



# 2016 SWOMA Conference: Moving On

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Learning to Move / Moving to Learn:  
A Focus on Early Motor & Mobility Development

Presented by

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# Learning to Move / Moving to Learn: A Focus on Early Motor & Mobility Development

## Objectives for Today

- Review the basics of early motor development.
- Examine the impact of early onset blindness/visual impairment upon early motor development.
- Highlight appropriate intervention strategies.

## Fine and Gross Motor Definitions

Motor skills are motions carried out when the brain, nervous system, and muscles work together. Fine motor skills are small movements, such as picking up small items or holding a spoon that use the small muscles of the fingers, toes, wrists, lips, and tongue. Gross motor skills are the bigger movements, such as rolling over, sitting up, crawling, and walking— that use the large muscles in the arms, legs, torso, and feet.

Developmental Definition: MOBILITY: “Mobility for a child with blindness/visual impairment refers to motor development, including the normal integration of reflexes, acquisition of motor milestones, refinement of quality-of-movement skills, and purposeful, self-initiated movement” (Anthony et al., 2002, p. 328)

Motor Development Building Blocks: Variables that affect the rate and quality of motor development of young children include: healthy brain maturation, healthy central nervous system, unaffected input from sensory systems, and opportunities to practice skills.

Motor Development Directionality: Cephalo-caudal: Infants’ muscular development proceeds from head to toe. Proximo-distal: Infants improve control of muscles starting at the midline of the body and moving toward extremities. Gross to fine: Infants gain control over their larger muscles before their smaller muscles

Motor Development Sequence: With each developmental step, the next skill missed or not fully mastered will affect children’s abilities to achieve subsequent skill mastery. Mobility and Stability: The acquisition of controlled movement or of postural control requires both stability (maintaining a posture) and mobility.

## Components of Movement

Primitive Reflexes	Posture / Body Alignment
Tone	Balance
Strength	Righting /Protective /Equilibrium Responses
Rotation	Coordination of Movements
Sensorimotor Integration	Motor Planning
Locomotion (move from place to place independently)	
Conceptual Understanding	

What is the Same? What is Different? When a child has early onset blindness /visual impairment? Same: Children must learn to move in order to move to learn.

Different: It helps to understand the role of vision in motor milestones.

## Role of Vision in Motor Skills

Primary functions include:

- a) incentive to engage in movement;
- b) simultaneous and precise spatial perceptions of visible space;
- c) protection opportunity due to visual anticipation of dangerous situations;
- d) control of movement by tracking its performance;
- e) feedback of motor performance based on monitoring quality of executed movements.

The two secondary functions include:

- a) social feedback perceived from other's facial expressions or body language that invite or `detour movement and
- b) observation of others to support imitative motor acts. (Brambring, 2006)

Our Research Literature Tells a Story: Early researchers noted the impact of blindness upon the developing child's motor development. Further research and a cross-developmental understanding have elevated our understanding of a unique developmental path for infants who are blind/visually impaired. Early intervention has brought a focus upon specific interventions to mitigate motor concerns.

Motor Development: Our Role: Suggest / model specific strategies to the team that will promote security, safety, and self-initiated, purposeful movement in young children.

Collaborate with physical and occupational therapists to ensure optimal motor, sensory, and movement development through functional activities within the context of daily routines and natural learning opportunities. Collaborate to develop an understanding of the impact of BVI upon motor development and movement. Suggest specific strategies that will promote security, safety, & self-initiated, purposeful movement. Collaborate with PTs and OTs to ensure optimal motor, sensory, and movement development through functional activities within the context of daily routines and natural learning opportunities. But never abdicate – we are experts in blindness and movement / movement.

Getting Started! Motor Reflexes: Reflexes are involuntary responses to specific sensory stimuli—generally tactile, proprioceptive, or vestibular. Newborns' reflexive behaviors dominate movement, facilitate survival and set the stage for early primitive learning.

