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Studies of the etiological factors in reading disability and approaches, generally visual-perceptual, to the problem are presented. Krippner's study presents 15 causes of reading disability and reveals poor visual-perceptual skills as the most common cause. The Olson-Mitchell-Westberg study attempts to determine the effects of visual training upon the reading ability of college students. Getman's program stresses the attainment of proficiency in basic developmental processes such as general body movement, eye movement, and visual-perceptual organization. Kephart's approach attempts to orient the child more fully to his environment in order to promote successful perceptual-motor matches. Delacato's method claims to alter the neurological organization through physical activity. Visual training has resulted in improved reading ability, but not all attempts have been successful. Optometrists generally support the visual training approach; most eye doctors see little value in it. This address encourages the proponents of both views to better define their positions, to engage in more fruitful communication, and to conduct more research studies of the effects of visual training on reading improvement. Additional studies, an appendix, and a bibliography are included. (RT)

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Research in Visual Training and Reading Disability

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April, 1968

RESEARCH IN VISUAL TRAINING AND READING DISABILITY*

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Reading disability is generally defined in terms of a level of reading skill which is significantly below expectancy for a child in terms of his mental ability (1). Surveys indicate that in typical elementary schools one out of three children reads one or more years below grade level. Harris (2) states that "the majority are dull children whose reading is on a par with their other abilities. A substantial minority, comprising about 10 to 15 per cent of all the children, are cases of mild or severe reading disability."

It is generally agreed that there is no one cause of reading disability. The 10 to 15 per cent of children who are reading below their potential capacity may be suffering from one or several handicaps, but there is little agreement as to what the major handicap may be.

A simplistic approach to reading disability is proposed by Walcutt (3) who claims that a lack of training in phonics is the major cause of poor reading. Several writers take issue with Walcutt's notion but concede that educational factors outweigh any other etiological consideration. Bond and Tinker (4) demonstrate this point of view, stating that "the vast majority of our disability cases are brought about through faulty learning or lack of educational adjustment of one sort or another." Specifically, Bond and Tinker cite ineffective school administrative policies, lack of readiness programs, poor teaching methods, inadequate teacher preparation, and failure to consider individual differences, concluding that "reading disability is largely due to educational factors" (5).

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*Invited address, 21st Annual School Vision Forum and Reading Conference, Cleveland, 1968.

A radically different approach is taken by Brandon (6) who feels that reading disability is "a psychological problem" and by Blackhurst (7) who maintains that "most poor readers...have psychological problems." For Delacato (8) a lack of cerebral dominance accounts for the bulk of severely disabled readers; Rosborough (9) cites faulty skeletal and autonomic nervous system development. Smith and Carragan (10) postulate the theory that much reading disability is due to an inadequate balance between acetylcholine and cholinesterase at the nerve cell synapses. Other writers have given prominence to auditory processes, to hereditary factors, and to sociological forces.

In an attempt to examine etiological factors in reading disability, Krippner (11) made an intensive study of 146 poor readers with WISC IQs between 87 and 112 referred to a reading clinic. Using the Bond-Tinker formula (12), the Wechsler Intelligence Scale for Children, and the Durrell Analysis (13), it was discovered that the mean level of reading disability for the group was 1.99 years.

Following a series of diagnostic tests, a number of clinicians determined the major and the contributing etiological factors for each child. Table I presents the etiological factors for the 146 disabled readers studied; major and contributory factors are combined for the purposes of the table.

Table I

Etiological Factors in the Reading Disabilities of 146 Pupils of Average Intelligence Referred to a Reading Clinic

Impaired Acuity of Sight	28.1%
Impaired Acuity of Hearing	8.9
Poor Visual-Perceptual Skills	62.3
Poor Auditory-Perceptual Skills	35.6
Defective Speech	18.5
Brain Injury	20.5
Disturbed Neurological Organization	20.5
Directional Confusion (Left and Right)	26.0
Endocrinal Malfunctioning	11.6
Social Immaturity	17.1
Neurotic Tendencies	34.2
Psychotic Tendencies	2.1
Sociopathic Tendencies	5.5
Unfavorable Educational Experiences	56.8
Cultural Deprivation	6.2

It can be seen that poor visual-peceptual skills were the most common etiological factor in cases of reading disability, in the opinion of the clinicians making judgments. The criteria for classification in this category included a score on the visual memory section of the Durrell Analysis a year or more below the pupil's expected reading grade (as computed by the Bond-Tinker formula) and/or a rating of "unsatisfactory" on the Perceptual Forms Test (14). Three out of every five pupils fell into the category of poor visual-perceptual skills when these criteria were used.

