

Vision and learning

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When a child has learning problems, parents, teachers and therapists often seek diagnostic evaluation to determine whether or not vision could be a contributing factor. Thus, doctors of optometry should assume the role in the multidisciplinary team of health care practitioners and special education professionals for the comprehensive care of individuals with learning problems.^{1,2} The joint organizational *Policy Statement on Vision, Learning and Dyslexia* addresses these issues.³

Educational, neuropsychological and medical research has suggested distinct subtypes of learning difficulties.⁴⁻⁵ Current research indicates that some people with reading difficulties, such as difficulties related to dyslexia, have co-existing visual and language processing deficits. Unresolved visual deficits can impair the ability to respond fully to educational instruction.⁶

Once a student has the ability to read, they can then “read to learn,” rather than simply developing the technical skills needed to “learn to read.” Students at the “learn to read” level are unable to perform complex reading activities such as placing a piece of information, identifying the main theme of a text or making an easy connection with everyday knowledge.

Most of these students can probably read in the technical sense of the word. However, these students have serious difficulties in using literacy as an effective tool to expand and enhance their knowledge and skills in other areas. Students with subpar reading skills could not only face difficulties in their transition from school to the workplace, but could also fail to take advantage of a broader education and opportunities for lifelong learning.

A child who is performing poorly in school can be an exasperating challenge for parents, teachers and pediatricians. The delay in learning to read is one of the most common manifestations of so-called “high prevalence/low severity”⁷ disabilities in school-age children. Subtle developmental delays interact with environmental conditions, educational experiences, and the child’s inherent temperament, causing resulting delays in the acquisition of academic skills. For those invested in the child’s future, it is hard to passively observe the precipitous decline in self-esteem when a student realizes that his or her classmates are learning to read and he or she has not. It has been found that visual symptoms are inversely correlated with school performance - the poorer the school performance, the more symptoms reported by the patient or his or her parents.⁸ Similarly, visual skills are a predictor of academic success.⁹

It is commonly believed that two to 10 percent of children have some type of learning problem depending on the processes and definitions of each scholar¹⁰⁻¹¹ system in which reading is one of the main difficulties. Inefficient visual skills are also more prevalent in minority children and those with a low socioeconomic status. Therefore, there is a significant need for early intervention and it is vital that doctors of optometry actively participate as part of health sector personnel fighting this growing problem.

Children who read less tend to have lower academic achievement scores on visual skills tests compared with children at the appropriate reading level. Therefore, visual acuity serves as a useful tool to distinguish children with mild academic problems.¹²

Visual efficiency skills needed in the classroom

- **Distance vision:** being able to see the board
- **Near vision:** being able to see the words in a book
- **Focusing flexibility:** being able to maintain clear vision while shifting focus from a distant object to a near one, and from near to far

- **Tracking/eye movement skills:** being able to aim both eyes accurately and move smoothly across a line of print or from object to object with ease
- **Eye-hand coordination:** being able to use the eyes to guide the hands, as in handwriting
- **Eye teaming:** being able to coordinate the two eyes together so that they are precisely directed at the same object at the same time
- **Eye focusing:** maintaining, for long periods of time, completely clear vision while looking at near or distant objects

Signs and symptoms of accommodation and vergence deficits

- Asthenopia when reading or writing
- Headaches associated with near visual tasks
- Blurred vision at distance or near
- Diplopia
- Decreased attention for near visual tasks
- Overlapping letters/words while reading
- Burning sensations or tearing of the eyes during near visual tasks



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Signs and symptoms of oculomotor dysfunctions

- Moving head excessively when reading
- Skipping lines when reading
- Omitting words and transposing words when reading
- Losing place when reading
- Requiring finger or marker to keep place when reading
- Experiencing confusion during the return sweep phase of reading
- Experiencing illusory text movement
- Having deficient ball-playing skills

Visual information processing

Visual information processing skills provide the capacity to organize, structure, and interpret visual stimuli, giving meaning to what is seen. Efficient visual information processing leads to



perceptual constancy, creating a stable and predictable visual environment. In order for a child to effectively process the visual information and derive meaning from the object in space that has been selected as the “figure” and integrate at the same time the surrounding stimuli “ground,” the child needs to have balance between the central (ventral stream) and ambient (dorsal stream) visual system. We as optometric doctors have a very unique opportunity to develop such balance with the use of therapeutic lenses and/or optometric vision therapy. In order to provide the most effective treatment for the patient and be able to determine whether his or her visual system is helping or interfering with academic potential, we must understand how the child is using the visual system as well as the integration with other sensory systems. The battery of testing commonly used for a child that has academic performance problems should include the following skills and tests:

