

# AMERICAN ACADEMY OF PEDIATRICS

Committee on Children With Disabilities, American Academy of Pediatrics (AAP) and American Academy of Ophthalmology (AAO), American Association for Pediatric Ophthalmology and Strabismus (AAPOS)

## Learning Disabilities, Dyslexia, and Vision: A Subject Review

**ABSTRACT.** Learning disabilities are common conditions in pediatric patients. The etiology of these difficulties is multifactorial, reflecting genetic influences and abnormalities of brain structure and function. Early recognition and referral to qualified educational professionals is critical for the best possible outcome. Visual problems are rarely responsible for learning difficulties. No scientific evidence exists for the efficacy of eye exercises ("vision therapy") or the use of special tinted lenses in the remediation of these complex pediatric developmental and neurologic conditions.

### BACKGROUND

Learning disabilities have become an increasing personal and public concern. Among the spectrum of issues of concern in learning disabilities, the inability to read and comprehend is a major obstacle to learning and may have long-term educational, social, and economic implications. Family concern for the welfare of children with dyslexia and learning disabilities has led to a proliferation of diagnostic and remedial treatment procedures, many of which are controversial or without clear scientific evidence of efficacy. Many educators, psychologists, and medical specialists concur that individuals who have learning disabilities should: 1) receive early comprehensive educational, psychological, and medical assessment; 2) receive educational remediation combined with appropriate psychological and medical treatment; and 3) avoid remedies involving eye exercises, filters, tinted lenses, or other optical devices that have no known scientific proof of efficacy.

### EVALUATION AND MANAGEMENT

Reading involves the integration of multiple factors related to an individual's experience, ability, and neurologic functioning. Research has shown that the majority of children and adults with reading difficulties experience a variety of problems with language<sup>1-3</sup> that stem from altered brain function and that such difficulties are not caused by altered visual function.<sup>4-7</sup> In addition, a variety of secondary emotional and environmental factors may have a detrimental effect on the learning process in such children.

Sometimes children may also have treatable visual difficulty along with their primary reading or learning dysfunction. Routine vision screening examina-

tions can identify most of those who have reduced visual acuity. Pediatricians and other primary care physicians whose pediatric patients cannot pass vision screening according to national standards<sup>8,9</sup> should refer these patients to an ophthalmologist who has experience in the care of children.

### Role of the Eyes

Decoding of retinal images occurs in the brain after visual signals are transmitted from the eye via the visual pathways. Some vision care practitioners incorrectly attribute reading difficulties to one or more subtle ocular or visual abnormalities. Although the eyes are obviously necessary for vision, the brain performs the complex function of interpreting visual images. Currently, no scientific evidence supports the view that correction of subtle visual defects can alter the brain's processing of visual stimuli. Statistically, children with dyslexia or related learning disabilities have the same ocular health as children without such conditions.<sup>10-12</sup>

### Controversies

Eye defects, subtle or severe, do not cause the patient to experience reversal of letters, words, or numbers. No scientific evidence supports claims that the academic abilities of children with learning disabilities can be improved with treatments that are based on 1) visual training, including muscle exercises, ocular pursuit, tracking exercises, or "training" glasses (with or without bifocals or prisms),<sup>13-15</sup> 2) neurologic organizational training (laterality training, crawling, balance board, perceptual training),<sup>16-18</sup> or 3) colored lenses.<sup>18-20</sup> These more controversial methods of treatment may give parents and teachers a false sense of security that a child's reading difficulties are being addressed, which may delay proper instruction or remediation. The expense of these methods is unwarranted, and they cannot be substituted for appropriate educational measures. Claims of improved reading and learning after visual training, neurologic organization training, or use of colored lenses, are almost always based on poorly controlled studies that typically rely on anecdotal information. These methods are without scientific validation.<sup>21</sup> Their reported benefits can be explained by the traditional educational remedial techniques with which they are usually combined.

### Early Detection

Pediatricians, other primary care physicians, and educational specialists may use screening techniques

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

PEDIATRICS (ISSN 0031 4005). Copyright © 1998 by the American Academy of Pediatrics.

to detect learning disabilities in preschool-aged children, but in many cases, the learning disability is discovered after the child experiences academic difficulties. Learning disabilities can include dyslexia, problems with memory and language, and difficulty with mathematic computation. These difficulties are often complicated by attention deficit disorders. A family history of learning disabilities is common in such conditions. Children who are considered to be at risk for or suspected of having these conditions by their physician should be evaluated for more detailed study by educational and/or psychological specialists.

