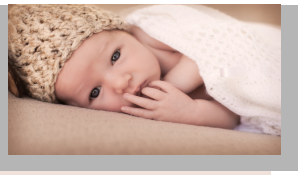
SENSE AND SENSIBILITY

Sensory processing difficulties following a neonatal admission



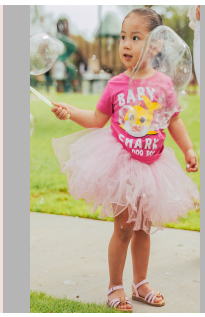
Emily Hills, Neonatal occupational therapist

GOALS OF THE SESSION

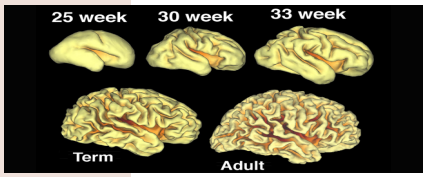


- Understand sensory processing
- Sensory environment and the preterm infant
- Sensory activities to enhance self regulation and infant development.

- We are sensory beings
- We live in a sensory world
- Our sensations are unique to us







- There are critical periods of sensory development and we can not accelerate development through stimulation.
- Sensory development is critical for attachment and preparation for the world.
- Out of phase sensory stimulation may interfere with normal development.

Credit for this image goes to Van Essen (Washington University in St. Louis), in collaboration with Terrie Inder, Jeff Neil, Jason Hill and others. The image illustrates human cortical development through gestation and into adulthood. http://brainvis.wustl.edu/wiki/index.php?Main_Page

SENSORY DEVELOPMENT

Tactile
proprioceptive
Vestibular
Taste/smell
Auditory
Vision









- Pineda et al (2017) enhancing sensory experiences for very preterm infants
- Sensory: sensory modulation and the preterm infant Broring T et al (2017)
- Celik et al (2017) 10-12 months sensory processing
- Crozier et al (2016) Sensory Processing Patterns in Children born very preterm
- Broring T et al (2018) Sensory Processing in school age children born very preterm
- Ryckman et al (2017) SPD in preterm infants
- Philpott-Robinson, K., et al. (2017). "The impact of the Neonatal Intensive Care Unit on sensory and developmental outcomes in infants born preterm

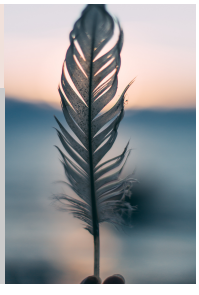
THE TACTILE SYSTEM

- Frist sensory system to arrive and last to leave
- Discriminative, protection, regulation
- Skin receptors (largest and heaviest organ in human body)



TACTILE EXPERIENCES IN NICU

- Skin is fragile and vulnerable to pain and trauma.
- Average 14 painful procedures per day (Simons, 2003)
- Difficult for preterm infant to distinguish between different types of touch.



RECOMMENDATIONS

Use soft, gentle touch in all caregiving interactions.

Provide neutral thermal environment for the infant

G.R.A.C.E (Halifax model of compassion)

- Gather your attention
- Recall your attention
- Attune by checking in with yourself
- Consider what will really service your patient
- Engage, enact ethically and then end the interaction

Do with not do (Waitzman, 2018)

5 Step dialogue (Bond, 2002)



Bambi Medical

RECOMMENDATIONS

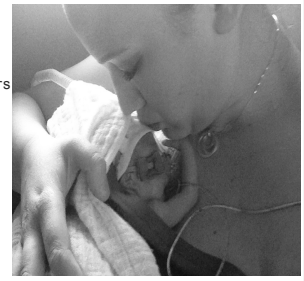
- Positioning: grasping, sucking and hand on face are important self-regulation techniques.
- Positioning: Flexion, containment, comfort and alignment
- Painter at al (2019) study improving neurodevelopmental outcomes in NICU patients results showed better weight gain, improved tone and flexion and higher scores in HINE

RECOMMENDATIONS: MASSAGE



Skin to skin holding

- Pineda et al (2018) Parent participation in neonatal intensive care unit: predictors and relationships to neurobehaviour and developmental outcomes.
- Charpak et al (2017) 20 year follow up KMC vs traditional care



THE VESTIBULAR SYSTEM



- Vestibular system is located in the inner ear.
- It detects head movements and gravitational pull.
- It influences development of posture and equilibrium
- It stabilises our visual field.
- It impacts on emotional regulation

VESTIBULAR EXPERIENCES IN NICU

- Can be fast, sudden and unexpected
- Preemie flip!!!!
- Fly Zone!



