

Dyslexia: The Disease You Get in School

By Mr. Samuel L. Blumenfeld

Dyslexia is an exotic word, concocted from the Greek dys, meaning ill or bad, and lexia, meaning words. It was invented to describe a condition that affects many normal and intellectual youngsters who, for some reason that seems to baffle most educators, parents, and physicians, can't learn to read.

The difference between a dyslexic and a functional illiterate is purely social. Dyslexics are usually adolescents from middle-class or professional families whose parents assume that their child's reading difficulty is more of a medical or psychological problem than an educational one. The child is too smart to be that dumb.

The functional illiterate is simply someone who has kept his reading problem to himself and goes through life pretending he can read, avoiding situations which involve reading, choosing jobs which do not reveal his reading disability. He assumes he's dumb, not sick or mentally disturbed.

However, in the last ten years, with the growth of federally funded Special Education and the proliferation of early testing, more and more children with reading difficulties are being labeled "learning disabled," or LD, in the first grade or even kindergarten. These children are being "diagnosed" as suffering from minimal brain damage, minimal brain dysfunction, neurological impairment, perceptual impairment, attention deficit syndrome, or dyslexia.

The Symptoms

What are the symptoms of dyslexia? The Academic American Encyclopedia (Vol. 6, page 320) gives us as good a summary of the disease as we shall find anywhere. It says:

"Dyslexia refers to an impaired ability to read or comprehend what one reads, caused by congenital disability or acquired brain damage. Dyslexia is independent of any speech defect and ranges from a minor to a total inability to read."

"Specialist used the term specific dyslexia to refer to inability to read in a person of normal or high general intelligence whose learning is not impaired by socio-economic deprivation, emotional disturbance, or brain damage. Psychologists disagree about whether specific dyslexia is a clearly identifiable syndrome. Those who think it is clearly identifiable note that it persists into adulthood despite conventional instruction; tends to run in families; and occurs more frequently in males. It is also associated with a specific kind of difficulty in identifying words and letters, which dyslexics tend to reverse or invert (reading p or q, or example or on for no). Competing theories exist about the causes and nature of dyslexia.

Although there is disagreement among “experts” over the causes of dyslexia, there is general agreement that the most effective “cure” is remedial programs that stress phonics.

Dr. Orton’s Findings

But it is somewhat puzzling that there should be so much disagreement over the cause of dyslexia, when, as early as 1929, a leading physician attributed its cause to a new look-say, whole word, or sight method of teaching reading that was being introduced in the schools of America. In February 1929, there appeared in the Journal of Educational Psychology an article entitled “The ‘Sight Reading’ Method of Teaching Reading as a Source of Reading Disability.” written by Dr. Samuel T. Orton, a neurologist at Iowa State University.

Dr. Orton, a brain specialist who dealt with children’s language disorders, had been seeing a lot of children with reading problems at his clinic. In diagnosing the children’s problems at his clinic he came to the conclusion that their reading disability was being caused by this new instruction method. He decided to bring these findings to the attention of the educators, and he did so in as diplomatic a way as was possible. He wrote:

“I wish to emphasize at the beginning that the strictures which I have to offer here do not apply to the use of the sight method of teaching reading as a whole but only to its effects on a restricted group of children for whom, as I think we can show, this technique is not only not adapted but often proves an actual obstacle to reading progress, and moreover I believe that this group is one of considerable size and because here faulty teaching methods may not only prevent the acquisition of academic education by children of average capacity but may also give rise to far reaching damage to their emotional life.”

This warning to the educators was quite explicit: this method of teaching will harm a large number of children.

Dr. Orton expected the educators to respond to his findings. They did – negatively. In fact, they accelerated the introduction and promoted of the new teaching methods throughout the primary schools of America. And it didn’t take very long before America began to have a reading problem.

The Disease Spreads

Although Dr. Orton went to become the world’s leading authority on “dyslexia,” and in effect created one of the most effective remediation techniques, the Orton-Gillingham method, his 1929 article is nowhere referred to in the literature on the subject.

I came across it quite by accident while doing research for my book, The New Illiterates, which was published in 1973. But why the experts on dyslexia have not found it, I don't know. In any case, dyslexia was virtually unknown in this country until the 1940s when, suddenly millions of American children were coming down with the disease. Life magazine reported in April 1944:

“Millions of children in the U.S. suffer from dyslexia which is the medical term for reading difficulties. It is responsible for about 70% of the school failures in the 6- to 12-year-age-group, and handicaps about 15% of all grade-school children. Dyslexia may stem from a variety of physical ailments or combination of them – glandular imbalance, heart disease, eye or ear trouble – or form a deep-seated psychological disturbance that ‘blocks’ a child’s ability to learn.

