RESEARCH AND CLINICAL STUDIES ON VISION, LEARNING and OPTOMETRIC VISION THERAPY (OVT)

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Introduction

Optometric vision therapy (OVT) has been shown to improve many binocular and sensory dysfunctions. Accommodative problems, vergence anomalies, oculomotor dysfunctions, amblyopia and strabismus are all treatable with optometric vision therapy. This has well documented in hundreds of publications, studies and review papers (*The Efficacy of Vision Therapy*[1] edited by Dr. Alan Cohen). Optometrists, who perform OVT have been encouraged to say, "Optometric vision therapy improves vision function and this in turn improves learning ability." This paper presents a literature review that supports the link between vision and learning.

Parents and teachers of patients undergoing OVT often report an improvement in academic related quality of life issues and and school preformance including: reduction of asthenopia, enhanced reading ability, and decreased information processing time, as well as an enhanced attention span and improved grades. Another benefit often noted when OVT has been completed is an improvement in the child's self-esteem. Our clinical experience tells us that OVT when used to address the issues of learning related vision problems, improve the learning experience by providing a child with all the visual and visual perceptual skills he or she needs to perform appropriately.

COVD members understand that learning is a multi-faceted phenomenon and that learning disabilities usually have numerous etiological possibilities. These may include: health, psychological, occupational, and physical problems; as well as speech and auditory, educational, neurological and nutritional issues.

It is unfortunate that our patients often seek help from individuals (ophthalmologists, pediatricians, and even optometrists) who have not kept up with the current research that supports the efficacy of OVT in the treatment of learning related vision problems. Various organizations have from time to time, attempted to question optometric vision therapy, but their position papers have all been discredited by rebuttals published in peer-reviewed journals.[2]

This paper presents over 350 abstracts from 77 different journals within education, optometry, ophthalmology, neurology and psychology fields of study. All works found relating to vision and learning are included – even those that purport to show little to no relationship between vision and learning. Of the many summaries related to vision and learning reviewed here, only fifteen (15) concluded that vision was not related to learning. This strongly supports COVD's view that vision and learning are indeed intimately interconnected.

The following is a summary of research and other papers that relate vision to academic performance. This ought to be considered a work in progress. If you know of additional papers that should be included, please contact COVD. Please email Ms. Pamela Happ, COVD Executive Director at phapp@covd.org.

I wish to thank Drs. Merrill Bowan, Esther Han, Nate Bonilla-Worford, Lisa Dibler and Dominick M. Maino (OVD editor) and the COVD Board of Directors for their help and support for this project.
Roger Trudell, OD, FCOVD

CATEGORIES OF VISION AND LEARNING

[1] Cohen AH. The efficacy of optometric vision therapy. J Am Optom Assoc 1988;59(2):95-105.
[2] Bowan M. Learning disabilities, dyslexia, and vision: a subject review. Optom 2002;73(9):553-575.

1. Binocular Dysfunction And Learning
2. Books And Booklets On Vision And Learning
3. Dyslexia And Learning
4. IQ And Vision
5. Learning Disabled And Vision
6. Oculomotor and Visual Motor Aspects of Reading and Learning
7. Reading/Reading Disabled And Vision
8. Refractive Status And Learning
9. School-Based Vision Programs
10. Visual Information Processing/Perception Skills And Learning
11. Visual Screenings: Testing Results, Reading Failure
12. Vision And Learning, Miscellaneous

BINOCULAR DYSFUNCTION AND LEARNING

Future of Visual Development/Performance Task Force. The efficacy of optometric vision therapy. J Am Optom Assoc 1988;59(2):95–105.

Summary: A task force of the American Optometric Association compiled a comprehensive list of studies and reports that support the efficacy of vision therapy. Two hundred thirty-eight references are cited to support their position. Numerous ophthalmology documents are listed in the rebuttal. Most of the references sited support the efficacy of optometric vision therapy (OVT) related to accommodation, binocular disorders, strabismus and amblyopia.

No hyperlink is available.

Atzmon D, Nemet P, Ishay A, Karni E. A randomized prospective masked and matched study of orthoptic treatment versus conventional reading tutoring treatment for reading disabilities in 62 children. Binocular Vis and Eye Muscle Surgery Qrtly 1993;8(2):91-106.

Summary: 120 reading disabled children were studied to determine if vision training can treat reading disabilities. This was a controlled study whereby 40 students were matched and randomly divided into three groups: orthoptic treatment, traditional reading tutoring and a no-treatment control. The first two groups were given two twenty minute training sessions per day. The results showed that increasing convergence amplitudes to 60A was as effective traditional in-school reading tutoring of the reading disabled. An added benefit of the OVT was that astheniopia disappeared. The author recommended OVT as additional treatment for reading disabled and primary treatment for students with astheniopia and convergence insufficiency symptoms.

No hyperlink is available.

Cooper J. Review of computerized orthoptics with specific regard to convergence insufficiency. Am J Optom Physiol Opt 1988;65(6):455-63.

Summary: Traditional OVT has been shown to improve convergence insufficiency. There are now electronic and computerized methods involving an operant conditioning model available for treating this disorder. Using this technique has been shown to improve patient motivation along with therapeutic reliability and standardization.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=PubMed&list_uids=3046364&dopt=AbstractPlus

Evans BJ, Drasdo N, Richards IL. Investigation of accommodative and binocular function in dyslexia. Ophthalmic Physiol Opt 1994;14(1):5-19.

Summary: Forty-three control and 39 dyslexic children were matched for age, sex and IQ. The dyslexic group showed significantly lower convergence and divergence reserves at near. Their accommodative amplitudes were also reduced. Several other binocular measures were taken between the two groups which showed no difference between the control and dyslexic children. A simulated reading visual search task suggested that accommodative and vergence dysfunction were not the major cause of dyslexia. The authors concluded that accommodative-convergence problems may not be the etiolgy of dyslexia.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=PubMed&list_uids=8152821&dopt=Citation

Friedhoffer A. Optometric diagnosis and visual training as they relate to school achievement. Opt J Rev Optom 1969;106(10):27-31.

Summary: Ten OVT patient case reports are presented showing improvements academically. Reasons for this improvement are improvements in understanding where things are in space and what things. Problems with vision skills can decrease reading potential and classrooms are typically designed for visual learning.

No hyperlink available.

Hall PS, Wick BC. The relationship between ocular functions and reading achievement. J Pediat Ophthalmol Strabismus 1991;28(1):17-19.

Summary: This study attempted to correlate 11 ocular functions to a student's reading ability. Reading ability was measured using the Stanford Achievement Test. The study concluded that there was no relationship between reading ability and students with small phorias and refractive error.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2019952&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus

Hennessey D, Iosue RA, Rouse MW. Relation of symptoms to accommodative infacility of school-aged children. Am J Opt Phys Optics 1984;61(3):177-83.

Summary: Accommodative infacility may result in asthenopic symptoms, The researchers tested sixty subjects by using +/- 2.00 lenses and than gave questionnaires to determine whether the patients were symptomatic. The results showed that symptomatic subjects performed significantly worse than those without symptoms.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=DetailsSearch&Term=Hennessey+D%5BAuthor%5D+AND+Iosue+RA%5BAuthor%5D+AND+Rouse+MW.%5BAuthor%5D

Hoffman LG, Rouse M. Referral recommendations for binocular function and/or developmental perceptual deficiencies. J Am Optom Assoc 1980;51(2)119-126.

Summary: This paper gives recommendations for referral of patients with binocular and perceptual

dysfunction. Practitioners who do not perform treatment of these problems are given symptoms and clinical findings to aid in referral of these problems.

No hyperlink is available.

Kane M. Demise of a myth? J Am Optom Assoc 1992;63(2):86–89.

Summary: The author's search of ophthalmology literature in 1990 shows about one dozen articles relating to binocular vision and learning. Optometry literature shows hundreds of published articles linking accommodative and convergence disorders to social, emotional, intellectual and academic behavior. Ophthalmology should not prorogate this myth to conceal the neglect of the past.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=DetailsSearch&Term=(Kane+M.%5BAuthor%5D+AND+Demise%5BAll+Fields%5D+AND+myth%3F%5BAll+Fields%5D+AND+%22J+Am+Optom+Assoc%22%5BJournal%5D)+AND+2%5BAll+Fields%5D+AND+86-89.%5BAll+Fields%5D

Kedzia B, Tondel D, Pieczyrak G, Maples WC. Accommodative facility test results and academic success in Polish second graders. J of the Am Optom Assoc 1999;70(2):110-6.

Summary: Accommodative infacility skills were compared to four areas of academics (reading, writing, math and gymnastics). Seventy-six second grade Polish children were tested. Results did not show any clear correlation between accommodative flexibility and academic function.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10457688&ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kurz M, Bauer G, de Graaf ME. Convergence insufficiency and school difficulties (author's transl). Klin Monatsbl Augenheilkd 1975;167:669-78.

Summary: 124 normal children ages 6-9 with exophoria, convergence insufficiency and learning problems were treated with physiological diplopia, convergence training and surgical treatment. Medial rectus surgery was performed when patients failed with "ophthalmological home-work". 65% of astheniopia disappeared within a few weeks. Improvement in concentration, reading and writing capacity was shown within months. The author recommended that visual exams of elementary students to detect visual defects.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=120950&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocm

Mantyjarvi MI. Accommodation in school children with music or sports activities. J Pediatr Ophthalmol Strab 1988;25(1):3-7.

Summary: The accommodative status of 324 children was studied before and after a twelve minute reading session. 120 children were musicians, 93 children were trained in an individual sport and 111 did neither serving as a control group. After the reading session, about 16% of the musicians showed a significant drop int accommodation compared to the control group. The athletes did not show a significant difference to the control group. Most of those with the decreased accommodative abilities where female.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3343637&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Mohindra I, Scheiman MM, Scheiman MT, Fixation disparity and learning disabilities. Br J Physiol Opt 1975;30(2-4):128-31.

Summary: Fixation disparity testing was performed on 53 learning disabled and 61 normal children. The fixation disparity of the learning disabled group showed no statistical difference from the control group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1236457&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Pierce J. Is there a relationship between vision therapy and academic achievement? Part 1. Optometric development vision therapy and academic achievement. Opt J Rev of Optom 1977;114(6):48-63.

Summary: This was a two part symposium on the relationship between OVT and academic achievement. The manuscript asked the question, "Is there a physiological basis or evidence for developmental vision therapy?" Numerous visual categories were explored from the literature. Perceptual-motor training was thought to improve learning strategies and therefore improve performance.

No hyperlink is available.

Rosner J, Rosner J. Relation between tonic accommodation and visual perceptual skills development in 6- to 12-year-old children. Optom Vis Sci 1989;66(8):526-9.

Summary: This study was to look for connections between tonic accommodation (TA) and visual perceptual skills (VPS). 162 children were assessed as to their tonic accommodation, VPS and refractive status. The results showed a high correlation between TA and VPS and refractive status. Children with high TA are more likely to have delays in VPS than children with low TA, regardless of refractive status.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2771343&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rundstrom M, Eperjesi F. Specific reading difficulty or decompensated heterophoria? Opthalmic Phsio Opt 1995;15(2):157-9.

Summary: This is a case report showing the importance of both optometric assessment and educational psychological evaluation in children with reading problems. Both evaluations are required to find the true etiology and treatment of the reading disabled.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7659412&ordinalpos=25&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Safra D. Die orthoptishche legastheniebehandlung. Klin Mbl Augenheilk 1992;200(5):612-3.

Summary: Dyslexia is believed to be due to organic-brain syndrome, with deficiencies in gnosics and binocular vision. The binocular vision problems are expressed by intermittent alternating central scotoma which would impair vision. Orthoptic therapy should be done to eradicate the scotoma and stabilize binocularity which would improve reading ability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1614171&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Simons H, Grisham J. Binocular anomalies and reading problems. J Am Opt Assoc 1987; 58(7);578-87.

Summary: The authors reviewed the literature on the binocular anomalies and their relationship to reading problems. The review showed definitive relationship for exophoria, fusional vergence reserves, convergence insufficiency and other binocular diagnoses. There was a lesser relationship for esophoria and none for distance lateral phorias.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3312379&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stifter E, Burggasser G, Hirmann E, et al. Monocular and binocular reading performance in children with microstrabismic amblyopia. Br J Ophthalmol 2005;89(10):1324-9.

Summary: Reading performance of 40 (20 normal and 20 microstrabismic amblyopic) children was evaluated under monocular and binocular conditions. Significant differences were found in the binocular maximum reading speed (MRS) between the two groups. This held true for the monocular amblyopic eye also. The authors concluded that there would be reading impairment even when binocular visual acuity of both groups were similar.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=16170125&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Sucher DF, Stewart J. Vertical fixation disparity in learning disabled. Optom Vis Sci 1993;70(12):1038–43.

Summary: This study relates learning disabilities to refractive error, accommodative infacility, poor pursuits, and vertical disparity. Input to reading is mostly vision, thus, there are correlations to visual defects and learning problems. There was a high incidence of vertical disparity in 5^{th} and 6^{th} graders with learning disabilities. Problems with vertical oculomotor, vestibular and learning are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8115127&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Worcester DA. The influence of orthoptic training on the reading ability of college freshman. J Exper Educ 1940;9(2):167-74.

Summary: Two experiments were performed to investigate the effects of orthoptic training on reading ability and visual function. There were three groups in the first study: 1) orthoptic and than reading skills training 2) reading skills than orthoptic training. 3) reading skills only training. Group one saw the most improvement in fixations and regressions.

The second experiment compared the efficacy of two techniques, the *Binocular Synchronizer* versus the mirror-type stereoscope. Group one had only reading skills training and group two had training with the instruments listed. Both groups had equal improvement in reading rate and comprehension. Group two showed an improvement in visual skills along with the improvements in reading.

No hyperlink is available.

Weisz CL. Clinical therapy for accommodative responses: transfer effects upon performance. J Am Optom Assoc 1979;50(2):209-16.

Summary: The study group was diagnosed with accommodative disorders and given accommodative training. A control group was given only perceptual-motor training. All subjects were tested pre and post therapy using a pencil-paper task. A significant decrease in errors occurred with the group receiving accommodative training compared to the control group. This shows a transfer of accommodative training to near point performance.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=379112&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Young B, Collier-Gary K, Schwing S. Visual factors – a primary cause of failure in beginning reading. J Optom Vis Devel 1994;25(Winter):276–88.

Abstracts from the COVD Journal: In a longitudinal study of 144 beginning readers in public school, data on 25 measures of visual efficiency were subjected to two- and three-way Analyses of Variance. Binocular function, visual acuity, discrepancies in acuity, and color deficiencies were all found to be statistically significant in impeding beginning reading. Significant differences were also found in the sequence of visual development between sexes, between eye dominance for different tasks, between specific factors for 6-, 7-, and 8- year olds and first and second grades. It was concluded that visual factors are a primary cause of beginning reading failure and that most current school screenings are inadequate in scope and rigor.

No hyperlink is available.

2. BOOKS AND BOOKLETS ON VISION AND LEARNING

Barber A, Johnson R. eds. *Consulting with schools.* OEP Behavioral Aspects of Vision Care, Vol. 42, No. 3. Santa Ana: Optometric Extension Program, 2002.

This book is co-authored by over twelve authors, many writing a chapter on their area of expertise. Subjects covered include: social consequences of undetected vision problems, legal rights and advocacy to special education, vision and reading, what teachers know about the learning process, auditory processing deficits, integrated visual learning, reports on vision screenings, vision and music, how visual processing skills affect learning and more.

Borsting E. Visual Perception and Reading. Vision and Reading 1996; Chapter 8: 149-228.

Garzia RP, Borsting EJ, Nicholson, SB, Press, LJ, Scheiman, MM, Solan, HA. *Care of the patient with learning related vision problem: reference guide for clinicians.* Optometric clinical practice guideline. St. Louis: American Optometric Association, 2000.

This optometric clinical practice guideline on the care of the patient with learning related vision problems describes appropriate evaluation methods and management strategies to reduce the risk of vision problems interfering with the learning process. It contains recommendations for timely diagnosis, intervention, and, when necessary, referral for consultation and/or treatment by another healthcare provider or education professional. This guideline will assist doctors of optometry with diagnosis of visual information processing problems, help in selection of instruments/tests, give strategies for patients with vision and learning problems, and help in the communication with parents and other professionals about the nature of a patient's visual problems.

Griffin J. Christenson, Garth N., Wesson, Michael D., Erickson, Graham B. Optometric Management of Reading Dysfunction; Butterworth-Heinemann, Newton, MA. 1997.

Butterworth G. What is Special About Pointing in Babies? The Development of Sensory, Motor and Cognitive Capacities in Early Infancy. In Simion, Butterworth (Eds), From Perception to Cognition. Psychology Press.1998: 171-190.

Ciuffreda, Kenneth J. Eye movements during reading: In Eye Movement Basics for the Clinician.Ciuffreda K, Tannen B. Mosby, St. Louis, MO. 1994.

Rosner J. Helping children overcome learning difficulties. New York: Walker and Company, 1975.

The purpose of this book is to help the parents of children with learning problems by laying out a practical and effective plan of action. The book is divided into two major sections: 1) testing and teaching, and 2) prevention of learning problems through proper preschool actions.

3. DYSLEXIA AND LEARNING

Adler-Grinberg D, Stark L. Eye movements, scanpaths, and dyslexia. Am J Optom Physiol Opt 1978; 55(8):557-70.

Summary: This study attempted to determine if dyslexia involved oculomotor dysfunction or visual perception problems. Oculomotor performance of 25 dyslexic and 19 normal children was tested. When following a meaningless scan path, dyslexics and normal children performance was the same. When scanning their reading level print, there was a marked difference. The conclusion notes that dyslexia is beyond visual perception, possibly due to visual language input into language-acquisition function.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=742646&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Barnard N, Crewther S, Crewther D. Visual processing and dyslexia. Clin Exp Optom 1996;79:19-27.

Summary: This paper is a review of current theories in reading disability. It summarizes research in this field confirming that most dyslexics have both transient and temporal processing problems with vision and other senses. Visual testing of transient function (flicker contrast) and temporal processing speed correspond to the magnocellar pathway. Students with deficits in this testing could be treated by methods that enhance visual attention and binocularity.

No hyperlink is available.

Biscaldi M, Fischer B, Hartnegg K. Voluntary saccadic control in dyslexia. Perception 2000;29(5):509-21.

Summary: Many dyslexics show poor saccadic control in both single and sequential tasks. This study tested dyslexics by requiring saccadic movement opposite the direction of the stimulus (an anti-saccade). 620 subjects were tested, 506 were dyslexic and the control had 114. All subjects did a forward saccade and a gap anti-saccade. Saccadic reaction time, number of errors, and number of number of trials the subject failed to complete the saccade were recorded. The results were significantly worse in dyslexics with a 1.5 standard deviation below the control group.

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Bishop D. Unfixed reference, monocular occlusion, and developmental dyslexia--a critique. Br J Ophthalmol 1989;73(3):209-15.

Summary: Prior research proposed that poor binocular control of vergence eye movements was the cause of reading problems in a subset of dyslexic children, as shown on Dunlop's reference eye test. Four predictions are evaluated: 1. Few good readers have unfixed reference 2. Contradictions in findings that unfixed reference exists in dyslexics 3. there is little support that dyslexics with unfixed reference make reading errors as those with fixed reference and 4. studies that show monocular occlusion is successful treatment for dyslexia are flawed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2650732&

Borsting E, Rider WH, Dudeck K, Kelley C, Matsui L, Motoyama J. The Presence of a magnocellular defects depends on the type of dyslexia. Vision Res 1996;36(7):1047-53.

Summary: Prior studies show that 75% of dyslexics have magnocellular pathway deficits. This study examined adults with both dyseidetic and dysphoneidetic dyslexia had magnocellular pathway deficits. Vertical contrast sensitivity functions were used. Findings show that dysphoneidetic form had a reduction below 10 Hz and dyseidetics did not. Results thus show that the type of dyslexia is consistent with the magnocellular deficit.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8736263&ordinalpos=18&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Burkhart F, Klaus H. Effects of visual training on saccade control and dyslexia. Perception 2000;29;531-42.

Summary: This study reports selected dyslexic children showing poor eye-movement control, particularly fixation stability and/or voluntary control. Three training tasks were done daily: 1. fixation 2. saccades and 3. use of a dystractor. The subject had to detect the orientation of a pattern rapidly. The children were give a small LCD device for daily home use. Results showed improved perceptual capacity and voluntary saccadic control. After 3-8 weeks the dyslexic findings were the same as the control group.

No hyperlink is available.

Buzzelli A. Stereopsis, accommodative and vergence facility: do they relate to dyslexia? Optom Vis Sci 1991;68(11):842-6.

Summary: Thirteen normal readings and 13 dyslexics were compared as to stereopsis, accommodative facility and vergence facility as related to reading skills. Visual acuity and stereopsis was the same for both groups. Dyslexic subjects had better accommodative facility. Dyslexics had significantly worse vergence facility. These results show non-dynamic tasks (such as VA and stereopsis) do not affect reading whereas dynamic tasks, decreased vergence facility, may contribute to reading disability. These vergence problems may contribute to the many small eye movement problems seen in dyslexics and this may be related to oculo-motor dysfunction.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1766644&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Christenson GN, Griffin JR, DeLand PN. Validity of the dyslexia screener. Opt Vis Sci 1991;68(4):275-81.

Summary: The Dyslexia Screener (TDS) was developed to quickly diagnose one of three types of dyslexia. Results showed that the TDS had similar clinical information to the Dyslexia Determination Test.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2052283&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Christenson G, Griffin J, Taylor M. Failure of blue-tinted lenses to change reading scores of dyslexic individuals. Optometry. 2001;72(10):627–33.

