

AYRES SENSORY INTEGRATION® FOR INFANTS AND TODDLERS

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EARLY IDENTIFICATION AND INTERVENTION IS ADVISED FOR ALL INFANTS AND TODDLERS WITH SUSPECTED DIFFICULTIES. IT IS WELL ESTABLISHED THAT EARLY INTERVENTION CHANGES THE TRAJECTORY OF DEVELOPMENT THROUGHOUT LIFE. IF WE EXAMINE THE RESEARCH IN NEUROPLASTICITY, WE FIND THAT IN YOUNG ANIMALS AND HUMANS' EXPOSURE TO SENSORY INFORMATION AND EXPERIENCES FROM THEIR ENVIRONMENT LEADS TO SPECIALIZATION AND MATURATION THAT FOSTERS GROWTH AND DEVELOPMENT. IN A RECENT SERIES OF ARTICLES PUBLISHED IN THE JOURNAL OF PEDIATRICS ON SCREENING, EVALUATION, AND TREATMENT FOR 0-3 AND CHILDREN WITH ASD, THE RESULTS WERE CONCLUSIVE (ZWAIGENBAUM ET AL, 2015A, B, C, D). CHILDREN WHO WERE IDENTIFIED AND TREATED EARLIER HAD BETTER OUTCOMES. IN FACT, THREE OF THESE ARTICLES WERE CONSIDERED WITHIN THE TOP 20 MOST INFLUENTIAL RESEARCH ARTICLES ON AUTISM OF 2015 (INTERAGENCY AUTISM COORDINATING COMMITTEE, 2015). WHETHER CHILDREN ARE IDENTIFIED AS HAVING AUTISM OR OTHER DEVELOPMENTAL CONCERNS, IT IS INCUMBENT UPON PRACTITIONERS TO ACT SWIFTLY WHEN CONCERNS ARISE WITH INFANTS AND THEIR FAMILIES.

Ayres Sensory Integration® (ASI): Ayres Sensory Integration® is a developmental theory that provides insights into the way in which sensory information from the body and about the world is integrated and informs actions and interactions. Sensory integration and processing is the management and organization of incoming sensory information from both the Central Nervous System (CNS) and the Peripheral Nervous System (PNS) to produce adaptive responses in people and the environment. These adaptive responses influence performance during activities of daily living including play, movement, socializing, and learning.

In typical development, sensory experiences shape the way in which the baby understands feelings from inside the body such as hunger, temperature, and the need to eliminate as well as information about body position and movement from the vestibular and proprioceptive systems, and information about sensations emanating from the world outside the body through touch, vision, smell, taste, and hearing. (See Table 1)

'IN TYPICAL DEVELOPMENT, SENSORY EXPERIENCES SHAPE THE WAY IN WHICH THE BABY UNDERSTANDS FEELINGS FROM INSIDE THE BODY..!'



The perceptual knowledge of these sensations builds with every experience, facilitating learning and adaptation to environmental challenges. In most infants, this process proceeds at an amazing pace, unconsciously, and with few difficulties. All functions of the brain must be in balance with each other to produce the most effective adaptive response in daily living activities (i.e. playing, eating, and school performance). Processing and interpreting sensory information efficiently is imperative for successful participation in home, community, and school environments. However, increasing numbers of infants are struggling with sensory integration and for those families it is often confusing why their babies or toddlers are struggling, and why their lives are difficult.

These hidden deficits in sensory integration are often mistaken for other types of issues such as motor control, behaviour, or emotional stability. They are not all the same and are often missed.

'LIMITATION IN CREATING STANDARDIZED MEASURES WAS DUE TO THE DIFFICULTY TESTING CHILDREN IN YOUNGER AGE RANGES...'

While Ayres identified sensory integration and praxis difficulties across the lifespan including in young children (Ayres, 1979) and adults (Brown, 1974), Ayres Sensory Integration® (ASI) theory and practice has been applied primarily for preschool and school age children. This is due in part to the availability of performance assessments, particularly the Sensory Integration and Praxis Tests (SIPT) that has normative data from 4 years to 8 years 11 months (Ayres, 1989). Limitation in creating standardized measures was due to the difficulty testing children in younger age ranges with these tests, and the maturation of abilities tested by the SIPT by age 9 so that normative data in the older age ranges was not essential. Unfortunately, the limitation in the age range of the tests has led some to believe that the identification and intervention for sensory difficulties is restricted to school age children. Certainly,

definitive evaluation of sensory integration and praxis is difficult with infants and young children, however, it is imperative that informed occupational therapists identify and treat these concerns in young children and not wait for the time if and when they can perform on the SIPT.

