3. The total reading scores on the post-test were significantly different;

4. They were not significantly different on the vocabulary pre-test;

5. They were significantly different on the vocabulary post-test;

6. They were not significantly different on either the post-test or the pre-test on the comprehension section.

7. When the reading improvement group was combined with the normative group, there was no correlation revealed between WEFT and total scores on the Nelson-Denny Reading Test.

8. Significance of the differences in total scores on the post-test and the pre-test for the entire reading improvement group was between the 5 and 6 percent confidence level.

9. The high group did improve significantly in total reading ability while the low group did not.
The Normative Group. The normative group, composed of students enrolled in a psychology class (Psychology of Learning and Evaluation) which was included in the education sequence and who had not previously failed the Teacher Education reading test and/or had not taken a similar reading class, were administered the WEFT and the N-D, form A. Because this group was not subjected to treatment, no post-test was administered. Again, there was no correlation between reading scores and WEFT scores.

In Table IV there is given a complete summary of the data collected on the normative group. Again, means, medians, standard deviations and ranges have been included.
Summary of Results. Twelve college students enrolled in a reading improvement program for one quarter were administered the Nelson-Denny Reading Test (N-D) as a pre-test and post-test measure of reading improvement (gains in scores). Ss were divided into two groups of six each: 1. the six showing the greatest gains, and 2. the six showing the least gains. The Fisher Exact Probabilities test was used to test differences between the two groups. On the N-D pre-test measure there were no significant differences in Vocabulary, Comprehension, or Total scores. On the post-test measure there were significant differences on the N-D Vocabulary and Total scores. The two groups also differed in scores obtained on the Witkin Embedded Figures Test (WEFT), and this difference also favored the group who showed the most improvement in reading during the quarter in which they were enrolled in the reading class.

There was no correlation between WEFT and N-D total pre-test scores. When these twelve Ss were combined with twenty-six other students enrolled in an undergraduate psychology class, no correlation was found between N-D and WEFT scores; nor was there a correlation between N-D and WEFT scores for the latter group alone.

Results of the study tend to substantiate Witkin's conclusion that mode of perception shows limited relation
to verbal skills. On the other hand, serious questions are raised by the study concerning his conclusion that perceptual mode is not related to ability to learn. It is possible that the discrepancy is related to the fact that his conclusions are based on the relationship between mode of perception and verbal index score based on the subtests of the WISC. (29:188) It may also be suggested that the studies of learning were laboratory learning situations and not those which might conceivably be expected to take place in an ordinary classroom. (29)

The dilemma of why the absence of a relationship in college students between perceptual style and ability to read and the presence of a relationship between perceptual style and the ability to improve reading skill under an instructional program such as that provided in the reading improvement program at Central was not resolved. Suggestions, speculations, and recommendations are included in the conclusions.
The Relationship Between Mode of Visual Perception and Reading Ability at the College Level. Analysis of the results of this investigation tends to support the position of Frostig and others in the field that perceptual ability is not predictive of reading ability at the college level, at least in so far as such ability is measured by the WEFT. This must, however, be qualified. It should be remembered that all the Ss in the reading improvement group were academically successful, at least to some degree. That is, all had mastered the skills involved in reading to the extent of being able to graduate from secondary school and attempt college. It is unlikely, therefore, that any of the Ss had serious trouble with any of the foundational reading skills. At any rate, the evidence does not warrant the rejection of the null hypothesis: scores on the Witkin Embedded Figures Test had not been shown to be predictive of reading ability per se at the college level.

The Relationship Between Mode of Visual Perception and Ability to Profit from Reading Instruction. Ss who failed to make significant gains in reading through the instruction offered in the reading improvement program at
Central Washington State were different in three ways from those who succeeded. These differences were all significant at the 5% level of confidence or more: in total gains in reading skill, in total gains in vocabulary, and in performance on the WEFT. Those Ss in the H group improved a significant amount; those in the L group did not. The null hypothesis of no difference between the groups, therefore, must be rejected, and it can be stated that there appears to be a relationship between perceptual style and the ability to benefit from reading instruction at the college level.

As previously stated, the dilemma of why a measure of perceptual style should be predictive of ability to gain skill under instruction, but is not predictive of skill already acquired has not been resolved. It is interesting to consider some possibilities, however, in the form of two speculations on etiology and two specific recommendations.

Speculations. One of the possibilities that occurs is that those Ss who failed to make appreciable gains are hampered by an inflexible perceptual style. That is, these people find it difficult to perceive or to manipulate their environments in a variety of ways. Once having acquired minimal skills which enable them to read, if not adequately, at least to a degree, they are unable to
modify their modes of attack to fit their changing needs.

During testing, the examiner noted that those who tended to score low on the WEFT frequently exhibited signs of tension and defensiveness in the testing situation. In addition, almost all of the Ss from the Reading Improvement Group (with the exception of A 2 and A 5 only) exhibited these same signs. Not only that but the reading improvement group as a whole tended to be un-cooperative and hard to test (missing appointments, late, etc.). It would be interesting to observe the performance of a similar group on test involving flexibility and level of dogmatism in relation to the WEFT and N-D.

The second possibility concerns the instruction offered. It is evident that those Ss who score poorly on the WEFT also fare poorly in the reading program as it is now designed. It would be interesting to observe the results of offering especially designed instruction--part of which should include training in learning how to learn--to those who score below the median in the WEFT.

It should be noted that the above are only two possibilities that are included within a myriad of ideas. For example, the problem could be rooted in cognitive development, cognitive potential, personality development, or any one of a number of the facets of human learning. It is not the scope of this study, however, to range
wildly over the landscape. The two speculations above appear to be the most likely to be causally related to the problem.

**Specific Recommendations.** The trends noted in this study lend themselves to two evident recommendations, one for further research, the other for a change in the instructional design of the reading improvement program offered at Central Washington State.

(1) The relationship between cognitive and perceptual style and reading at the college level should be thoroughly researched. A start would be to examine those students who fail the teacher education screening examination in relation to concomittant performance on the Cf which has a low (.53) but significant correlation with the WEFT and has the advantage of easy administration. Then those whose Cf scores warrant further examination should be examined for performance on the WEFT.

These Ss should be thoroughly studied for other ways in which they are similar to each other, e.g., socioeconomic status, intelligence quotient, family history, academic history, personality.

(2) Using controls, those students who enroll in the reading improvement program should receive individualized reading instruction based on thorough diagnosis of
reading difficulty, aberrant perceptual style, and possible personality blocks which might be modified by some form of therapy. It is further suggested that a more efficient method of evaluation be devised to permit more exact statistical procedures.
BIBLIOGRAPHY


28. ________. "Individual Differences in Ease of Perception of Embedded Figures." Brooklyn, New York: Herman A. Witkin, State University College of Medicine, n.d. (Mimeographed)

APPENDIX

MATERIALS USED IN THE READING IMPROVEMENT PROGRAM AT CENTRAL WASHINGTON STATE

A. BOOKS, WORKBOOKS, AND PROGRAM


Controlled Reader Story Set (filmstrips) MN, IJ. Huntington, New York: Educational Development Laboratories, n.d.


B. MACHINES

Controlled Reader. Educational Development Laboratories.

Craig Reader. Craig Research, Inc.

Reading Accelerators, Model III. Science Research Associates.

Shadowscope. Pyrotechnics, Inc.

Skimmer. Educational Development Laboratories.


Visualizer. The Better Reading Program, Inc.