The article then described the treatment for dyslexia given a young girl at Chicago’s Dyslexia Institute on the campus of Northwest University: “thyroid treatments, removal of tonsils and adenoids, exercise to strengthen her eye muscles. Other patients needed dental work, nose, throat or ear treatment, or a thorough airing out of troublesome home situations that throw a sensitive child off the track of normality.”

Enter Dr. Flesch

In 1955, Dr. Rudolf Flesch published his famous book, Why Johnny Can’t Read, in which he revealed to parents the true cause of the reading problem. He wrote:

“The teaching of reading – all over the United States, in all schools, and in all textbooks – is totally wrong and flies in the face of all logic and common sense.”

And then he explained how in the early 1930s the professors of education changed the way reading is taught in American schools. They threw out traditional alphabetic-phonics method, which is the proper way to teach a child to read an alphabetic writing system, and put in a new look-say, whole-word, or sight method that teaches children to read an alphabetic writing system, and they put in a new look-say, whole-word, or sight method that teaches children to read English as if it were Chinese, an ideographic writing system. Flesch contended that when you impose an ideographic teaching method on an alphabetic writing system you cause reading disability.

Dr. Orton had said as much in 1929, but in 1955 Flesch could cite millions of reading-disabled children as substantiation of what he was saying. Naturally, the educators rejected Flesch’s contentions.

Most people, of course, don’t know the difference between an alphabetic system and an ideographic one. But one must know the difference in order to understand how and why look-say can cause dyslexia.

The Alphabet

Ours is an alphabetic writing system, which means that we use an alphabet. What is an alphabet? It is a set of graphic symbols – we call them “letters” – that stand for the irreducible speech sounds of the language. In other words, alphabet letters are not meaningless configurations. They actually stand for something. Each letter represents a specific sound, and in some cases more than one sound.

All alphabets are the same in that regard. The Russian, Greek, and Hebrew alphabets all stand for sounds of their respective languages, and the English alphabet stands for the sounds of the English language.

How does one teach a child or anyone else to read an alphabetic writing system? For hundreds of years it was done very simply in three steps. First, the child was taught to recognize the letters of the alphabet; second, the child was taught the sounds the letters stood for; and third, the child was then given words and sentences to read.

How was the child taught the letter sounds? Usually it was done in the simplest mechanical way possible. For example, the child was taught the consonant sounds and then drilled on the consonant-vowel combinations arranged in column form, such as ba, be, bi, bo, bu; da, de, di, do, du etc. the purpose of the drill was to enable the child to develop as quickly and easily as possible an automatic association between letter and sound. Developing that association is at the heart of learning to read an alphabetic writing system.

Pictographs and Ideographs

The first alphabet was invented about 2,000 B.C. Prior to that invention, the earliest form of writing we know of is pictograph – the pictures represented objects and actions. You didn’t have to go to school to learn to read pictographs, for the symbols looked like the things they represented.

However, as civilization became more complex, the scribes had to begin drawing pictures of things that did not lend themselves to easy depiction. For example, how would you draw pictures of such concepts as good, bad, dream, reality, persuasion, confidence, memory, intent, liberty, justice, etc? You can’t. So the scribes drew symbols, none of which looked like the concept they represented. Thousands and thousands of such symbols – called ideographs – were created. And now you had to go to school and be taught what all these symbols meant. The result was that literacy was limited to a small class of scholars, scribes and priests. Ancient Egyptian hieroglyphics is an ideographic writing system, and so is modern Chinese. The Chinese use 50,000 ideographs, of which 5,000 must be mastered if an individual is to be able to read a Chinese newspaper. Thus, ideographic writing is cumbersome, difficult, and time-consuming to master.

However, somewhere around 2,000 B.C. someone in the area of ancient Phoenicia (today's southern Lebanon and northern Israel) made a remarkable discovery. He discovered that all the human language, everything we say, is actually composed of a small number of irreducible speech sounds arranged in endless combinations. It occurred to him that by creating a set of symbols to stand for the irreducible speech sounds of the language, he could create a new form of writing based on actual transcription of the spoken word. And so alphabetic writing was invented.