A number of criticisms could be made of this study. The data represent pupils referred to a reading clinic rather than a random sampling of poor readers in the classroom. The usefulness of the Bond-Tinker formula for estimating reading disability has been called into question by McLeod (15). Furthermore, the two criteria tests do not cover the entire range of visual-perceptual skills. Nevertheless, these data resemble those of Coleman (16) who studied 87 disabled readers in grades one through six, using tests of visual acuity, ocular motility, hand-eye-foot dominance, refractive errors, ophthalmological pathology, form perception, handwriting ability, number construction, visual memory, spatial orientation, laterality, body image, hand-eye coordination, and the visual skills which produce satisfactory performance on the Keystone Telebinocular. Coleman discovered that 49.5 per cent of the pupils tested "had visual, visual-perceptual or refractive errors severe enough to handicap them in their approach to education."

In the Coleman study, 70.1 per cent of the disabled readers were boys. In the Krippner study, 89.0 per cent of the disabled readers were boys. Of Coleman's pupils, 20 per cent manifested impaired sight acuity and refractive errors -- a proportion which is similar to the 28.1 per cent noted in the Krippner study.

Krippner emphasized the multi-causality nature of reading disabilities and the overlapping which occurs in arbitrarily-drawn etiological categories. However, the importance of properly functioning vision was demonstrated by his study as well as by the more intensive investigatior by Coleman.

Sight and Vision

In both the Krippner and the Coleman studies, a differentiation was made between sight and vision -- the former referring to sensory acuity and freedom from refractive errors, the latter referring to perceptual skills involving central nervous system functioning. This differentiation assumes importance when one considers the divergent points of view held by the two professions most intimately connected with the eyes, ophthalmology and optometry.

An ophthalmologist (or oculist) is a physician who specializes in the care of the eye and its related structures. He has completed a full course of general medical studies, received an M.D. degree, and served an internship in general medicine and surgery. He has then taken additional specialized training in ophthalmology -- the branch of medical science dealing with the structure, functions, and diseases of the eye. He is the only person legally qualified to diagnose and treat all eye disorders. He may prescribe eyeglasses and contact lenses.

An optometrist also specializes in the care of the eyes and its structures. Following a general undergraduate course of study in college, he enters optometric school and eventually receives an O.D. degree. He is licensed to prescribe refractive lenses (e.g., eyeglasses, contact lenses) and to treat the functional aspects of vision. Not being a physician, he cannot treat eye diseases or prescribe medicinal agents for the eyes (17).

Many optometrists take advanced study in "developmental vision" through the Optometric Extension Program and become proficient in visual training. The concept of developmental vision was originally put forward by A.M. Skeffington who maintained that proper vision for complex skills such as reading is a learned activity which involves the central nervous system (i.e., the brain and spinal cord) as well as the eyes themselves (18). Skeffington maintained that there were certain visual disorders that could not be ameliorated by glasses but which would respond to specific types of training. The Optometric Extension Program was organized to promulgate this point of view and to train optometrists who were interested in working with children having developmental vision problems.

A few ophthalmologists are favorably disposed toward Skeffington's concept of developmental vision and many optometrists reject it. However, the most severe criticism of Skeffington's point of view has come from prominent ophthalmologists rather than from optometrists. For example, Goldberg (19) holds that "eye exercises are not the answer" to reading disability. He further states that visual training "may increase motivation and help to provide a sympathetic atomosphere," but it has no value beyond this psychological benefit.