Summary: A group of dyslexics, mainly dysphoneidetic dyslexics, was given blue filters than several weeks later tested with no filters. The MacGinitie Reading test was used. The results show no significance in the blue filter group to the no-filter group, comparing reading comprehension. The authors suggested that the transient system defect may occur in both the visual system and reading centers of the brain.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11712629&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Demb JB, Boynton GM, Best M, et al. Psychophysical evidence for a magnocellular pathway deficit in dyslexia. Vision Res 1998;38(11):1555-9.

Summary: This study examined reading ability and reading performance of dyslexics associated with the magnocelluar pathway. Speed discrimination and contrast detection thresholds were determined under conditions where performance is dependent on the magnocelluar pathway. Dyslexics had higher psychophysical thresholds with speed threshold being especially low. Evidence supported a magnocellular pathway abnormality in dyslexics and that motion discrimination may be better predictor of dyslexia than contrast sensitivity.

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Di Lollo V, Hanson D, McIntyre JS. Initial stages of visual information processing in dyslexia. J Exp Psych 1983;9(6):923-35.

Summary: A group of dyslexics was compared to a control group using four tasks. Two tasks used visual backward masking and two involved temporal integration. Dyslexics had slower processing in the backwards masking task. The temporal-integration tasks showed longer visible persistence in dyslexics. It is suggested that dyslexic visual system may take longer to recover from aftereffects of same retinal location stimuli.

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Duffy FH, Denckla MB, Bartels PH, Sandini G. Dyslexia: regional differences in brain electrical activity by topographic mapping. Ann Neurol 1980;7:412-420.

Summary: EEG and evoked potential data were compared in dyslexic boys versus a normal group. Four different regions had variances in the brain activity of the two groups. The dyslexia was found in much

of the cortical region involved with speech and reading. Group differences were found in the bi-frontal, left-temporal and left posterior regions. Dyslexics also showed increased EEG alpha activity at rest suggesting cortical inactivity.

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Eden GF, Stein JF, Wood HM, Wood FB. Differences in eye movements and reading problems in dyslexic and normal children. Vis Res 1994;34(10)1345-58.

Summary: Eye movements in dyslexics were studied during non-reading tasks. Fixation, vergence amplitude, saccades and pursuits were tested. The phonological ability of the two groups was compared. Stability of fixation, vergence amplitudes, smooth pursuits and phonological awareness were lower in dyslexics. Backwards reading children were compared to dyslexics and the findings between these two were similar. Sex, handedness, IQ or ADD did not affect performance of eye movement tasks. Oculomotor abnormalities in non-reading tasks show that the deficits are not caused by language problems alone.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8023443&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Eden GF, VanMeter JW, Rumsey JM, et al. The visual deficit theory of developmental dyslexia. Neuroimage 1996;4(3Pt 3):S108-17.

Summary: Reading impairment can occur due to cerebral insult in cases of acquired dyslexia. This group can also exhibit impairments in their ability to process phonological features of language. Acquired dyslexics may also be impaired in visual tasks involving visuomotor, visuospatial and motion processing. Studies of this group and suggest that dyslexia is more complex than initially thought, going behyond the language areas of the brain.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9345535&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Eskenazi B, Diamond SP. Visual exploration of non-verbal material by dyslexic children. Cortex 1983;19(3):353-70.

Summary: Eye movements of 15 dyslexic boys were compared to 15 normal boys. The dyslexic group took longer to find matching targets when the targets were tilted and the dyslexic group took slightly longer when the target material was unfamiliar. Two explanations were given to explain this: 1. dyslexics have problems processing direction which confuses information and 2. dyslexics have difficulty in motor gating of visual information.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6641243&ordinalpos=43&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Evans BJ, Drasdo N, Richards IL. An investigation of some sensory and refractive visual factors in dyslexia. Vision Res 1994;34(14):1913-26.

Summary: There is controversy as to the role of visual factors and dyslexia. A dyslexic group was matched to a control, than psychometric and optometric data was obtained. Spatial contrast sensitivity with sinusoidal flickering was tested as a better way to test magno-cellular function. A non-verbal reading search task was performed. Dyslexics showed reduced visual acuity, impaired flicker

detection, reduced special frequency and slightly lower reading search task ability. The two tests of transient function are weakly correlated showing these tests do not measure the same function. The decreased reading search of dyslexics was attributed to visual sequential memory. Other explanations to the findings are given.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7941393&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Evans BJ, Drasdo N, Richards IL. Dyslexia: the link with visual deficits. Ophthalmic Physiol Opt 1996;16(1):3-10.

Summary: Results of this study show dyslexia to be associated with binocular instability, decreased accommodative amplitude and reduced contrast sensitivity – both special and uniform field flicker. Ways to test binocular instability are discussed. There was a significant correlation between flicker threshold and binocular instability – linking sensory and motor correlates to dyslexia. Other evidence show that binocular anomalies do not cause poor coding. Visual characteristics are not the factors in reading disability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8729561&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Evans BJ, Cook A, Richards IL, Drasdo N. Effect of pattern glare and colored overlays on a simulated-reading task in dyslexics and normal readers. Opt and Vis Sci 1994;71(10):619-28.

Summary: A decrease in astheniopia using colored filters has been reported. A possible cause would be pattern glare, a hypersensitivity to repetitive patterns including lines of print. One experiment investigated pattern glare and colored filters on performance in a visual search task. This was done on normal college students and showed marginal improvement in reading. A second experiment pattern glare was compared to dyslexic children and a normal group. Pattern glare in the dyslexics was correlated with flicker sensitivity.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7877805&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Everatt J, Bradshaw MF, Hibbard PB. Visual processing and dyslexia. Perception 1999;28(2):243-54.

Summary: This study was to determine if the magnocellular pathway was responsible for deficits for dyslexics and certain visual tasks. Vernier acuity, perceptive motion and perceptive shapes were compared in a dyslexic and normal group. No difference was found in visual acuity. Generally, most dyslexics scored lower in motion perception and stereopsis. The data is consistent with prior data that the magnocellular pathway is deficient in dyslexics.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10615463&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Facoetti A, Molteni M. The gradient of visual attention in developmental dyslexia. Neuropsychologia 2001;39(4):352-7.

Summary: Visual attention was compared by measuring reaction time in children with reading disorders to a normal group. A target was presented within a circle 70% of the time and outside 30%. Normal

children showed no difference. The reading disabled group showed slower reaction times when the stimulus was presented in the left field with no difference in the right. A hypothesis that a spatial attention disorder was related to a right parietal cortex dysfunction.

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Facoetti A, Turatto M, Lorusso ML, Mascetti GG. Orienting of visual attention in dyslexia: evidence for asymmetric hemispheric control of attention. Exp Brain Res 2001;138(1):46-53.

Summary: Two experiments were performed on a normal group versus a dyslexic group looking at orientation. Experiment one tested the "exogenous orientation with a 350 ns quick stimulus target. There was no difference in normal readers comparing the right and left fields. In dyslexics the target was absent in the right field but greater on the left. Experiment two measured the "endogenous" orientation using central target presented at 750 ms. Dyslexics showed a slower reaction time in the left field. Possible explanations include: asymmetrical control of spatial attention, right parietal cortex, interhemispheric dysfunction and/or cerebellar dysfunction.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11374082&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Felmingham KL, Jakobson LS. Visual and visuomotor performance in dyslexic children. Exp Brain Res 1995;106 (3):467-74.

Summary: A dyslexic group was compared to a normal group using tasks involved with the magnocellar (M) pathway and the cortical dorsal stream. Dyslexics were found to have reduced sensitivity to the M- system functions – which inputs into the dorsal stream. It was found that dyslexics had decreased function with cortical dorsal stream functions (stereopsis – although mild, visuomotor control and structure recognition).

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8983990&ordinalpos=16&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Fischer B, Hartnegg K. Stability of gaze control in dyslexia. Strabismus 2000;8(2):119-22.

Summary: This is a longitudinal study comparing fixation instability of eye movements of (N=99) normals and (N=262) dyslexics. Pro-saccade and the gap of an anti-saccade were measured. Both groups improved in fixational stability over time but the dyslexic group had developmental lag. The magnocellular pathway was discussed as being the cause.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10980693&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Fischer B, Hartnegg K. Dynamic visual perception of dyslexic children. Perception 2000;29(5):523-30.

Summary: Three tasks detecting the orientation of a quickly appearing pattern were compared in a dyslexic to a normed group. Task one was had the stimulus in the same location. Task two had the pattern required a saccade as the target would shift to one side. Task three interjected a distractor as the target was shown to the opposite side. The dyslexic group scored lower in all three tasks with the

greatest disparity with the third (distractor) task. Both groups showed improvement with age. The study also showed that some dyslexics have dysfunciont in perceiving fast changing stimuli, connected to the magnocellular system.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10992951&ordinalpos=9&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Fisher B, Hartnegg K. Effects of visual training on saccade control in dyslexia. Perception 2000; 29:531-42.

Summary: Three visual tasks were used to train a dyslexic group: a fixation, a saccade and a distractor condition. The subject was to detect orientation of a small pattern. A handheld LCD device was used for the training. Results show that daily training improved perceptual ability and voluntary saccadic control. After 3-8 weeks the dyslexic group matched the control.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10992952&ordinalpos=8&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Flax N, Mozlin R, Solan HA. Discrediting the basis of the AAO policy: learning disabilities, dyslexia, and vision. J Am Optom Assoc 1984;-55(6):399-403.

Summary: The American Academy of Pediatrics, the American Academy of Ophthalmology and Otolaryngology, and the American Association of Ophthalmology issued a policy statement entitled "The Eye and Learning Disabilities," in 1972 which basical said the vision is not related to learning. Nathan Flax and others disputed this policy showing inaccurate use of references and quoting numerous other works disputing this statement. In 1984 a similar policy statement was issued by the American Association for Pediatric Ophthalmology and the American Academy of Ophthalmology. Dr.'s Flax and Solan dispute this second position paper examining the fifteen references and statements within the position paper.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6736536&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Geiger G, Lettvin JY. Peripheral vision in persons with dyslexia. N Engl J Med 1987;316(20):1238-43.

Summary: Dyslexic and normal readers were studied to determine how they identify letters and short letter sequences. Dyslexic subjects could detect letters further in the periphery than normal readers. Dyslexic subjects "masked" letters presented centrally. It was surmised that dyslexics learn to read peripheral to the fovea and that they use different strategies to read such as foveal – peripheral relations.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3574384&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Geiger G, Lettvin JY, Fahle M. Dyslexic children learn a new visual strategy for reading: a controlled experiment. Vision Res 1994;34(9)1223-33.

Summary: This study was to determine whether a new method of remediation (by Geiger et al.) was effective in children. A control group was given the new method of reading therapy and the control group was continued methods administered by the school. After three months, students using the new method improved 1.22 grade levels while the control group improved 0.17 grades. After this, the control group was also given the new remediation method. Five months later testing on the initial

experimental group showed improvement. The initial control group improved over 2 grades. Gains were noted in both groups after a third retest performed 8 months later.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8184565&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Graves RE, Frerichs RJ, Cook JA. Visual localization in dyslexia. Neuropsychology. 1999;13:575-81.

Summary: Dyslexics may exhibit visual abnormalities such as prolonged visual persistence, decreased contrast sensitivity, lower motion detection, etc. These problems may be due to a defect in the magnocellular visual afferent pathway. Two experiments were performed to test this in adults with reading disability. Results showed a lower ability to report locations of briefly flashed stimuli.

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Griffin JR, Birch TF, Bateman GF, Land PN. Dyslexia and visual perception: is there a relation? Opt Vis Sci 1993;70(5)374-79.

Summary: A group of dyseidetics were compared to a group of reading disabled non-dyslexics to determine if visual perception has correlations with dyslexia. The Dyslexia Determination Test (DDT) and the Test of Visual Perceptual Skills (TVPS) were used. There was no correlation. A non-dyslexic could have poor visual perception and/or a dyslexic could have good perception. The results show that reading disabilities by dyseidesia are different than non-dyslexic poor readers. It is likely that visual perceptual problems lead to learning problems. Dyslexics would require different therapy than those with visual perceptual problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515965&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Griffin JR. Genetics of dyseidetic dyslexia. Opt Vis Sci 1992;69(2):148-51.

Summary: Nine pedigrees for autosomal dominant transmission of dyseidetic dyslexia were presented. Sex-influence is attributed to the higher incidence amongst males. Other genetic modes of transition are not likely for dyseidesia but are possible for other forms of dyslexia. Genetic counseling may help for dyseidetic dyslexia.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1584553&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Griffin JR. Prevalence of dyslexia. J Optom Vis Dev 1992;23(4):17-22

Summary: 100 children were studied in a ten year longitudinal study. The Dyslexia Screener Test was used. There was no difference in boys versus girls in severity and dyslexic subtypes. These results differed from the traditional view that there is higher incidence in males. Possible factors estimating prior estimates of dyslexia are discussed.

No hyperlink is available.

Guerin DW, Griffin JR, Gottfried AW, Christenson GN. Dyslexic subtypes and severity levels: are there gender differences? Opt Vis Sci 1993;70(5):348-51.

Summary: 100 children were studied in a ten year longitudinal study. The Dyslexia Screener Test was used. There was no difference in boys versus girls in severity and dyslexic subtypes. These results differed from the traditional view that there is higher incidence in males. Possible factors estimating prior estimates of dyslexia are discussed.

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Haddad HM, Isaacs NS, Onghena K, Mazor A. The use of orthoptics in dyslexia. J Learn Disabil 1984;17(3):142-4.

Summary: Seventy three children were given a full ophthalmological evaluation, 24 of which were diagnosed with dyslexia. All patients with poor fusional amplitudes showed improved reading with orthoptic exercises. Orthoptics did not affect the perceptual deficits in the dyslexics.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6715993&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Heim S, Freeman RB Jr, Eulitz C, Elbert T. Auditory temporal processing deficit in dyslexia is associated with enhanced sensitivity in the visual modality. Neuroreport 2001;12(3):507-10.

Summary: Auditory and visual processing data in dyslexics was determined. In this group, none of the dyslexic children showed abnormal visual temporal processing. Dyslexics that had poor auditory temporal processing had higher visual performance. This suggests that dyslexics with poor temporal auditory processing compensate with functional sensory vision.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11234754&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Hyona J, Olson R. Eye fixation patterns among dyslexic and normal reader: effects of word length and word frequency. J Exp Learn Mem Cog 1995;21(6):1420-40.

Summary: A group of dyslexics compared to a normal group was compared. The subjects read aloud and than word-frequency and word-length were determined. There was not a significant difference between the two groups which disproves prior oculomotor dysfunction cause of dyslexia. The results support that both groups have eye fixation patterns to identify text.

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Iles J, Walsh V, Richardson A. Visual search performance in dyslexia. Dyslexia 2000;6(3):163-77.

Summary: If the theory that magnocellular defects cause dyslexia is true, than dyslexic patients given tasks that stress the magnocellar pathway should be detected at higher level visual processing. One such area is the posterior parietal cortex. Defects in this region of the brain show decreased visual search. Two groups of dyslexics was compared to a normal group were tested on visual search tasks. One of the dyslexic groups had elevated coherence thresholds, a sign of LGN visual processing problems one group did not. Both dyslexic groups should show decreased visual search performance, but the second group did not. The results show that dyslexics with vision problems related to the magnocellular pathway also have vision-attention problems in the parietal cortex.

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Johannes S, Kussmaul CL, Munte TF, Mangun GR. Developmental dyslexia: passive visual stimulation provides no evidence for a magnocellular processing defect. Neuropsychologia 1996;34(11):1123-27.

Summary: Livingston et al. presented in 1991 evidence for a magnocelluar visual processing cause to dyslexia. VEPs were performed on adult dyslexics to determine if this was valid. Different reversal rates and contract levels were tested. No differences were found between a dyslexic group versus a control group which does not support Livingston's theory.

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Latvala ML, Korhonen TT, Penttinen M, Laippala P. Ophthalmic findings in dyslexic school children. Brit J Ophthal 1994;78(5)339-43.

Summary: A group of 55 dyslexics compared to a normal group (N = 50) was compared. They were broken down into six subgroups: general deficiency, general language, visuomotor, naming, mixed, and normal. VA, refraction, phoria, tropia, stereopsis, fusion and accommodation were similar for the two groups. Convergence insufficiency was more common for the dyslexic group (36% for the visomotor dyslexic subgroup). The "general deficient " subgroup also had decreased convergence amplitude (38%). Findings show a low accommodative /convergence ratio.

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Leisman G. Aetiological factors in dyslexia: III. Ocular-motor factors in visual perceptual response efficiency. Percept Mot Skills 1978;47(2):675-8.

Summary: A group of dyslexics compared to a normal group was studied concerning the effects of induced interferences of a backward masking paradigm. Results show that dyslexics do not have problems with perceptual localization.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=724410&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Leisman G, Ashkenazi M, Sprung L, Schwartz J. Aetiological factors in dyslexia: II. Ocular-motor programming. Percept Mot Skills 1978;47(2):667-72.

Summary: A group of dyslexics compared to a normal group was studied as to the preprogramming of saccades and the differences in oculo-motor patterning. No difference in saccadic control is demonstrated between the two groups.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=724409&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lennerstrand G, Ygge J. Dyslexia; ophthalmological aspects 1991. ACTA Ophthal 1992;70(1) 3-13.

Summary: Dyslexia is probably due to a poorly developed phonological awareness and neurologically related. Ophthalmologically, dyslexia is not due to: VA, refractive error, accommodation, binocularity, stereopsis and eye dominance. Reduced contrast sensitivity is found in dyslexics for middle range spatial frequencies showing a possible impaired transient system. There is no evidence that eye movement problems are causative of dyslexia. Backwards saccades are typical for dyslexics and when there is poor comprehension. There is no specific treatment of dyslexia, but the ophthalmologist must examine dyslexics and correct ocular, orthoptic or neurological problems that can make reading difficult. Patients and parents should be told that there is no visual cause to the disability and that it is neurological.

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Leonard CM, Voeller KK, Lombardino LJ, Morris MK, Hynd GW, Alexander, et al. Anomalous cerebral structure in dyslexia revealed with magnetic resonance imaging. Arch. Neurol 1993;50(5)461-469.

Summary: This study was to develop methods to find cerebral anomalies on MRI in patients with dyslexia and learning disabilities. Dyslexic patients, a non-dyslexic relative and a control group were given an MRI. Final results showed the dyslexic group to have amplified asymmetries, with a sizeable shift of planar tissue from the temporal to the parietal bank. The dyslexic group also had more cerebral bilateral anomalies. The authors concluded that MRI can find cerebral anomalies but these readings would need to be improved to diagnose, classify, and treat dyslexia and learning disabilities.

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Leslie S. The optometrists role in learning difficulties and dyslexia. Clin Exp Optom 2004;87(1):1-3.

Summary: This issue of Clinical and Experimental Optometry gives important concepts to optometrist to help those with learning disabilities.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=14720112&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

This issue of Clinical and Experimental Optometry publishes an invited review by Dr. Trichur Vidyasagar on the neural underpinnings of dyslexia, which presents important ideas for optometrists who are involved in helping children with learning difficulties.

Levinson HN. Abnormal optokinetic and perceptual span parameters in cerebellar-vestibular dysfunction and learning disabilities or dyslexia. Percep Motor Skills 1989;68(1):35-54.

Summary: An optokinetically based tracking method was created to measure ocular fixation and sequential scanning dysfunction. 70 subjects and 70 controls tested showed that decreased fixation, tracking, visual span and "movement illusions." This data helped verified that cerebellar-vestibular problems can cause reading disorders. Additional research would be required to norm this rapid screening method.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2928068&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Livingstone MS, Rosen GD, Drislane FW, Galaburda AM. Physiological and anatomical evidence for a magnocellular defect in developmental dyslexia. Proc Natl Acad Sci USA 1991;88(18)2556.

Summary: This study shows that dyslexics have decreased visually evoked potentials during the fast, low contrast tests. This is consistent with defects in the magnocellular pathway. Studies in auditory and somatosensory testing show dyslexics do poorly in fast discriminations. The authors theorized that there are slow and fast subdivisions in many cortical systems and that dyslexics are affected in the rapid area.

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Masters MC. Orthoptic management of visual dyslexia. Brit Orthopt J 1988;45:40-8.

Summary: 250 dyslexics were examined at the Birmingham hospital. Their management, differential diagnosis and treatments are described.

No hyperlink is available.

Motsch S, Muhlendyck H. Differentiation between dyslexia and reading disorder due to ocular causes. Ophthalmologe 2001;98(4):660-4.

Summary: Dyslexia is not believed to be caused by basic ocular disorders such as refractive error, accommodative and heterophoria. This study evaluated patients seen in the clinic for the past three years with dyslexia. 85% had ocular findings. 79% showed improved reading after therapy. Most had hyperopia, under accommodation, and exophoria. The results show the importance of correcting even small refractions when reading and writing disorders exist.

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Motsch S, Muhlendyck H. Frequency of reading disability caused by ocular problems in 9- and 10-year-old children in a small town. Strabismus 2000;8(4):283-5.

Summary: A study was performed to determine the percentage of children with reading disability caused by ocular disorders and real dyslexia in a normal population. The study group consisted of fourth graders in a German town. Results of the 89 children examined showed 16, 18 %, had reading problems. Most of these children (n = 6) had hypo-accommodation. Five children were not using their correct refractive glasses. One child had esophoria and another had exophoria. In three children, no ophthalmic cause could be found which was believed to be due to “true” dyslexia. All of the children are reading improved with the correct glasses, bifocals and/or prisms.

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Nicolson RI, Fawcett AJ, Berry EL, Jenkins IH, Dean P, Brooks DJ. Association of abnormal cerebellar activation with motor learning difficulties in dyslexic adults. Lancet 1999;353(9165):1662-67.