Advantages of the Alphabet

And now for the first time man had an accurate, precise means of transcribing the spoken word directly into written form, and an equally precise means of translating the written word back into its spoken form. It was the most revolutionary invention in all history. It did away with hieroglyphic and ideographic writing and accelerated the speed of intellectual development. It also made learning to read simple and available to the population as a whole.

The invention of the alphabet also had great spiritual significance for mankind. It permitted the word of God to be put down on paper accurately and precisely in the form of the Scripture. It made the word of God accessible to the human race.

Clearly, alphabetic writing had enormous advantages over ideographs: It permitted greatly increased speed and accuracy in communications, it was easy to master, and it facilitated a tremendous expansion in vocabulary, permitting the human mind to develop ideas hitherto inconceivable.

In the light of all these advantages, it seems strange that professors of education in the 1930s would decide to teach American children to read English as if it were an ideographic writing system. How could you possibly teach children to read that way? To a logical mind the whole idea seems not only absurd but insane. Yet, that is what the professors did.

Going Backwards

Their idea was that it was better for children to look at whole words as pictures and have them associate them directly with objects, actions and ideas rather than have them learn to associate the letters with sounds. And so they eliminated step two in the three-step alphabetic learning process and had the children go directly from step one to step three; sometimes they would even skip step one and started out with whole words.

Essentially, the method works as follows: the child is given a sight vocabulary to memorize. He is taught to look and say the word without knowing that the letters stand for sounds. As far as the pupil is concerned, the letters are a bunch of arbitrary squiggles arranged in some arbitrary, haphazard order. His task is to see a picture in the configuration of the whole word – to make the word horse look like a horse.

Of course, the word horse does not look like a horse. So how does a child remember that the word is horse? Anyway he can. There isn't a professor of education anywhere in the world who can tell you how a child learns a sight vocabulary. The only research we know of that addresses that question was done by Josephine H. Bowden at the elementary school of the University of Chicago around 1912. A description of the studies was given by Prof. Walter F. Dearborn in 1914 as follows:

In the first study of pupils, who had had no instruction in reading, were taught by a word method without the use of phonics and the problem was to determine by what means children actually recognized and differentiated words when left to their own devices. The following quotation indicates the methods employed by the experimenter: "First, incidents; for example, one day when the child was given the cards to read from, it was observed that she read with equal ease whether the card was right side up or upside down. This incident suggested a test which was later given. Second, comments of the child; for example, when she was asked to find in context the word 'shoes,' she said that 'dress' looked so much like 'shoes' that she was afraid she would make a mistake. Third, questioning; for example, she had trouble to distinguish between 'sing' and 'song.' When she had mastered the words she was asked how she knew which was which. Her reply was, 'by the looks.' When questioned further she put her finger on the 'i' and the 'o.' These three types of evidence correspond to introspection with an adult. The fourth type of evidence is comparison of the words learned with the words not learned as to the parts of speech, geometric form, internal form, and length. Fifth, misreadings; for example, 'dogs' was read 'twigs,' and 'feathers,' 'fur.' Sixth, mutilations; for example 'dogs' was printed 'digs,' lilac' was printed 'lalci.'"

Some of the conclusions may be cited, first as regards the kinds of words most easily learned on the basis of the word form. Four out of six children learned more 'linear' words, i.e., words like "acorns," "saw," in which there were no high letters, than of any other group. In but one case were the "superlinear" words more easily recognized

Misreadings or the mistaking of one word for another occurred most frequently in these early stages, first when the words were of the same length (which again controverts Messmer's findings); secondly, when words had common letters, the "g" and "o" of "igloo" caused it to be read as "dogs"; thirdly, when the initial letters of words were the same; and fourthly, when the final letters were the same. Words were recognized upside down nearly as easily as right side up, but [only] two children noticing any difference. The word seems to be recognized as a whole, and as the author notes, recognized upside down just as the child would recognize a toy upside down. The general conclusion of the study may be quoted:

“The comments and the questions, as well as misreadings, seem to show that children learn to read words by the trial and error method. It may be the length of the word, the initial letter, the final letter, a characteristic letter, the position of the word in the sentence, or even the blackness of the type that serves as the cue. ... There is no evidence that the child works out a system by which he learns to recognize words. That he does not work out phonics for himself comes out quite clearly in the transposition test. Furthermore, only once did a child divide a word even into its syllables. There is some evidence that the child is conscious of letters, though there is none that he analyzes the word letter by letter, except in the case of “E,” who so analyzed the word “six.” Sometimes, when the child seems to have made a letter analysis, he failed to recognize the word a second time, and in some cases did not learn it at all.”