Gordon (20) calls visual training "worthless," adding that "optometrists are seizing on this field of therapy as a means of widening their participation and enhancing their reputation with the lay public as surveyors of 'eye care.'"

Blackhurst (21) accuses optometrists of misunderstanding the problem of reading disability, adding that an optometrist who prescribes visual training "is trying to pad his office practice." A similar position is taken by Hardesty (22), Haffley (23), and Goldberg (24). Apt (25) notes that orthoptics -- a procedure for correcting strabismus by the use of eye exercises -- sometimes assists a child in overcoming his reading difficulty, but mainly because of the personal interest someone takes in the child. Apt, unlike most of his fellow ophthalmologists, does concede that "the cerebral aspect of seeing" can be improved by eye exercises.

Hardesty (26) holds that there is no research study that establishes a relationship between eye function and reading disability, or between visual training and reading improvement. Therefore, it is necessary to review the research literature and examine the pertinent data.

The Olson-Mitchell-Westberg Study

Contemporary practitioners of visual training utilize techniques advocated by the Optometric Extension Program which was founded by A.M. Skeffington and E.B. Alexander in 1928. These methods have been further refinedand developed at the

Gesell Institute of Child Development in New Haven, Connecticut.* A number of early research studies were carried out by Apperson (31), Peters (32), Lyons and Lyons (33), and Worcester (34). Most of the results were favorable but the studies were criticized because they lacked control groups. In addition, it was pointed out that personal attention and motivation may have accounted for much of the improvement in reading ability.

Olson, Mitchell, and Westberg (35) attempted to determine the effect of visual training upon the reading ability of college students. They also investigated its effect upon mental ability and personality test patterns. Visual training was defined as

> ...a technique for improving visual skills. The basic assumption in such training is that the seeing process is a <u>learned</u> skill and therefore is amenable to improvement through proper development of the functions involved, reorganization of the visual skills pattern, and, in certain cases, subjecting the individual to visual phenomena never before experienced....The consensus seems to be that visual training should be considered as a process for improving the innervation at synaptic and neuromuscular junctions and for providing a new fund of information by which one may better interpret his visual impressions.

The subjects for this study were principally college sophomores; nearly all of the 49 students had a C average. All were essentially normal in terms of sight; optometric examination disclosed no significant uncorrected refractive errors or any indication of pathology. Pretest and posttests were administered of the Otis

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*Gesell (27) believed that vision "is not a separate, independent function. It is profoundly integrated with the total action system of the child -- his posture, his manual skills, his motor demeanors, his intelligence, and even his personality traits. When viewed in terms of the action system, the mechanisms of vision become a key to the understanding of reading behavior, both normal and deviate. Developmental optics in theory and in practice is concerned with the growth and organization of visual functions in their dynamic relation to the total action system." Gesell utilized optometrists to administer tests of visual skills to children seen at his clinic. He was severely criticized for this practice by several members of the medical profession. However, optometric examinations are still a standard part of the test battery at the Gesell Institute. Furthermore, disabled readers do more poorly on these tests than do satisfactory readers (28, 29) and a 1967 study by Snyder and Freud (30) demonstrated significantly poorer performance on visual-perceptual tests (e.g., the Spiral Aftereffect) on the part of low-scorers on reading readiness tests than high-scorers.

Test of Mental Ability, the Iowa Silent Reading Test, the Bernreuter Personality Inventory, and the 21-point Optometric Extension Program scale. Four subject groups were created, having been equated in terms of the Otis, Iowa, and O.E.P. scores:

1. Visual training (15 students)
2. Visual training plus counseling (14 students)
3. Counseling (13 students)
4. Neither visual training nor counseling (7 students)

Subjects reported for training on alternate days, three days per week over an eight week period. The training periods were 45 minutes in length. The instruments utilized included the Arneson Korector, the Keystone Ophthalmic Telebinocular, the Keystone Ortho-trainer, the Keystone Correct-Eye Scope, the Keystone Overhead Projector, the Keystone Tele-Rater Control Unit for the Ophthalmic Telebinocular, and (for the last six sessions only) the Science Research Associates Reading Accelerator.