Summary: Children with dyslexia show problems with phonological skill, motor skill and balance which show evidence of mild cerebellar dysfunction. Adult dyslexics were tested against a control group monitoring finger movements while being monitored by positron emission tomography. Brain

activation was significantly lower in dyslexic adults in the cerebellar cortex. This is evidence that adult dyslexics have cerebellar abnormalities.

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[No authors listed] Vision, learning and dyslexia; A joint organizational policy statement. American Academy of Optometry, American Optometric Association, Optom Vis Sci 1997; 74(10):868-70.

Summary: This statement policy on vision and learning recommends that at risk children should be tested by an optometrist who diagnoses and treats children with learning problems and dyslexia. Treatment would improve visual function, allowing children or adults maximum functioning. It is recognized that optometry is one facet of a multi-disciplinary approach required for maximum improvement.

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Pammer K, Lovegrove W. The influence of color on transient system activity: implications for dyslexia research. Percept Psychophys 2001;63(3):490-500.

Summary: An experiment to study the transient system's response to color was designed. Results showed no effect; however, contrast was found to manipulate metacontrast. Discussion was made regarding the findings and their relation to research in reading-disability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11414136&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Pavlidis G. Eye movement differences between dyslexics, normal, and retarded readers while sequentially fixating digits. Am J Optom Physiol Optics 1985;62(12):820-32.

Summary: Three matched groups of dyslexics, normal and retarded readers eye movements were studied using spaced digits. It was found that dyslexics had significantly more regressions than the two other groups. It was believed that a dyslexic diagnosis could be made looking for regressions, using nonverbal material, prior to reading age.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4083326&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Pestalozzi D. Further observations of dyslexia patients with prism correction. Klin Monatsbl Augenheilkd 1992;200(5):614-9.

Summary: 281 dyslexic subjects were corrected for prism. Visual acuity and sensory function improved. The prism appeared to decrease severity of dyslexia (good or better in 71%) and also decreased asthenopia. 17% of the subjects showed no improvement in the dyslexia. Follow up after two years showed that the prism continued to help. The author surmised that the prism decreased stress allowing more energy for interpreting the text being read.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1614172&ordinalpos=14&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Report on 370 dyslexics, whereof 281 can be evaluated. The heterophoric cases were all corrected by Haase's method of prismatic binocular full correction. There are mainly esophorias but only little exophorias and strabisms. 3% are orthophoric. Visual acuity improved as well as sensory adaptations. The latter were mainly fixation disparities II. 82 operated cases resulted in a residual angle of 3+/-3 prism-diopters measured by Polatest. The influence on dyslexia is very good in 11%, good in 60%. 17% showed no influence on dyslexia but got rid of asthenopic symptoms. Only 12% failed. Good results are seen already after three months up to one year and in some cases even after 2 or 3 years. As optical and surgical corrections do not heal the dyslexia, it is discussed how to explain the obtained good results. The author's opinion is that prismatic corrections may save energy as the patients have no longer to compensate their heterophoria themselves. Thus they dispose on more energy e.g. for understanding of the text they are reading.

Raymond JE, Ogden NA, Fagan JE, Kaplan BJ. Fixational instability and saccadic eye movements of dyslexic children with subtle cerebellar dysfunction. Am J Opt Phys Optics 1988;65(3)174-81.

Summary: Dyslexic children showed significantly greater fixational instability than a matched control group. Latency and saccadic eye movement accuracy were the same as normal readers. These results show that dyslexics reading difficulties may be due to gaze stability rather than poor control of saccadic movements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3364526&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ridder WH 3rd, Borsting E, Banton T. All developmental dyslexic subtypes display an elevated motion coherence threshold. Optom Vis Sci, 2001;78(7):510-7.

Summary: Three dyslexic subtypes (dyseidetics, dysphonetics, and dyphoneidetics) had there motion coherence thresholds measured by guessing the direction of a dot motion stimulus. All dyslexic subtypes were found to have increased thresholds. Noted was that some subjects in each subtype had normal coherence thresholds. This shows that there are other factors that predict the motion deficits in dyslexia.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11503940&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ridder WH 3rd, Borsting E, Cooper M, McNeel B, Huang E. Not all dyslexics are created equal. Optom Vis Sci 1997;72(2):99-104.

Summary: Dysphonetic dyslexics were studied and found to have magnocellular pathway defect. Dyseidetic and dysphoneidetic dyslexics were previously studied. Dyseidetics did not have this pathway defect whereas dysphoneidetics did. This study showed that the most severely dysphonetic dyslexics exhibited a magnocellular pathway defect. These results suggest that each dyslexic type may require different treatment strategies.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9097326&ordinalpos=17&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Shapiro KL, Ogden N, Lind-Blad F. Temporal processing in dyslexia. J Learn Disabil 1990; 23(2):99-107.

Summary: 15 dyslexic children had their temporal processing tested to an aged match control. One and two syllable words were displayed with a hypothesis that the increased temporal integration of a two-syllable word would be worse for dyslexics. Dyslexics indeed had decreased accuracy. Another experiment was unable to find any differences in eye movement behaviors.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2303744&ordinalpos=19&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Slaghuis WL, Lovegrove WJ, Davidson JA. Visual and language processing deficits are concurrent in dyslexia. Cortex 1993;29(4):601-15.

Summary: This study was performed to determine if visual and language processing deficits both occur in dyslexics. 35 dyslexics ages 7-14 were compared to 35 normals on three reading skills: 1. visual processing 2. phonological coding and 3. language comprehension. The visual processing score was found to be 91% predictive for the dyslexic group. The phonological coding test, using non-words was 100% predictive. The phonic coding test did not vary between the two groups showing that visual and language deficits do exist in dyslexia.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8124937&ordinalpos=13&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Slaghuis WL, Twell AJ, Kingston KR. Visual and language processing disorders are concurrent in dyslexia and continue into adulthood. Cortex 1996;32(3):413-38.

Summary: Two experiments were performed to determine if adult dyslexics have visual and language processing disorders. Two visual processing tests (Ternus apparent movement) and a language processing test were performed and compared to normal readers. The duo experiment also drew results that adult dyslexics have a transient system disorder.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8886520&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Snowling M, Goulandris S. A longitudinal study of reading development in dyslexic children. J of Edu Psy 1996;88(4):653-69.

Summary: Literacy skills were studied in 20 dyslexics from age 7 to 12. At Time I, dyslexics performed worse on reading, spelling and phonological processing than age matched readers. The dyslexic children made poor progress when tested two years later. They showed deficits in nonword reading, repetition and dysphonic spelling. The authors concluded that the dyslexic reading skill becomes more pronounced over time due to phonological deficits.

No hyperlink is available.

Solan HA. Dyslexia and learning disabilities: an overview. Optom Vis Sci 1993;70(5):343-47.

Summary: A literature search shows that dyslexia has had numerous definitions. Optometrists can help treat the reading disabled with visual related dysfunctions that are part of this condition. Dyslexia requires multidisciplinary treatment.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515960&ordinalpos=12&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Spafford CS, Grosser GS. Retinal differences in light sensitivity between dyslexic and proficient reading children: new prospects for optometric input in diagnosing dyslexia. J Am Optom Assoc 1991;62(8):610-615.

Summary: Visual fields were done on dyslexics to determine brightness thresholds. These were compared to a normal reading group. The dyslexic group was found to significantly lower sensitivity in the upper hemifield. Results show that visual may be useful in diagnosing dyslexics.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1813570&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stanley G, Hall R. Short-term visual processing in dyslexics. Child Development 1973;44(4):841-4.

Summary: Two visual processing tests were performed on a dyslexic group and compared to a control group. On the first test, stimuli were presented with increased time intervals until recognized. On the second, the stimuli were presented being masked by dots. In both studies, the dyslexics had significant differences compared to the control.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4751305&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stanley G, Smith G, Howell E. Eye movements and tracking in dyslexic and control children. Br J Psychol 1983;74(Pt 2):181-7

Summary: The tracking of eye movements sequential lights were compared for 15 dyslexics to a control. Non-verbal intelligence was also compared. The authors found no significant differences on tracking and intelligence.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6883009&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein J. The magnocellular theory of developmental dyslexia. Dyslexia 2001;7(1):12-36.

Summary: Dyslexia has a large array of symptoms including poor phonological and reading skills. The magnocellular system of the brain is responsible for timing of eye movements while reading. In dyslexics the visual magnocellular system is impaired with abnormal development of the lateral geniculate nucleus. This causes poor visual localization and binocular instability causing letters to move. Dyslexics can also have poor phonological problems and inability to distinguish letter sounds. The cerebellum, the head ganglion for the magnocellular pathway, is also defective in dyslexics. It is believed that there is a genetic link to these neurological defects. Dyslexics, on the other hand, may have a heightened parvocellular system which may increase their holistic/artistic talents.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11305228&ordinalpos=19&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

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Stein JF, Fowler S. Diagnosis of dyslexia by means of a new indicator of eye dominance. Brit J Ophthalmol 1982;65(5)332-6.

Summary: Dyslexic children have difficulty controlling eye movements. This possibly may be from an inability to match retinal – oculo-motor signals. This is necessary to give true locations of objects and images. The authors studied retinal/oculomotor correspondence in dyslexic children and age/IQ matched normals of which the dyslexics showed unstable oculo-motor dominance.
http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7074007&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein JF, Riddell P, Fowler S. Fine binocular control in dyslexic children. Eye 1987;1(Pt 3)433-8.

Summary: Dyslexic children complain of letters moving which may be caused by poor vergence control. 67% of dyslexics have poor control of vergence movements. Treatment using monocular occlusion and training helped 51% of dyslexics to improve reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3308532&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein JF, Fowler S. Effect of monocular occlusion on visuomotor perception and reading in dyslexic children. Lancet 1985;2(8446):69-73.

Summary: Unstable vergence control was seen in 68% of dyslexics which is a visual versus a phonemic error. A double blind study with this group using plano glasses or left lens occluded lenses was prescribed for six months. 51% of the occluded group gained fixed preference versus 24% of the plano glass group. The monocular occluded group increased reading ability by six months and the plano group regressed. The authors concluded that one-sixth of dyslexic children develop vergence control and better reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2861526&ordinalpos=47&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein JF, Richardson AJ, Fowler MS. Monocular occlusion can improve binocular control and reading in dyslexics. Brain 2000;123(1):164-70.

Summary: 5-10% of children have dyslexia which in part is due to a visual magnocellar defect. This causes poor eye movement control due to poor binocular control. This study patched 143 dyslexics with unstable binocular control. They were split into two groups, wearing yellow lenses and lenses with occlusion of the left eye. They were followed for 9 months. 59% of the occluded groups showed improvement versus 36% of the unoccluded group. This was a 9.4 month improvement in reading and exceeded other forms of reading remediation.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10611130&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein J, Riddell PM, Fowler S. Disordered vergence control in dyslexic children. Br J Ophthalmol 1988;72:162-6.

Summary: Eye vergence movements were measure in a dyslexic group and compared to a normal. Dyslexic children showed poor vergence movements with small macular sized targets. This same group had normal movements with large, non-macular targets. This suggests that recording small vergence movements of macular sized targets may be useful in diagnosing and treating the reading disabled.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3355801&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein J, Walsh V. To see but not to read; the magnocellular theory of dyslexia. Elsevier Science Ltd 1997;20(4):147-52.

Summary: Dyslexics complain that letters move on the page which is due to visual magnocellular abnormalities. The m-stream culminates in the parietal cortex which is responsible for guiding vision. Evidence of dyslexics show that they have temporal processing problems with phonological, visual and motor deficits.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9106353&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stuart GW, Lovegrove WJ. Visual processing deficits in dyslexia: receptors or neural mechanisms? Percept Mot Skills 1992;74(1):187-92.

Summary: Prior experimenters claimed that dyslexics had abnormalities in their peripheral vision. The authors argued that this was not true and that there was more likely to be a deficit in the transient visual channel. This hypothesis is supported by anatomical and physiological evidence.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1561023&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Vidyasagar TR, Pammer K. Impaired visual search in dyslexia relates to the role of the magnocellular pathway in attention. Neuroreport 1999;10:1283-7.

Summary: The authors compared a dyslexic group to an age-matched normal group in their ability to search task requiring detection of a target's color and form. Color and form are normally processed by parvocelluar system. The dyslexic's scored significantly poorer than controls proving that there is a neural mechanism with a dyslexic's reading dysfunction.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10363940&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Vidyasagar TR. Neural underpinnings of dyslexia as a disorder of visual-spatial attention. Clin Exp Optom 2004;87(1):4-10.

Summary: This paper reviews the literature with preference to studies showing a defect in neural pathways as the cause to dyslexia. From this, a neural theory to reading dysfunction is give based on how these pathways interact with each other. Primarily, the magnocellular fast-track pathway arising from the retina has a "gating function" in focusing on individual letters. The gating probably occurs in the primary visual cortex.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=14720113&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Walther-Muller PU. Is there a deficit of early vision in dyslexia? Perception 1995;24(8):919-36.

Summary: Prior studies find the cause of dyslexia to be due to a transient deficit. Experiments performed showed that this was not the case. Errors in previous findings can be attributed to reduced amplitude of the transient response. The generality of prior findings the failure to find a transient dysfunction is discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8848361&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Winner E, von Karolyi C, Malinsky D, French L, Seliger C, Ross E, Weber C. Dyslexia and visual-spatial talents: compensation vs. deficit model. Brain Lang 2001;76(2):81-110.

Summary: Three tests were done to find the whether the neurological etiology of dyslexia was associated with superior (a compensation model) of visual-spacial skills. Results showed this to be false, there was no visual-spatial problems associated with dyslexia. It was also shown that dyslexics are prevalent in many visual-spacial professions.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11254251&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Winters RL, Patterson R, Shontz W. Visual persistence and adult dyslexia. J Learn Disabil 1989; 22(10):641-5.

Summary: Adult dyslexic's visual persistence was studied to determine if it compared to childhood dyslexia. A temporal threshold measure was devised to do this. Results showed that adult dyslexics was impaired compared to normal reading adults. Results show adults with dyslexia have longer visual persistence.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2592869&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ygge J, Lennerstrand G, Axelsson I, Rydberg A. Visual functions in a Swedish population of dyslexic and normally reading children. Acta Ophthalmol 1993;71(1):1-9.

Summary: 86 matched dyslexic children were compared to a normal group. The dyslexics had decreased far and near acuity. They also had lower contrast sensitivity in low frequencies. There was no difference in refractive errors or contrast sensitivity in the middle frequency range.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8475702&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

4. IQ AND VISION

Aubert AJ. Optometric implications of the structure of intellect abilities test. J Optom Vis Dev 1987;12(4):18-9.

Summary: This article gives information about the Structure of Intellect Learning Abilities Test (SOI-LA) is an IQ test

No hyperlink is available.

Gottfried AW, Gilman G. Visual skills and intellectual development: a relationship in young children. J Am Optom Assoc 1985;56(7):550-5.

Summary: 130 children were tested every six months from age one year to age 3 ½ on convergence, oculomotor skills, stereopsis and form perception. Results show correlations between vision skills and intellectual development. Stereopsis and form correlated the most.

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http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4020008&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Keim RP. Visual-motor training, readiness, and intelligence of kindergarten children. J Learn Disabil 1970;3(5):256-59.

See Above.

Kane M, Kane D. The impact of visual training on intelligence. J Optom Vis Devel 1988;19(4):5-8.

Abstract of COVD Journal: Many of the most important skills that people possess are often overlooked in an optometric evaluation. These skills are the innate intellectual capabilities of the patient. Because they are not considered during testing, they are not included in the implementation of a visual training program. Confounding the problem is the notion held by psychologists and those assessing intelligence that there exists but two types: verbal intelligence and performance intelligence. In reality there are a number of different types of intellectual potentials that can be assessed and enhance. These multiple intelligences include: linguistic intelligence, visual/spatial intelligence, logical-mathematical intelligence, personal intelligence, and interpersonal intelligence. Each of these different types of intelligences has a significant impact on behavior. With an understanding of the various aspects of intelligence, optometric visual training activities can be designed and or modified to enhance a patient's intellectual performance.

No hyperlink is available.

Mencarini S, Thompson G, Hoffman L. The relationship of saccadic ability to the coding portion of the wechsler intelligence scale for children. J of Opt Vis Devel 1988;19(12):11.

Abstract of COVD Journal: Many school-related tasks require accurate saccades. It has been suggested that the Wechsler Intelligence Scale for Children (WISC) coding subtest also requires accurate saccades. The purpose of this study was to investigate the correlation between saccadic ability and performance on the coding subtest. Ninety-five third graders were tested on both the WISC-R coding subtest and the King-Devick saccade test. The correlation found between the two tests is statistically significant. This implies that educators should consider this visual component when interpreting scores on the coding subtest. Further research is needed in order to evaluate a possible cause-effect relationship.

No hyperlink is available.

Silverman LK. Diagnosing and treating visual perceptual issues in gifted children. J Optom Vis Devel 2001;32(Fall):153–76.

Abstract of COVD Journal: Many gifted children (IQ's above 130) are visual-spatial learners. Some of these children will score average or above average on visual information processing testing, but will not be functioning at their full potential. Dr. Silverman recommends vision training for gifted children not meeting their maximum function. The author covers IQ testing methods, interpretation of the testing, especially the visual subtests (picture testing, block design, mazes, assembly, etc.). Guidelines for assessing children with learning disabilities are provided. Case histories on patients who received OVT are included.

No hyperlink is available.

Streff JW, Poynter HL, Jinks SB, Wolff BR. Changes in achievement scores as a result of a joint optometry and education intervention program. J Am Optom Assoc 1990; 61(6):475-81.

Summary: A control group of kindergarteners was compared to a group receiving a visual training program. IQ and school achievement were compared. The visual intervention group showed increases in four of eight areas tested when compared to the control group.
http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2370414&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Wachs H. Accommodation as a measure of sensorimotor intelligence. J Optom Vis Devel 1982; 13(3):1-4.

Abstract of COVD Journal: The term accommodation has been adopted by the visual sciences to mean the focusing of one's eyes. In other words, the structuring of a body part, the eyeball, to enable the thinking person to deal with the problem of visually grasping spatial objects. This paper will address how this is a cognitive act, and as such, a matter of accommodation through assimilation in Piagetian terminology.

No hyperlink is available.

Stewart-Brown S, Haslum MN, Butler N. Educational attainment of 10-year-old children with treated and untreated visual defects. Dev Med Child Neurol 1985;27(4):504-13.

Summary: Children with visual defects were compared to non-visual defective children over ten years in: intelligence, reading, math skills, and sports ability. Intelligence was slightly higher in myopes and slightly lower in hyperopes. Hyperopes were found to underachieve in reading. Math skills did not vary with refractive error. Sports ability slightly diminished in hyperopes.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4029521&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Williams SM, Sanderson GF, Share DL, Silva PA. Refractive error, IQ and reading ability: a longitudinal study from age seven to 11. Dev Med Child NeuroL 1988;30(6)735-42.

Summary: Refractive error groups were compared on IQ and reading. Myopic children had increased verbal and performance IQ. Verbal IQ differences could not be attributed to prior values. There were no differences in reading scores. The authors concluded that myopic children's higher IQ could not be attributed to familial or pre-existing abilities.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3234604&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

5. LEARNING DISABLED AND VISION

American Academy of Pediatrics, American Academy Association for Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology, Joint Policy Statement on Learning Disabilities, Dyslexia, and Vision. Pediatrics 1992;90;124-6.

Summary: These three associations state that educators, psychologists, and medical specialists recommend that individuals with dyslexia or related learning disabilities should receive 1) early comprehensive educational, psychological, and medical assessment: and 2) educational remediation combined with appropriate psychological and medical treatment. They recommend early detection and multidisciplinary treatment approach. The role of the eyes is decoding of retinal images and reading difficulties are not due to visual abnormalities. Ophthalmologists should be consulted to find refractive error, focusing deficiencies, eye muscle imbalances, and motor fusion deficiencies. If these are not found the child should be referred to a pediatrician to coordinate multidisciplinary care. The controversy of OVT in the treatment of learning problems is discussed. "Claims of improved reading and learning after vision training, neurological organization training . . . are typically based upon poorly controlled studies that rely on anecdotal information or testimony. The educator ultimately plays the key role in providing help for the learning disabled or dyslexic person.

Blackwell SL, McIntyre CW, Murray ME. Information processed from brief visual displays by learning-disabled boys. Child Dev 1983;54:927-40.

Summary: Tachistoscope spans were compared between learning-disabled (LD) and normal boys. Noise letters were introduced and compared under four different experiments. The LD boys showed decreased spans. These were attributed to greater distractiveness or slower pick up of the information presented.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6617311&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Borsting E, Rouse MW. Detecting learning-related visual problems in the primary care setting. J Am Opt Assoc 1994;65(9):642-50.

Summary: A strategy was given to help primary care optometrists recognize children with learning related vision problems. The use of related case history questions and a few additional tests would help optometrists diagnose most vision-related learning problems during a routine vision exam.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7963224&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Brier N. The relationship between learning disability and delinquency: a review and reappraisal; J Learn Disabil 1989;22(9):546-53.

Summary: Review of research shows that learning disabilities are prevalent in delinquents. A multifactor explanation is given. It is believed that interactions of psychosocial issues and learning disabilities lead to delinquency.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2681487&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Bruininks V, Bruininks R. Motor proficiency of learning disabled and nondisabled students. Percept Mot Skills 1977;44(3 Pt 2):1131-7.

Summary: A control group of normal students was compared on motor skills to a learning disabled group. The learning disabled students performed lower in motor skills, scoring lowest in fine motor and body equilibrium tasks, which require integration of visual and kinesthetic senses.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=887368&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Chernick B. Profile of peripheral visual anomalies in the disabled reader. J Am Optom Assoc 1978;49(10):1117-8.