And so it was obvious to the professors as far back as 1914 that the sight method was a totally horrendous, inefficient and illogical way to teach a child to read. And despite Dr. Orton’s warning in 1929 that the method would harm many children, they proceeded to put their new reading programs in all the schools of America.

Look-Say Strategies.

Of Course, they beefed up their sight vocabulary approach with a battery of “word recognition strategies.” They provided configuration clues – putting sight words in frames; picture clues – loading the page with illustrations depicting the words; context clues – inane stories in which the word could be easily guessed on the basis of context; and phonetic clues – teaching initial and final consonant sounds to reduce some ridiculousness of some of the guessing.

It is important to note that teaching phonetic clues is not the same as teaching intensive, systematic phonics. The latter helps the child develop an automatic association of letters and sounds and teaches blending. The former simply teaches isolated consonant sounds with no connection to the rest of the syllable.

That this method of teaching can cause symptoms of dyslexia is not difficult to surmise. What are the symptoms? Dr. Harold N. Levinson, founder of the Medical Dyslexic Treatment Center in Lake Success, New York, and author of Smart But Feeling Dumb which he dedicated to “40 million dyslexic Americans,” lists the symptoms as follows: (1) memory instability for letters, words, or numbers; (2) a tendency to skip over or scramble letters, words, and sentences; (3) poor, slow, fatiguing reading ability prone to compensatory head tilting, near-far focusing, and finger pointing; (4) reversal of letters such as b, d, words such as saw and was, and numbers such as 6 and 9 or 16 and 61.

Most of these symptoms sound like the very mistakes made by those children back in 1912 who were trying to learn a sight vocabulary. Some of those children even read words upside down!

Poor Spelling

But it is obvious that if you are told to look at words as a picture, you may look at it from right to left as easily as from left to right. You will reverse letters because they look alike and you have not been drilled to know them by sound as well as by sight. You will be a poor speller because the sequence of letters seems completely arbitrary, with no rhyme or reason. Of course, to a phonetic reader the sequence of letters is most important because it follows the same sequence in which the sounds are uttered.

Other symptoms include transposing letters in a word, for example, abroad for aboard, left for felt, how for who; confusing words with others of similar configuration, such as, through, though, thought, or quit, quite, quiet, guessing at unknown words.

Dr. Kenneth L. Goodman, America's top professor of reading, calls reading a "psycholinguistic guessing game." And that's exactly what it is for most American children in today's primary schools. The result is an explosion in Special Education, which has become the growth industry for educators so worried about falling enrollment. The primary schools create the learning disabilities, and the federal government is funding a new industry to deal with them. In the 1976-77 school year there were 976,000 learning disabled students in Special Education. In 1983-84 there were 1,806,000. Dyslexia is booming!

Obviously, the prevalent teaching method causes dyslexia. I have visited many American cities on my lecture tours and have seen for myself the look-say basal reading programs being used in today's primary classrooms all across the country. You can imagine my feelings when I know that the minds of millions of American children are being permanently crippled, their futures handicapped, their self-esteem destroyed by educators who should have known better. This criminal malpractice is going on right now in your community. And yet there is little one can do about it. The professors of education won't listen – after all, they write the textbooks. The book publishers publish what the educators want and what the textbooks committees adopt. The classroom teachers, as a whole, know no other way to teach; the professional organizations promote look-say; the principals, administrators, and superintendents leave the teaching of reading to the "experts."

Circumventing the System

But there is some hope. There are a growing number of private and church schools that are teaching children to read by alphabetic, systematic, intensive phonics. Also, the home-school movement has largely adopted phonics as the technique to teach reading. And here and there one finds a teacher in public schools who uses an alphabetic-phonics approach or even a school district that has adopted a phonics-oriented basal.

However, for the nation as a whole, there is little hope that the vast majority of schools will change their teaching methods in the foreseeable future – unless a group of well informed top business leaders make the teaching of reading a top priority issue and force the educators to change their ways. But considering how poorly informed our business leaders are and how difficult it is to reach them, let alone brief them on this rather complex subject, there is little likelihood that they will act effectively on behalf of the children entrapped in the public schools.