There are several classic patterns of sensory integration difficulties that present quite differently from one another (Mailloux, Mulligan, Smith Roley et al, 2011). Based on the babies that we have seen for evaluation and intervention, we have consolidated these patterns of difficulties into four main types, the Fussy Baby, the Sleepy Baby, the Clumsy Baby, and the Disorganized Baby. These sensory integration and praxis patterns we have identified are related to how these babies present in parent reports and clinical observations in the intervention session.

(See Table 2)

The Fussy Baby: These babies have difficulty modulating their responses to sensation, both from the exteroceptors and the interoceptors.

Sensory modulation is the nervous system's process of self-organization and regulation of its own activity. It is the process of increasing (exciting) or reducing (inhibiting) neural activity to keep that activity in harmony with all other functions of the nervous system. Babies who are experiencing poor regulation of sleep, feeding and mood are struggling with homeostasis. Caregivers of these babies are often worried, exhausted and confused about how to support growth, development and behavioural organization in their young charges.

Co-regulation between parents and babies may be disrupted, leading to missed cues and poor bonding.

THE SLEEPY BABY: These babies have diminished perception from one or more sensations. They often under react to sensation and may not fully register important sensation such as hunger or temperature. They may get sleepy during a feeding, taking prolonged time or not waking when mother's body is letting her know it's time for her baby to eat. They may not visually explore their



environment and have decreased response to social interactions. They are at risk for missing perceptual learning due to prolonged sleeping or lack of noticing that are critical foundations for social skills and development.

THE CLUMSY BABY: These babies have signs of poor vestibular-proprioceptive awareness essential for head control, posture, and bilateral motor control. They are often referred for delays in sitting, standing, crawling and walking. They may have delayed head control for midline positions, have difficulty tolerating lying on their tummies, and fall a lot once they start to independently sit, stand, or walk.

THE DISORGANIZED BABY: These babies have difficulty figuring out how to do even simple tasks unless someone shows them. Some babies have difficulty figuring out how to motor plan the use of their bodies to do things or to move in and around obstacles. Some babies have difficulty figuring out how to manage objects spatially such as when fitting things inside of a container or stacking blocks. Some babies have difficulty imitating facial or hand gestures during social play.

‘THESE BABIES HAVE DIFFICULTY FIGURING OUT HOW TO DO EVEN SIMPLE TASKS UNLESS SOMEONE SHOWS THEM.’

When they get a little older they may also have difficulty figuring out how to follow one or more verbal instructions. This baby may be reaching developmental milestones but has poverty in their repertoire of movement or play ideas. There is a distinct lack of flexibility in motor skills. The baby uses the same motion each time and becomes frustrated when he or she is unable to use the preferred pattern for the motor action. These babies often have difficulty with transitions between sitting and crawling, sitting and standing, getting down from standing, pulling up to standing. They often cry for assistance in changing position.

ASSESSMENT:

Occupational therapists who provide evaluation of sensory integration and praxis for babies and toddlers must have a solid understanding of typical and atypical development, not only for motor, social or cognitive milestones but also for the sensory regulatory and perceptual abilities that are the building blocks for development.

‘WHEN THEY GET A LITTLE OLDER THEY MAY ALSO HAVE DIFFICULTY FIGURING OUT HOW TO FOLLOW ONE OR MORE VERBAL INSTRUCTIONS.’

While all of occupational therapy is meant to be family centered, the younger the child, the more critical it is to consider that baby within the social, environmental, cultural, and socio-economic context within which they are growing. Some say there is no such thing as a baby; there is only the baby and his or her caregivers as one unit. Since babies are part of their family system, therapists must consider attachment to their family unit when we are evaluating and creating intervention programs. Caregiver feedback is critical to consider during assessment, intervention, and home follow-up.