Postural Reactions: Postural reactions are automatic movements and adjustments in response to or in anticipation of, changes of position in relation to the center of gravity. Postural reactions provide the basis for postural stability upon which more mature movement is built.

Two Types of Postural Reactions: Righting reactions are automatic movements that restore normal alignment of the head in space and of the trunk in relation to the head. Support reactions and protective reactions are responses that maintain upright posture when the body is suddenly displaced.

Vision Loss May Affect Righting Responses Optical righting. Labyrinth righting Equilibrium responses.

Vision plays a role in these righting responses.... the righting responses result in body weight shifts, which in turn strengthen the upper extremity and trunk.

Equilibrium reactions are integrated responses that help to maintain balance when the child's center of gravity is disturbed by an external force.

The Glue! Postural Tone" Postural tone refers to the readiness of the muscles to respond to stimuli from the brain. The tension of the muscles must be sufficient enough to maintain anti-gravity postures and still allow for movement to new postures.

Postural Tone: Postural tone can be too high (hypertonia), too low (hypotonia), or fluctuating between high and low (athetoid). With children who are blind/visually impaired, there is a tendency toward "low normal tone."

Vision & Proprioception: Since all movement operates on a feedback system, either visual or proprioceptive, the latter sense provides the only means by which people who are blind can identify and precisely coordinate movement. "Limited or absent "body part watching" – influences movement and, later, maintaining specific body positions used for protective techniques and cane techniques. Rosen (1997, p. 174)

Vision and Vestibular Systems: Children who are blind/visually impaired may not learn to fully use vestibular input (Rosen, 1997) and may demonstrate motor problems such as hypotonia, delayed postural reactions, and delayed movement milestones (Brown & Bour, 1987; Jan, Robinson, Scott, & Kinnis, 1975). When there is a vision loss, it is more than a loss of a sensory system – the use of vestibular and proprioceptive input is affected (Strickling, 1998).

Vision Ties to Postural Tone - Impact of Hypotonia: The hypotonia reported in preschool-age children who are blind has more significant impact on static than on dynamic balance. Static balance skills ("standing up for a short time" or "standing up confidently") requires "only" stable body posture, whereas performing dynamic skills ("walking along a line" or "bending down") calls for additional locomotor abilities or movements of the whole body.

Role of Active Movement: Blind (all) children must become "active movers" if they are to become independent travelers." Cutter, 2007, p. xvii.

Self-initiated movement—not passive movement where the child is moved by others—is essential for children to develop motor skills. Proprioceptive and vestibular awareness, muscle tone, and coordination are developed when children experience active movement.

Self Initiation: "One way to describe the essence of active movement is when children are free to move when and where they want. This can be done when children monitor their own movement. Monitoring their own movement occurs when children decide when and where to move and when to start and stop their own movement. When the purposeful thought for movement comes from the child, this is one way to describe "active movement and when we do the movement for children by manipulating their bodies, this is one way to describe passive movement

Blind children are vulnerable to experience more than their share of passive. For example, when blind children are manipulated manually by adults, what they experience is passive movement and not their own active movement. This is not the way to learn about the world.

Resistance to Being in the Prone Position Can Lead to: Decreased spinal extension due to proximal tone deficits at shoulders and hips. Reduced upper extremity strength due to poor proximal stability. Challenges of fluid, graded upper extremity movements, Reduced proprioceptive awareness of arms in space The upper trunk of the baby's body is used to explore their "first ground," the parent. Through such exploration, the baby develops the appropriate components of movement. Similar exploration may not occur when the baby is placed on the floor, which is not as interesting a space as the parent's chest." Joe Cutter, 2007, p. 37

The Eyes Usually Lead the Hand - Hands of Young Children with VIB - Hands are open within three months – though less grasping and exploration behavior. Less play at midline. Reach noted at 9 months – tied to object permanence. Grasping triggered by an auditory stimulus emerges later in development than grasping behavior triggered visually (Bigelow, 1983, 1986)

Manual Skills – Research 2007: Stronger delays in manual or daily living skills are stronger than those found in gross motor. Fine motor impose higher coordination demands than gross motor. High degree of variability. Suggestion that children who are blind apply different strategies to compensate for loss of vision when they acquire single skills. Tool function skills – twice as long to accomplish. (child needs to be responsive to working from behind guidance to assist with spatial and multiple objects components of the task). Need time for tactile and auditory exploration, guidance, and practice.

