

Vision impairment in children with cerebral palsy

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Everyone knows that children with neurological impairments are more likely to have visual impairments than typically developing children or those with other disabilities. This is only logical, as the most common causes of neurological impairments such as anoxia or prematurity, are equally associated with eye conditions – for example, optic nerve atrophy and retinopathy of prematurity (ROP). Additionally, the same etiology that results in damage to the motor cortex can also be expected to affect the visual cortex and indeed, cortical visual impairment is also common in this population. To complicate issues, motor development milestones such as reaching and crawling that promote the development of normal visual capacities, are delayed or absent in these children, putting children with intact visual systems at risk for delay or inadequate quality in some visual skills.

As can be imagined, the impairment of vision impedes easy and rich learning in any child, but in a child with additional impairments, the loss of access due to the combined condition, can have tremendous consequences. While the impact of the combination of vision and hearing loss on learning and development is often discussed, not enough attention has been paid in the literature to the challenges of motoric impairments like cerebral palsy, when it occurs along with visual impairment. When vision is poor or absent, we teach children to rely on the ability to move around, to hear, and to use touch to explore as alternate ways of learning about the world. For children with low vision, touch serves as a key way of concretizing their visual experience. Motor issues often mean that touch as an alternate exploratory sense is also inadequate. Many children are hypersensitive or hyposensitive and so many children with cerebral palsy have limited hand and finger skills and poor or absent independent mobility.

Many children who have cerebral palsy have “normal” eye exams, but have problems in using their vision efficiently (Jacob & Prabhakar, 2006, Jacob et al, 2008). Particular areas of difficulty are gaze maintenance and the associated problems of following, tracking and gaze shift. Additionally, many have issues in the judgment of depth, focusing at near, and in older children, perceptual tasks such as reading and writing. Finally, a major difficulty seemed to be in the willingness or ability of the children in giving visual attention in functional situations, although it could be elicited in clinical or “managed” environments. As an interventionist, this is important to know and check for in functional assessments of children. It is also an area that can be supported effectively with a good understanding of the learning process.

This discussion focuses around some issues that pose specific challenges to use of vision when a child has atypical motor development so we can better understand why children with normal vision but atypical motor development, may still have trouble utilizing their visual capacity efficiently for learning.

Motor development and vision

At birth, the visual system is not completely developed. Much of its development proceeds in response to visual experiences, particularly in the first year of life. Many visual skills develop in tandem with the maturation of the motor system and therefore the health and functioning of the visual system is often at risk when there are delays or dysfunctions in the motor system.

Let us look at some normal milestones that allow for rich visual experiences in the infant. From when they are very young, infants have many experiences of looking and gaze maintenance. Lying on their back, they gaze at their environment, captured by patterns, light, contrast and movement. They practice many visual skills in this position – keeping their gaze on things and following them as they move. We talk of babies being stimulus governed, looking being comparatively little under their control. With enough of this experience though, infants begin to exercise their choice, moving their eyes with greater and greater control and volition to look at what they want to see. It is this active looking that will support healthy visual skill development.

The first major move to volitional and controlled looking comes at around two to three months, coinciding with the development of head control, a more stable experience of the world in a vertical position, and with the beginning of reaching to objects. Batting provides early eye-hand experience, incorporating gaze fixation, convergence, reach, gross arm control and the gradual discovery of the power of their hands

Let us switch here to children with neurological impairments. What early looking experiences do they have? Often struggling for survival in intensive care units, they have little desire to see and little to see if they desired

In another month or two, the little infant will push up with his hands while lying on his stomach. The proprioceptive input and the motor organization and balance they experience when pushing up on their arms, gives them valuable foundation skills of organization of gaze, making it stable, developing the capacity to direct it, focus it and thus lays the foundation for the emergence of convergence. Children with motor delays may not do this until well past their first year of life. It is not surprising then that gaze maintenance and convergence are often challenging for our children.

Many children with motor delays, with no visual impairment as per their eye exam, still did not prefer to use their vision for learning even though it would have increased their task efficiency. Looking at their early visual experiences and the particular difficulties of their motoric impairment, we can see some reasons for this preference.

Understanding why children may not value vision

Visual experiences

Children with severe motor issues often spend a large part of their early life lying down. They miss much of the infant's experience of volitional change of positions and as a

result have less experience in developing visual perspectives. With poor head control delayed often by several months to years or even life, or with strong reflexes that trigger uncontrolled movements, consider what typical visual experiences are available to the children. While sitting, head hanging down or head hanging back are the two most common positions in which the children find themselves. As a result, for large parts of the day, their visual universe is restricted to the ceiling or floor.

Integrating sensory input

Learning is facilitated by combining information from our different senses. Hearing the telephone ring, the baby watches as someone goes and picks it up and notices that the ringing stops. When something brushes his foot, the child looks down and sees the cat. Seeing it, the child reaches out to pull and poke at it to see what it does. Poor motor control and co-ordination, means that the child will miss many of these experiences. By the time the child has turned his head, the adult may already be on the phone and the cat will be long gone. Experiences are often a series of still photographs rather than the fluid, constant information of a video. Unless well mediated, a lot of information and understanding of process may be lost. Many children learn early that using vision actively – turning to see something, searching the environment visually – is not useful, and may not even *try* to turn.

Additionally, limitations in sensory processing capacity mean that integrating input from more than one sense at a time is a challenge for many of these children, particularly children born very premature, children who have failed to thrive, those with negative hospital or other early experiences and children with CVI.

Conclusion

In order to provide good early intervention, we must understand the limitations the motor impairment poses on the development of visual capacities and functions and come up with alternate experiences that enable children to realize their visual potential. Functional vision assessments must be carried out within the context of the overall development and experience of the child so that we do not confuse visual processing issues with larger sensory or early experience issues. Intervention strategies may then be tailored to respond to the cause of poor use of vision.

References

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