An analysis of covariance design was used to evaluate the posttest results. No statistically significant changes were noted for any of the groups on the Bernreuter Personality Inventory. There were no statistically significant changes for any group on the Otis Test of Mental Ability.

When the students' scores on the Iowa Silent Reading Test were examined, no significant changes in reading comprehension were noted although the mean scores were considerably higher for those groups which had received visual training. The two groups which had received visual training made a statistically significant improvement in reading rate. The group which received visual training plus counseling made a mean gain of 13.28 points in reading speed while the group receiving visual training only made a mean gain of 16.74 points. Four months after the program terminated, 14 students who had received visual training were again tested on the Iowa; there were no significant declines in their reading rate scores.

This study is an important one because of its utilization of four subject groups. In addition, it included a counseling program for two of the groups to investigate whether personal attention and motivation alone could be responsible for changes in reading test scores (the data indicated that this was not the case). Although the comprehension scores improved under visual training, they were not statistically significant, indicating that in a college population reading rate may be the skill most amenable to improvement.

Getman and Kephart

The Olson-Mitchell-Westberg study involved college students instead of elementary and secondary students. Little research has been done at the lower educational levels involving adequate control groups and follow-up. This lack of basic research is puzzling when one considers the emphasis on visual-perceptual skills found in such widely discussed remedial procedures as those advocated by Getman (36), Kephart (37), and Delecato (38).

Gesell (39) was frequently criticized for his assertion that "minimal cerebral injuries are more common than is ordinarily supposed, and they sometimes account for certain persisting visual defects and even for personality deviations." Recent investigations, however, have confirmed Gesell's statement; Myklebust and Boshes (40), utilizing both medical and psychological measures, discovered that five per cent of a large sample of Chicago public school children suffered from some type of psychoneurological learning disorder.

Getman, an optometrist, has long been associated with the Optometric Extension Program. His program stresses the attainment of proficiency in six basic developmental processes:

1. General movement, e.g., crawling and creeping.
2. Special movement, e.g., manipulative skills.
3. Eye movement, e.g., visual tracking of an object.
4. Communication, e.g., speech and gestures.
5. Visual-perceptual organization, e.g., reading.

Getman's procedures were employed in a 15-week study of four first grade classes studied by McKee (41) and his associates. The experimental group's gains in reading comprehension were significantly greater than those of the control group at the end of the program.

Kephart, a psychologist, has worked closely with a number of optometrists and utilizes visual training procedures with disabled readers. Kephart attempts to orient the child more fully to his environment in order that he will make successful perceptual-motor matches, the absence of which retards learning. According to Kephart, reading disabilities often result from learning disorders because of two factors:

1. There is an incomplete integration of present and past stimuli.
2. There is an incomplete feedback from the muscle system to the brain to compensate for errors in perception.

Kephart's procedures were utilized in an experimental study reported by Halgren (42). The increase in reading scores for the experimental group was almost twice as great as that for a control group receiving orthodox remedial reading instruction and an upward shift of seven IQ points was noted for the experimental group. A study undertaken by Rutherford (43) also used Kephart's procedures; again the experimental group did significantly better on learning tasks than the control group.

Not all attempts to improve reading ability by means of visual-perceptual exercises meet with success. Cohen (44) gave 10 weeks of training, utilizing the Frostig program (45), to an experimental group and gave no special training to a control group of first grade pupils. The experimental group made a significantly greater gain in visual-perceptual skills at the end of the 10 weeks. However, it did not make significantly greater gains on the reading achievement tests. Cohen concluded that the significant gains in visual perception of the experimental group were not reflected in gains in reading.*

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*Frostig's own research reports (46) support the effectiveness of her material.

