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## Analysis of Difficulties in Reading and Learning to Read

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ANALYSIS OF DIFFICULTIES IN READING AND  
LEARNING TO READ

BENA K. HANSEN

Probably one of the most difficult of mental tasks undertaken by human beings is one that must be begun by the child at five to seven years of age. If the tools with which he works at this task, namely, learning to read, are not up to par, his reading will be carried on in a defective manner or may not even be achieved at all. Bad habits of attacking this task may also handicap the child in learning to read. Inability to read with some degree of efficiency is the cause of failure in school and conflicts in both home and school. The child who has pronounced disabilities in silent reading is usually discouraged and often on the defensive and frequently develops antagonistic and antisocial attitudes and behavior. Defective readers can be found throughout our educational system from the first grade up through college.

The diagnosis of reading difficulties of children and the remedial treatment of these individuals are still in the experimental stage. Each case calls for careful diagnosis to attempt to discover the cause or causes of the disability, and, following that, the remedial treatment must be based on the findings of the diagnosis and on methods best suited for improving reading ability. Where the difficulty is due merely to ineffective early habits of reading, the task is simplified. Where it is due to other causes, detailed procedures are sometimes necessary. More information both as to diagnosis and to treatment needs to be collected and made available before this great task is completed. Many experimental studies and clinical surveys are being conducted at this time in our colleges and universities, directed either to the discovery of and the causes for reading disabilities or for the various methods effective in aiding non-readers or those with reading disabilities. Among such clinics are the following, the Orthogenic School of the University of Chicago, the Psycho-Educational Clinic of Harvard University, the clinic for non-readers in Boston Teachers College, The Fernald-Keller Experimental Method of the University of Southern California, The Iowa State College Experimental Study on the Improvement of Reading by College Students as conducted by the **Psychology Department**, and many other clinics in this field.

## CLINICAL PROCEDURES

I shall attempt here to confine myself to a discussion of the work done in the diagnosis of reading disabilities, the laboratory investigation carried on in one institution in which I had the opportunity of observing and of participating in a small measure in this particular type of study. This investigation was conducted in the Psycho-Educational Clinic in Harvard University under the direction of Dr. Walter F. Dearborn. The clinic has for a number of very crowded years been engaged in diagnostic and remedial work in reading, and from time to time reports in educational journals and by way of the radio have been given the public regarding this work. Possibly the fact that Dr. Dearborn has a medical training as well as one in psychology and education may be an explanation of the broad and scientific nature of his attack and handling of this truly serious difficulty, the problem of the non-reader and the consequences of his disability to himself and to those associated with him.

The work as conducted in the clinic for non-readers or for those with reading difficulties may be divided into three parts:

1. Testing each case for his intelligence level.
  2. Testing each case for his reading ability or disability.
  3. Laboratory tests to determine handedness, eyedness, etc.
- and other phenomena connected with special reading disabilities.

In the first of these steps the child reporting to the clinic is given the Terman Revision of the Binet Tests. Non-language intelligence tests are given to the individuals with the more serious handicaps in reading, tests such as the Dearborn A and B form or the Pintner non-language test.

In the second division of the diagnostic procedure a number of reading tests are given each child. For the younger children the Gray Oral Reading Paragraphs Test and the Gates Silent Reading Tests, types 1, 2 are used. For intermediate grade children the Gates Silent Reading Test, types A, B, C, and D, the Ayres-Burgess Scale, the Chapman-Cook Speed of Reading Test or the Chapman Unspeeded Test are among the best. For high school and college students the Iowa Silent Reading Test as well as some of the tests used for intermediate grade children are chosen. A record of the errors and other characteristics of the child's work on these tests are tabulated or graphed. Such features as are unusual are also noted by the examiner and added to the report. It is possible to discover such faults as inversions, such as reading *was* as *saw*, or *b* as *d*, or a tendency to read from right to left, or

seeing letters but not words, a fault called alexia or word blindness. Back-handed or back-eyed tendencies in reading can be discovered also by means of photographs of eye movements while reading.

After the testing procedures for intelligence and for reading disabilities, the third step in the diagnostic examination is undertaken. However, it does not matter particularly in what order the three steps in the investigation are taken, for all the findings are carefully studied at the end of the examination and before any remedial exercises and instruction begin.