Pipsqueaker Endorsement from JC Greeley: Children at this stage are usually in an "egocentric" phase, needing to "center" or pull in to midline so that they can establish an ultimate reference point with a tactile boundary they recognize as "me." Since auditory information tracks are most consistently intact, if not enhanced, when other sensory pathways may be impeded, the squeaks strongly reinforce suggestions for pairing sound with tactile info for "holistic" conceptualization on child's part.

Transitional Movements: Movement transitions refer to movement from one position to another. Simple transitional movement sequences can be incorporated into daily routines. Adelson & Fraiberg, 1974

Although children who are blind may be able to sit and stand independently within the age range of sighted children, they may not move into, out of, or forward from these positions at the same ages as sighted children. Adelson & Fraiberg, 1974

Crawling: Some children with visual impairments demonstrate delays in crawling; others never crawl. Developmental lags in crawling might be related to the fact that reaching to objects by sound alone occurs later in infants who are blind.

Strategies to Encourage Crawling: Provide opportunities to: reach while in the prone position and on all fours, and to play on all fours, especially to encourage side-to-side weight shifts to develop the balance needed to shift weight and free one side for movement. Facilitate movement transitions: prone to supine (tummy to back) | supine to sitting; sitting to all fours to develop the underlying components of movement needed for crawling.

Cruising: Cruising means walking sideways along furniture or walls using one or two hands for support. Children with vision often cruise before they walk independently. Benefits: Provides varied and repeated hands-on experiences. Promotes development of mental maps and upright, independent mobility. Prepares children for trailing. Lowry & Hatton, 2002

Walking: Most children begin to walk independently at 10 to 15 months of age, and with practice, soon become very independent in walking. Children who are blind may take steps with hands held and stand alone toward the end of their first year, but may show delays in taking independent steps.

Capitalize on the Child's Motivation to Move: The goal is for the child to self-initiate her movements as an active learner. The motivation stems from the desire to want to explore or do a specific task. Knowing a child's preferences will help family members and professionals know how to situate tasks. If a child loves water play, there are many ways to encourage movement with the reward of water: independent travel to the bathtub, dumping toys into the tub; standing and shifting weight from one leg to another to stay involved in the activities of a water-play table in a preschool classroom, running through a lawn sprinkler, puddle splashing on a rainy day, and swimming lessons at the neighborhood pool.

Older Students: 2010 Research to validate the use of the Test of Gross Motor Development 2 (TGMD-2) (locomotion: run, gallop, hop, leap, horizontal jump, slide and object control: two handed strike, stationary bounce, catch, kick, overhead throw, and underhand roll) Age range – 4 – 12 years,. Findings: Valid tool, Qualitative differences; Boys did better than girls

In Summary, Children with BVI May Display  
decreases in head-righting responses to movement;  
delays in the development of protective, righting, and equilibrium reactions;  
low postural tone;  
lack of head and trunk rotation; and

paucity of movement and decreased exploration of the environment.

Early Onset BVI: Motor Impact: Motor (movement) development may be delayed and may present with atypical patterns (quality of movement) of motor development. The impact of visual impairment on early motor development depends on a complexity of interactions between children's characteristics and the characteristics of the social and physical environment.

## What We Know

It is not enough to simply know motor development.

We must understand contributions of:

- role of vision
- role of low postural tone
- the role of auditory localization
- the role of object permanence
- the role of self-initiated movement in the developing child's motor /movement development

When we understand, we can be proactive and see results.

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Figure 1 Region 11 ESC logo.

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Figure 2 TSBVI logo.



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