The following assessment tools can be used to evaluate sensory integration and praxis abilities in young children, usually used in combination with each other and clinical observations:

- Sensory Integration and Praxis Tests (SIPT)
(Ages 4 – 9 yrs.) (Ayres, 1989)
- Postrotary Nystagmus Test, 9 months to 4 years
(Mailloux, et al, 2014)
- Preschool Imitation and Praxis Scale
(Ages 1.5 – 4.9 yrs.) (Vanvuchelen et.al. 2011)
- Sensory Processing Measure-P
(Ages 2 – 5 yrs.) (Parham & Ecker, 2010)
- Test of Sensory Functions in Infants
(Ages 4 mo. – 18 mo.) (DeGangi & Greenspan, 1989)
- Infant/Toddler Sensory Profile
(Ages 0-3 yr.) (Dunn, 2002)
- DeGangi-Berk Test of Sensory Integration
(Ages 3 – 5 yrs.) (DeGangi, 1983)
- Miller Function and Participation Scales
(Ages 2.6 – 3:11 and 4 - 7.11) (Miller, 2006)
- Miller Assessment for Preschoolers
(Ages 2.9 - 5.8) (Miller, 1988)

The following clinical observations additionally inform our understanding of the child:

1. Goodness-of-fit between the caregiver and child:
Consideration of the caregiver's sensory preferences and how that fits with the child.
2. Signs of Autonomic Instability:
 - Flushing or other colour changes
 - Perspiring
 - Gagging
 - Turning and arching away from stimuli
 - Digestive system changes such as spitting up, bowel movements, and hiccups
 - Changes in heart rate, respiratory rate, or oxygen saturation

3. Regulation of arousal states, state change, activity level, emotion, and attention.

Examples of dysregulation:

- Difficulty establishing sleep/wake/eat/elimination cycles
- Poor maintenance of calm, alert state when awake
- Over or under reactive to typical sensations such as hugs, clothing, bathing
- Difficult to console, fussy, irritable
- Difficult to wake and once awake, difficult to go back to sleep
- Dislikes movement or head position changes

4. Sensory Perceptual Skills:

- Child's unusual enjoyment or dislike of various sensations
- Child's attention to usual things in the environment or lack of awareness to sensations such as someone calling his/her name

5. Vestibular-postural ocular and motor control:

- Head position, head lag
- Righting responses
- Dynamic equilibrium
- Postural adjustments
- Labyrinthine responses
- Disassociated movements
- Bilateral coordination
- Emergent laterality

6. Praxis including the child's ability to utilize the affordances of the physical environment:

- Motor planning
- Sequencing
- Imitation, oral facial gestures
- Tool use
- Exploring environmental space
- Construction
- Symbolic play or representation of objects
- Ideation



Further training is required for the occupational therapist to accurately differentiate sensory integration and praxis difficulties from other neuromotor deficits or diagnoses such as visual or hearing impairment or autism.

Sensory integration and praxis deficits often co-exist with these other diagnoses.

WHAT TO DO (FOR SPECIFIC SENSORY STRATEGIES SEE TABLE 3):

TIPS FOR THE FUSSY BABY

Sensitive babies tend to cry more, have more digestive upsets, are easily awakened, and have difficulty settling into sleep. Parents and caregivers often feel overwhelmed by the fussy baby's needs. These families need support and guidance to find sensory strategies that help the fussy baby find homeostasis.

Teaching parents and caregivers calming and organizing sensory tools that work for their baby builds confidence in their caregiving abilities and supports attachment within the families.

'THESE FAMILIES NEED SUPPORT AND GUIDANCE TO FIND SENSORY STRATEGIES THAT HELP THE FUSSY BABY FIND HOMEOSTASIS.'

Parents/caregivers can identify what we call STOP SIGNS in their babies, such as colour changes, looking away, jerky movements or fussing, that alert them to signals that the baby is becoming dysregulated, which is a sign of losing homeostasis.

Caregivers will see better regulation in babies if they see one or more STOP SIGNS and cease to make social demands and apply one or more calming sensory activity until the baby is calm and organized again. Usually the baby will calm to sleep or indicate their desire for cuddles or playful communication.

In this way self-regulation is learned and the attachment processes is improved.

TIPS FOR THE SLEEPY BABY

Parents/caregivers become aware of their sleepy baby particularly when the baby is not staying awake to drink or waking when it is time to eat. Sometimes babies look sluggish or disinterested in people and objects, not looking when their name is called or not noticing relevant things around them. It is particularly concerning when it is affecting weight gain or when developmental skills including motor milestones are delayed.

Parents/caregivers may feel it takes a lot of effort to engage their baby due to decreased social responsiveness, which interferes with attachment.

We know we have sleepy babies when more intense stimulation wakes them up, increases smiles and laughter, and they are better able to engage in the world around them. Baby massage is an excellent strategy and is associated with improved weight gain and growth in infants (Feber, et al., 2002).