If, while the laboratory tests are being made, it seems evident that the child has certain visual defects that may be remedied by a specialist's attention, he is sent to an oculist for examination to be fitted with glasses in case of need before the testing is continued. Ordinarily this will have been done before the child is referred to the clinic for study. Neurologists hold that in the development of speech and writing one of the hemispheres of the cerebrum is dominant. In right-handed and right-eyed individuals the left hemisphere is dominant, and in the left-handed and left-eyed person the right hemisphere is dominant. There are many who hold the theory that the cause of reading disabilities is too often a failure of the establishment of the dominance of one cerebral hemisphere. On the basis of this viewpoint investigators in the field of reading disabilities are concerned in testing hand, foot, eye, and ear preference in each case reporting for study and treatment of a remedial nature. To test handedness, eyedness, etc. there are a large number of laboratory tasks or trials given each child.

#### STUDY OF HANDEDNESS

Form 1 below indicates the kinds of tests that have been chosen for use by the Harvard Psycho-Educational Clinic in determining lateral dominance in each case. There are over a hundred such tests from which these enumerated have been chosen. You will note that one group of these tests is for determining hand preference, another eye preference, still another set for ocular acuity, and last, a group of tests for mirror writing and mirror reading. Still another set can be added to these, which I shall speak of later, the tests for aniseikonia.

##### *Form 1 — Psycho-Educational Clinic*

Name \_\_\_\_\_ Age \_\_\_\_\_ Grade \_\_\_\_\_  
 School \_\_\_\_\_ Birth date \_\_\_\_\_  
 Referred by whom \_\_\_\_\_

Form I cont'd.

<i>Handedness Tests</i>		1	4	L	R	2	3	Pre-ferred		L	R
Peg setting	_____	_____	_____	_____	_____	_____	_____	_____	Writing	_____	_____
Ball placing	_____	_____	_____	_____	_____	_____	_____	_____	Drawing	_____	_____
Tapping	_____	_____	_____	_____	_____	_____	_____	_____	Erasing	_____	_____
Fork setting	_____	_____	_____	_____	_____	_____	_____	_____	Gimlet	_____	_____
Shot Tube	_____	_____	_____	_____	_____	_____	_____	_____	Spoon	_____	_____
Dynamometer	_____	_____	_____	_____	_____	_____	_____	_____	Throwing	_____	_____
Scissors	_____	_____	_____	_____	_____	_____	_____	_____	Quoits	_____	_____
Punch	_____	_____	_____	_____	_____	_____	_____	_____	Kicking	_____	_____
Hammer	_____	_____	_____	_____	_____	_____	_____	_____			

*Bimanual Handedness Tests*

	L	R			L	R	
Shovel	_____	_____	Dom. H. on end	Bat Hand	_____	_____	Dom. H. in
Broom	_____	_____	Dom. H. on end	Bat Shoul.	_____	_____	middle

*Eyedness Tests*

	L	R	Test Record for Sterescope	
ABC vision	_____	_____	Left	Right
Card ring	_____	_____	2846086428	7593195373
Peephole	_____	_____	6428204062	3957917519
Manuscope	_____	_____	8602468426	5379573951
Stereoscope	_____	_____	4264820640	9135739137
Selzer	_____	_____		L R
Maddox	_____	_____	2.50 Diopter Test	_____
Winking	_____	_____		
Cover test	_____	_____		

*Ocular Tests*

Visual acuity \_\_\_\_\_ Astigmatism \_\_\_\_\_  
 Refraction Correction \_\_\_\_\_  
 Phoria \_\_\_\_\_ degrees at 20 feet \_\_\_\_\_ degrees at 16 inches \_\_\_\_\_  
 Size right \_\_\_\_\_  
 Visual symptoms \_\_\_\_\_

Mirror Writing \_\_\_\_\_  
 Monroe Picture Reading Positive \_\_\_\_\_ Negative \_\_\_\_\_  
 Monroe Mirror Drawing \_\_\_\_\_  
 Mirror Reading Time with mirror \_\_\_\_\_ Time without mirror \_\_\_\_\_  
 Tachistoscope Test \_\_\_\_\_

It becomes an easy matter for the beginner in reading to form faulty habits of word recognition if he has left-dominant, mixed or non-dominant tendencies.

Other factors that make for disabilities in reading are also found. First, a considerable number of non-readers are semi-neurotic, although it is sometimes hard to tell whether the nervous disposition causes the reading difficulty or whether the reading difficulty causes the nervous state. Second, faulty functioning or lack of balance of the muscles of the eyes are contributing factors in reading difficulties. Third, differences in the size and in the form of the two retinal images is a condition which is receiving attention and some investigation at this time.