Summary: Testing was performed on 80 disabled readers to give a profile of anomalies found. The most common visual anomalies found were accommodative, fusion, oculomotor skills relative to visual acuity. Comparative studies to normal readers were presented to give the reader the differences between the two groups.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=730979&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Christenson G, Griffin J, Wesson M. Optometry's role in reading disabilities: resolving the controversy. J Am Optom Assoc 1990;61(5):363-71.

Summary: Reading disabilities, dyslexia and theories of brain function are reviewed along with optometric vision therapy in treatment. Methods of diagnosis and how optometric vision therapy is beneficial in the management of these patients is presented.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2191996&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cordova KB. The speech-language pathologist's role in an interdisciplinary approach to learning-disabled children. Optom Vis Sci 1993;70(5):352-6.

Summary: Multidisciplinary treatment is required in the treatment of children with language disorders. Language areas that affect learning disabilities are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515962&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Evans BJ. The underachieving child. Ophthalmic Physiol Opt 1998;18(2):153-9.

Summary: Visual factors in people with learning disabilities were reviewed. These include: binocular instability and low accommodation. Colored filters may help with these problems and relieve eyestrain. Visual processing issues can also occur which optometrist can help treat.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9692036&ordinalpos=12&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Evans BJ, Patel R, Wilkins AJ, Lightstone A, Eperjesi F, Speedwell L, Duffy J. A review of the management of 323 consecutive patients seen in a specific learning disabilities clinic. Ophthal Physiol Opt 1999;19(6):454-66.

Summary: Visual problems with learning difficulties include poor binocularity, accommodation, and Meares-Irlen Syndrome. Meares-Irlen Syndrome signs show asthenopia and perceptual distortions which are alleviated by specially prescribed colored filters. 48 % of 323 patients were prescribed OVT and non-tinted spectacles. 50% of the 323 were given colored filters. 30% of the patients who received colored filters were later given Prescription Tints. 40% given OVT were later given colored filters. A telephone survey one year later showed that the colored filters were equal in their correctional ability as non-tinted spectacles.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10768028&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Flax N, Mozlin R, Solan HA. Discrediting the basis of the AAO policy: learning disabilities, dyslexia, and vision. J Am Optom Assoc 1984; 55(6):399-403.

See Above

Friedenberg HL. A multidisciplinary evaluation of the child with a visually related learning disability. J Am Optom Assoc 1975;46(10):975-77.

Summary: It is conceded that not all learning disabilities are visual or visual perceptual in nature. Optometrists are advised to understand other disciplines methods of treating learning disabled children.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1078343&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Friedman HN. Outcomes of optometric intervention for the adult patient with learning disabilities. J Optom Vis Devel 1995;26(4):212-18.

Summary: Learning disabilities stay with an individual form childhood to adulthood. Adults with academic problems often have other social and behavioral difficulties. Optometric examination and treatment may help some of these adults.

No hyperlink is available.

Goldberg H, Arnott W. Ocular motility in learning disabilities. J Learn Disabil 1970;3(3):40-42.

Summary: One theory of dyslexia is that this class has poor ocular motility skills. 25 dyslexics were studied and compared with a control group. Eye movements were examined with a Electronystagmograph. Several reading methods were compared: above and below frustration level and shadow reading. Results showed an improvement in eye movement if a child was taught frustration words. It was concluded that the degree of comprehension is a factor in quality eye movements.

No hyperlink is available.

Heiger AA. Vision training and learning disorders. Conn Med 1984;48(12):778-80.

Summary: A possible role for orthoptics in the therapy of learning disabilities is described with an illustrative case presentation.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6509973&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Hoffman LG. Incidence of vision difficulties in children with learning disabilities. J Am Optom Assoc 1980;51(5)447-451.

Summary: Incidences of visual difficulties found in the learning disabled population were examined. Several of these visual difficulties are also found in a non-learning clinic population. There was found to be a higher incidence of visual difficulties in the learning disabled group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7391513&ordinalpos=14&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Keogh BK. Optometric vision training programs for children with learning disabilities: review of issues and research. J Learn Disabil 1974;7(4):219-31.

Summary: This paper reviews the literature on the effects of vision training to enhance readiness skills for entering school and correction of learning problems. It was found that varied program procedures and research methodology make current research too limited to make a conclusion. Efficacy is yet to be determined which therapy programs are effective for children.

No hyperlink is available.

Keys MP, Silver LB. Learning disabilities and vision problems: are they related? Pediatrician 1990;17(3):194-201.

Summary: The authors believe that vision problems are not the cause of learning disabilities. If a patient is found with a refractive error or ocular muscle dysfunction, these should be corrected. The choice of treatment for learning disability is special education.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2194184&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Marks HB. Evaluation of visual perceptual training for reading disabilities. RI Med J 1970; 50(3):150-62.

Summary: This is a subjective article where the author believes that vision perception is one part in many that contribute to reading disabilities. Others include language, cognitive function, motor skills, recall, etc. The author feels that a child would benefit best from trained teachers working in the entire learning process. He believes that a majority of the learning disabled would be best improved with an individualized educational program.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=5264911&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Punnett AF, Steinhauer GD. Relationship between reinforcement and eye movements during ocular motor training with learning disabled children. J Learn Disabil 1984;17(1):16-9.

Summary: Four reading disabled children were given eight sessions of oculomotor training without feedback/reinforcement. Two reading disabled subjects were given feedback without the ocular motor training and were considered the control group. The results showed fixations and regressions decreased. The four experimental subjects showed improvement on the Gilmore
Oral Reading test and the two controls declined. This shows that reinforcement used in oculomotor skills training can improve results.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6699499&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Santiago HC, Matos I. Visual recognition memory in specific learning-disabled children. J Am Optom Assoc 1994;65(10):690-700.

Summary: A learning disabled and a control group of children were presented geometric stimuli to determine to determine if the normal learners had superior visual recall and recognition skills. The disabled group indeed did have poorer visual recognition memory. Other results of: reaction time, encoding and explanations of this difference are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7995892&ordinalpos=14&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Seiderman AS. Optometric vision therapy – results of a demonstration project with a learning disabled population. J Am Optom Assoc 1980;51(5):489-93.

Summary: Two groups of learning disabled children were compared over two years. The experimental group received a visual perceptual program. The second (control) group received physical education, art and music classes. Both groups received individual reading assistance. The vision perceptual group made significant gains in reading versus the control group using sub-tests of the Stanford Achievement Tests and actual classroom reading levels.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7391515&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Silver LB. Controversial approaches to treating learning disabilities and attention deficit disorder. Am J Dis Child 1986;140(10):1045-52.

Summary: Treatment methods for learning disabled often show up in public media before they are researched and placed in a professional journal. It is understood that parents will seek out treatment to help their child. The author reviews significant literature to help physicians provide guidance to parents.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2875647&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Swanson WL. Optometric vision therapy: how successful is it in the treatment of learning disorders? J Learn Disabil 1972;5(5):285-90.

Summary: 100 consecutive cases of learning disorders treated with OVT were examined. 46 different items were analyzed such as: What was treatment success? What was the refractive error? Etc. Improvement was seen in 90% of cases. The Snellen Chart is not effective for testing learning disorders.

No hyperlink is available.

Wharry RE, Kirkpatrick SW. Vision and academic performance of learning disabled children. Percept Mot Skills 1986;62(1):323-36.

Summary: Refractive error and it relation to academic performance was studied. Myopic children scored better than hyperopes and emmetropes on math testing and reading and other academic skills.

Severity of refractive error also affected the Wechsler Intelligence Scale. Other findings were reported and discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3960678&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ziring PR, Brazdziunas D, Cooley WC, Kastner TA, Kummer ME, Gonzalez de Pijem L, Quint, Puppert RD, Sandler AD. Learning disabilities, dyslexia, and vision: a subject review. Am Acad of Pediatrics 1998;102(5):1217-9.

Summary: This is a subject review by the American Academy of Pediatrics (AAP), the American Academy of Ophthalmology (AAO) and the Association of Pediatric Opthalmology and Strabismus (AAPOS). Their conclusion is that learning disabilities are multi-faceted problem including genetics, neurological structure and function. Vision issues rarely cause learning difficulties and there is no evidence that OVT is effective in treatment of learning difficulties.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9794958&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

6. OCULOMOTOR THERAPY/VISUAL MOTOR THERAPY AND LEARNING

Black JL Collins DW, DeRoach JN, Zubrick S. A detailed study of sequential saccadic eye movements for normal and poor reading children. Percept and Motor Skills 1984;59;423-34.

Summary: A group of normal children were compared dyslexics in their saccadic eye movements. No parameters were statistically different between the groups. The authors concluded that measuring saccadic eye movements were not diagnosing dyslexia.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6514491&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Biscaldi M, Burkhart F, Franz A. Saccadic eye movements of dyslexic and normal reading children Perception 1994;23(1):45-64.

Summary: A control of 12 normal readers was compared to 12 dyslexics testing five non-cognitve tasks. The dyslexics had poorer fixation, missed the target fixation point more, and had smaller saccades and reaction times. The 12 dyslexics were divided into two groups and other comparisons were made on these two dyslexic groups.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7936975&ordinalpos=9&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Calef T, Pieper M, Coffey B. Comparisons of eye movements before and after a speed-reading course. J Am Optom Assoc 1999;70(3):171-81.

Summary: An infrared monitoring device was used to measure eye movements of a control group compared to group taking a speed-reading course. The speed reading group improved in five categories of reading: speed, fixations, regressions, word span, and duration of fixations.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10457692&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ciuffreda KJ, Bahill TA, Kenyon RV, Stark L. Eye movements during reading: case reports. Am J Opt Phys Optics 1976;53(8):389-95.

Summary: Reading movements have saccades and fixations. These were measured using a infrared method of five patients. Several reading types were recorded: a normal, slow readers, a dyslexic and a nystagmus patient. Slow readers had increased fixations. The dyslexic had increased reversal movements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=984163&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Colby D, Laukkanen HR, Yolton RL. Use of the Taylor Visagraph II system to evaluate eye movements made during reading. J Am Optom Assoc 1998;69(1):22-32.

Summary: Fifty first year optometry students were measured with a Taylor Visagraph using college level material. The instrument operated correctly on 498 of 500 trials. It was found that there was significant improvement in skill with subsequent paragraphs read. There was also a wide range of reading skill level amongst the students. The authors concluded that more than one test trial would was required to get usable data.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9479933&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Gnadt JW, Bracewell RM, Anderson RA. Sensorimotor transformation during eye movements to remembered visual targets. Vision Res 1991;31(4) 693-715.

Summary: For the brain to remember targets during eye movements, the retinotopic coordinate frame must be transformed to the oculomotor plant. During eye movements there is spatial distortion with a pattern of hypermetria for up saccades and hypometria of down movements. Discussed are theories of spatial coding.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1843771&ordinalpos=21&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Goldstein DJ, Britt TW. Visual-motor coordination and intelligence as predictors of reading, mathematics, and written language ability. Precept Mot Skills 1994;78(3):819-823.

Summary: In 44 children with learning difficulties, three test scores for children's visual-motor coordination were compared to scores for reading, math and written language. Results show that visual motor coordination scores compared moderately to highly to these educational skills.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8084697&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Goldberg H, Arnott W. Ocular motility in learning disabilities. J Learn Disabil 1970 3(3):40-42.

See Above

Groffman S. Correlation between cognitive processing and ocular motility. Optom Vis Sci 1993; 70(5):380-83.

Summary: This study found that sequential processing (looking at information in a linear or serial method) correlated with saccadic fixation and simultaneous processing (looking at information holistically) was the method used for ocular pursuits.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515966&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Eubanks, Nutt, Teitelbaum. Television viewing, oculomotor skills and reading ability: a correlation study. J Opt Vis Develop 1983;14(2):19-21.

With television in practically every home in America, today's children are spending an ever-increasing amount of time watching this mechanical babysitter. This study will investigate the possibility that television could adversely affect the development of a child's ability to make small, accurate eye movements, and will also explore to what extent these eye movement skills affect the ability to read.

No hyperlink is available.

Heiner WH, Henderson JS. Information processing strategies of good and poor readers as evidenced by eye movements. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL April 15-19, 1974.

Summary: Eye movements were measured on material with cloze deletions and normal reading material. Good readers had increased regressions and saccades reading cloze materials. They also had better comprehension. It was surmised that good readers search for extra cues while poor readers use a constant cue search method.

No hyperlink is available.

Hoover CD, Harris P. The effects of using the ReadFast computer program on eye movement abilities as measured by the OBER2 eye movement device. J Optom Vis Devel 1997;28(Winter):227-34.

Abstract of COVD Journal: Transference of visual skills into learning is the goal of most vision training (VT). Eye movement research has demonstrated the value of guided reading and tachistoscopic work. This study of 44 patients was initiated to determine the degree to which transference of VT into the reading process was increased by the ReadFast Computer program. Subjects were tested with the OBER2 Eye Movement device before VT, at the end of the regular VT program, and then again after completing an average of seven additional sessions of ReadFast. At each test, they read different material, but at the same grade level. The qualities measured were the number of fixations per 100 words, number of regressive eye movements, average duration of fixation, reading rate, and comprehension. At the end of the regular VT program, an average improvement in reading speed of 45% was noted, whereas after completing ReadFast an average improvement of 73% in reading speed was measured. Other significant changes occurred in numbers of regressions (ReadFast cut them in half compared with therapy alone) and reading comprehension. (VT alone improved comprehension by 6%; adding ReadFast improved it by 12%.) This paper details how ReadFast was used and why it has now become an integral part of VT for learning-related visual problems in our office.

No hyperlink is available.

Keim R. Visual-motor training, readiness, and intelligence of kindergarten children. J Learn Disabil 1970;3(5):256-59.

See Above

Koenig GS, Price NC, Baird ML, Laukkanen HR, Yolton RL. Use of the Ober2 Model B-1200 system for analysis of eye movements made during reading. J of the Am Optom Assoc 1997;68(3):155-162.

Summary: The Ober2 Model B-1200 is an infrared recorder of eye movements devise. 62 students were tested using Taylor test paragraphs. It failed on 30% of recordings. Of those read correctly, there were differences between the various test paragraphs read.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9109293&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kowler E, Anderson E, Dosher B, Blaser E. The role of attention in the programming of saccades. Vision Res 1995;35(13)1897-916.

Summary: The method of determining the saccadic target was explored. The authors studied whether perceptual attention or a saccadic goal was the mechanism for accurate saccades. They also studied the performance difference between saccades or perceptual judgments.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7660596&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kulp M, Schmidt PP. The relationship between visual skills and performance on saccadic eye movement testing. Optom and Vis Sci 1998;75(4):284-87.

Summary: 181 children (mean age 6.25) were studied to determine the effects of visual skills on saccadic eye movements. The King-Devick and Developmental Eye Movement (DEM) tests were used to evaluate saccades. Visual skills were evaluated using a Modified Clinical Technique (MCT) and the Randot stereoacuity test. Statistical analysis showed significant relations of the King-Devick, DEM and poor stereoacuity to referral of the MCT.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9586754&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kulp M, Schmidt PP. The relation of clinical saccadic eye movement testing to reading in kindergartners and first graders. Opt and Vis Sci 1997;74(1)37-42.

Summary: First graders and kindnergartners had their eye movements tested with the King-Devick and the Developmental Eye Movement test. Digit knowledge was measured with the Reversals Frequency Test. Reading was assessed with the MAT6 test and teacher assessments. Letter reversals as measured with the Gardner was significant to the King-Devick and DEM. The King-Devick scores were significant to reading ability. Other correlations of these tests are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9148265&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kulp MT, Schmidt PP. Effect of oculomotor and other visual skills on reading performance: a literature review. Optom Vis Sci 1996;73(4):283-92.

Summary: Oculomotor anomalies can affect reading performance. The literature shows a correlation between poor Oculomotor skills and reading efficiency. Oculomotor difficulties can often be treated with optometric vision therapy.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8728497&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kulp MT. Survey of perceptual testing among binocular vision/pediatric faculty. J Optom Vis Devel 2001;32(Summer):93-8.

Abstract of COVD Journal: The purpose of this study was to survey the binocular vision and pediatrics faculty at schools and colleges of optometry to determine the frequency of administration/instruction and a judgment of value/utility for each oculomotor/perceptual test. A survey addressing the use and utility of 62 commonly available perceptual tests was mailed to binocular vision/pediatrics faculty members identified by their institution. Each faculty member was asked to indicate the frequency at which he/she administered/taught each test (not available, never, rarely, sometimes, often, or routinely) and to judge the overall value/utility of each test (no opinion, poor, fair, good or excellent). The opportunity to add and rate other tests was provided. The tests that were most frequently administered/taught and most highly regarded were the Developmental Eye Movement Test, direct observation of eye movements (e.g., NSUCO), the Beery-Buktenica Developmental Test of Visual-Motor Integration, and the Test of Visual Perceptual Skills. This information should help guide future research that examines perceptual tests and have implications for optometric education.

No hyperlink is available.

Leisman G, Schwartz J. Ocular-motor function and information processing: implications for the reading process. Int J Neurosci 1977;8(1):7-15.

Summary: The lack of blurred vision during eye movement is discussed. A model of vision is proposed where there is a discontinuous of percepts in both phase and temporal saccadic eye movements. Errant saccadic duration and saccadic velocity are diagnosed as possible processing defects. A model of reading is made base on the findings.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=617622&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lisberger. Eye-movement study shows glimpse of how brain plans movement; Howard Hughes Medical Institute (http://www.hhmi.org/news/lisberger.html)

Summary: Researchers at the Howard Hughes Medical institute have found a region of the brain that plans the high-level movement of the eye during a saccade. Experiments of rhesus monkeys show how the cortex adjusts eye movements during the tracking of objects.

No hyperlink is available.

Liu Z, Lu Qian. Learning motion discrimination without motion, J of Vision 2001;1(3) Abstract 27,p27a.

Summary: Two random-dot stimuli were presented to study the visual perceptual learning of motion. Two stimuli pair were moved eight degrees and the subject was to determine if this movement was clockwise or counter-clockwise. Subjects could learn this motion but when the two pair stimuli were presented five degrees apart, they could not. It was concluded that MT was not critical for determining motion discrimination and that the task difficulty was critical.

No hyperlink is available.

Lowry RW. An optometric approach to rapid reading. Optom Ext Program 1963-1964;36-37: 1-74.

Summary: Reading is a visual skill of which optometric tests and treatment are useful to helping patients faster. Visual problems need to be addressed before improved reading skills can be achieved.

No hyperlink is available.

Maples WC, Atchley J, Ficklin T. Northeastern State University College of Optometry's oculomotor norms. J of Behav Optom 1992;3(6):143-50.

Summary: The NSUCO Oculomotor test is used to test pursuits and saccades is performed on a large number of children of both sexes to obtain normative data. Clinicians can use this information for age based scoring and evaluation.

No hyperlink is available.

Poynter HL, Schor C, Haynes HM, Hirsch J. Oculomotor functions in reading disability. Am J Optom Physiol Optics 1982;59(2)116-127.

Summary: This study was to determine the ration between Oculomotor skills and reading ability of 4th and 6th graders. Four different Oculomotor skills were measured. When review collectively, these skills relate significantly to reading ability but not when each skill is examined individually. The frequency of fixations and lag of accommodation appeared to be most responsible for reading skills. A model of reading is proposed based on the findings.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7065104&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Pitcher-Baker G. Does perceptual training improve reading? J of Optom Vision Therapy 1974; 5(3):40-45.

Summary: There is little research to prove that perceptual vision training directly improves reading ability. The author discusses the fact that visual perception is a major process whereby a child inputs information, thus would be an important to the reading process.

No hyperlink is available.

Rayner K, Fischer MH. Mindless reading revisited: eye movements during reading and scanning are different. Percep Psychophys 1996; 58(5):734-47.

Summary: Eye movements were tested for three tasks: 1. reading 2. scanning non-word text and 3. visual search. Reading eye movements showed more fixations, refixations, longer saccades and less

skipping of targets. The authors found that eye movements are guided by immediate processing demands which are different than prior research.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8710452&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Reichle ED, Pollatsek A, Fisher DL, Rayner K. Toward a model of eye movement control in reading. Psychological Rev 1998;105(1):125-57.

Summary: The authors discuss present versions of the E-Z Reader model, number one through five. The later versions explain more than time spent on a word, but go on to explain durations of fixations and the number of fixations. The limitations and further needed research are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9450374&ordinalpos=9&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rosner J. Visual analysis training with preschool children. J Am Optom Assoc 1974;45(5):584-91.

Summary: A group of inner-city four year old children were given a visual-motor and training program. The training group scored better than a non-trained inner city group and equal to a non-trained suburban children group.

No hyperlink is available.

Rounds BB, Manley CW, Norris RH. The effect of oculomotor training on reading efficiency. J Am Optom Assoc 1991;62(2):92-9.

Summary: A visagraph was used to test the reading efficiency of ten students who failed a reading test. This group was given 12 hours of oculomotor training. This therapy group showed improved reading efficiency compared to a similar group of students who had no oculomotor training.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1814996&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Royden CS, Crowell JA, Banks MS. Estimating heading during eye movements. Vision Res 1994;34(23)3197-3214.

Summary: Eight experiments were set up to explore heading during tracking eye movements. Retinal-image and extra-retinal information were assessed. Results showed extra-retinal eye velocity indicators are used in the heading of most eye movements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7975351&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA, Larson S, Shelley-Trembley J, Ficarra A, Silverman M. Role of visual attention in cognitive control of oculomotor readiness in students with reading disabilities. J Learn Disabil 2001;34(2):107–18.