TIPS FOR THE CLUMSY BABY

Parents/caregivers often become concerned about their babies if they have difficulty holding up or turning their head in the early months, fail to acquire typical motor milestones or when moving, show asymmetry or uncoordinated movements.

Babies with difficulty acquiring motor skills and moving in a coordinated way, often have difficulty with vestibular-proprioceptive processing. They may have difficulty sustaining their balance while sitting, standing, crawling and walking. They often benefit from engaging in frequent and more intense vestibular and proprioceptive sensory input obtained through swinging, carrying, and dancing together with their caregivers. Moving through space and understanding where and how their bodies are moving are essential for babies to develop improved sensory motor coordination.



TIPS FOR THE DISORGANIZED BABY

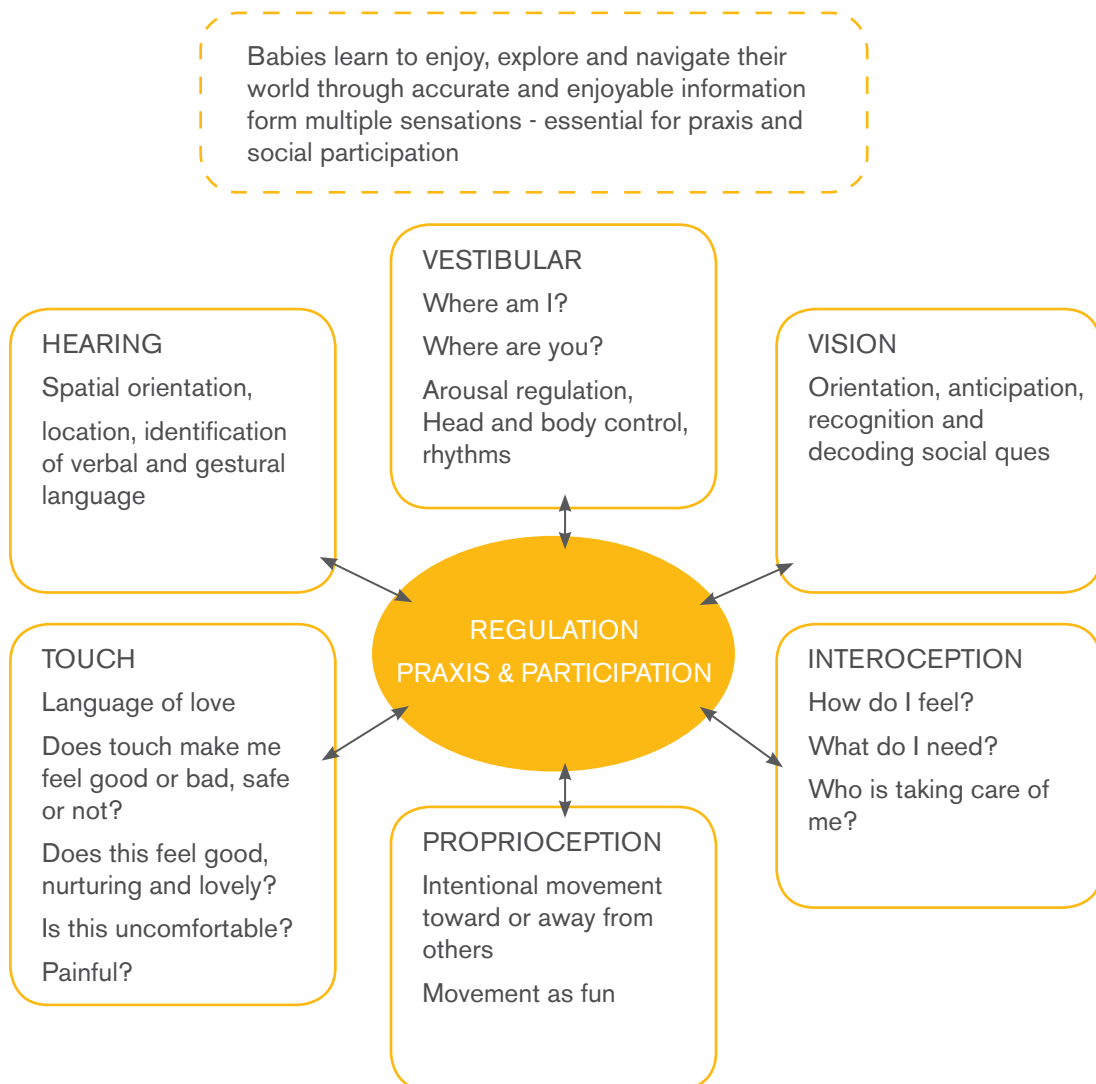
Parents/caregivers are often confused when their children don't seem to easily learn new skills. These babies seem to need more assistance from their caregivers when doing simple tasks, even learning how to push into sitting, sit down from standing, or navigate obstacles. When we observe these babies in play, they may prefer to do the same game over and over and become upset with the introduction of new or novel games, rather than showing excitement with them or experimenting with different ways to use their body or exploring different toys or spaces.

