

Sensorimotor Development and O&M

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What is Sensorimotor Development?

- The **awareness** and **interpretation** of sensory information and its **integration** with motor skills to perform activities in an **effective** and **efficient** manner.

– Rosen, S. (2010). Improving sensorimotor functioning for orientation and mobility. In W. R. Wiener, R. L. Welsh, & B. Blasch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. II, pp. 118-137). New York: American Foundation for the Blind.

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Kinesiology

- The study of movement
- Provides structure for categorising, analysing, understanding, and communication about sensorimotor skills

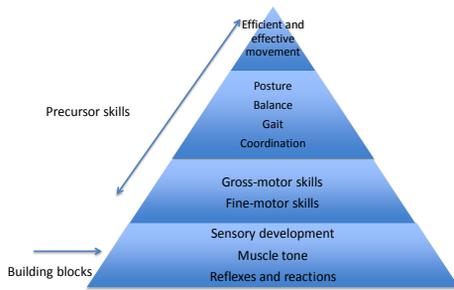
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The Process of Motor Development

- Cephalo-caudal
- Proximo-distal
- Gross to fine and general to specific

Hierarchy of Motor Abilities



Rosen, S. (2010). Etiology and sensorimotor functioning for students with vision loss. In W. R. Wiener, R. L. Welch, & E. Blusch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. 1, pp. 138-172). New York: American Foundation for the Blind.

Reflexes

- What are reflexes?



Early Reflexes

- Rooting



- Moro



Early Reflexes

- Stepping



- Palmar



Early Reflexes

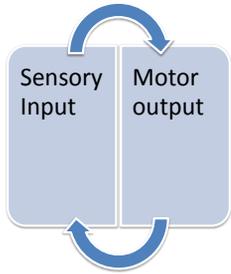
- Asymmetrical Tonic Neck Reflex (ATNR)



- Symmetrical Tonic Neck Reflex (STNR)



Sensorimotor functioning



Sensory awareness

- There are seven major types of sensory input, which are....??



Vision

- Feedback mechanism by which children develop, self-monitor, refine, and integrate sensorimotor skills into daily functioning.
- Provides vital sensory input in integrating other sensory systems.

Tactile System

- Deep touch (awareness of touch)
- Light touch (textures)
- Vibration
- Pain
- Temperature
- Two-point touch (identification of the number of points of contact an object has with the skin at any given time)

Proprioception

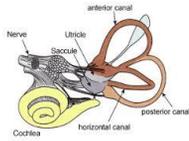
- Awareness of body position in space
- Together with tactile input, forms *haptic perception*



Proprioceptive System

- Receptors located in the muscles, tendons and joints of the body.
- Provide an awareness of **static** body position at any given moment and the **relationship of body parts to one another.**

Vestibular System



- Located in the inner ear
- Plays an important role in **regulating muscle tone** and **coordination, balance and equilibrium**, and arousal and attending state.

Vestibular system

- Fully functional at birth.
- Children who have not learned to use vestibular input are delayed in gross-motor activities requiring coordination of both sides of the body, balance, eye-hand coordination and fine-motor control.
- May also show poor muscle tone , delayed postural reactions and delayed mobility.

• Rosen, S. (2010). Kinesiology and sensorimotor functioning for students with vision loss. In W. R. Wiener, R. L. Welsh, & B. Blasch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. 1, pp. 138-172). New York: American Foundation for the Blind.

Impacts of Vision Impairment

- Motivation to lift head.
- Development of muscle strength and control of the head, neck, and trunk.

<http://www.brillbaby.com>



(Rosen, S. (2010). Kinesiology and sensorimotor functioning for students with vision loss. In W. R. Wiener, R. L. Welsh, & B. Blasch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. 1, pp. 138-172). New York: American Foundation for the Blind.)

Impacts of Vision Impairment

- Potential delays in:
 - Reaching for objects
 - Crawling
 - Walking



– <http://www.tinylove.com>

Impacts of Vision Impairment



- Muscle tone
 - Hypertonia - too high
 - Hypotonia - too low
 - Athetoid - fluctuation between high and low

– <http://pedsinreview.aappublications.org/content/30/3/e66>

Postural Reactions, Stability and Control

- low postural tone
- decrease in head-righting responses to movement
- lack of head and trunk rotation
- delays in the development of protective, righting and equilibrium reactions
- paucity of movement and decreased exploration of the environment

Postural Reactions

- Automatic movements and adjustments
- Basis for postural stability



Postural Stability

- Delayed motor development.
- Atypical patterns of motor development.
- Low tone through trunk and pelvis.
- Weak abdominal muscles.
- Static and dynamic balance reactions are diminished.

Head and Neck

- Head often deviated to one side.
- Head 'stacked' or dropped forward.
- Sways or moves nonpurposefully.



Shoulders, Arms and Hands

- Unstable shoulder girdles with poor proximal control - 'floppy'.
- 'Winging' at scapulae.
- Weakness of arm muscles and intrinsic hand muscles.
- Forearm supination and pronation diminished.
- Poorly developed arches of the hand.

Legs and Feet

- Legs externally rotated from hip
- Hypermobile knees and hips
- Toe-walking
- Wide base of support

Legs and Feet

- Elevated shoulders.
- Excessive movement through the trunk while walking.
- Persistence in high guard posture.
- Pronation at midfoot.



• <http://www.cabotchiropractor.com>

Postural Tone

- Children with motor dysfunction can present with abnormal postural tone.
- Postural tone is changeable and influenced by
 - movement
 - handling
 - positioning
 - the task itself

Postural Stability

- Ability to maintain body posture as weight is shifted.
- Infants may use certain positions that provide mechanical stability to perform a new movement.
- Muscle contraction to provide stability.
- Through maturation and practice of movement, the muscles will be capable of providing dynamic stability.

Sensorimotor development and O&M

- Impacts on:
 - Individuals with congenital vision loss
 - Elderly populations

Exercise

- [Long cane travel exercise](#)
- As you watch this video, what do you observe about the long cane traveller's posture and gait?

Key Principles

- Sequencing.
- Active movement.
- Quality of movement.

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Key Principles

- **Timing** of movement
 - Sequential development of sensorimotor skills at normal developmental ages.
 - O&M skills and techniques can be adapted to be developmentally and age-appropriate – this builds the foundations for effective functional motor and mobility skills later in life.

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Key Principles

- **Integration of movement**
 - Sensorimotor activities need to be incorporated within individual’s everyday lives.
 - Sports and recreational activities provide excellent opportunities for development and ongoing facilitation of sensorimotor functioning.

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Further reading

- Celeste, M. (2002). A survey of motor development for infants and young children with visual impairments. *Journal of Visual Impairment & Blindness*, 96(3), 169-17.
- Rosen, S. (2010). Kinesiology and sensorimotor functioning for students with vision loss. In W. R. Wiener, R. L. Welsh, & B. Blasch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. I, pp. 138-172). New York: American Foundation for the Blind.
- Rosen, S. (2010). Improving sensorimotor functioning for orientation and mobility. In W. R. Wiener, R. L. Welsh, & B. Blasch (Eds.), *Foundations of orientation and mobility* (3rd ed., Vol. II, pp. 118-137). New York: American Foundation for the Blind.
- Warren, D. (1994). *Blindness and children: An individual differences approach*. Cambridge, UK: Cambridge University Press.

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