Summary: Students with reading disability (RD) were given eye movement therapy followed by comprehension therapy. In a second group was the therapy was reversed. Testing was done before therapy and repeated after 12 weeks and 24 weeks of therapy. Results showed that the order of therapy

did not matter. Movement therapy improved eye movement skills and comprehension. Comprehension therapy improved both reading skills also. This supports the theory that there is a cognitive connection between oculomotor readiness and reading comprehension.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=15497263&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA. Eye movement problems in achieving readers: an update. Am J Optom Physiol Opt 1985;62(12):812-9.

Summary: Ten cases were presented were the Iowa Silent Reading test and eye movement recordings were performed. Three of these subjects received training to improve reading efficiency, all of which improved after training.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4083325&ordinalpos=9&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Vitu F, O'regan JK, Inhoff AW, Topolski R, Mindless reading; eye-movement characteristics are similar inscanning letter stings and reading texts. Percep Psychophys 1995;57(3);352-64.

Summary: Oculomotor performance was tested under four conditions: reading text, letter strings, target letter scans and target letter strings. Results showed saccades, fixations, word skipping rate, landing site, etc. to be similar for all four conditions. Since the eyes can generate independent scanning strategies in the absence of linguistic information, there is likely not a predetermined oculomotor strategy used during the reading process.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7770326&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ygge J, Lennerstrand G, Rydberg A, Wijecoon S, Pettersson BM. Oculomotor functions in a Swedish population of dyslexic and normally reading children. Acta Ophthalmol 1993;71(1):10-21.

Summary (See Above): Summary: 86 matched dyslexic children were compared to norm group. The dyslexics had decrease far and near acuity. They also had lower contrast sensitivity in low frequencies. There was no difference in refractive errors or contrast sensitivity in the middle frequency range.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8475702&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

7. READING/READING DISABLED AND VISION

Abrams J C. The psychologist-educator views the relationship of vision to reading and related learning disabilities. J Learn Disabil 1981;14(10):565-67.

Summary: Vision should be viewed as a psychophysical process. Most visual problems relating to learning disability are due to binocular dysfunction. Visual defects should not be confused with visual perceptual problems. The diagnosis and treatment of visual problems is important in the remediation of learning disabilities.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7310236&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Barnard N, Crewther SG, Crewther DP, Development of magnocelluar function in good and poor primary school-age readers. Optom Vis Sci 1998;75(1):62-8.

Summary: 209 subjects had their contrast sensitivity relating to a flicker contrast form which predominantly uses the magnocellular pathway (M-pathway). Both reading and mental age were determined. Results showed an improvement from age four to age 12. There was no significant difference between normal readers and reading disabled. Thus, reading disabled, with reported reduction in M-pathway function, showed no significant difference in contrast threshold flicker discrimination than normal readers.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9460788&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Baxstrom C. Eye movements, perceptual organization and reading. In: Barber A. ed. Pursuits and Saccades: Theories and Testing. Vision Therapy 1995;37(2):85-104.

Summary: Three levels of the learning process: inputting data, meaningful movement and knowledge involved with reading are discussed. Eye movements are important to reading relating to perceptual organization. Testing saccades is only one part of the eye movements. Reading skills can be improved by training eye movements, bilateral skills and improving visual hygiene.

No hyperlink is available.

Beauchamp R, Kosmorsky G. The neurophysiology of reading. Int Ophth Cl 1989;29(1):16-9.

Summary: This article gives a framework of the neurophysiology of the reading process. Little is known of reading at the cellular and molecular level.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2645230&ordinalpos=72&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Birnbaum MH. Vision disorders frequently interfere with reading and learning: they should be diagnosed and treated. J Behav Optom 1993;4(3):66-71.

Summary: Volumes of evidence show that hyperopia, binocular disorders, oculomotor dysfunction and visual perceptual dysfunction can help cause academic problems. Deficits in visual development (form perception, visual memory, visual-auditory integration, etc.) are more apt to cause reading problems in the earlier grades. Disorders of accommodation and binocularity usually will not interfere with learning to read but will interfere with reading efficency in latter grades.

No hyperlink is available.

Blika S. Ophthalmological findings in pupils of a primary school with particular reference to reading difficulties. Acta Ophthalmologica 1982;60(6)927-934.

Summary: Stereopsis, refraction, visual acuity, phoria, tropia, fusional break and amplitude were measured in a group of good readers and poor readers. There was no statistical difference between the two groups in these binocular skills. The need for corrective glasses was also equal for the two groups.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7170934&ordinalpos=24&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Boden C, Brodeur DA. Visual processing of verbal and nonverbal stimuli in adolescents with reading disabilities. J Learn Disabil 1999;32(1):58–71.

Summary: A group of reading disabled (RD) was compared to a reading normal group to their visual processing. The RD group was slower a processing rapid verbal and nonverbal visual stimuli. These results indicate that some RD have temporal processing deficits that add to difficulties in process verbal information while reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=15499888&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ciuffreda KJ, Bahill AT, Kenyon RV, Stark L. Eye movements during reading: case reports. Am J Optom Physiol Opt 1976;53(8):389-95.

Summary: Saccades and fixations were measured on one normal and four abnormal reading subjects. Several different patterns were noted. One slow reader showed excessive fixation and longer durations. A dyslexic patient showed excessive regressions while reading. One patient exhibited nystagmus on the reading pattern.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=984163&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Clark CR, Bruininks RH, Glaman GV. Kindergarten predictors of three aspects of reading achievement. Percept Mot Skills 1978;46(2):411-9.

Summary: Intelligence level, auditory and visual perception and associative learning were used to predict reading achievement on kindergartners. Multiple correlations of predictors were greatest for reading comprehension. Reasons for the various study findings were discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=662538&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cooper J. Deflating the rubber duck. J Behav Optom 1998;9(5):115-9.

Summary: Dr. Cooper refutes the article “Is Vision Therapy Quacker?” by an ophthalmologist in a 1998 issue of the Review of Ophthalmology. He sent a scholary letter to the editor which was never published. Dr. Cooper cites over 60 studies, many from ophthalmology journals, refuting claims of the article. Most of the entries support the efficacy of OVT in the treatment of amblyopia, accommodative disorders, binocular disorders and other visual conditions.

No hyperlink is available.

Cornelissen PL, Hansen PC, Hutton JL, et al. Magnocellular visual function and children's single word reading. Vision Res 1998;38(3):471-82.

Summary: It has been suggested that impaired magnocellular function may affect reading. The authors suggest that magnocellular deficits may degrade where letters are positioned compared to other letters, known as a "letter error". 58 children were given a single word reading task to test this theory. Results showed that a dysfunctional magnocellular pathway and phonological deficits may affect reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9536370&ordinalpos=15&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cornelissen P, Bradley L, Fowler S, et al. What children see affects how they read. Dev Med Child Neurol 1991;33(9):755-62.

Summary: Children with various abilities were presented three word lists. With each assending list, print size was made smaller. Visually impaired children showed more word errors as print size was reduced. This suggests that visual processing may affect reading accuracy.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1936628&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cornelissen P, Bradley L, Fowler S, et al. Covering one eye affects how some children read. Dev Med Child Neurol 1992;34(4):296-304.

Summary: 32 mixed-ability children were compared to an equal number of reading matched controls. Their binocularity was tested using the Dunlop test. They than read words with both eyes open, than with the left eye covered. Only children who failed the Dunlop test made less errors with one eye occluded. This evidence supports the theory that poor binocular control can affect reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1572515&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Christenson GN, Griffin JR, Wesson MD. Optometry's role in reading disabilities: resolving the controversy. J Am Optom Assoc 1990;61(5):363-72.

Summary: This paper discusses the role of optometry in reading disabilities and dyslexia. Methods of diagnosis and the beneficial role of OVT for patients with reading disability are discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2191996&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Dykman RA, Ackerman PT, Oglesby DM, et al. Autonomic responsitivity during visual search of hyperactive and reading-disabled children. Pavlov J Biol Sci 1982;17(3):150-57.

Summary: Heart rate and skin conductance were measured on hyperactive reading disabled and a control group of boys. These autonomic readings did not differentiate between the two groups. Control students showed a more consistent heart decleration than the hyperactive group. A model was given for the test findings.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7133780&ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Eames TH. Comparison of eye conditions among 1,000 reading failures, 500 ophthalmic patients, and 150 unselected children. Am J Ophthalmol 1948;31:713-17.

Summary: 1000 poor readers, 500 ophthalmic and 150 unselected patients had their IQ's and tachistoschope measurements determined. Values of these findings are given.

No hyperlink is available.

Eden GF, Stein JF, Wood HM, et al. Differences in visuospatial judgment in reading-disabled and normal children. Percept Mot Skills 1996;82(1):155-77.

Summary: Three groups of children (normal, dyslexic, and poor reading) were tested for phonological and visuospatial abilities. The dyslexic group scored worse than normal readers (but similar to poor readers) on a line orientation test and had a tendency to scan the task in reverse order. Poor performance was shown on the phonological awareness test for both dyslexics and poor readers. Results show that reading disabilities cannot be contributed to phonological, left-hemisphere dysfunction alone.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8668471&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Eden GF, Stein JF, Wood MH, Wood FB. Verbal and visual problems in reading disability. J Learn Disabil 1995;28(5):272-90.

Summary: This is a continuation of a prior study by Eden, Stein and Wood, with a larger test group to show that visuospatial and oculomotor (visual) tests are responsible for reading disability. Other researchers have stated that the problem is mostly a language processing issue. 93 learning disabled children had their visuospatial abilities tested and compared to a non-disabled group. The disabled group scored poorly on the verbal tests, visual and eye-movement tests. Results show that reading disability is in part due to problems with the visual and oculomotor systems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7775847&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Everatt J, Underwood G. Individual differences in reading subprocesses: relationships between reading ability, lexical access, and eye control. Lang Speech 1994;37(Pt 3);283-97.

Summary: This study showed that an individual's reading ability was related to eye movements, word vocabulary and lexical access were related to reading ability. Variability in comprehension scores can be predicted based off of fixation duration, vocabulary and non-word processing.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7861913&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Flax N, Greenspan SB, Grisham D, Jose RT, Pierce JR, Richman, RE. Is there a relationship between vision therapy and academic achievement? Part 1. Rev of Opt 1977;114(6):44-52.

Summary: This is a two part symposium paper answering questions on "why" vision therapy improves academic achievement. This first part is a manuscript written by Dr. Pierce. Responses by the other members will be discussed in the 1977, July issue of the Review.

No hyperlink is available.

Fisher B, Hartnegg K. Effects of visual training on saccade control in dyslexia. Perception 2000; 29(5):531-42.

Summary: 85 dyslexic children with eye movement control problems were given daily training in saccadic eye movements and than compared to a control group. An LCD screen where the child monitors orientation of a pattern was used as training. Results indicated that this daily practice improved the perceptual capacity and voluntary control of saccades in dyslexics. Post therapy, the dyslexic group scored equal to the control group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10992952&ordinalpos=9&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Friedhoffer A. Optometric diagnosis and visual training as they relate to school achievement. Opt J Rev Opto 1969;106(10):27-31.

See Above

Garzia RP, Nicholson SB. Visual function and reading disability: an optometric viewpoint. J Am Optom Assoc 1990;61(2):88-97.

Summary: This paper presents a literature review and traditional concepts of the relationship between vision and reading. The recent research of a transient visual system defect found in reading disability and its clinical implications are also discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2179385&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Gerber MJ, White DR. Verbal factors in visual recognition memory of poor readers. Percept Mot Skills 1983;57(3 Pt 1):851-7.

Summary: 36 poor male students were compared to an equal control in verbal factors and their ability of visual memory recognition. Poor readers did not vary from good readers in verbal processing. They did; however, perform poorly on recognition tasks. These results support a perceptual deficit of visual recognition in poor readers.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6664768&ordinalpos=19&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Grisham JD, Sheppard MM, Tran WU. Visual symptoms and reading performance. Optom Vis Sci 1993;70(5)384-91.

Summary: 78 university students were studied and found to have increased asthenopia with reading for long periods of time. With increased symptoms there was a decreased reading rate. With increased symptoms, there were decreased vocabulary and comprehension scores.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515967&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Grosvenor T. Are visual anomalies related to reading ability? J Am Optom Assoc 1977;48:510-17.

Summary: A review of the literature shows that nearsighted children tend to be better readers. Visual anomalies, including: astigmatism, hyperopia, poor vergence and strabismus tend to cause poor reading.

Better controlled studies need to be performed and children with reading problems should have a vision exam.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=30153 2&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Guttentag RE. A developmental study of attention to auditory and visual signals. J Exp Child Psychol 1985;39(3):546-61

Summary: Three experiments were set up to evaluate developmental changes in attention of auditory and visual signals. Four year olds responded more to targets with precues. Seven year olds and adults directed their attention to vision rather than auditory cues in the absence of a precue.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=39986 64&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Guttentag RE. Picture-naming interference with good and poor readers. Percept Mot Skills 1979;49(1):67-70.

Summary: 22 third graders were tested in their ability to name pictures in the presence of word stimuli. Both groups showed interference with intra-category words showing automatic word processing. Good readers had more interference with "pseudowords" showing that poor readers are less sensitive to orthographics.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=50376 2&ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Halliwell JW, Solan HA. The effects of a supplemental perceptual training program on reading achievement. Except Child 1972;38(4):613-21.

Summary: Three equal groups of 35 first grade children, diagnosed as potentially poor readers, were place in three separate groups at the beginning of the school year. The first group received perceptual training, the second received traditional extra reading instruction and the third group received no special training, acting as the control. At the end of the school year, only the perceptual training group read significantly better than the control group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=50161 85&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Hardenbergh FE. Letter to the journal. Binoc Vis Eye Muscle Surg Q 1993;8(2):105.

Summary: Dr. Hardenbergh (Chief of Ophthalmology and Ophthalmologist to the Harvard University Health Services) comments on a study by Atzmon, et.al. (1993) concerning orthoptic treatment compared to conventional reading tutoring. He writes that students with reading disabilities or convergence problems should receive vision training before other methods.

No hyperlink is available.

Hefner B. Effects of vision therapy on reading students with vision problems. *Paper presented to the Kansas Legislature. Kansas Optometric Association,* February 9, 2000.

Summary: Oveer 500 students were screened by optometrists over two years. 27 of these students found to have reading problems were compared to a control. The treatment group received about four months of vision training. The treatment group's reading level increase one grade level to that of the control.

No hyperlink is available.

Helsen L, Maples WC. The optometric evaluation of adult females who are participating in a remedial reading program. J Behav Optom 1994;5(4):87-90.

Summary: Fourteen female adults in a remedial reading program were given an extensive battery of optometric tests. Their failure rate is reported and compared to another publication.

No hyperlink is available.

Hiatt RL. Reading problems and the ophthalmologist. Ophthal 1984;16(2)116-22.

Summary: Many patients see ophthalmologists directly or indirectly for reading problems. Dyslexia is reviewed along with a classification of reading disorders. A routine vision exam and some specialized testing can lead to a diagnosis. Reviewed is the paucity of evidence that visual or motor treatment can improve this condition.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6703583&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Hoover C, Harris P. The effects of using the ReadFast computer program on eye movement abilities as measured by the OBER2 eye movement device. J Optom Vis Devel 1997;28(4):227-34.

See Above

Hogben J, Pratt C, Dedman K, Clark C. Blurring the image does not help disabled readers. Vis Res 1996;36(10):1503-7.

Summary: A study was designed to replicate prior research to determine if blurring an image would improve the search rate of poor readers. Results showed found that poor readers performed a search task equal to average readers when blurring the display.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8762767&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Humphries T, Krekewich K, Snider L. Evidence of nonverbal learning disability amongst learning disabled boys with sensory integrative dysfunction. Percept Mot Skills 1996;82(3 Pt 1):979-87.

Summary: 90 boys with learning disability and sensory integrative dysfunction had their sensorimotor function tested. 14% of the boys had nonverbal learning disability. This group showed higher errors in space visualization and visual motor coordination when compared to a control.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8774042&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Iovino I, Fletcher JM, Breitmeyer BG, et al. Colored overlays for visual perceptual deficits in children with reading disability and attention deficit/hyperactivity disorder: are they differentially effective? J Clin Exp Neuropsychol 1998;20(6):791-806.

Summary: The Transient Channel deficit model of reading was evaluated by putting colored overlays before four groups of 15 children: 1. reading disabled 2. math deficits 3. ADHD 4. normal group. Three different transparent overlays were used. The overlays did not improve reading performance. Noted was that the blue overlays improve comprehension but decreased reading speed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10484691&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Jeanes R, Busby A, Martin J, et al. Prolonged use of coloured overlays for classroom reading. British Journal of Psychology 1997;88(Pt 4)88:531-48.

Summary: 152 children were asked to observe random letters and give the perceptual effects using colored overlays. A total of 29 colors were used. 53% reported improved perceptual effects and than were given their preferred color pattern to use randomly as desired. Ten months later 22% of the children were still using their overlays and read at faster rates with the overlay than without. A second independent group actually read slower with their chosen coloured overlay. A third independent group had an increase in reading speed with their chosen overlay color.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9415962&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Johnson-Brown S, Kimmons RE, Cienkus R, Daluga S. Review of an eight-year program to incorporate vision therapy in a remedial reading program in a school setting. J Optom Vis Devel 2001;32(Fall):142–52.

Abstract of COVD Journal: This study ascertained the effects of optometric intervention on reading growth and visual-perceptual skills growth of at-risk elementary school students. A control group received teacher instructed OVT and another group received optometric technician therapy. Pre and post perceptual tests were compared. The question of whether or not there was any statistical predictability between the visual processing tests and the student's vocabulary, comprehension, and cognitive ability tests was investigated. The therapy group produced statistically significant results from pre- and post-test readings. There was no predictability between perceptual scores and student's vocabulary, comprehension and cognition scores.

No hyperlink is available.

Kak AV, Brown DR. Schematic concept formation: psychophysical analysis of early reading skill. Percept Mot Skills 1979;49(3):959-70.

Summary: The authors studied children's ability to construct visual classification in children with and without reading problems. The children with reading problems had greater difficulty in their ability to assign patterns to classes than normal readers.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=530797&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kak AV, Brown DR. Visual pattern perception: a multidimensional analysis of development of children's reading skills. Percept Mot Skills 1979;49(3):819-30.

Summary: 36 elementary students were assessed on their ability to visual process a pattern which related to reading skill. Discrimination latencies taken were used to classify students as good or poor readers. No patterns distinguished between these classes.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=530782&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Katz PA, Deutsch M. Visual and auditory efficiency and its relationship to reading in children. Cooperative research project No. 1099. Institute for developmental studies, New York Medical College, 1963:147.

Summary: Numerous auditory and visual skills were measured on a group of normal and poor readers in the 1st, 3rd and 5th grade and related to reading achievement. Results showed that reading could be affected by psychological, discrimination, memory, learning and conception. Difficulties in some of these areas relating to vision and audition could reduce reading results.

No hyperlink is available.

Koslowe KC. Optometric services in a reading disability clinic: initial results. J Behav Optom 1995;6(3):67-8.

Summary: A newly formed multi-disciplinary clinic in Israel included optometric services. After one year, an analysis was performed to evaluate the efficacy of theses services. Out of 100 patients, 41% of the initial diagnosed poor binocular vision patients were severe enough to require treatment.

No hyperlink is available.

Krippner S. On research in visual training and reading disability. J Learn Disabil 1971;4(2) 8-17.

Summary: The author reviewed several papers concerning the phonic, psychological and visual causes of reading disorders. He discusses that ophthalmology sees little value in OVT and that it is also criticized by pediatrians. He recommends that those who believe in OVT so do more research which will create intellectual discussion.

No hyperlink is available.

Kulp MT, Schmidt PP. Visual predictors of reading performance in kindergarten and first grade children. Optom Vis Sci 1996;73(4):255–62.

Summary: 181 masked students, age 5-7, were tested on several visual tests and their relationship to reading performance. These students were of normal IQ. +/- 2.00 flipper lenses testing was predictive of reading performance along with steroacuity and failure of the Modified Clinical Technique testing. These results show that visual performance does relate to reading performance.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8728493&ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lefton LA, Lahey BB, Stagg DA. Eye movements in reading disabled and normal children: a study of systems and strategies. J Learn Disabil 1978;11(9)549-58.

Summary: Several prior studies show that visual discrimination can be a cause of reading disabilities. This study suggests that this may be due to a sex-difference ratio because many more males have greater errors than females. Prior studies, therefore may be misconstrued, if sex differences were not controlled.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=731120&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Legein CP, Bouma H. Reading and the ophthalmologist. An introduction into the complex phenomenon of ordinary reading as a guideline for analysis and treatment of disabled readers. Doc Ophthalmol 1982;53(2):123-57.

Summary: Ophthalmologists often see patient with reading disabilities. An optical correction may often help, but the problem can often still exist. This paper describes the visual reading process and provides treatment recommendations. The elderly, low vision, dyslexic, etc, will all require remedies including visual aids.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7173014&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lehmkuhle S, Garzia RP, Turner L, et al. A defective visual pathway in children with reading disability. New Eng J Med 1993;328(14)989-96.

Summary: Visual evoked potentials (VEPs) were taken on children, 8-11 years old, to test the magnocellar and parvicellular systems as an etiology to reading disability. Results showed greater latencies of VEPs with low spacial-freqency targets of the reading disabled when compared to a normal group. VEP latencies were normal with high spatial targets. In normal readers flickering the target increased latency and decreased VEP amplitudes, which did not occur with the reading disabled group. The authors concluded that the magnocellular visual pathway is slower in the reading disabled population which may be a cause of reading disability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8450876&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lightstone, Evans. A new protocol for the optometric management of patients with reading difficulties. Ophthal Phys Opt 1995;15(5)507-12.