Imitation in play and in social interactions may be limited or missing. Activities that help babies to figure out how to do new things or old things in new ways are essential for supporting development of praxis.

WHEN TO REFER FOR OT

Parents/caregivers will benefit from occupational therapy consultation when they have concerns about their baby's development. While typical development unfolds at different time frames caregivers with concerns should

TABLE 1



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seek out assistance to confirm or calm their fears. When in doubt, call and see your occupational therapist to ask whether the child will benefit from a full evaluation or if perhaps simply gaining some advice will suffice.

CONCLUSION

Babies learn to enjoy, explore, and navigate their world through accurate and enjoyable information from multiple sensations, essential for mastery and the development

of praxis and social participation. Sensory strategies are useful for supporting typical development. Occupational therapy using a sensory integration approach is advised when infants and young children have dysregulated behaviours, motor delays or difficulty learning which is not significantly improved through sensory enrichment provided by the caregivers.

TABLE 2
Sensory Integration including Praxis and Sensory Regulatory Difficulties
SIGNS AND SYMPTOMS IN INFANTS AND YOUNG CHILDREN
 © Susanne Smith Roley and Kate Crowley 6/06; revised 2016

FUSSY BABY	SLEEPY BABY	CLUMSY BABY	DISORGANIZED BABY
Sensory Over-responsive/ Defensive	Sensory Under-responsiveness	Poor posture ocular motor	Poor praxis including planning/sequencing
Pushes away when handled, held too closely, cries during bath or with textures	Withdrawn, self-absorbed or seems lost	Weak, poor muscle effort, floppy, sluggish, heavy to carry	Confused how to do things; needs extra time to learn something
Cries to noises, holds hands over ears; gets wild with loud music, high energy, high affect	Slow to wake, lethargic	Head lag, weak neck muscles, needs to hold head up when sitting	Tolerates transitions poorly
Labile especially in situations with lots of people, noise and movement	Excessive self-rocking, jumping, pounding or making-sounds	Poor eye contact and head, neck and eye control	Repetitive behaviours, poor transitional movements
Eating and feeding difficulties, including being held or socializing while feeding	Stuffs mouth, poor chewing and swallowing with food, craves extreme tastes	Clumsy, uncoordinated	Poor imitation of gestures, finger or facial play
Easily stressed and difficult to console, withdraws from human comforting efforts	Seeks extreme sensations even those that may be perceived as painful	Awkward positioning of body, doesn't correct	Immature play routines, limited play repertoire, only familiar scenarios
Picky eater, gags at sight and smell as well as taste	Crashes into people, objects, reckless behaviour	Cannot sit still or stand still without leaning	Rigid, inflexible, fearful of new people or situations



Demonstrates fight, fright, flight or freeze behaviours	Self-stimulates on visual or motor actions	Can run and climb, but cannot learn ball skills	May not use hands as tools; prefers others to do things
Shields eyes to lights, poor eye contact	Responds well to high affect, high energy	Poor hand use for manipulating objects	Difficulty following directions
Intolerant to smells	High pain tolerance	Delayed motor skill acquisition	Cannot track time sequences
Dislikes head position changes; cries when jostled	Misses auditory & visual cues or other important features of the environment	Poorly coordinated use of two hands, no preference	Difficulty with puzzles; Poor construction