The opinion of most medical specialists toward visual training is consisely stated by Money (47), a pediatrician who has done some significant work with disabled readers. Specifically referring to Getman's approach, Money describes visual training as "a faddist therapy that is currently enjoying considerable vogue, generally under optometric auspices." He continues:

> This therapy is derived from a doctrine of the interrelatedness of motor, auditory, linguistic and visual maturation -- with particular emphasis on visuomotor or visuopostural relatedness. The fallacy of this faddism is that it takes hypotheses which, quite conceivably, are valid principles of development and applies them, prematurely and untested, as principles of training and treatment, with unjustified reliance on disproved assumptions concerning that old psychological war horse, the transfer of training. What is needed in the place of prematurely applied visual theories is more basic investigation of vision and seeing as developmental processes prerequisite to reading.

This point of view about developmental vision pervades most of the medical profession. It is not uncommon for parents to enroll a child in a program of visual training only to have the family ophthalmologist threaten to discontinue his service to the child unless the visual training is discontinued. Physicians will often counsel parents against visual training for a disabled reader, presenting the alternatives of hiring a remedial tutor, seeing a psychiatrist, or simply having patience in the hopes that their child will outgrow his reading problem. Garvin (48) attests that many disabled readers improve simply because "time has passed" while Rabinovitch (49) admits a preference for telling parents "to do nothing" to prescribing a series of "regressive" exercises for the child.

The Kershner Study

Although most optometrists are extremely skeptical about the procedures employed by Delacato with disabled readers, Money (50) criticizes Delacato with the same terminology he uses for Getman. Referring to Delacato's approach as one of the "current faddist therapies," he asserts that "it is far too premature to be applying hypotheses of cerebral dominance to methods of treatment."

Delacato's approach (51) is controversial because it claims to alter neurological organization through physical activity. The evidence mustered by Delacato (52) in support of his approach has been criticized by Glass and Robbins (53) who maintain that the 12 studies completed to date were "poorly designed and executed." Following the Glass-Robbins critique, an investigation was reported by Kershner (54) which overcomes several of the methodological shortcomings of the previous studies.

The purpose of Kershner's investigation was to determine the effects of a structured program of physical activities, including certain eye exercises, upon the physical and intellectual development of trainable mentally retarded children. Subjects consisted of 30 pupils from special education classes in Lehigh County, Pennsylvania. There were 14 subjects in the experimental group and 16 subjects in the control group. The programs extended for 74 consecutive teaching days and were administered by the teacher and teacher aides of the respective schools. A pretest, posttest design was employed.

For the experimental group, the activities were structured according to neurological stages of development. Each child was taught to master his lowest functional level within each stage before going on to the next higher level. The entire school curriculum involved activities consistent with Delacato's theory of neurological organization. A typical daily schedule follows:

9:00 to 9:15...Near point dominance eye exercises.

9:15 to 9:30...Far point dominance eye exercises; auditory discrimination.

9:30 to 9:40...Break.

9:40 to 10:40..Homolateral coordination; cross pattern coordination; cross pattern crawling; cross pattern creeping; tactual stimulation; bilateral reinforcement; kicking with dominant foot; throwing with dominant hand.

10:40 to 11:10.Break.

11:10 to 11:50...Tactual stimulation and discrimination;
auditory stimulation and discrimination;
olfactory stimulation and discrimination;
gustatory stimulation and discrimination.

11:50 to 12:00...Break.

12:00 to 12:45...Lunch.

12:45 to 1:30....Unilateral sleep pattern reinforcement.

1:30 to 2:30.....Bilateral and unilateral group activities;
cross pattern walking.

For the control group, the activities also involved the entire school day. The children were given attention which equaled that of the experimental group; for example, while the experimental group was visually occluded on the nondominant side, the control group wore an eye occluder on the back of their heads. (This was done to compensate for any possible effect that mere ownership of an eyepatch may have had on the children in the experimental group.) Nonspecific activities were introduced to achieve better rhythm, balance, and coordination. A typical daily schedule follows:

9:00 to 9:15....Table play (e.g., building block towers).

9:15 to 9:30...."Show and Tell" activities.

9:30 to 9:40....Break.

9:40 to 10:40...Jumping jacks; jumping rope; marching; swinging arms;
follow the leader to music; carrying rhythm sticks;
stopping when the music stops; rolling balls;
catching balls; playing dodge ball; hopping; jumping;
galloping; skipping; duck walk; elephant walk;
"flying" like a moth to recorded music.