(The quotation from Dr. Dearborn is from The Psychological Researches of James McKeen Cattell: A Review by Some of His Pupils, Archives of Psychology, No. 30, 1914, pp. 40-41.)

Note from Internet Publisher: Donald L. Potter

March 24, 2009

It gives me great pleasure to publish another essay by Dr. Samuel Blumenfeld. I have known Sam since about 1993 when I began teaching his highly effective phonics-first program, *Alpha-Phonics*. Sam not only writes on the causes of dyslexia, but he has published the leading phonics method that has prevented countless children from developing artificially induced whole-word dyslexia. Sam's smaller book, *How to Tutor*, is a compact source of all the information a parent needs to teach phonics, handwriting, and basic arithmetic. His earlier book, *The New Illiterates*, was a brilliant, detailed analysis of the look-and-say method of teaching "reading." By carefully examining the teacher's manuals, Mr. Blumenfeld was able to infer the logical outcome of the method. Basically **when you teach a sound-associational system with a sight-associational method, you get associational confusion**, known as artificially induced whole-word dyslexia. Or as Blumenfeld explained it, "**when you impose an ideographic teaching method on an alphabetic writing system you cause reading disability.**"

The article by Dr. Orton mentioned in Mr. Blumenfeld article is available on my web site, www.donpotter.net The late Mr. Charlie Richardson of Long Island, NY sent me a copy. For your convenience, I am including a copy in reduced print at the end of this article.

The article Sam mentioned by Josephine H. Bowden is available on my web site. My friend, Paul Luwaski, sent me a copy in April 2005: Bowden, Josephine Horton. "Learning to Read." *The Elementary Teacher*. University of Chicago Press, September 1911, pp. 21 - 23.

I especially recommend articles by Helen Lowe and Raymond Laurita on my web site. Lowe recorded over 100,000 reading errors that she neatly classified into logical categories, demonstrating clearly that the source of the errors was the sight-word teaching method. Mr. Laurita also kept records of errors and noticed how they grew out of the sight vocabulary method.

For more in-depth information on the history and psychology of the sight-word vocabulary method of teaching reading, I recommend the books and essays by Miss Geraldine Rodgers.

Document last edited 3/29/09.

Reprint from February 1929, The Journal of Educational Psychology.

THE "SIGHT READING" METHOD OF TEACHING READING,

AS A SOURCE OF READING DISABILITY

SAMUEL T. ORTON, A.M. M.D.

New York City

I feel some trepidation in offering criticism in a field somewhat outside of that of my own endeavor but a very considerable part of my attention for the past four years has been given to the study of reading disability from the standpoint of cerebral physiology. This work has now extended over a comparatively large series of cases from many different schools and both the theory which has directed this work and the observations gained therefrom seem to bear with sufficient directness on certain teaching methods in reading to warrant critical suggestions which otherwise might be considered overbold.

I wish to emphasize at the beginning that the strictures which I have to offer here do not apply to the use of the sight method of teaching reading as a whole but only to its effect on a restricted group of children for whom, as I think we can show, this technique is not only not adapted but often proves an actual obstacle to reading progress, and moreover I believe that this group is one of considerable educational importance both because of its size and because here faulty teaching methods may not only prevent the acquisition of academic education by children of average capacity but may also give rise to far reaching damage to their emotional life. The sight reading method (or "look and say" of the English) has been credited with giving much faster progress in the acquisition of reading facility than its precursors and this statement I will not challenge if the measure of accomplishment be the average progress of a group or class. Average progress of large numerical units, however, makes no allowance for the study of effect in individual, particularly if certain of them deviate to some degree from the others in their methods of acquisition and therefore in their teaching requirements. To the mental hygienist whose interest is focused on the individual and his problems rather than on group progress the results as determined by average accomplishment are of little value whereas the effect of a given method on the individual child is all important.

