

Vision: It's More Than What You See

By Amanda Nicolussi MOT, OTR/L

Vision is the dominant sense in our perception of the world around us. Approximately 70-80% of sensory receptors are allocated to vision. Over 50% of a student's day at school is spent performing near-point visual tasks such as reading and writing. An additional 20% is spent having to shift focus from far to near (and back again) in order to complete tasks like copying from a blackboard. Students spend over 70% of their day engaged in activities that place tremendous stress on their visual systems.

Take, for example, the child that is having difficulty completing assignments at school and putting together puzzles with her younger sister. She also has difficulty finding her favorite toy in the cluttered drawer. At first you think she may be having

difficulty with her vision; however, results of the vision screening at school indicated that her vision is normal. "Was the screening incorrect?" you wonder. Is there a vision problem that has not been identified?

The Components of Vision

The truth is most schools screen only for visual acuity. Visual acuity determines the sharpness of our vision, usually through identification of letters your child can read on a standardized wall chart. Although this information is highly important in determining when to refer to an optometrist for the possibility of corrective lenses, visual acuity is only one aspect of vision. The other important component of vision is visual perception. Visual perception is the brain's ability to interpret what is seen and is dependent on adequate ocular control.

Ocular Control

Six small muscles surround each eye and are responsible for coordinating eye movements. Good neck and trunk control are needed for a child's eyes to successfully work together. There is a developmental progression to the control of eye muscles.

The first area of ocular motor control to develop is visual fixation. This is usually first observed as you see a very young baby fixate their gaze on one stationary object (such as their mother's face). Visual fixation is a prerequisite skill for all other ocular motor skills. Switch of visual gaze

or divergence of gaze is the next ocular motor skill to develop. During this phase the child is able to fixate their gaze on one stationary object and then move their gaze to another stationary object. This is often first observed as a baby looks at mom and then looks at a bottle or toy. Next, visual tracking occurs when a child is capable of continually maintaining eye contact on a moving object (such as a person walking across the room). Initially visual tracking occurs with the head and eyes moving together. However, as the ability to control eye movement develops, the ability to move the eyes independently from head movement develops. Visual tracking skills progress in a developmental pattern from horizontal, vertical, diagonal, and finally circular directions. Typically, children demonstrate smooth, controlled coordinated tracking in all directions by the time they reach kindergarten. Visual scanning is the ability to move both eyes together within a visual field to find a particular item. We do this frequently when trying to locate our keys or other object that we have temporarily misplaced or when trying to find something good in the fridge to eat. Children use this skill when looking for their favorite toy or searching for pieces to put together in a jigsaw puzzle.

The ability to use both eyes together to focus on a close object, such as a picture in a book, is visual convergence. Sustained visual convergence is needed for children to perform table tasks, and sustained visual convergence combined with visual tracking and scanning is needed for reading. Visual convergence is also needed for the complete development of depth perception.

Ocular Control is a "Fine Motor" Skill

We typically think of "fine motor control" as the ability to use the small muscles of the hands for fine, delicate, intricate work such as buttoning, writing, cutting with scissors or playing the piano. The muscles in and around the eye are very small muscles indeed. Just as adequate development of finger muscles requires control of muscles in the arms, shoulders and trunk, development of ocular control is dependent on development of head and trunk control.

Because development of ocular control is dependent on strength and stability in neck musculature, children who have low muscle tone or have poor head/neck control are at particular risk for deficits in ocular control and visual perception. Activities that improve strength and endurance to the neck and trunk musculature provide the foundation for development of more refined eye movements. Vestibular

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(movement) stimulation, especially fast linear movement while lying in either a prone or supine position, strengthens the muscles of the neck and trunk to provide this important foundational skill. This is usually a component of occupational therapy treatment for children with low muscle tone and deficits in ocular control.

Eye Contact

Children with sensory processing deficits often lack the ability to use central vision and to maintain central visual focus. These children may have a preferred visual field that is not "central vision." As a result, these children may need to tilt or turn their head in order to accurately perceive visual information.

Children with autism, cerebral palsy, sensory processing disorders or other neurological disorders often have difficulty with sustained use of central vision. They have significant difficulty maintaining visual focus and are easily distracted by extraneous visual stimuli. They may have improved visual perception when using peripheral vision for close table work or when engaging in conversation. Often these children are accused of "not looking" or "not giving eye-contact" when in reality, they are "looking."

Some children with sensory processing deficits often have difficulty processing sensory information from more than one sensory system at a time. Sometimes, when trying to concentrate on difficult subject matter, children may be able to comprehend better if not having to spend extra energy "looking" at the same time they are listening.

Visual Perceptual Skills

Visual perception is how the brain processes what is being seen. Visual perceptual skills include a child's ability to recognize and identify shapes, colors, objects, and other qualities. It is dependent on the eyes' ability to maintain a visual focus and move in a coordinated manner. Visual perception is also dependent, to some degree, on higher level cognitive processing. Components include:

Sovereign Pediatric Therapy Welcomes

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Amanda graduated from Midwestern University with a Masters degree in Occupational Therapy and has experience working with children with a variety of challenges including cerebral palsy, autism, muscular dystrophy and sensory processing disorders. Amanda has a passion for empowering children to achieve their fullest potential. Amanda lives with her husband, Mark, and their dog, Gimli, in Carol Stream, IL. Amanda is a marathon runner and is continually training for the next long run. Amanda is currently accepting new patients at our Naperville location.



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Visual discrimination: The ability to detect features of an object for recognition, matching and categorization. For instance, can the child tell the difference between a circle and a square?

Visual memory and visual sequential memory: The ability to remember what was seen and/or the sequence or pattern. For example, remembering the word being copied instead of having to look at each individual letter.

Visual spatial relationship: The ability to determine the relationship of figures and objects to themselves or other objects. For example, when writing, children are expected to know how to place letters and words on a paper in the correct location and orientation.

Visual form constancy: The ability to recognize forms and objects as being the same even when they are in various environments, positions, and sizes. For example, the letter "A" and "a" are the same even though they are different sizes and formats.

Visual closure: The ability to identify an incomplete form or object. The ability to read a poorly copied document from a printer almost out of toner would be an example of when visual closure may be needed.

Visual figure ground: The ability to find an object within a cluttered background. If a child has difficulty finding their favorite toy in a cluttered drawer, or finding their pencil on a messy desk, they may have a visual figure ground deficit.

Summing it up

For most of us, the task of moving our eyes happens as automatically as breathing. However, for some children, moving their eyes is not automatic and requires conscious effort, and the need to expend added energy. This leaves less energy available for tasks such as learning new material or listening. Lack of ocular control not only impacts vision and attention skills, but it also impacts coordination and balance. Occupational therapy can help children develop the foundational skills needed for refined ocular control. When ocular control improves, attention, visual perception, and improved school and social performance often result.

Want more information on your child's use of vision?

Join Amanda Nicolussi and Debra Denniger, Pediatric Occupational Therapists, on Thursday, May 6, from 7-8:00 pm, in our Naperville office, for a presentation titled: **Visual Motor Control and Visual Perceptual Skills.**

Call 630.585.7337 for reservations.



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