### Role of the Physician

Ocular defects in young children should be identified as early as possible, and when they are correctable, they should be managed by an ophthalmologist who is experienced in the care of children.<sup>22</sup> Treatable ocular conditions among others include refractive errors, focusing deficiencies, eye muscle imbalances, and motor fusion deficiencies. When children have learning problems that are suspected to be associated with visual defects, the ophthalmologist may be consulted by the primary care pediatrician. If no ocular defect is found, the child needs no further vision care or treatment and should be referred for medical and appropriate special educational evaluation and services. Pediatricians have an important role in coordination of care between the family and other health care services provided by ophthalmologists, optometrists, and other health care professionals who may become involved in the treatment plan.

### Multidisciplinary Approach

The management of a child who has learning disabilities requires a multidisciplinary approach for diagnosis and treatment that involves educators, psychologists, and physicians. Basic scientific and clinical research into the role of the brain's structure and function in learning disabilities has demonstrated a neural basis of dyslexia and other specific learning disabilities and not the result of an ocular disorder alone.<sup>4-6</sup>

### The Role of Education

The teaching of children, adolescents, and adults with dyslexia and learning disabilities is a challenge for educators. Skilled educators use standardized educational diagnostic evaluations and professional judgment to design and monitor individualized remedial programs. Psychologists may help with educational diagnosis and classification. Physicians, including pediatricians, otolaryngologists, neurologists, ophthalmologists, mental health professionals and other appropriate medical specialists, may assist in treating the health problems of these patients. Because remediation may be more effective during the early years, prompt diagnosis is paramount.<sup>20,21</sup> Educators with specialty training in learning disabilities play a key role in providing help for the learning disabled or dyslexic child or adult.

### RECOMMENDATIONS

1. For all children, clinicians should perform vision screening according to national standards.<sup>8,9</sup>
2. Any child who cannot pass the recommended vision screening test should be referred to an ophthalmologist who has experience in the care of children.
3. Children with educational problems and normal vision screening should be referred for educational diagnostic evaluation and appropriate special educational evaluation and services.
4. Diagnostic and treatment approaches that lack objective, scientifically-established efficacy should not be used.

### SUMMARY

Reading difficulties and learning disabilities are complex problems that have no simple solutions. The American Academy of Pediatrics and the American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus strongly support the need for early diagnosis and educational remediation. There is no known visual cause for these learning disabilities and no known effective visual treatment.<sup>23,24</sup> Recommendations for multidisciplinary evaluation and management must be based on evidence of proven effectiveness demonstrated by objective scientific methodology.<sup>23-24</sup> It is important that any therapy for learning disabilities be scientifically established to be valid before it can be recommended for treatment.

COMMITTEE ON CHILDREN WITH DISABILITIES, 1998-1999

Philip R. Ziring, MD, Chairperson  
 Dana Brazdziunas, MD  
 W. Carl Cooley, MD  
 Theodore A. Kastner, MD  
 Marian E. Kummer, MD  
 Lilliam González de Pijem, MD  
 Richard D. Quint, MD, MPH  
 Elizabeth S. Ruppert, MD  
 Adrian D. Sandler, MD

#### LIAISON REPRESENTATIVES

William Anderson  
 Social Security Administration  
 Polly Arango  
 Family Voices  
 Paul Burgan, MD, PhD  
 Social Security Administration  
 Connie Garner, RN, MSN, EdD  
 United States Department of Education  
 Merle McPherson, MD  
 Maternal and Child Health Bureau  
 Marshalyn Yeargin-Allsopp, MD  
 Centers for Disease Control and Prevention

#### SECTION LIAISONS

Chris P. Johnson, MEd, MD  
 Section on Children With Disabilities  
 Lani S. M. Wheeler, MD  
 Section on School Health

### REFERENCES

1. Mattis T, French JH, Rapin I. Dyslexia in children and young adults: three independent neuropsychological syndromes. *Dev Med Child Neurol.* 1975;17:150-163