10:40 to 11:10..Break.

11:10 to 11:20..Writing numbers and the alphabet to music.

11:20 to 11:30..Break.

11:30 to 12:30..Lunch.

12:30 to 1:30...Rest period; listening to music.

1:30 to 2:30....Movies; group singing; dancing games; musical chairs; rhythm band.

The Revised Oseretsky Test of Motor Development was used to investigate changes in motor proficiency. Pretest and posttest data indicated that both the experimental and control groups had made statistically significant improvements. However, it could not be determined how much of the gain was due to physical maturation and how much was due to the physical activities.

The Peabody Picture Vocabulary Test was utilized to measure changes in intelligence. The data indicated that the experimental group had made significant gains but that the control group had not. The 12 point mean IQ gain of the experimental group was dramatic but Kershner noted that the two groups represented two populations rather than representing a randomization of one school population. Therefore, initial group differences may have contributed to the effect.

A 47-point crawling and creeping scale was devised to measure changes in perceptual-motor performance. The data indicated that the experimental group had made significant improvement, as measured by this scale, while the control group had not. Kershner pointed out that the results supported Delacato's theory, noting that the experimental group jumped from a mean score of 51.64 to one of 84.74 on the crawling and creeping scale. The control group improved only slightly, from 43.53 to 44.94. Once again, however, the fact remains that the two classes represented two somewhat different school populations.*

Kershner called for more rigorous investigations, but concluded, "Within the stated limitations, these findings suggest that the procedures may prove beneficial in application with retarded children in public schools."

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*An earlier study reported by Robbins (55) failed to support the Delacato theory. Robbins used second grade pupils in Chicago parochial schools. The experimental group underwent a three month program emphasizing cross pattern creeping and walking, avoidance of music, and use of the specific writing positions advocated by Delacato. However, the Robbins program did not stress the visual training activities found in the Kershner program. There are many other reasons which may account for the differential results of these two experiments but the visual factor may be one of the most important.

Three Suggestions

If professionals can not agree upon the role of visual training in reading disability, one can sympathize with the confusion and conflict experienced by many parents. Not only will an optometrist and an ophthalmologist often give two entirely different prescriptions to the same child for glasses, but the two professionals will often disagree violently on the advisability of visual training to ameliorate a case of reading disability. The classroom teacher or reading clinician is often caught in the middle of the disagreement, besieged by equally imposing opinions from the opposite sides. Three suggestions are in order for those professionals who are involved in the treatment of reading disability and/or the care of the eyes.

In the first place, a great deal of semantic obscurity characterizes the entire area of visual training. Flax (56) points out that this situation has obscured the significance of visual training and has "delayed its more widespread application and acceptance by psychologists and educators." Flax continues:

> This confusion is compounded because clinicians in the eye care field utilize differing conceptual frameworks. Some tend to emphasize optical and anatomical consideration while others are more concerned with functional aspects of vision. Even the concept of visual function has differing interpretations. Some consider peripheral function while others consider inter-sensory integration to be part of the visual process.

One critical semantic problem involves whether both the peripheral nervous system (PNS) and the central nervous sytem (CNS) should be considered when speaking of vision, or whether one should think basically in terms of PNS end organ reception. Flax (57) makes a useful distinction between PNS and CNS disorders which would at least clarify the issue even if all professionals did not agree on the definitions. To Flax, PNS disorders refer to deficiencies of the end-organ system of vision (i.e., the eye); they include visual acuity, refractive error, fusion, convergence, and accommodation, all of which involve the eye mechanism and which are responsible for producing clear, single, binocular vision. CNS disorders involve deficiencies in organizing and interpreting images received by the eyes and sent to the brain. In CNS disorders, a clear, single visual image may be present but the child still can not decode the printed word because of problems in organization and interpretation of what is seen.