Outstanding cases of so-called "congenital word blindness"—a complete inability to learn to read—have been recognized and studied for a number of years at first chiefly by physicians. It has also been recognized by teachers and psychologists that there is a large group of children who have a much greater difficulty in getting started in reading than would be expected from their ability in arithmetic, from their ease in auditory acquisition and from their general alertness. In the past there has been a tendency, at least among medical men, and to a considerable degree among psychologists as well to exclude the minor cases of slow learning in reading from the category of congenital word blindness. This largely derives from the work of Hinshelwood¹ who made the first extensive study of these cases following the pioneer work of Kerr² and Morgan.³ Hinshelwood's statement in this is "... the rapidity and ease with which children learn to read by sight vary a great deal. No doubt it is a comparatively common thing to find some who lag considerably behind their fellows, because of their slowness and difficulty in acquiring their visual word memories, but I regard these slight defects as only physiological variations and not to be regarded as pathological conditions. It becomes a source of confusion to apply to such cases as has been done of late the term of 'congenital word blindness' which should be reserved for the really grave degrees of this defect which manifestly are the result of a pathological condition of the visual memory center and which have proved refractory to all ordinary methods of school instruction." Unfortunately, Hinshelwood's criterion is a double one, neither part of which can be looked upon as of sufficient diagnostic accuracy to establish a clear cut entity. Not only has no pathological condition of the visual memory center yet been substantiated in such cases but there are certain neurological and clinical data which suggest that no such condition exists. Again, the "ordinary methods of school instruction" does not prove to be an accurate measure. Such methods vary widely and our own figures indicate that the number of children who show a significant handicap in reading is to some degrees related to the teaching method in use. Bachmann⁴ has called attention to the looseness of the concept of congenital word blindness and related to this the striking variation in the frequency of such cases as recorded by various authors. Without some fairly clear objective symptoms on which to establish the entity, the choice of cases to be included naturally rests on the judgment of the examiner as to the severity of the disability. My own initial work⁵ in this field led to a firm conviction that we were dealing here, not with two separate groups—a physiological and a pathological—but that those children who were specifically retarded in reading (thus excluding cases of general mental defect) formed a graded series extending from the normal to the extreme and that they showed consistent characteristic performance which not only would serve for diagnosis but which also was highly suggestive of the reason for their lack of progress and which gave excellent cues to methods for retraining. I was convinced not only that the specific reading disability formed an entity of much greater numerical importance than had been recognized before but that it was (even in the extreme cases) an obstacle of a physiological nature rather than a pathological condition and that therefore adequate special methods of teaching should correct it.

I can not here go fully into the details of the anatomical background for our present theory of this disability but some presentation is necessary in order to illustrate the basis for the criticism of teaching method which is here offered.

Only a small portion of the retina of the eye is used in acquisition of reading. This is the focus of central vision or the *macula lutea*, so called because it is seen as a yellow spot in ophthalmoscopic examinations. The rest of the retina receives only general and less detailed impressions coming from outside the rather small area to which we are directing our attention. This point is noteworthy because the nervous connections of these two divisions of the retina are quite unlike. The peripheral retina or outer zone has connections with only one-half of the brain (there are some complexities here but these need not concern us). The *macula lutea*, however, which receives impressions with greatest detail and which is hence used exclusively in learning to read, has a double connection with the brain. The nerve fibers arising here divide and one-half of those starting from each *macula lutea* to the visual area of the hemisphere of the brain of the same side and the other half to the corresponding area of the opposite hemisphere. Thus impressions received by either eye, or by both eyes, are relayed simultaneously to both hemispheres of the brain. This double implantation does not give us a double sensation in consciousness, however, as a touch on both thumbs would do. The simultaneous activity of both areas results in our seeing but a single image. The visual sensation, however, is not a unitary function. There is apparently need for the simultaneous or additive activity of several parts of the visual cerebral mechanisms to complete the linkage of a printed symbol with its meaning and the steps in this process are shown in relief by differential losses such as are seen when certain parts of the back of the brain are destroyed by disease. When all of that part of the brain which has to do with vision is destroyed the individual becomes totally blind. The eyes, however, are not damaged and they can still be moved and they will turn toward a sudden sound and the pupils will respond by closing and opening to increase and decrease of the amount of light which strikes them. This condition is known as cortical blindness, to differentiate it from blindness due to disease of the eyes or optic nerves. We may, however, see things surrounding us with sufficient clarity to avoid colliding with them, that is to guide our general body movements but without being able to appreciate the meaning of things which we see. This was first demonstrated by Munk in dogs in which much of this part of the brain had been removed. They were able to avoid collisions but did not recognize their master or even food by sight alone, and did not cringe from a whip. To this condition Munk gave the name of mindblindness and its parallel has since frequently been recorded in cases of disease of the human brain. Apparently at the first level the visual area of the brain serves as a very accurate guide to motion and it probably also furnishes the element of awareness of the external origin of a sensation (as contrasted to & memory). In psychological terms it furnishes the pure perceptual element to sensation but simultaneous or additive activity in other higher level visual areas are requisite to attach meaning and again we know that this is not accomplished in one step. If destruction of brain tissue happens in a certain area there results a condition in which the patient not only can see correctly but can also understand the meaning of objects seen, but in which the ability to read the printed or written word is entirely lost. That vision in the ordinary sense is normal, is shown by the fact that such a patient can copy printed material but cannot read either the original or his copy. Thus we see from these differential losses that the process of linking a printed word to its meaning passes through at least three stages of elaboration in the brain before it is completed.