On this last condition the investigation by Dr. Dearborn and Dr. Irving H. Anderson of Harvard has been completed recently, and the entire study has been published under the title, "Aniseikonia as Related to Disability in Reading." The word *aniseikonia* is derived from three words, *ana*, meaning negative, *iso*, meaning equal, and *eikon*, meaning image. It is a condition of the eyes in which the ocular images or impressions which reach consciousness through the vision are unequal either in size or shape, with the result that during binocular vision conflicting excitations arrive at the visual centers in the occipital cortex and cause difficulties in fusion of the disparate images. The most common types of aniseikonia are (1) all over differences in which the image formed in one eye is somewhat larger in both vertical and horizontal meridians than the image formed by the other eye, (2) a difference in which the image formed by one eye is larger than that formed by the other eye in only one of these meridians, and (3) compound meridional differences in which the image formed in one is larger in one but smaller in the opposite meridian as compared with the image of the other eye. Some other meridional differences may also exist, but all forms of aniseikonia result in imperfect fusion and indistinct vision. Accompanying this is also visual discomfort, headaches, nervousness, and ocular and bodily fatigue at times. The individual suffering from this disturbance to vision usually reads in small units such as a word or a letter at a time instead of in larger units in which peripheral vision is needed to control proper fixation pauses. The two unfused images may result in too frequent fixations and in frequent regressive movements of the eyes. The reading would be slow and hesitant and show frequent repetitions and errors of perception. This type of difficulty had not been discovered until the instrument called the *Ophthalmic-Eikonometer* was designed. It originated in the Dartmouth Medical School. The one used by Drs. Dearborn and Anderson was of the same sort and made in the Psycho-Educational Clinic at Harvard by the department in 1931. At the time the writer saw it in use, it had not been patented, and it probably would not be. This instrument has an adjustable head rest and a chin rest, corneal aligning devices for placing the eyes so that they are equidistant from the planes of the target, a target which can be placed in position for distant or for near vision. Distortionless prisms may be swung into position in front of the eyes so that the target may be projected to a distance of twenty feet, a distance suitable for testing the eyes.

## ANALYSIS OF FINDINGS

The experimental group used in this investigation for aniseikonia consisted of the 100 most severe cases of reading disability measured in the Harvard clinic during the period from October 1932 to May 1938. The control group consisted of 100 unselected children. The ages of the children in both groups ranged from 9 to 18 or over. No attempt was made to match the group on the basis of mental age, for there is no evidence at all to show that mental ability, as such, is related to the amount of aniseikonia. An amount of 1.00% of aniseikonia is approximately the amount which has been found to be necessary to produce visual disturbances, although smaller amounts may still be clinically significant. Of the experimental group, the non-readers, 49% of the 100 cases had aniseikonia of less than 1.00%, while 77% of the control group had less than 1.00% of aniseikonia. To put it in another way, 51% of the experimental group had aniseikonia of more than 1.00%, in fact, of from 1.00% to as much as 4.00% or over in some of the worst cases, while the control group had only 23% who had aniseikonia amounting to 1.00% up to 2.75%. None in the control group had aniseikonia more than 2.75%, while in the experimental group of non-readers eleven were found to have as serious a condition as 3.00 to 4.00% or over of aniseikonia. The differences between the percentages of these two groups is 4.31 times the standard error of the difference. This means that the chances are 99.9 in 100 that the difference is a true difference. In several of the worst cases it was found that binocular single vision is improbable or impossible.

How important this defect is in the causation of reading disability is difficult to estimate. Certainly it is not the only cause, for many poor readers do not have it. Even among those who do have this particular defect, other factors operate to further complicate the problem. Therefore it is difficult to isolate any one single factor and to evaluate its importance as apart from the other factors that may be present in a given case. However, according to the data of this investigation, aniseikonia is a factor that is at work in approximately 50% of extreme cases of reading disability. Other factors such as errors of refraction, deviations in ocular and manual lateral dominance, muscular imbalance, and other conditions greatly modify reading efficiency. But aniseikonia seems to be a more frequently found obstacle to efficient reading than many of the others, and it conditions reading efficiency more significantly. The eye defects which more seriously affect the

ability to read are those which result in inadequacies of fusion of which aniseikonia is a type and a more serious type than refraction disturbances such as near sight and astigmatism, because the specialist in eye defects would be less able to supply means to remedy such defects.

The question of aniseikonia is one of plain psychology and pedagogy. If these cases are recognized early enough, their difficulties may be anticipated and in part, at least, prevented or corrected by some weeks of individual attention and individual instruction. "Structural defects may operate to produce retardation in reading . . . in that they are in the nature of initial handicaps, more or less readily surmounted by the great majority of children, but which trip the faltering steps of a few individuals either because the amount of impairment is in excess of that which they are prepared to overcome or because the structural conditions occur in combination with each other or with other barriers to learning." Certainly, whatever remedial instruction is given non-readers or those with any disabilities in reading, one must take into account the particular nature of the disabilities found among the various cases.

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