Summary: Prior research is discussed pertaining to visual processing, visual motor and for potential improvement with coloured filters. Three dyslexic patient cases were presented, all with asthenopia, which required three different treatments. The first patient required OVT for exotropia and suppression. The second was treated with coloured lenses. The third patient needed both of these treatments for asthenopia relief.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8524584&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lott LA, Schneck ME, Haegerstrom-Portnoy G, et al. Reading performance in older adults with good acuity. Optom Vis Sci 2001;78(5):264-9.

Summary: Reading performance of 544 older adult patients, mean age of 73, with visual acuity 20/30 or better was tested. Reading rate was found to decrease over the age range. Note that if other

measurements such as low contrast, motor ability and attentional field integrity were factored into the age, age did not predict reading rate.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11384009&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lovegrove WJ, Martin F, Slaghuis W. A **theoretical and experimental case for** a **visual deficit in specific reading disability. Cognitive Neurpsychology 1986;3:225-267.**

Summary: 70% of disabled readers showed deficits in the transient subsystem of the visual system.

No hyperlink is available.

Lovegrove WJ, Garzia RP, Nicholson SB. Experimental evidence for a transient system deficit in specific reading disability. J of the Am Optom Assoc 1990;61(2):137-46.

Summary: This paper reviews evidence that the transient system may be responsible for reading disability. A transient system deficit was found in 75% of specific reading disabled subjects. It is suggested that the transient system defect precedes the reading disability. Mechanisms for the deficiency are presented.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2179383&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Lovegrove W, Martin F, Bowling A, Blackwood M, Badcock D, Paxton S. Contrast sensitivity functions and specific reading disability. Neuropsychologia 1982;20:309-15.

Summary: Contrast sensitivity was measured in two experiments on a group of normal and specific reading disabled subjects. Both experiments showed differences in pattern sensitivity between the two groups. This provides evidence of a difference in visual mechanisms between normal and disabled readers.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7121798&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ludlam W, Ludlam D. Effects of prism-induced, accommodative convergence stress on reading comprehension test scores; J Am Optom Assoc 1988;59(6)440-6.

Summary: Forty-eight optometry students were presented matched passages to read and than given comprehension tests. The results of this experiment showed significantly lower comprehension rate with base-in prism lenses. This effect was greater with prolonged reading with a greater number of questions to be answered.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3403888&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ludlam WM. Visual training, the alpha activation cycle and reading. J Am Optom Assoc 1979; 50(1):111-5.

Summary: Two cases where OVT was done to normalize optometric vision findings were presented. After the OVT, improved reading performance and the attenuation of alpha rhythm occurred. Only OVT was used with no direct training of the alpha activation cycle.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=762372&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ludlam WM, Twaroski C, Ludlam DP. Optometric visual training for reading disability: a case report. J Optom and Arch Am Acad Optom 1971;50(1):58-66.

Summary: A fourteen year old male with poor accommodative, reading and oculomotor skills was given 14 weeks of OVT. After this time period binocular skills had improve along with improved reading ability. Pre and post training values are presented.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4509742&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

McKane, PF, Maples WC, Sellars P, McNeil M. A comparison of auditory/language therapy with school visual support procedures in a public school setting. J Optom Vis Devel 2001;32(Summer):83–92.

Abstract of COVD Journal: Introduction: There is little doubt that functional illiteracy is one of the major social challenges of the 21st century. Learning to read is difficult for some. Others have trouble reading efficiently. In neither case is the cause fully understood and is therefore the subject of debate. It is logical to think that sensory function, either auditory/language or visual, or the integration of these sensory functions, could be a cause. The literature concerning the influence of auditory skill facility and visual skill facility in the learning process has yet to give a definitive answer. Some hold that poor reading eye movements are caused by poor language skills and if the auditory/language skills were improved that reading and eye movements during reading would also improve.

Method: Twenty-nine third grade children who had previously been identified as being below average in some academic area were the subjects of this study. The experimental group contained 18 subjects, equally distributed between genders. The control group contained 11 subjects, 4 females and 7 males. After screening evaluations, all children were enrolled in an auditory/language enrichment program and the experimental group also received school based vision techniques which were individually programmed by a board certified optometrist (FCOVD) and administered by school personnel, in the school setting daily for 30 minutes a day. The program was administered for 3.5 months during the spring semester of the school year.

Results: Both groups improved significantly over pre-test scores on the reading aspect of the WRAT and reading rate with comprehension as measured by the Visagraph. The experimental group also demonstrated a significant improvement in reading eye movements as measured by the Visagraph, but the control group did not.

Conclusions: Both visual and auditory/language intervention have a positive effect on the reading WRAT scores as well as the reading rate with comprehension. Reading eye movements however were significantly improved only with visual intervention and not with auditory/language therapy.

No hyperlink is available.

McMonnies CW. Visuo-spatial discrimination and mirror image letter reversals in reading. J Am Optom Assoc 1992;63(10):698-704.

Summary: Visuo-spatial and linguistic mechanisms were reviewed for discriminating mirror image letters. Visuo-spatial is involved because left-right awareness needed for beginning readers and in older readers who are deficit in linguistic skills. Early instruction programs that teach left-right laterality are appropriate for pre-school development.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1430744&ordinalpos=20&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Metzger RL, Werner DB. Use of visual training for reading disabilities: a review. Pediatrics 1984;73(6):824-829.

Summary: This article reviews the literature, saying there is now connection between reading problems and perceptual ability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6374600&ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Moores E, Frisby JP, Buckley D, et al. Vergence control across saccades in dyslexic adults. Ophthalmic Physiol Opt 1998;18(5):452-62.

Summary: Two experiments were performed of 17 adult dyslexics and a control. Measurements of sequential stereopsis thresholds and a simultaneous stereopsis task were taken. No major differences were found between these two groups. Results show that adult dyslexics have normal vergence control across saccadic eye movements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10023479&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Motsch S, Muhlendyck H. Frequency of reading disability caused by ocular problems in 9- and 10-year-old children in a small town. Strabismus 2000;8(4):283-5.

Summary: Third and fourth grade children, from a small German town, were measured to determine the percentage of children with dyslexia and vision problems. 89 children were tested. 18% had reading problems, 2 girls and 14 boys. 6.7 % had accommodative issues. Five children needed changes in their eyewear. Two had phorias needing correction. Reading ability was improved in all the slow readers with proper glasses and prisms.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11262688&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Muehl, S. The effects of visual discrimination pretraining on learning to read a vocabulary list in kindergarten children. J Educ Psych 1960;51(4):217-21.

Summary: Kindergarten children were taught read a vocabulary list by using one of three visual discrimination methods: 1. the actual vocabulary list 2. different words 3. geometric forms. Results showed that using the actual word list was most effective. There was no difference in the other two methods. The authors concluded that learning word lists is related to the development of visual discrimination skills.

No hyperlink is available.

Naylor H, Lambert NM, Sassone DM. et al. Lateral asymmetry in perceptual judgments of reading disabled, hyperactive and control children. Int J Neurosci 1980;10(2-3):135-43.

Summary: Three groups of boys: 1. reading disabled with hyperactivity 2. hyperactive and 3. normal were asked to match or differentiate from verbal or visuospatial stimuli. The reading disabled group made more errors. All groups were faster when the target was presented in the left field. All reaction

times were slower if two stimuli were given at the same time. The authors concluded that there was immaturity in the cerebral commissures and that the reading disabled group used a different method of information processing.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7364542&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Njiokiktjien CJ, Visser SL, de Rijke W. EEG and visual evoked responses in children with learning disorders. Neuropadiatrie 1977;8(2):134-47.

Summary: Visual Evoked Response (VER) and EEGs were measure spontaneously on 58 children with learning disorders. Latencies of the VER were increased along with amplitudes of waves II and III. EEG measurements were abnormal in 45% of the children. This same 45% showed more abnormalities in the VER. This study showed that VER is valuable in appraising children with learning disorders.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=577596&ordinalpos=7&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Orfield A, Basa F, Yun J. Vision problems of children in poverty in an urban school clinic, their epidemic numbers, impact on learning, and approaches to remediation. J Optom Vis Devel 2001; 32(Fall):114–41.

Abstract of COVD Journal : There were 1,544 vision evaluations performed on 801 students. Seventy-nine students received vision therapy and 85 received glasses for reading. Fifty-three percent of students were found to have visual problems. Most of these vision problems were near point related. Treatment using reading glasses and OVT correlated with improvement in grades, percentiles on standardized tests in reading and mathematics. The Developmental Eye Movement Test was found to be an excellent predictor of reading failure.

No hyperlink is available.

Petri JL, Anderson ME. Eye and head movements in reading-disabled and normal children. Am J Occup Ther 1980;34(1):801-8.

Summary: Eye and head movements of 16 reading disabled children and compared to a control. Randomly positioned visual were presented. The reading disabled group had more eye and head movements. The vestibular system was suggested as a causative factor with the reading disabled population with atypical eye and head movements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7282842&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Petre LL, Hazel CA, Fine EM, et al. Reading with eccentric fixation is faster in inferior visual field than in left visual field. Optom Vis Sci 2000;77(1):34-39.

Summary: This study was to determine if reading without eye movements is better with text in the inferior or left visual field. Results showed faster reading in the inferior field.

Pierce J. Is there a relationship between vision therapy and academic achievement? Part 1. Optometric development vision therapy and academic achievement. Opt J Rev of Optom 1977;114(6):48-63.

See Above

Robinson GL, Foreman PJ. Scotopic sensitivity/Irlen syndrome and the use of coloured filters: a long-term placebo controlled and masked study of reading achievement and perception of ability. Percept Mot Skills 1999;89(1):83-113.

Summary: 113 subjects with reading difficulties were tested in a double-blind study using placebo, blue and optimal filters over 20 months. The control group did not use filters. The treatment group's reading speed did not increase but their accuracy and comprehension did. It is discussed that the filters decrease background distortions allowing for better text processing. Remedial therapy would also be recommended because there was no increase in reading speed.

This study investigated the effects of using coloured filters on reading speed, accuracy, and comprehension as well as on perception of academic ability. A double-masked, placebo-controlled crossover design was used, with subjects being assessed over a period of 20 mo. There were three treatment groups (Placebo filters, Blue filters, and Optimal filters) involving 113 subjects with "reading difficulties", ranging in age from 9.2 yr. to 13.1 yr. and with an average discrepancy between chronological age and reading age of 1.8 yr. The 35 controls (who did not use coloured filters) ranged in age from 9.4 yr. to 12.9 yr., with an average discrepancy between chronological age and reading age of 2.1 yr. The treatment groups increased at a significantly greater rate than the control group in reading accuracy and reading comprehension but not for speed of reading. For self-reported perception of academic ability, two of the three treatment groups showed significantly greater increases than the control group. The larger improvements for treatment groups in reading comprehension may be related to a reduction in print and background distortions allowing attention to be directed to the processing of continuous text rather than to the identification of individual words. A reduction in print distortion, however, may not be sufficient to generate improved word-identification skills without additional remedial support, and this may be indicated by the nonsignificant increase in rate of reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10544403&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Sassoon HF, Davis M, O'Connell EM. Vision tests as predictors of learning disabilities. J Am Optom Assoc 1977;48(1):49-55.

Summary: Visual tests linked to learning problems included color matching, speed of scanning and visual language field development. Blue was the only color involved with color matching making tasks more difficult. Using said tests for early childhood screen may help detect children with learning problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=845385&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Seiderman AS. Optometric vision therapy – results of a demonstration project with a learning disabled population. J Am Optom Assoc 1980; 51(5):489-93.

See Above

Shafrir U, Siegel LS. Preference for visual scanning strategies versus phonological rehearsal in university students with reading disabilities. J Learn Disabil 1994;27(9):583-8.

Summary: 35 reading disabled college students were compared to a control of 15 students. Their strategy for visual scanning versus phonological rehearsal for recognizing words, letter and symbol

strings was tested. Results showed that most normal reading students used phonological rehearsal and the reading disabled group used visual scanning for tasks tested.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7806962&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Sigler G, Wylie T. The effect of vision therapy on reading rate: a pilot study. J Behav Optom 1994; 5(4):99-102.

Summary: Three students identified with visual disorders were given OVT. Their reading rate was tested pre and post therapy. Reading rate improved dramatically during therapy for all three and for two it continued post-therapy.

No hyperlink is available.

Simons H, Grisham J. Vision and reading disability: research problems. J Am Optom Assoc 1986;57(1)36-41.

Summary: This paper reviews problems with studies involving vision and reading disability. False positives, false negatives, subject selection, small sample sizes, etc. are discussed can cause faulty conclusions.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3950310&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Simons HD. An analysis of the role of vision anomalies in reading interference. Optom Vis Sci 1993;70(5):369-73.

Summary: This paper promotes studying the process of why visual anomalies cause reading problems versus showing a relationship between vision and reading problems. The paper gives numerous causes to deliberate when studying reading problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515964&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Sohrab-Jam, G. Eye movement patterns and reading performance in poor readers: immediate effects of convex lenses indicated by book retinoscopy. Am J Optom Physiol Opt 1976;53(11):720-26.

Summary: 38 fourth and fifth grade males were measured on a reading eye track with plano and +0.50 lenses. Half of the group required plus lenses for reading and the other half did not using book retinoscopy testing. The group requiring plus lenses showed improvement in fixations, regressions, reading speed and efficacy when given plus lenses over plano. The group not requiring plus lenses actually showed decreased reading skills measured when given plus lenses.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1033674&ordinalpos=18&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA, Ficarra AP. A study of perceptual and verbal skills of disabled readers in grades 4, 5 and 6. J Am Optom Assoc 1990;61(8):628-34.

Summary: Perceptual and verbal tests were given to 4^{th} – 6^{th} grade students with normal intelligence but reading ability below 30 percentile. These tests were compared to a normal group. The reading disabled group score lower in seven of eight perceptual tests and five of six verbal tests. Results show that both verbal and perceptual problems are related to reading. 38% of the variance in reading was related to perceptual skills.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2394903&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan H, Ficarra A, Brannan J, Rucker F. Eye movement efficiency in normal and reading disabled elementary school children: effects of varying luminance and wavelength. J Am Optom Assoc 1998;69(7):455-64.

Summary: A reading disabled group was compared the a normal group using a Visagraph. Gray and blue filters were than used and recorded with the Visagraph. The normal group did not change with either colored filter. The blue filter improved some improvement of the reading disabled group with blue filters.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9697381&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan H, Larson S, Shelley-Trembley J, Ficarra A, Silverman M. Role of visual attention in cognitive control of oculomotor readiness in students with reading disabilities. J Learn Disabil 2001;34(2):107–18.

See above

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=15497263&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan H, Feldman J, Tujak L. Developing visual and reading efficiency in older adults. Optom and Vis Sci 1995;72(2):139-45.

Summary: Adults, ages 62-75 with normal healthy eyes were given a training program of rapid visual processing, oculomotor and Guided Reading. Results showed improvement in fixations, regressions, word span and reading rate as measured with a Visagraph.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7753527&ordinalpos=18&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA, Brannan JR, Ficarra A, Byne R. Transient and sustained processing: effects of varying luminance and wavelength on reading comprehension. J Am Optom Assoc 1997;68(8):503-510.

Summary: Children with reading disability read a series of word passages under four conditions: no filter, light gray filter, dark gray filter, and a blue filter. Results showed improved comprehension with blue filters for the reading disabled which corroborates the theory of transient system defects.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9279050&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA, Shelley-Tremblay J, Ficarra A, et al. Effect of attention therapy on reading comprehension. J Learn Disabil 2003;36(6):556-63.

Summary: A group of sixth graders had their attention tested after OVT. After therapy this group showed improvement in both attention and reading comprehension. A control group showed no change in either.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=15493437&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan A, Solan H. Transient and sustained processing, a dual subsystem theory of reading disability J of Behavior Opt 1994;5(6):149-51.

Summary: The two visual pathways, transient and sustained, are reviewed. The transient system has been shown to interfere with reading, but the two systems must work in synchrony for good timing required while reading. Treatment procedures are presented.

No hyperlink is available.

Solman RT, Dain SJ, Keech SL. Color-mediated contrast sensitivity in disabled readers. Optom Vis Sci 1991;68(5)331-337.

Summary: Contrast sensitivity was measured in 20 disabled readers and compared to an equal number of normal readers by using colored filters. The filter which best improved contrast was chosen. Reading disabled subjects showed improved sensitivity with their best filter color while normals did not. The authors suggested that filters may help weak transient systems in reading disabled children.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1852393&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stanley G. Two-part stimulus integration and specific reading disability. Percept Mot Skills 1975; 41(3):873-4.

Summary: A group of dyslexics were shown two halves of a black cross, one half of the cross was shown a various intervals to the other half. Dichoptic and binocular presentations were made. Dyslexics showed thresholds at longer intervals which supports the theory that dyslexics have longer visual persistence than normal readers.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1215118&ordinalpos=19&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein J, Riddell P, Fowler M. The Dunlop test and reading in primary school children. Br J Ophthalmol 1986;70(4):317-20.

Summary: The Dunlop synoptophore test was used to check fusional control on a sample of 451 children and compared to their reading ability. Unstable vergence control decreased with age, 49% in 5 year olds decreasing to 11% in 10 year olds. Children with good vergence were also better than average readers. The authors concluded that the Dunlop test was a good method to help evaluate children with reading problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3964633&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Steinman SB, Steinman BA, Garzia RP. Vision and attention. II: Is visual attention a mechanism through which a deficient magnocellular pathway might cause reading disability? Optom Vis Sci 1998; 75(9):674-81.

Summary: Visual attention is controlled by the magnocellular (M) input pathway. This study was to determine if this portion of the M pathway is responsible for reading disability. Spatiotemporal functions were measured using line motion illusion. There were abnormalities in a reading disabled group compared to a reading group suggesting that the M pathway could affect reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9778701&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Symann-Louett N, Gascon GG, Matsumiya Y, et al. Wave form difference in visual evoked responses between normal and reading disabled children. Neurology 1977;27(2):156-9.

Summary: Wave form differences were found between reading and normal children. Greatest changes were seen in the left parietal region with little in the vertex and occipital.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=556831&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Underwood G, Clews S, Everatt J. How do readers know where to look next? Local information distributions influence eye fixations. Q J Exp Psychol A 1990;42(1);39-65.

Summary: Skilled readers' had saccades and fixations recorded. Four types of target words were placed in sentences. These consisted of words were used from highly redundant to very informative letters within the words. Results showed that meaningful words had a single fixation, had that fixation near the center of the word and a longer fixation time. Redundant words had a shorter fixation near the beginning of the word. These findings support the theory of parafoveal processing of guiding the eye while reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2326490&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Vellutino FR, Smith H, Steger JA, Kaman M. Reading disability: age differences and the perceptual-deficit hypothesis. Child Dev 1975;46(2):487-93.

Summary: A prior study showed that reversal errors (b's confused with d's, etc.) were due to verbal identification. That study was performed on children 9-15 years old. This study checked younger age groups by exposing tachistoscopic verbal and non-verbal stimuli. Results showed that this lower age group of reading disabled had poor verbal encoding.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1183273&ordinalpos=16&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Wesson MD. Diagnosis and management of reading dysfunction for the primary care optometrist. Optom Vis Sci 1993;70(5):357-68.

Summary: This paper presents a model for optometric diagnosing and managing reading disabled. The first part of the model looks for basic functional aspects. The second part is more complex. Case histories, literature review, and correlations between visual perceptual tests are given. Noted, is that not all of the reading disabled population are not dyslexic.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515963&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Williams MC, Lecluyse K, Rock-Faucheux A. Effective interventions for reading disability. J Am Optom Assoc 1992;63(6):411-7.

Summary: This article discusses the recent method of using colored overlays to improve reading comprehension. 80% of reading disabled showed gains.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1378860&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Williams MC, May JG, Solman R, Zhou H. The effects of spatial filtering and contrast reduction on visual search times in good and poor readers. Vision Res 1995;35(2):285-91.

Summary: The time to search a letter string that had altered spatial frequency and contrast reduction was performed on four groups: reading disabled, attention deficit disorder, a comorbid group and a control. High contrast – unfiltered letter strings showed increased search times for the reading disabled and comorbid groups. The reading disabled groups' search times improved with low contrast targets. The results support the theory that image blurring improves the reading disabled by decreasing the contrast.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7839623&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Williams M, Lecluyse K. Perceptual consequences of a temporal processing deficit in reading disabled children. J Am Optom Assoc 1990;61(2):111-21.

Summary: Temporal aspects were measured in normal and disabled readers. Disabled readers had longer integration time and processing rates. By blurring an image, contrast of high spatial frequencies is reduced. Blurring an image produced normal temporal processing in the reading disabled.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2313028&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Worcester DA. The influence of orthoptic training on the reading ability of college freshman. J Exper Educ 1940;9(2):167-74.

See Above

Young BS, Pollard T, Paynter S, Cox RB. Effect of eye exercises in improving control of eye movements during reading. J Optom Vis Devel 1982;13:4-7.

Abstract of COVD Journal: This study utilized the total population of the Stephen A. Austin Learning Center, 33 subjects, a) to determine the proportion of dyslexic students suffering from poor binocular control and b) the effect of eye exercise in aiding binocular control and reading efficiency as measured by a moving-eye camera.

All subjects were screened for problems in fusion, stereopsis, and lateral posture using the Keystone Visual Survey. Students with deficiencies were then pre-tested, reading recreational level material, with the moving-eye camera. Each student showing deficiencies practiced three, 5 minute,

periods per day on individually prescribed exercises from Kaplan (Ch. 1) in addition to 45 minutes of reading instruction. After six weeks, totaling 6 hours of visual therapy, the subjects were post-tested using the moving eye camera and standardized reading tests.
Among the 33 students, 39% showed fusion, stereopsis, or lateral posture problems. Following therapy, statistically significant differences were recorded in a) number of fixations per 100 words, b) number of seconds required to read the 100 work selection, c) number of seconds the right eye was out of voluntary control (moving in a direction contrary to the opposite eye and without relationship to the printed material), d) number of seconds the left eye was out of voluntary control, c) fixation duration. Reading achievement increased slightly despite a 25% reduction in instructional time.