There are differences, however, in the brain destruction necessary to produce losses at these different elaborative levels. Destruction in one hemisphere only is not sufficient to produce either cortical blindness or mindblindness. At these first two levels of elaboration, that is in perception and recognition of the meaning of objects, apparently destruction must involve the areas subserving these functions in both hemispheres before their loss results. The two hemispheres are apparently of equal importance here as it apparently makes no difference which side is affected; i.e., either hemisphere is alone adequate for these functions. Exception must be taken to these statements in the case of peripheral vision but, as noted before, this is not of interest to us here since central vision is used exclusively in learning to "read. When we come to the third plane of elaboration, the situation is strikingly different, this is the level at which the written or printed symbol is linked with its meaning and hence it is variously described as the associative, concept, or symbolic level. Here not only is damage to one hemisphere sufficient to destroy function but it makes a difference which hemisphere is affected. If the hemisphere which is known as the dominant happens to suffer, a complete loss of this function results and the patient becomes word blind. If, on the other hand, the damage occurs in the other hemisphere—the non-dominant—nothing apparently happens. So entirely without result is a destruction here that this area of the brain takes its place with certain others among those which the surgeons called the "silent areas" of the brain. Obviously, the visual records implanted in both halves of the brain are not requisite for reading. This situation also exists in the field of understanding of the spoken word, and of speech and of writing. In all four of these functions destruction in the dominant hemisphere in the so-called language zone is meaningful while destruction in exactly similar parts of the opposite hemisphere is meaningless.

Thus we learn to understand, to read, to speak, and to write words from sensory records or engrams of one hemisphere only. This fact is so striking that we have been prone to overlook what must happen in the inactive side. We believe today that the completed growth and development of nerve coils is largely a result of stimulation. If cells do not receive stimuli they do not reach their full development. The two sides of the brain do not show much, if any, difference in size or complexity and certainly no such difference as we see in function as outlined above. To account for equality of growth we must accept equality of stimulation—equal nervous irradiation of the two sides—and if they are equally irradiated, records must be left behind in each; i.e., engrams must be formed in the non-dominant as well as in the dominant hemisphere. To account then for the difference in effect of damage in the two sides we must assume that the engrams of one side become the controlling pattern through establishment of a physiological habit of use of that set and that the other set of recorded engrams is latent or elided. Variations in the completeness of this physiological selection, i.e., failure of elision of the non-dominant engrams, forms the kernel of my conception of the reading disability. Such a theory conforms nicely to our observations that these cases are not to be divided into two categories, that is, cases of word blindness and cases of slow acquisition of reading,

but that they form a series graded in severity according to the degree of confusion which exists in choice of engrams and it also offers an explanation of certain errors and peculiarities which characterize their performance.

The two halves of the body are strictly antitropic, that is, reversed or mirrored copies of each other. The muscles and joints of the right and left hand, for example, are alike but reversed in arrangement. This is also true of the groups of nerve cells in the spinal cord which control the simpler motor responses (spinal reflexes) and also of the cells in the brain which combine or integrate these simpler spinal units into more complex acts. The movements of the left hand, therefore, which are the exact counterpart of the right will give a mirrored result. Thus, the movements of sinistrad (mirror) writing with the left hand are exactly comparable to those of dextrad writing with the right hand and it seems therefore highly probable that the engrams which are stored in the silent areas of the non-dominant hemisphere are opposite in sign, i.e., mirrored copies, of those in the dominant. If then these opposite engrams are not elided through establishment of consistent selection from one hemisphere we would expect them to evince themselves by errors or confusion in direction and orientation and this is exactly what we find in cases of delayed reading.

This description is really "putting the cart before the horse" as our observations of tendency to reversals came first and the theory developed therefrom but this method of presentation has been adopted for the sake of clarity. Many workers with word blind children have noted their tendency to reversals but none, so far as I am aware, have offered an adequate explanation of it.