The general public has a vague understanding of PNS disorders such as myopia (near-sightedness), hyperopia (far-sightedness), astigmatism, etc. However, the parent who is told that his child may have a visual-perceptual problem is likely to respond, "Well, can't it be corrected with glasses?" At this point, the professional worker must educate the parent as to the nature of CNS disorders, pointing out that it is not the eye that reads the printed page but the brain.

A second need in the field of visual training is for communication among professional workers. Ophthalmologists and optometrists usually go their separate ways, each condemning the other and refusing to admit that the rival profession has anything unique to offer in working with reading disability cases. Most meetings on vision and school achievement sponsored by optometrists are conspicuous for the absence of ophthalmologists, or of anyone else with an M.D. degree. On the other hand, it is a rare occasion when an individual with an O.D. degree is invited to speak at an ophthalmological conference.

In 1961, the Johns Hopkins Conference on Research Needs and Prospects in Dyslexia and Related Aphasic Disorders was held. Among the 13 participants, only one had a background in optometry. His paper was notable for its lack of any mention of optometric testing or visual training (58). In 1968, the Fifth Annual International Conference for Children with Learning Disabilities featured a panel discussion on vision and reading (59). It was concluded that disabled readers do not have significantly more visual problems than other youngsters. The three panelists were all ophthalmologists; a more productive session -- and a livelier one -- would have been guaranteed had a member of the Optometric Extension Program been invited as a discussant.*

A third difficulty is the paucity of basic research on the validity of visual training. Even those studies which have been reported do not answer such questions as:

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*The American Medical Association recently lifted its ban which prevented ophthalmologists from working with optometrists. This action may lead to greater interdisciplinary efforts

1. How many times per week should appointments be scheduled for optimum results?

2. Which aspects of visual training are most therapeutic in overcoming reading disabilities?

3. Are expensive machines and elaborate equipment needed in a visual training program?

4. What is the efficacy of supplementary exercises done at home?

5. For what types of reading disability is visual training best suited and for which, if any, is it worthless?

A professional program which charges parents fairly substantial amounts of money for its services must eventually owe its clients answers to these questions -- answers which can be supported by specific facts and figures.

In conclusion, it appears as if the cold war between the supporters and the detractors of visual training will continue for some time. However, the protagonists -- at the very least -- ought to define their terms, communicate with each other, and engage in research projects. The data resulting from these research projects may not end the cold war, but they might at least raise the battle from the level of dogmatic assertion to that of intelligent discussion.

Appendix

The conflict between ophthalmologists and optometrists has been brought into sharp focus by two recent studies, one by Lancaster (60) and his associates, the other by Blum, Peters, and Bettman (61). Both studies attempted to determine what type of visual acuity disorder, identified by public school screening tests on the Snellen Chart, should be followed by complete visual examinations.

Lancaster obtained replies from 149 ophthalmologists. Blum, Peters, and Bettman received replies from 279 optometrists and 261 ophthalmologists. Of the optometrists in these two studies, 22 per cent would agree that a child with 20/25 visual acuity on the Snellen Chart should be referred for a more extensive examination; however, only 6 per cent of the ophthalmologists would agree. A child with 20/30 visual acuity would be recommended by 75per cent of the optometrists and 50 per cent of the ophthalmologists. A child with 20/40 visual acuity would be referred by 98 per cent of the optometrists and 95 per cent of the ophthalmologists.

Another aspect of the conflict over visual training involves the work of Woolf (62) in the Optometric Extension Program. Woolf uses the term "dysdiopia" to refer to a syndrome for which visual training, in his opinion, is especially useful. Woolf has extensively described this syndrome. He has also described the methods which can be used to detect it and the therapeutic measures best suited to correct it. Although Woolf's conceptualization of this syndrome would not be well received by anyone who ignores the role of the central nervous sytem in reading disability, the "dysdiopia" syndrome presents a useful model for both therapy and research. Especially pertinent, also, to therapy programs is the work with children with visual perceptual problems carried out in Winter Haven, Fla. These materials are now available to the public schools (63), as are methods compiled by Van Witsen (64), and the screening tests used in Euclid, Ohio (65), one of the few communities with a school-wide visual screening program organized by a committee of both ophthalmologists and optometrists.

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