No hyperlink is available.

Zurcher B, Lang J. Reading capacity in cases of 'cured' strabismic amblyopia. Trans Ophthalmol Soc U K 1980;100(4):501-3

Summary: Fifty cases of treated amblyopia where occlusion was abandoned at age eight were examined at age 12. Reading capacity was found to be impaired. It was recommended to taper off occlusion until the child can read fluently out of each eye.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6947597&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

8. REFRACTIVE STATUS AND LEARNING

Bishop DV, Jancey C, Steel AM. Orthoptic status and reading disability. Cortex 1979;15(4):659-66.

Summary: 147 children were tested on IQ, reading ability and phoric posture. No correlation was found between phoric posture, stereopsis or convergence and reading disability. Crossed hand and eye dominance was also not associated with reading problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=548227&ordinalpos=23&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cohen LD, Komeker A, McKee GW. The relationship between learning disabled and academically normally achieving young children and their respective refractive status. J Optom Vis Dev 1977; 8(4):10-27.

Abstract of COVD Journal: The vision examination records of 400 children ages five through nine were selected from the files of a College of Optometry Vision Clinic to compare the visual characteristics of learning disabled and normally achieving children. Two hundred learning disabled and two hundred normal subjects' records were randomly chosen for evaluation of refractive status. The study was based on the hypotheses that learning disabled children in the selected ages would not spend as much time studying or at related near-point tasks as would academically normally achieving children. Therefore, if refractive status is influenced by environmentally induced visual stress there should be fewer learning disabled children with refractive errors. This was found to be true for the boys in this sample.

No hyperlink is available.

Eames TH, The effect if anisometropia on reading achievement. Am J Optom 1964; 41(12):700-2.

Summary: 25 anisometropes and 25 control subjects with equal refractive error were compared to reading ability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=14233726&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Fulk GW, Goss DA. Relationship between refractive status and teacher evaluations of school achievement. J Optom Vis Devel 2001;32(Summer):80-2.

Abstract of COVD Journal: Previous research suggested that myopic children were better readers than hyperopic children. This study considered how school performance as evaluated by the teacher, is related to refractive error. At two schools, a vision screening determined refraction. Based on teacher evaluations, the school performance of each child was categorized as upper, middle, or lower levels. 34% of hyperopes fell into the lowest level of school performance compared to 14% of emmetropes and 12% of myopes. It was concluded that hyperopes were more likely to perform poorly in school.

No hyperlink is available.

Mantyjarvi MI. Changes of refraction in schoolchildren. Arch Ophthalmol 1985;103(6)790-792.

Summary: 1,118 children were monitored over time to determine changes in refraction. 30 of 260 were hyperopic and became myopic, increasing 0.07 diopters per year. The 828 myopic children increased in myopia 0.69 diopters. A longitudinal study showed similar results with a conclusion that myopic children increase at a higher rate of myopic shift than hyperopic children.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4004615&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rosner J, Gruber J. Differences in the perceptual skills development of young myopes and hyperopes. Am J Optom Physiol Opt 1985;62(8):501-4.

Summary: Myopes were shown to have better perceptual skills than hyperopes of over 700 university students studied. Comparisons with emmetropes are made and discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4037055&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rosner J, Rosner J. The relationship between moderate hyperopia and academic achievement: how much plus is enough? J Am Optom Assoc 1997;68(10):648-50.

Summary: 782 first to fifth graders were studied. Hyperopic children showed lower academic achievement. This occurred when the hyperopia exceeded +1.25 diopters.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9354056&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rouse MW, Hutter RF, Shiftlett R. A normative study of the accommodative lag in elementary school children. Am J Opt Phys Optics 1984;61(11):693-7.

Summary: MEM retinoscopy was used to measure accommodative lag in 100 children from grade K to six. Average values were +0.35 D. Analysis of the data showed a correlation between MEM age and grade.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6517127&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Saw SM, Wu HM, Seet B, et al. Academic achievement, close up work parameters, and myopia in Singapore military conscripts. Br J Ophthalmol 2001;85(7):855-60

Summary: 429 military recruits were tested for refractive error and environmental factors. Myopia was associated with increased education and increased near point activity.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11423462&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Seefelt ER. Effects of initial spectacle wearing on subsequent high school scholastic grade scores. Am J Optom and Arch Am Acad Optom 1962;39(9):477-93.

Summary: Three separate groups of high school students had their academic achievement monitored for 2 ½ months after receiving spectacles. Right after receiving eyewear, grade levels increased and than continuously drop until they are below the mean.

No hyperlink is available.

Simons HD, Gassler PA. Vision anomalies and reading skill: a meta-analysis of the literature. Am J Optom Physiol Opt 1988;65(11):893-904.

Summary: Reviewing 34 studies (meta-analysis) of visual anomalies and reading skill, it was found that hyperopia, near exophoria, vertical phoria and anisometropia are associated with poor reading skills. Myopes and esophores had better than average reading.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3252737&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

9. SCHOOL-BASED VISION PROGRAMS

Harris P. Learning-related visual problems in Baltimore city: a long-term program. J Optom Vis Devel 2002;33:75-115.

Abstract of COVD Journal: A longitudinal, single-masked, random sample study of children at a Baltimore City Public Elementary school documents the prevalence of learning-related visual problems in the inner city of Baltimore and tests the effectiveness of OVT. Vision therapy was provided to one of the randomly selected groups and data were collected on optometric tests, visual performance tests, and standardized achievement tests before and after treatment was provided. Data presented show that the OVT program has made a significant difference in the demand level of reading that could be read for understanding, in math achievement on standardized testing, and in reading scores on standardized testing, as well as on infrared eye-movement Visagraph recordings, which show significant changes on nearly all mechanical aspects of the reading process.

No hyperlink is available.

Hellerstein LF, Danner R, Maples WC, Press L, Schneebeck J, Miller S. Optometric guidelines for school consulting. J Optom Vis Devel 2001;32(Summer):56-75.

Abstract of COVD Journal: School-based vision programs are often needed to enable children to perform optimally in today's academic environment. A number of school vision programs are currently being implemented around the United States. These programs can address vision care and educational goals as well as provide unique services and opportunities for educators and students. The mission of a school-based vision program is to: 1) Improve the academic performance of children by enhancing their visual function. 2) Improve quality of life by reducing learning related visual symptoms. This article discusses initiating a school optometry program, school screenings, a proposed model, and resources required.

No hyperlink is available.

Hellerstein LF. School vision programs – current updates. J Optom Vis Devel 2001;32(Summer):76-9.

Abstract of COVD Journal: There have been numerous school-based vision programs across the country where optometrists have been consulting and implementing vision screening and treatment strategies within the school setting or with direct referral to optometric offices. Many of these programs were not initiated as research projects; therefore the data obtained may not withstand scientific scrutiny. However, these programs have been crucial by providing the optometrist experiences within the school system, thereby laying the foundation for future school-based vision programs. Many obstacles present when working within the school, such as frequent student turnover, change in student scheduling, school vacations, financial woes, etc. Thus strategies to combat these obstacles need to be continually evaluated.
No hyperlink is available.

Orfield A, Basa F, Yun J. Vision problems of children in poverty in an urban school clinic, their epidemic numbers, impact on learning, and approaches to remediation. J Optom Vis Devel 2001; 32(Fall):114–41.

See Above

10. VISUAL INFORMATION PROCESSING/PERCEPTION SKILLS AND LEARNING

Allegretti CL, Puglisi JT. Disabled vs. nondisabled readers: perceptual vs. higher-order processing of one vs. three letters. Percept Mot Skills 1986;63:463-9.

Summary: Twelve normal readers were compared to 12 disabled readers in their ability to recall letters after an initial stimulus. Disabled readers had more errors with decreased time between the two presented stimuli.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3774453&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Armstrong BB, Knopf K. Comparison of the Bender-Gestalt and revised Developmental Test of Visual-Motor Integration. Percept Mot Skills 1982;55(1)164-6.

Summary: The Bender-Gestalt was compared to the Beery Developmental Test of Visual-Motor integration on 40 children. Children from a learning disabled group were compared to normal students. The two tests had a high correlation for the learning disabled group but a lower correlation with normal students. This suggests that learning disabled students perform differently on the two tests.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7133897&ordinalpos=20&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Bieger E. Effectiveness of visual perceptual training on reading skills of non-readers, an experimental study. Percept Motor Skills 1974;38(3):1147-53.

Summary: Twenty-four third grade non-reading students received visual perceptual training and remedial instruction. The control group on non-reading students only received remedial instruction. After seven months, the perceptual group gained six months in reading while the remedially trained group improved eight months. The authors concluded that perceptual training did not improve reading skills.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4418619&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Bieger E. Effects of two different training programs on visual discrimination of nonreaders. Percept Mot Skills 1983;56(3):1009-10.

Summary: 52 second grade nonreading students who also had problems with visual discrimination, were given two separate training plans. Those who were given scanning strategies improved more than those given word matching.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6877956&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Casco C, Prunetti E. Visual search of good and poor reader: effects with targets having single and combined features. Percept Mot Skills 1996;82(3 Pt 2):1155-67.

Summary: A group of normal readers was compared to a group of poor readers in their visual-search strategy of targets. With increased complexity of the target, the poor readers had greater difficulty. This suggests that poor readers have difficulty with complex shapes (letters) versus their search strategy.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8823883&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cohen RI. Remedial training of first grade children with visual perception retardation. Educ Horizons 1966;45:60-3.

Summary: A group of first graders had ten weeks of in school visual-perceptual training. A control group received no training. Both the therapy group and the control group had performed below average on perceptual forms and reading development testing. No direct correlation between improved visual-perception and reading achievement was found. Other results showed that the visual-perceptual training showed lasting gains and a positive correlation in motor development. Intelligence was also found to be a major predictor of children with good visual-perceptual and reading skills.

No hyperlink is available.

Coleman HM. Visual perception and reading dysfunction. J Learn Disabil 1968;1(2):26-33.

Summary: Eighty-seven elementary school children with severe language and reading deficits were tested for visual and visual-perceptual problems. Referrals were made for visual, perceptual, neurological,

psychological and other anomalies. It was noted that many of the referred were males and than more than 50% had visual and visual-perceptual problems. Diagnosing visual-perceptual deficits could lead to therapy and appropriate teaching techniques to help children with these problems.

No hyperlink is available.

Erickson GB, Griffin JR. Thinking goes to vision therapy. J Behav Optom 1993;4(5):115-7.

Summary: Piagetian concepts were applied to cognitive educational tasks by Fruth and Wachs. These same tasks can also be applied to OVT objectives. Five example procedures are discussed with scientific reference to visual perceptual skills being trained.

No hyperlink is available.

Falik L. The effects of special perceptual-motor training in kindergarten on reading readiness and on second grade performance. J Learn Disabil 1969;2(8):10-17.

Summary: A group of kindergarten children where divided into a control group and a study group. The experimental group was given perceptual-motor therapy. The two groups were compared at the end of the school year and second grade. There was no considerable difference in reading achievement between the two.

No hyperlink is available.

Fichman T, Hoffman LG. The effect of time on the developmental test of visual motor integration. J Am Optom Assoc 1983;54(7):639-42.

Summary: The Visual-Motor Integration test (VMI) was given to children from ages 5-12. Some of the children had time restrictions to complete the test. Children with learning problems showed a significant difficulty with the test over the normal learning group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6886295&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Forrest EB. Visual imagery and written language. J Am Opt Assoc 1979;50(4)477-9.

Summary: Visual imagery is discussed this article concerning its help in diagnosing and treatment. It also has a relationship to the auditory system. Techniques of visual imagery to use are given.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=458106&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Friedhoffer A. Optometric diagnosis and visual training as they relate to school achievement. Opt J Rev Opto 1969;106(10):27-31.

See Above.

Godnig EC. Children and Computer Use: The Impact on Learning and Visual Development J of Behav Optom 2002;13(5):115-18.

Summary: Children are using computers at younger ages and for extensive time periods. There are concerns that excessive computer use is causing too little physical activity. Physical activity is important in visual development. Suggestions are given to optometrists on increasing awareness of excessive computer use along with guidelines and recommendations.

No hyperlink is available.

Groffman S, Press L. Computerized perceptual therapy programs - part 1. Research reports and special articles. Optom Ext Prog 1989;61(11):387-93.

Summary: This article describes methods that can be used in perceptual training. Computers are shown to be very effective to help treat learning problems, dyslexia and other perceptual problems.

No hyperlink is available.

Groffman S, Press L. Computerized perceptual therapy programs - part II. Research reports and special articles, Optom Ext Prog 1989;61(12):423-9.

Summary: Twelve perceptual computerized programs on visual search, span, etc. are presented. The programs are explained along with their benefits.

No hyperlink is available.

Jones MJ, Sinha P, Vetter T, et al. Top-down learning of low-level vision tasks. Brief Communication 1997;7(12)991-94.

Summary: A top-down model of visually analyzing 3-D images and other perceptual tasks was given. It was shown to be more effective than a bottom-up method in human testing. The authors concluded that a top-down approach to visual analysis would be more effective in learning perceptual tasks.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9382836&ordinalpos=12&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Karni A, Sagi D. The time course of learning a visual skill. Nature 1993;365(6443):250-52.

Summary: The physiology of learning a perceptual task was studied with its effect on learning. There was a fast learning effect in the first session. Thereafter, performance of the task was stable until eight hours of training, where large improvements were noted. Memory of the task was retained for over two years. The authors concluded that perceptual training can cause neural changes in the visual system. It takes several hours of training to become useful.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8371779&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kavale K. Meta-analysis of the relationship between visual perceptual skills and mathematics J Learn Disablil 1982;15(1):42-51.

Summary: Visual perceptual and visual memory tests were given to 171 students and compared to mathematical performance. Results showed a significant relationship between poor visual perception and mathematical skills. Visual memory also showed a correlation with mathematics.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7069285&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Kulp MT. Relationship between visual motor integration skill and academic performance in kindergarten through third grade. Optom Vis Sci 1999;76(3):159-63.

See Above

Kulp M, Earley M, Mitchell G, Edwards K, Timmerman L, Frasco C, Geiger M. Are visual perceptual skills related to mathematics ability in second through sixth grade children? Optom Vis Sci (Supplement) 2001;78(12):149.

Summary: 171 students were tested with various visual perceptual tests. Controls for verbal ability were factored in. Visual perception was found to be significantly related to mathematical ability.

No hyperlink is available.

Kulp MT, Edwards KE, Mitchel GL. Is visual memory predictive of below-average academic achievement in second through fourth graders? Optom Vis Sci 2002;79(7):431-4.

Summary: Visual memory was tested on 155 students and compared to academic achievement. Age and verbal ability were included in the controls of the study. Visual memory was significantly compared to poor reading-decoding, math and academic achievement in the second to fourth graders tested.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=12137397&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Maples WC. Visual factors that significantly impact academic performance. Optom 2003;74(1):35-49.

Summary: This study showed that visual skills were more predictive of academic ability than was race and socio-economic issues.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=12539891&ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Mitchell-Burns JA. Performance of children with and without learning disabilities on Canter's Background Interference Procedure and Koppitz's scoring system for the Bender test. Percept Mot Skill 2000;90(3 Pt 1):875-82.

Summary: The Bender Gestalt test was performed on 66 children using Canter's Background Interference (BIF) and Koppitz's scoring. Four methods of combining these methods were employed. All four methods were found to accurate in their assessment. Canter BIF combined with Canter scoring combined with the Bender was the best method of diagnosing learning problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10883769&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Morgan M W. The effect of visual perceptual training upon subsequent scholastic progress of children with specific visual disabilities. Masters Thesis, University of Nevada, August 1996. Reno, Nevada. (Printed by OEP Foundation.)

Summary: A treatment group of 40 poor achieving students was given vision training in three optometric offices and compared to a like group who had no vision training. Ten separate characteristics of the students were tested pre and post therapy. The treatment group improved in almost all areas versus the control. Some of the categories tested were: reading comprehension, speech patterns and scholastic performance.

No hyperlink is available.

Muehl, S. The effects of visual discrimination pretraining on learning to read a vocabulary list in kindergarten children. J Educ Psych 1960;51(4):217-21.

See Above

Pierce J. Is there a relationship between vision therapy and academic achievement? Part 1. Optometric development vision therapy and academic achievement. Rev of Optom 1977;114(6):48-63.

See above.

Pitcher-Baker G. Does perceptual training improve reading? J of Optom Vis Ther 1974;5(3):40-45.

See Above

Robertson K, Zaborske R. The relationship of academic achievement to visual memory. J Opt Vis Devel 1988;19(6):12-5.

Abstract of COVD Journal: The purpose of this study was to determine what form of visual memory, if any, is most closely related to reading, spelling, and math. Forty second graders were administered the three sections of the WRAT and three visual memory tests: The VASL, the Visual Sequential Memory subtest of the ITPA, and the Wepman Visual Memory Test. Relationships between the academic tests and the visual memory tests were analyzed using the Pearson Product Moment Correlation and the Multiple Correlation Analyses. Significant relationships were found between reading and spelling and the VASL and the Wepman. A student who is doing poorly in these academic areas will presumably also have difficulty in the perceptual skill of visual memory.

No hyperlink is available.

Solan HA. Visual perceptual factors and reading: clinical implications of some recent optometric research. J Behav Optom 1990;1(3):59-64.

Summary: Numerous optometric articles on visual perceptual skills were reviewed and presented. Shown is the correlation between visual perceptual skills and academic achievement. Reading disabled children have a greater relationship of poor visual perceptual skills than normal learners.

No hyperlink is available.

Solan H, Ciner E. Visual perception and learning: issues and answers. J Am Optom Assoc 1989; 60(6):457–60.

Summary: This is a literature review of visual perception and learning readiness. Studies are presented showing this. Perceptual training is shown to help learning ability.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2768756&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan HA, Mozlin R, Rumpf DA. Selected perceptual norms and their relationship to reading in kindergarten and the primary grades. J Am Optom Assoc 1985;56(6):458-466.

Summary: 144 normal 2nd- grade children were tested in Tachistoscope, Divided Form Board, Grooved Pegboard and Auditory-Visual Integration. Norms and standards were determined for each test. Relationships were significant for the perceptual skills and reading readiness. Results show that initially, perception is important but by second grade cognition and language skills become more dominant.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4008855&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Waldron KA, Saphire GD. Perceptual and academic patterns of learning-disabled/gifted students. Percept and Motor Skills 1992;74(2):599-609.

Summary: Learning-disabled/gifted students were tested in visual perception and auditory skills. These were compared to their abilities in reading, math and spelling and than compared to a control group. Results showed a decreased ability in visual discrimination, sequencing and spatial perception. They were also weaker in auditory discrimination. It was concluded that perceptual problems of this group are related to the academic issues.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1594421&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Westman AS, Orellana C. Only visual impressions are almost always present in long-term memories, and reported completeness, accuracy, and verbalizability of recollections increase with age. Percept and Motor Skills 1996;83(2):531-39.

Summary: Two studies asked students about their memories from early childhood to current time. Visual feelings was present in all recollections. Sound awareness was more common from high school to present. Early childhood memories had internal feelings.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8902029&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

11. VISUAL SCREENINGS: TESTING RESULTS, READING FAILURE

Bailey N. Assessing the predictive ability of the test-positive findings of an elementary school vision screening. Optom Vis Sci 1998;75(9):682-91.

Summary: The Modified Clinical Technique (MCT) was used to screen elementary students of a below-average socioeconomic group. Testing was performed by second year optometry students. Predictive values of the findings were determined. 69% of the students were found to be true positives, which was less than

the California Orinda study. Shortfalls of this screening method were most likely due to the inexperience of the second year students.

No hyperlink is available.

Bolger PG, Stewart-Brown SL, Newcombe E, Starbuck A. Vision screening in preschool children: comparison of orthoptists and clinical medical officers as primary screeners; BMJ 1991;303(6813):1291-4.

Summary: Thousands of people were screened by orthoptists and clinical medical officers. The amblyopia and strabismus detection rate and false positive measures were compared. The study concluded that orthoptists were more effective screeners.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1747671&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Davidson JJ, Spollen DW. The influence of clinical judgment on the rate of referral from a school vision screening program. J Am Optom Assoc 1979;50(10):1126-7.

Summary: This study examined the higher referral rate of children from low income families which could be caused by the examiner modifying the referral criteria. Results of the study show that the referral rate was not changed by clinical judgment – based on ethnicity and socioeconomic level.

No hyperlink is available.

Johnson RA, Zaba JN. Literacy: the vision, learning and volunteer connection. J Behav Optom 1992; 3(5):128-131.

Summary: A trained volunteer using the NYSOA Vision Screening Battery tested 54 people from an adult literacy program. 74% of the adults failed the screening and were referred. Results show that illiterate adults have vision problems and the importance of screening this group.

No hyperlink is available.

Johnson RA, Zaba JN, Reynolds WT. Vision examinations for all children entering public school--the new Kentucky law. Optometry 2003;74(3):149-58.

Summary: Kentucky passed a law in 2000 whereby all children are required to have an eye examination before entering school. 43 Kentucky optometrists were survey concerning 5,316 children they examined. 740 (14%) were given eye glasses, 181 (3.4%) had amblyopia, 123 (2.3%) had strabismus and 44 had other eye diseases.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=12645848&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Johnson R, Nottingham D, Stratton R, Zaba J. The vision screening of academically at-risk pupils. J Behav Optom 1996;7(2):39-42.

Summary: 81 at risk students were tested with the NYSOA screening battery to help rule out visual problems, ADD, ADHD, dyslexia and related disorders. 33 were diagnosed and 97% of these failed at least

one portion of test battery. Statistics of the data showed that academic at risk students scored lower on tracking, stereopsis, hyperopia and color substests.