<p>TABLE 3</p> <p>TIPS FOR SUPPORTING SENSORY INTEGRATION</p> <p>INCLUDING SELF-REGULATION AND PRAXIS IN INFANTS AND YOUNG CHILDREN</p> <p>© Susanne Smith Roley and Kate Crowley 6/06; revised 2016</p>			
FUSSY BABY	SLEEPY BABY	CLUMSY BABY	DISORGANIZED BABY
Sensory Over-responsive/ Defensive	Sensory Under-responsiveness	Poor posture ocular motor	Poor praxis including planning/sequencing
Constant pressure touch rather than intermittent touch through swaddling or baby wearing in a sling or carrier	Help child wake up with gentle and soothing but alerting sensory activities	Spend more time carrying the baby through space and swinging to activate head control and muscles	Provide activities that increase body centered-sensory information
Reduce ambient sounds such as turning off television	Fast intermittent bouncing, rocking, or dancing providing vestibular sensations in parent's arms, a baby swing or a bucket swing at the park (Look for STOP SIGNS to avoid overwhelming this baby).	Frequent swinging, dancing, and being held and carried provides vestibular and proprioceptive sensations that support motor development	Provide activities that increase movement awareness through vestibular and proprioceptive sensations



Support environmental adaptation using soothing sounds such as a fan or ocean sounds, pastel colours and reducing number of toys	Provide more opportunities for movement throughout the day	Pull baby to sit with support to their back while encouraging head control	Give the baby additional time to process information; wait for the baby to initiate an action before continuing
Slow vestibular input in a rocking chair or baby swing	Stroking the baby's cheeks and lips to prepare muscles before latch on and suck/swallow; use cold or warm	Provide proprioception such as bouncing on a small ball with baby in sitting, pulling into sitting, and lying on tummy in preparation for crawling	Encourage baby to play in a way that invites imitation, for example facial play, vocal play, songs with hand gestures, or using a toy such as shaking a toy to make noise
Increase proprioceptive sensations produced by bouncing in a parent's arms or seated on a small ball	Check for health related conditions such as reflux or gastrointestinal issues. Provide additional sensory opportunities throughout the day	Physically position babies so that their bodies are in a well-aligned position of their head, trunk, and arms	Encourage baby to try different ways of moving in and out of positions; sitting to prone, prone to sitting, sitting to crawling, sitting to standing and back down
Nursing on demand; sitting at eye level with the family during mealtimes	Light tactile sensation such as lightly stroking baby's arms and legs, leaving baby's skin open to the air if the temperature is warm	Provide opportunities for bouncing at various intervals that activates their muscles	Take pictures of real people, places and things to show and label for the baby; can create baby books that help the child anticipate events
Daily baby massage	Provide enticing toys that support babies to move, reach, lift their head, or track with their eyes	Introduce ball play starting with balloons or bubbles that move slowly that they can track and catch	Support baby's ability to grasp different objects; show what objects can do such as fork, or cause and effect toys
Expose baby to pleasant non-chemical smells through herbs, flowers and oils	Baby massage followed by light touch to baby's arms, legs and face	Provide larger than usual objects to grasp such as baby spoons with built up handles, large crayons, or other tools that support grasp	Use songs and games for following verbal directions for gestures, pointing, or body movement
Watch for STOP SIGNS	Provide alerting sounds through music or vocal sounds and talk about what is going on around the baby during social interactions	Physically help baby/child to move in various ways through rolling games or songs such as Row, row, row your boat	Create visual schedules of activities; use kitchen timers and show clocks with clock faces for time



<p>Talk quietly to the baby and position caregivers face in front of baby at about 18 inches distance without moving too much to gain eye contact</p>		<p>Encourage baby to use both hands first by grasping two objects, then transferring hand to hand, and then with both hands working together like tearing paper or opening containers</p>	<p>Show babies/child ways to build with blocks, knocking them down and rebuilding and imitating structures</p>
<p>Prepare baby in advance by talking quietly and making eye contact before moving; be aware of head positions when moving baby through space</p>			

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PARENT RESOURCES:

SENSORY STRATEGIES FOR PARENTS OR THE SENSITIVE BABY:

Sensory Strategies for the Sensitive Baby:
www.youtube.com/watch?v=G3tengTlu40

DR HARVEY KARP:

<https://www.youtube.com/watch?v=eK4O9N3DjJM>

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CO-SLEEPING:

Dr William Sears:

http://www.babycenter.com/2_the-benefits-of-swaddling-your-baby_10347122.bc

PARENTING THE SENSITIVE BABY:

<http://passporttofunction.com/2016/04/parenting-the-sensitive-baby/>

SWADDLING:

http://www.babycenter.com/2_the-benefits-of-swaddling-your-baby_10347122.bc

BABY MASSAGE:

http://www.researchgate.net/publication/10996314_Massage_Therapy_by_Mothers_Enhances_the_Adjustment_of_Circadian_Rhythms_to_the_Nocturnal_Period_in_Full-Term_Infants

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