Visual perceptual skills

- Visual discrimination
- Visual form constancy
- Visual memory
- Visual spatial relations
- Visual figure ground
- Visual sequential memory
- Visual closure

Signs and symptoms of visual analysis skill deficiency

- Delayed learning of the alphabet
- Poor automatic recognition of words
- Difficulty performing basic mathematics operations
- Confusion between similar looking words

- Difficulty spelling irregular words
- Difficulty with classification of objects on the basis of their visual attributes
- Decreased automatic recognition of likenesses and differences in visual stimuli

Visual-motor integration

Visual motor integration is the ability to integrate visual information processing with motor movements and to translate abstract visual information into a motor activity.

Signs and symptoms of visual-motor skill deficiency

- Difficulty copying from the chalkboard/whiteboard
- Writing delays, mistakes, confusion
- Letter reversals or transpositions when writing
- Poor spacing and organization of written work
- Misalignment of numbers in columns when doing math problems
- Poorer written spelling than oral spelling
- Poor posture when writing, with or without torticollis
- Exaggerated paper rotation when writing
- Awkward pencil grip

Optometric evaluation of the patient with learning-related visual problems

Case history

The patient's case history should be very detailed and should verify the timeliness of his or her developmental milestones. One should ask about whether the child has had any other treatment or educational or therapeutic intervention.

Eye health

The patient must have a regular comprehensive examination to rule out any ocular health conditions.

Visual acuity

Make sure you use the appropriate target for the patient's developmental age. In non-verbal or very young patients LEA Symbols work well both near and far.

- **Refraction** Static retinoscopy
- Subjective refraction

Accommodative-vergence function

- Cover test
- Near point of convergence
- Heterophoria, near and far
- Fusional vergence amplitudes, near and far
- Vergence facility
- Amplitude of accommodation
- Accuracy of accommodative Response/lag
- Negative and Positive Relative Accommodation

- Accommodative facility
- Fixation disparity analysis
- Stereopsis

Ocular motility tests

- Developmental Eye Movement Test (DEM)
- NSUCO Pursuits and Saccades (Northeastern State University College of Optometry)
- SCCO Pursuits and Saccades (Southern California College of Optometry)
- Visagraph
- Readalyzer

Visual information processing tests

- Test of Visual Perceptual Skills (TVPS) — Revised
- Monroe Visual III
- DEM (Vertical portion)

Visual motor integration tests

- Beery-Buktenica Developmental Test of Visual Motor Integration

Laterality and directionality tests

- Piaget Right-Left Awareness Test
- Reversals Frequency Test
- Jordan Left-Right Reversal Test — Revised.
- Standing Angels

Eye-hand coordination tests

- Grooved Pegboard Test
- Eye-Hand Coordination Subtest of the Developmental Test of Vision Perception — 2

COVD QOL 30 Item

Optometry must assume its rightful role in the field of learning disabilities, working in an interdisciplinary approach to provide comprehensive care to their patients.

Likewise, given recent trends, patients are spending many hours working for what Dr. Arthur Martin Skeffington mentioned was biologically unacceptable amount of time. This adds stress to the visual system, which generates an increasingly large number of patients with symptoms and vision-related learning problems.

For this reason, doctors of optometry should consider including a standardized testing battery that would allow the doctor to determine the proper developmental age of his or her patient's visual perceptual ability. This would enable the optometrist to provide better care to the patient by designing an appropriate treatment plan that would improve the patient's potential to achieve his or her goals in life.



Efficient visual information processing leads to perceptual constancy, creating a stable and predictable visual environment.

Vision cannot be completely separated from the individual or any of their sensory systems. Vision does not have a specific location in the body, but is integrated into the complete human being. Vision is a learned skill and like all skills is likely to be improved. Its development is a holistic process that is closely associated with the simultaneous development of the whole organism. As Dr. Skeffington said "...if we cannot see 100% ... we can't be 100%."

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