No hyperlink is available.

Johnson RA, Blair RJ, Zaba J. The visual screening of title I reading students. J Behav Optom 2000; 11(1):3–6.

Summary: 186 economically challenged children were tested with the NYSOA screening battery. 93 were title one students. These students scored significantly lower in tracking, fusion, convergence and visual-motor testing. 92% of the title I students failed the screening, much lower than the other 93 non-title I group.

No hyperlink is available.

Laudon RC, Hinrichs C, Lieberman LM, et al. The interface of education, psychological and visual services in pediatric optometry. J Am Optom Assoc 1984;55(8)591-594.

Summary: Optometry alone cannot treat the learning disabled. A multidisciplinary approach is necessary to help children with learning problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6481069&ordinalpos=16&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Mantyjarvi M. Vision screening and eye examination of school children. Scan J Prim Health Care 1985;3(4);223-6.

Summary: Two vision screenings in Finland school system produced hundreds of referrals for complete vision exams. The data from 100 of each of these referrals were analyzed. About 62% of the referrals were girls. Age distribution was even through the grades, but age 13 was the largest age group. Myopia was the most common reason for referral. There was a difference in the two years in false positives which is accounted for by the school nurses who performed the screenings.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=4081403&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Newman DK, Hitchcock A, McCarthy H, et al. Preschool vision screening: outcome of children referred to the hospital eye service. Br J Ophthal 1996;80(12):1077-82.

Summary: Orthoptists performed school screenings in two separate years on 3 ½ year old children, with the primary reason to find amblyopia. 6794 children screened which produced 348 referrals for the following etiologies: refractive error – 33%, amblyopia 30%, false positive 20%, strabismus 13% and other reasons was 4%. Treatment for amblyopia produced a 94% success rate due to the early age of treatment.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9059274&ordinalpos=15&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Reed MJ, Kraft SP. Vision health care providers' attitudes and experiences with preschool vision screening in Ontario. Opt Vis Sci 2004;81(7):548-53.

Summary: Optometrists, pediatric ophthalmologists, public health administrators and orthoptists were surveyed about preschool screenings. Results showed that all groups favored school screenings. The

providers had all performed screenings and methods differed. There was agreement that preschool screenings need to be better structured with quality control and other improvements.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=15252355&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rosen CL. An experimental study of visual perceptual training and reading achievement in first grade. Percept Motor Skills 1966;22:979-86.

Summary: 12 classrooms were given 29 days of the Frostig program in visual development while 13 classrooms were used as a control group. Significant differences were found in post-testing leading to the suggestion that more research is necessary in this area.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=5963130&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Ritty J, Solan H, Cool S. Visual and sensory-motor functioning in the classroom: a preliminary report of ergonomic demands. J Am Optom Assoc 1993;64(4):238-44.

Summary: Ergonomic conditions of eleven classrooms measuring space, lighting and academic tasks were measured. 50% of the tasks required were near point. Oculomotor dysfunctions may be a cause for reduced performance. Further research was discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8315198&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Robinson B, Bobier WR, Martin E, et al. Measurement of the validity of a preschool vision screening program. Am J of Public Health 1999;89(2)193-8.

Summary: Nurses were trained to do preschool screenings. The validity of their findings is analyzed. Over 1,100 children were screened each year which produced about 12% referrals. These results match other school screenings and show a fairly high rate of vision problems.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9949748&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Steele G, Ireland D, Block S, Beeksma S. Vision screening tests for preschoolers: testability, sensitivity, and specificity. J Optom Vis Devel 2001;32(Summer):99–106.

Abstract of COVD Journal: Screening tests must be both sensitive (able to detect the condition screened for) and specific (able to correctly identify people without the condition as normal). Specificity is a particular problem in preschool vision screenings, where aspects such as the difficulty of the test can lead to false positives and over-referrals. The goal of the present study was to look at the testability, sensitivity, and specificity of three vision screening tests that could reasonably be administered by lay people. One hundred and sixty-two children aged 2 to 5 years were screened with the distance Massachusetts Visual Acuity Test using Lea symbols, distance HOTV visual acuity, and the Nikon Retinomax Plus auto-refractor. Testability was determined on responses obtained at the screening. Ninety-three children returned for comprehensive eye examinations. Sensitivity and specificity were calculated by comparing the screening results to the cycloplegic examination results. The percentages of children able to perform the tests at the first visit were

32% at age 2 to 100% at age 5 using both the HOTV and the Massachusetts Visual Acuity Test. The authors concluded that testability for children less than 4-years-old was insufficient on visual acuity tests requiring subjective responses. Vision screenings that rely solely on a measure of visual acuity may lead to false positives. They noted that combining a visual acuity test with an objective measure such as auto-refraction provided a preschool screening battery with increased specificity.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=12917576&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Yawn, Kurland, Butterfield, et al. Barriers to seeking care following school vision screening in Rochester, Minnesota; J of School Health 1998;68(8):319.

Summary: This study tried to find causes of why children who failed school vision screenings did not receive follow up treatment. These included: lack of public knowledge about vision problems, poor communication between the parent and school, cost of glasses, etc. A plan was developed to provide better compliance.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9800181&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

12. VISION AND LEARNING - MISCELLANEOUS

Armstrong BB, Knopf KF. Comparison of the Bender-Gestalt and revised Developmental Test of Visual-Motor Integration. Percept Mot Skills 1982;55(1):164-6.

See above

Bannatyne A, Wichiarajote P. Relationships between written spelling, motor functioning and sequencing skills. J Learn Disbil 1969;2(1):6-18.

Summary: 50 3rd grade students were tested in spelling ability and than motor functioning, balance, visual-spatial, auditory and other skills. Written word spelling was correlated with balance, visual memory and visual-motor drawing for memorized designs. Un-drawn designs required different skills. From this information, a sequence to teach spelling was recommended.

No hyperlink is available.

Birch HG, Belmont L. Auditory-visual integration, intelligence and reading ability in school children. Percept Motor Skills. 1965;20(2):295-305.

Summary: 220 children were tested in auditory-visual integration and compared to IQ. There was a correlation but they were not identical. Auditory-visual integration correlated with IQ at lower ages while reading ability correlated more at higher ages. This was attributed to the auditory visual test used, that perception is more important in learning in initial learning and that intellect was more important in older childhood learning.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=5962775&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Birnbaum MH. The power of visual training. J Am Optom Assoc 1984;55(4):257-60.

Summary: Recent findings that is easier to change human visual function than once thought will have implications that OVT can alter visual function.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=6725825&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Bowan, MD. Learning disabilities, dyslexia, and vision: a subject review – a rebuttal, literature review, and commentary. Optom 2002;73(9):553–75.

Summary: This is a rebuttal by Dr. Bowman of a statement paper from pediatrics, ophthalmology and pediatric ophthalmology boards entitled "Learning Disabilities, Dyslexia and Vision; A Subject Review." Their basic premise is that there is no connection between vision, learning disabilities and dyslexia. The statement paper completely ignored numerous sources that would confute their claim. Over 1,400 references are noted by Dr. Bowman that disclaim the position paper, show errors and contradictions.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=12387562&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cook D. Vision training and quality of life. J Optom Vis Devel 1995;26(Winter):205–11.

Abstract of COVD Journal: The author surveyed 838 patients who completed a OVT program. These included fewer than 10% adults, fewer than 5% preschoolers, and approximately 10% strabismics. The remainder, were binocular cases. Sixty-five questions were asked regarding ocular symptoms, reading, academic changes, and behavioral changes. To summarize, 254 reported improved reading, 110 reported an increase in reading enjoyment, 137 reported better grades and numerous other positive changes.

No hyperlink is available.

Cotter SA, Rouse MW, DeLand PN. Comparative study of the Jordon Left-Right Reversal Test, the Reversals Frequency Test, and teachers' observations. Am J Optom Physiol Optics 1987;64(3)195-203.

Summary: The Jordan Left-right Reversal Test (JRT) was performed on 510 normal and 126 learning disabled students. These were divided into age groups and compared to a teacher questionnaire of the students. There was low statistical agreement between the two methods of evaluating reversals at both age and student groups.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3578485&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cordova KB. The Speech-language pathologist's role in an interdisciplinary approach to learning-disabled children; Optom Vis Sci 1993;70(5):352-56.

Summary: Treating the disabled-learning is a multidisciplinary task. The speech-language professional's expertise in decoding and encoding language is part of this treatment and is discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8515962&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Cornelissen P, Bradley L, Fowler S, Stein J. What children see affects how they spell. Dev Med Child Neurol 1994;36(8):716-26.

Summary: A group of poor spelling children with poor binocular skills was compared to a similar group with good binocularity. Children with unstable binocularity made more phonetic reasonable errors than the control group.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8050625&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Courtney SM, Ungerleider LG, Keil K, Haxby JV. Transient and sustained activity in a distributed neural system for human working memory. Nature 1997;386(6625):608-611.

Summary: Encoding visual information is part of human memory. Functional MRI (fMRI) was used to look at neural activity during visual observation of faces. Three occipitotemporal areas of the ventral vision pathway were believed to be involved with transient perceptual processing. Three prefrontal brain areas were thought to be related to memory. The visual areas showed selectivity and the prefrontal areas expressed various degrees of sustained activity.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=9121584&ordinalpos=8&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Dowis R. The effect of a visual training program on juvenile delinquency. J Am Optom Assoc 1977; 48(9):1173-76.

Summary: A group of juvenile delinquents had vision exams to look for visual defects. Vision therapy was provided to those who needed it. The most common visual problems were: accommodative, saccades, visual memory and vergence recoveries. Vision therapy reduced the incidence of delinquency.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=903560&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Dzik D. Optometric intervention in ocular movement thinking problems of mentally retarded (MR) persons. J Optom Vis Devel 1975;6(3):6-11.

Abstract of COVD Journal: Applying the principles of successful optometric vision treatment with people who are handicapped with developmental deficiencies and learning disabilities, and reasoning that mentally retarded (MR) people have the same visual-tactual-auditory systems as the normal child, the author of this article developed a successful technique with the Dzik Electronic Auditory Marsden Ball to help the severely MR person perform at a higher level. It is well known that if the hands are to be efficient and productive, the eyes must guide the hands of the sighted person. Furthermore, the eye is an important information gathering system, and to be efficient, ocular movements must be efficient. To this end, the Dzik Electronic Auditory Marsden Ball technique was developed as a stronger stimulus to help the MR person.

No hyperlink is available.

Eubank TF, Ooi TL. Improving visually guided action and perception through use of prisms. Optom 2001;72(4):217-27.

Summary: Four case reports, where patients had different forms of trauma, were presented where visual impairments are improved by adding prism. The authors discuss how prisms can improve visual function neurologically.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=11338446&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Feldman J. Behavior modification in vision training: facilitating prerequisite behaviors and visual skills. J Am Optom Assoc 1981;52(4):329-40.

Summary: Nine studies were presented showing that learning visual skills through vision training can be improved with operant conditioning.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7252030&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Friedhoffer A. Optometric diagnosis and visual training as they relate to school achievement. Opt J Rev Opto 1969;106(10):27-31.

See above.

Freeman RD, Thibos LN. Electrophysiological evidence that abnormal early visual experience can modify the human brain. Sci 1973;180(88):876-8.

Summary: Astigmatism can cause decreased acuity in oriented objects. Electrophysiology studies show that subjects who have a decreased resolving power of oriented targets also have decreased visual evoked potential.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17743606&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Helveston EM, Ellis FD, Weber JC, et al. A performance test to accompany ophthalmic examination in the young school age child: the "draw a bicycle" test. J Pediatr Ophthalmol Strab 1985;22(1):17-9.

Summary: A decreased performance of “draw the bicycle test” is shown to have a strong correlation of children doing poorly in school. It is recommended to use this test, during routine vision exams, for immediate results in consulting with parents on therapy.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3981376&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Hohendorf RA, Sonnenberg WA. VT survey results. Mich Optom 1983;62(12):8-12.

Summary: This paper prints the results of a survey sent to all Michigan optometrists in 1983 concerning OVT. The portions of this survey relating OVT to learning show that 64% believed learning problems could be improved with therapy. Of all the anomalies treated with vision therapy, learning problems were the most difficult to treat.

No hyperlink is available.

Johnson, SP, Kirkham, Slemmer. Vision statistical learning in infancy. J of Vis 2001;1(3) Abstract 25,p 25a.

Summary: The authors tested infants to determine if statistical learning occurred with continuously presented visual stimuli. The infants were shown repeated patterns. They were than retested and found to have longer viewing times of randomized patterns over habituated patterns. Since infants tend to be more interested in new information, it was concluded that children were learning constant patterns.

No hyperlink is available.

Keim RP. Visual-motor training, readiness, and intelligence of kindergarten children. J Learn Disabil 1970;3(5):256-59.

Summary: One group of kindergarten children received a visual-motor training program and was compared to another group that was given the standard kindergarten program. Results showed no differences between the two groups at one year.

No hyperlink is available.

Kulp MT. Relationship between visual motor integration skill and academic performance in kindergarten through third grade. Optom Vis Sci 1999;76(3):159-63.

Summary: 191 children, ages 7-9, were tested with the Visual Motor Integration test (VMI). This finding was than compared to teacher's ratings of the child, the Standford Diagnostic Reading Test and the Otis-Lennon School Ability test. The VMI correlated significantly with teachers' ratings (grades) in reading, math and spelling. The VMI also related highly to the Stanford and Otis-Lennon tests, with variances for the grade level.

No hyperlink is available.

Lorch-Bacci I, Shankman A. Vision enhancement: training in concentration. J Behav Optom 1993; 4(2):38-42.

Summary: This is an article describing how to improve concentration. A patient is taught to improve visual input, enlarge their field of view and to understand processes of concentration. This increased awareness should transfer to all facets of a person's life.

No hyperlink is available.

McCormick C, Schnobrich J, Footlik S. The effect of perceptual-motor training on reading achievement. Academic Therapy 1969;4(3):171-76.

Summary: First grade students were given nine weeks of perceptual-motor training and tested to find if this improved reading ability. At the end of the program, normal readers showed no change. Below average readers exhibited significant gains in reading achievement.

No hyperlink is available.

Mitchell G. Working with school nurses: improving children's vision and building relationships. J Am Optom Assoc 1999;70(11):739-40.

Summary: This article discusses the importance of optometry building relationships with school nurses, who serve as the gatekeepers of health to millions of children. An AOA program to communicate with school nurses and improve school screenings is discussed.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10618852&ordinalpos=12&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

[No authors listed] Joint Statement on Vision Therapy. A joint organizational policy statement of the American Academy of Optometry and the American Optometric Association. 1999.

Summary: This policy states basic purposes of OVT. Vision therapy is prescribed to treat certain visual anomalies. The goals of therapy are to decrease symptoms, improve integration with the other senses and improve the patient's quality of life.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=10485169&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

O'Grady. The relationship between vision and educational performance; a study of year 2 children in Tasmania. Aust J Optom 1984;67(4)126-140.

Summary: Children in Tasmania were given a series of vision tests which were compared to independent educational tests administered by school guidance teachers. The two series of tests showed a statistical relationship between visual problems and school performance.

No hyperlink is available.

Podell SM. The effectiveness of developmental training. Optom Wkly 1976;9:1074-6.

Summary: This paper is a case report of a four year old that was designated to be in special education. After visual perceptual therapy, IQ and neurological tests were all found to be normal.

No hyperlink is available.

Roid. Construct validity of the figural, symbolic, and semantic dimensions of the Structure-of-Intellect Learning Abilities Tests. Educational and Psychological Measurement 1984;44(3):697-702.

Summary: The Structure of Intellect Learning Abilities test (SOI-LA) is widely used to test students. There is a Figural, Symbolic and Semantic aspect to the test mechanism the test, and this study tried to determine which was most used. 364 normal students showed that the Figural factor was the obvious parameter.

No hyperlink is available.

Rosenfield AG. Integrational deficits in children with visual-perceptual-motor disabilities. Percept Mot Skills 1975;40(1):51-7.

Summary: 12 normal children were tested against 12 learning disabled children in a visual-motor task, both with and without a verbal component. No differences were found for the motor portion but there were major differences with the combined visual-verbal task. Tests which combine these two tasks could therefore help diagnose learning disabilities.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=1118289&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Rosner J, Rosner J. Comparison of visual characteristics in children with and without learning difficulties. Am J Opt Phys Optics 1987;67(4)531-3.

Summary: 261 learning disabled children had their binocular and perceptual skills compared to 496 normal learning children. Results showed the learning disabled group had a higher prevalence of hyperopia and perceptual skills while normal learners showed an increase in myopia.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=3631210&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Scheiman M, Blaskey PF, Ciner EB, et al. Vision characteristics of individuals identified as Irlen filter candidates. J Am Optom Assoc 1990;61(8);600-5.

Summary: Irlen filters are tinted lenses used to treat "Scotopic sensitivity syndrome." Irlen believe that the tinted lenses alleviated visual symptoms such as headaches, eye strain, double vision and word movement on the page. 39 Irlen lens candidates were given complete vision exams prior to being given filters. 95% were found to have visual anomalies.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2394899&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Schoups AA, Vogels R, Orban GA. Human perceptual learning in identifying the oblique orientation: retinotopy, orientation specificity and monocularity. J Physio 1995;483(Pt 3);797-810.

Summary: Human subjects were trained to identify an oriented field. Improvements in recognition were seen in two weeks. Improvement was shown with each session and restricted to only the trained orientation. There was no transfer effect when orientation was changed in each eye but there was transfer between the two eyes. The authors concluded that processing occurred in the visual pathway were binocular input had occurred but where spatial processing had not.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7776259&ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Solan H. Learning Disabilities: The role of the developmental optometrist. J Am Optom Assoc 1979; 50(11):1259-66.

Summary: Treating of learning disabilities is beyond standard optometric services. The effects of etiology, diagnosis, and treatment of the learning disabled are discussed. The optometrist is often helpful in advising patients with reading, learning and psychological difficulties relating to learning disabilities.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=93120&ordinalpos=18&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Spafford C, Grosser G, Donatelle J, et al. Contrast sensitivity differences between proficient and disabled readers using colored lenses. J Learn Disabil 1995;28(4);240-50.

Summary: Colored filers (Irlen lenses) were used with a group of with reading problems and compared to a normal reading group. Tested was: the wavelength, effect of change of lens-color/luminosity, visual

detection and peripheral retinal brightness of the lenses. Spatial frequency of the filters discriminated normal from abnormal readers. Low reading performers also had lower contrast sensitivity and higher peripheral retinal thresholds.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7738436&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Stein J, Fowler S. Effect of monocular occlusion on visuomotor perception and reading in dyslexic children. Lancet 1985;2(8446):69-73.

See Above

Streff JW, Poynter HL, Jinks B, Wolff BR. Changes in achievement scores as a result of joint optometry and education program. J Am Optom Assoc 1990;61:475-81.

Summary: An experimental group of kindergarten children was given a visual optometric and educational program in the fall. This group was compared to another non-treatment group in the spring in eight areas: IQ, academic achievement and paper/pencil perceptual tests. The visually treated group showed significant differences in four of the tested areas.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=2370414&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Vidyasagar TR. Basic information processing and higher cognition: does the mammalian cerebral cortex deal with them at different hierarchical levels? Clin Exp Pharm Physiol 1996;23:908-912.

Summary: Two experiments, show that the visual cortex does higher cognition levels of attention and memory rather than being just a basic processing area than area. This was shown: 1. that in monkeys suppression of other brain regions occurred and 2: in cats, the cortex was quite plastic. A cortex area that is involved in basic visual stimuli should be immuned to plasticity.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=8911734&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Wildsoet C, Foo K. Reading performance and low plus lenses. Clin Exper Optom 1988;71(3):100-5.

Summary: 13 children who wore low plus lenses were tested to determine reading performance with and without wearing lenses. An Eye-Trac Recorder showed no difference in reading performance between plano and low plus lenses. Parameters measured were: speed, fixations, regressions and comprehension.

No hyperlink is available.

Wilkins A, Evans B, Brown J, Busby A, Wingfield A, Jeanes R, Bald J. Double-masked placebo-controlled trial of precision spectral filters in children who use coloured overlay. Ophthal Physio Opt 1994;14(4):365-70.

Summary: A group of 68 children who used a prescribed colored filters for reading were given a second pair of filters dyed to a color outside the perceptual range of vision. They were than randomly given each pair for one month and results were recorded. At the end of the experiment, there was no difference between the two filters and the second, non-prescribed set of filters, actually decreased symptoms.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7845693&ordinalpos=8&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

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Alwitt LF. Decay of immediate memory for visual presented digits among non-readers and readers. J Educ Psych 1963;54:144-48.
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Apperson SV. Effectiveness of orthoptic training as a means of remedial instruction of reading. J Exper Education 1940;9:160-66.
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Aslin, C, Blake, Chun. A dissociation in the transfer of perceptual learning based on visual temporal structure. Journal of Vision 2001;1(3) Abstract 24.
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J Exper Educ

J Exp Learn Mem Cog

J Learn Disabil

J of Optom Vis Ther

J Pediatr Ophthalmol Strab

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Journal of Vision = J Vis

Klin Mbl Augenheilk

Lancet

Lang Speech

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Nature

Neuroimage

Neurology

Neuropadiatrie

Neuropsychologia

Neuroreport

New England Journal of Medicine = New Eng J Med

Optometry = Optometry

Optometric Extension Program

Optical Journal And Review Of Optometry = Opt J Rev Optom

Optometry and Vision Science = Optom Vis Sci

Optometric Weekly = Optom Wkly

Ophthal

Ophthalmologe (Germany) = Ophthalmologe

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Pavlov J Biol Sci

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Perception = Perception

Percept Psychophys

Percept and Motor Skills = Percep Mot Skills

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