# WHY SENSORY SKILLS AND MOTOR SKILLS MATTER

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The following gives a brief understanding of sensory brain connections and movement brain connections that aid in your child's development.

Sensory brain connections and motor brain connections are necessary building blocks for all aspects of child development and learning, including mood and social development. Early development and learning begin with sensation and gesture.

Deep brain areas (brain stem) that are responsible for involuntary sensory and motor reflexes emerge in-utero and protect/help the fetus develop in the womb and survive/grow out of the womb. This reflex development lays a foundation for higher sensory motor brain areas to develop. The timing/modulation of sensory motor connections in the brain can be inefficient in children having developmental difficulties. This can result in sensory difficulties including sensory sensitivity, sensory defensiveness, sensory integration deficits and dysfluency of movement.

Even during early gestation at five weeks in-utero, the fetus withdraws from touch to the upper lip. As sensory motor connections develop, sensory awareness matures. At nine – twelve weeks in-utero the fetus does not withdraw and is less startled by touch (Moro reflex). At birth, sensory motor connections help prepare the child for delivery and exploration of the world. Efficient sensory motor development at birth and at very early ages allows for progress from apedal to quadrapedal (crawling) to bipedal movement (standing). Sensory motor

development is also connected with breathing and heart rate. If the sensory system is inefficient, overcharged (hyper) or undercharged (hypo), then breathing and heart rate will be inefficient (hyper or hypo). This is why when a child is startled due to sudden change or noise for example, breathing is excited and arms go out (sympathetic nervous system response). When a child is relaxed, breathing calms down and arms come in (parasympathetic nervous system response). This reflects the "fight" or "flight" response. Interestingly, a hug brings arms in and relaxes breathing. Children with pervasive sensory delays are often overexcited by sensory stimuli and often flap their arms and hands and breathe quickly and develop repetitive behaviors. This is also why children having sensory motor delays can be prone to anxiety.

Sensory motor reflexes associated with palm/hand movement are linked with sucking, swallowing, feeding, digestion and breathing. These reflexes also emerge inutero (Palmar reflex). This is why infants knead their hands in pace with feeding/sucking. It is also why stroking or closing the palm of the hand eases/calms children, especially children with sensory motor delays. Stroking a child's palm can also be beneficial in the feeding process. Hand/body coordination is also associated with reflex development inutero. An infant's head turning to one side causes extension of arms and legs on that side and the other side of the body flexes (asymmetric tonic neck reflex). This begins eye/head/hand coordination. If you touch a baby's cheek while feeding, the child's head turns toward the touch and sucking increases. In time, the sight of the breast/bottle can elicit sucking responses.

If an infant is in the prone position and you stimulate one side of the spine, the hip will rotate to that side (spinal gallant reflex). This reflex also emerges in utero and is inhibited by 3-9 months of life. This reflex is also associated with sound because movement results in vibration and vibration produces sound. Even amniotic fluid movement allows for vibration through the spinal cord.

Sensory- motor pathways are found throughout the entire body. It is a whole body experience. The vestibular (balance) nerve is the only cranial nerve connected throughout the body. Every sensory system connected with the vestibular system is energized through movement/vibration. A reflex that is vestibular in origin and produces a whole body impact is the tonic labyrinthine reflex that emerges at birth and is inhibited by 6 weeks- 3 years of age. This reflex aids in head forward and backward movement. Head movement above and below the spine helps control eye movement, crawling, balance, walking and global motor modality. The head, neck, arms and legs are all tied together allowing for a full sensory motor experience. Even the pre-educational impact of movement is noted at these early stages of child development. If the child has difficulty with control, coordination, and balance in the sensory system there is an impact upon the global sensory systems affecting attention, reading, writing, memory, language, mood, and even social interaction.

As a child develops, midbrain and higher brain connections develop, eliciting more mature reflexes. Righting reflexes emerge approximately 3-12 months of age and remain throughout life. A child's head and trunk stay in position as the body turns. Equilibrium reactions through connections from the brain stem through the midbrain with the higher cortex emerge from 3-6 months and last throughout life. These reactions protect children and help tilting, balance, and coordination. If not modulated efficiently children can look clumsy or get dizzy with movement or rides in a car. Head control allows one to cross midline with eyes without having to turn the head. If a child's body moves forward, the head and neck go backward. If a child's body moves backward, the head and neck go forward. This aids balance and coordination. It is also linked with inner ear and movement. Otoliths have gel mass into which the inner ear projects. This is under the influence of gravity, hair cells, and movement. Movement and hair cells in the inner ear result in vibration which results in sound.

More advanced reflexes help a child to keep the head level when tilting the body (labyrinthine, head righting reflex). They help the head stay stable when eyes move on a target (occular head righting reflex). These reflexes help make tone develop and help movement from prone (stomach) to supine (back) positions. These sensory motor connections allow for rolling and allow for alignment of the trunk of the body with the head when rolling or rotating (sequential rolling reflexes). This is why when an infant's head is on one side, the reflex reactions allow the body to follow the line of the head. As an infant's body tilts and whole body reaction starts, the thorax tightens, stretching the body starts, the abdomen and legs move, and rolling begins starting with the shoulders and hip. Movement begins with head, shoulder, thorax, and pelvis and vice versa. The child can sit, kneel, stand, walk, run, and jump. Reflex maturation is a continuous process.

The smallest muscle in the body, the stapedius muscle, is found in the ear. The acoustic-stapedius reflex begins approximately 2-4 months of age as the moro reflex is inhibited. Loud noise (greater than 80-90 decibels) activates this reflex which reduces sound to protect the inner ear (approximately 20 decibels). Many children with pervasive sensory problems, including autistic children, are sound sensitive because this reflex is inefficient. This reflex also activates just before vocalization so as to reduce interference of the sound of one's own voice. Contraction of the muscle pulls occicles away from the ear drum and lessens vibrations and sound. If not efficient it would be like talking in a vacuum with the sounds echoing in the head.

The nerve that controls this muscle mingles with the facial nerve affecting facial expression in the skin of the external ear. This is also why some children with pervasive developmental disorders have flat facial expressions or varied pallar of the external ear. Many often have a horse voice related to vibration alterations. If this process is significantly inefficient select mutism can develop. Startle reflexes increase because the sensory system is overwhelmed and the startle impedes language expression. Some children with developmental delays are very picky

eaters. Some prefer softer foods and some prefer crunchier foods. It is possible that, due to this reflex/sensory inefficiency, that the children hear the sound of what they are eating as echoing too loudly. Or, some of the children may not even be able to sense the impact of chewing when eating.

From conception forward, connections from the brain stem through the mid brain to the higher cortex and back, are developing and interacting so as to promote a child's development. The body and all sensory connections become a vehicle for brain development. Movement affects the sensory system, sound affects the sensory system, touch affects the sensory system, light affects the sensory system, and anxiety affects the sensory system.

We are multi-sensory beings. Optimal learning and development requires alertness/relaxed alertness. Optimal development requires efficient timing modulation of sensory systems throughout the body. Inefficient systems that are over-charged or under-charged will impede development and quality of life. Awareness of sensory pathways and movement pathways can aid in developing the quality of a child's life.