My original studies in a small group of cases convinced me that there were certain "symptoms" in reading disability which seemed to characterize the whole group and these were confusions between lower case b and d and between p and q, uncertainty in reading short pallindromic words like was and saw, not and ton, and on and no; a tendency to reverse parts of words or whole syllables as when gray is read as gary, tarnish as tarshin and tomorrow as tworrom; a greater facility than usual in reading from the mirror, and frequently a facility in producing mirror writing. These observations have been adequately supported in an extended study of a much larger group of cases. Many other types of errors are to be found in the performance of retarded readers but they appear to me to be secondary effects due to the failure of association which has resulted from the obstacle presented by confusion in direction. The relation of the cardinal symptoms to the theory as above outlined is obvious and I think has direct bearing on the teaching method. Visual presentation will, hypothetically at least, result in the implantation of paired engrams and certain other factors must determine which of these is selected for associative linkage. What these factors are as a whole, we can not consider here although it may be well to suggest that heredity probably plays a part in the establishment of dominance here comparable to that which it plays in stuttering and in left-handedness. Undoubtedly training influences may be brought to bear on this process of choice, however, and from the theoretical standpoint the most promising of these should be that of kinesthetic training by tracing or writing while reading and sounding and by following the letters with the finger (a method under taboo today) to insure consistent direction of reading during phonetic synthesis of the word or syllable.

Under a grant from the Rockefeller Foundation, an extended field study was carried out in 1926-27 in Iowa by the organization, as a part of the research work of the State Psychopathic Hospital, of a Mobile Mental Hygiene Unit to visit schools in various communities and a Laboratory Unit to study selected cases more intensively. Fuller reports of these studies are to appear elsewhere but certain observations may be quoted here. In my original group of reading disability cases, I was surprised at the large proportion of these children encountered. Fifteen out of one hundred twenty-five children sent by their teachers to our experimental field clinic for a variety of problems⁶ seemed to me to show evidence of this trouble. In our extended work we have found in every community visited no less than two per cent of the total school population to be retarded readers showing this characteristic picture. Our studies were not carried out as a survey and hence these figures probably fall far below the actual numbers. There was however a difference in the numbers of cases encountered in certain communities which seemed to bear directly on the subjects here considered. Of two communities of about the same constituent population, in one we found about two per cent of the school population to be retarded in reading to a significant degree and to show symptomatic evidence of the specific disability, while in the second we found more than double this percentage. In the community with the lesser number of cases, sight reading methods were employed but when children did not progress by this method, they were also given help by the phonetic method. In the town with the larger number, no child was given any other type of reading training until he or she had learned ninety words by sight.

Aside then from theoretical considerations, this strongly suggests that the sight method not only will not eradicate a reading disability of this type but may actually produce a number of cases. Moreover, our retraining experiments⁷ seem to indicate clearly that such children can be trained to read properly with adequate special methods devised to eradicate the confusion in direction and in orientation and this has also been borne out by the remedial efforts of other workers.

Our studies of children with reading disabilities has also brought to light certain other aspects of the problem which are of educational importance but which can not be elaborated here. Among these were notably the effect of this unrecognized disability, upon the personality and behavior of the child. Many children were referred to our clinics by their teachers in the belief that they were feeble-minded, others exhibited conduct disorders and undesirable personality reactions which upon analysis appeared to be entirely secondary to the reading defect and which improved markedly when special training was instituted to overcome the reading disability.

In brief, while "sight reading" may give greater progress when measured by the average of a group, it may also prove a serious obstacle to educable children who happen to deviate from the average in the case of establishment of a clear cut unilateral brain habit. These physiological deviates form a graded group extending in severity from the normal to extreme cases (congenital word blindness). They can be detected by appropriate examinations and trained to overcome their handicap by specific methods of teaching. While the number of children who suffer from such a severe grade of the disability as to be practically uneducable by ordinary methods is quite small, the number in whom the disability exists to a sufficient degree to be a serious handicap to school performance and to wholesome personality development probably is of real numerical importance and moreover there seems to be reason to believe that even those who make a spontaneous adjustment without special training, and thus learn to read, may never gain a facility in this accomplishment commensurate with their ability in other lines.

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Edited from a OCR scan of a Reprint by Donald L. Potter 5/31/03