2. Vellutino FR. Dyslexia. *Sci Am*. 1987;256:34–41
3. Council on Scientific Affairs. Dyslexia. *JAMA*. 1989;261:2236–2239
4. Petersen SE, Fox PT, Posner MI, Mintum M, Raichle ME. Positron emission tomographic studies of the cortical anatomy of single-word processing. *Nature*. 1988;331:585–589
5. Galaburda A. Ordinary and extraordinary brain development: anatomical variation in developmental dyslexia. *Ann Dyslexia*. 1989;39:67–80
6. Hynd GW, Semrud-Clikerman M, Lorys AR, Novey ES, Eliopoulos D. Brain morphology in developmental dyslexia and attention deficit disorder/hyperactivity. *Arch Neurol*. 1990;47:919–926
7. Metzger RL, Werner DB. Use of visual training for reading disabilities: a review. *Pediatrics*. 1984;73:824–829
8. American Academy of Pediatrics, Committee on Practice and Ambulatory Medicine and Section on Ophthalmology. Eye examination and vision screening in infants, children, and young adults. *Pediatrics*. 1996;98:153–157
9. American Academy of Ophthalmology and American Association for Pediatric Ophthalmology and Strabismus. *Vision Screening for Infants and Children*. 1996
10. Golberg HK, Drash PW. The disabled reader. *J Pediatr Ophthalmol*. 1968;5:11–24
11. Helveston EM, Weber JC, Miller K, et al. Visual function and academic performance. *Am J Ophthalmol*. 1985;99:346–355
12. Levine MD. Reading disability: do the eyes have it? *Pediatrics*. 1984;73:869–870
13. Keogh B, Pelland M. Vision training revisited. *J Learn Disabil*. 1985;18:228–236
14. Beauchamp GR. Optometric vision training. *Pediatrics*. 1986;77:121–124
15. Cohen HJ, Birch HG, Taft LT. Some considerations for evaluating the Doman-Delacato “patterning method.” *Pediatrics*. 1970;45:302–314
16. Kavale K, Mattson PD. One jumped off the balance beam: meta-analysis of perceptual-motor training. *J Learn Disabil*. 1983;16:165–173
17. Black JL, Collins DWK, DeRoach JN, et al. A detailed study of sequential saccadic eye movements for normal and poor reading children. *Percept Mot Skills*. 1984;59:423–434
18. Solan HA. An appraisal of the Irlen technique of correcting reading disorders using tinted overlays and tinted lenses. *J Learn Disabil*. 1990;23:621–623
19. Hoyt CS. Irlen lenses and reading difficulties. *J Learn Disabil*. 1990;23:624–626
20. Sedun AA. Dyslexia at New York Times: (mis)understanding of parallel vision processing. *Arch Ophthalmol*. 1992;110:933–934
21. Bradley L. Rhyme recognition and reading and spelling in young children. In: Masland RL, Masland MW, eds. *Preschool Prevention of Reading Failure*. Parkton, MD: York Press; 1988:143–162
22. Ogden S, Hindman S, Turner SD. Multisensory programs in the public schools: a brighter future for LD children. *Ann Dyslexia*. 1989;39:247–267
23. Romanchuk KG. Skepticism about Irlen filters to treat learning disabilities. *CMAJ*. 1995;153:397
24. Silver LB. Controversial therapies. *J Child Neurol*. 1995;10(suppl 1):S96–S100

**Learning Disabilities, Dyslexia, and Vision: A Subject Review**  
Committee on Children With Disabilities American Academy of Pediatrics (AAP) and  
American Academy of Ophthalmology (AAO) American Association for Pediatric  
Ophthalmology and Strabismus (AAPOS)  
*Pediatrics* 1998;102;1217  
DOI: 10.1542/peds.102.5.1217

<b>Updated Information &amp; Services</b>	including high resolution figures, can be found at: <a href="http://pediatrics.aappublications.org/content/102/5/1217">http://pediatrics.aappublications.org/content/102/5/1217</a>
<b>References</b>	This article cites 22 articles, 5 of which you can access for free at: <a href="http://pediatrics.aappublications.org/content/102/5/1217#BIBL">http://pediatrics.aappublications.org/content/102/5/1217#BIBL</a>
<b>Subspecialty Collections</b>	This article, along with others on similar topics, appears in the following collection(s): <b>For Your Benefit</b> <a href="http://www.aappublications.org/cgi/collection/for_your_benefit">http://www.aappublications.org/cgi/collection/for_your_benefit</a>
<b>Permissions &amp; Licensing</b>	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: <a href="http://www.aappublications.org/site/misc/Permissions.xhtml">http://www.aappublications.org/site/misc/Permissions.xhtml</a>
<b>Reprints</b>	Information about ordering reprints can be found online: <a href="http://www.aappublications.org/site/misc/reprints.xhtml">http://www.aappublications.org/site/misc/reprints.xhtml</a>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **Learning Disabilities, Dyslexia, and Vision: A Subject Review**

Committee on Children With Disabilities American Academy of Pediatrics (AAP) and  
American Academy of Ophthalmology (AAO) American Association for Pediatric  
Ophthalmology and Strabismus (AAPOS)

*Pediatrics* 1998;102;1217

DOI: 10.1542/peds.102.5.1217

The online version of this article, along with updated information and services, is  
located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/102/5/1217>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 1998 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