RECOMMENDATIONS

- Help everyone recognise each baby's response to movement.
- There are many challenges when moving and handling a preterm infant.
- When lifting a preterm baby avoid supine, instead use lateral or prone.
- Turn the baby slowly and keep them in contact with a solid surface.
- Keep them in contact with your body when getting them out.
- Jesus, V. R et al (2018) Effects of hammock positioning in behavioural status, vital signs, and pain in preterms.

CHEMOSENSORY SYSTEM OLFACTORY



- Olfactory receptors are embedded in mucous membrane in the roof of the nasal cavity.
- Olfactory tract transmits signals to the olfactory cortex and limbic system.

CHEMOSENSORY SYSTEM GUSTATORY



- Much of the sensation that we consider taste is actually olfactory.
- Most taste buds are on the tongue and soft palate, although some are also on the epiglottis, esophagus and inside the cheeks.
- Flavor is a combination of taste (5 types) and smell (thousands)

CHEMOSENSORYEXPERIENCES IN NICU

- Limited opportunity to taste.
- Unpleasant taste experiences
- Warren and Bond (2010) exposure to nosocomial odours can irritate delicate developing lungs.
- Preterm infants are exposed to nosocomial odours an average of 1320-1800 times during their first month of life (Kuhn et al, 2011)



RECOMMENDATIONS

- Support positive smell experiences.
- Maternal odours have the potential to reduce stress and enhance attachment.(Thomas, 2014)
- Discourage aversive smells.
- Formula milk often changes the babies smell.
- Parents also need to smell their babies.

RECOMMENDATIONS

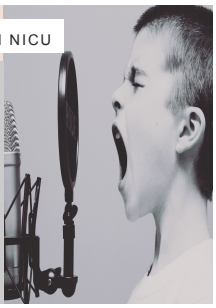
- Gentle oral care with mothers EBM.
- Medications via NG/OG tube.
- non-nutritive suck with taste of breast milk during gavage feed.
- make every feeding enjoyable experience

THE AUDITORY SYSTEM



- arousal and attention
- emotional bonding
- survival/protection
- information from the environment
- social/communication
- underpins speech/language development

AUDITORY EXPERIENCES IN NICU



- Sounds can be loud and unexpected.
- Think about continuous noise in the NICU, stop and listen. Think about the peak noises for example, alarms, doors, talking, crying babies, bleeps.
- Pineda et al (2014) Alterations in brain structure and neurodevelopmental outcome in preterm infants hospitalized in different neonatal intensive care unit environments J Pediatr 2014;164:52-60, e2.

Quality	peak intensity dB (A)	Example	Inside Incubator	Effect
just audible	10	heartbeat		
very quiet	20-30	whisper		<35 dBA desired for sleep
quiet	40 50	Average home light traffic for work	background	<50dBA desired
moderately loud	60 70	normal conversation vacuum cleaner	motor on and off bubbling in ventilator tubing	Annoyance
loud	80 90	Heavy traffic telephone ringing pneumatic drill	tapping incubator with fingers Closing the metal cabinet doors under the incubator	Hearing loss with persistent exposure
very loud	100	Power mower	Closing solid plastic porthole	
Uncomfortably loud	120 140	Boom box in a car jet plane 30m overhead Rocket-launching pad	dropping the head of the mattress	Pain and distress

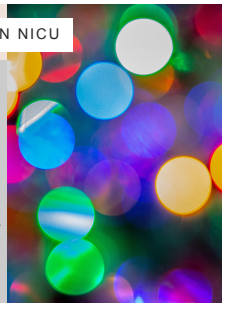
Source: American Academy of Paediatrics

VISUAL SYSTEM



- Survival and protection
- Attention, Orienting, localising & tracking
- Guidance of motor functions & posture
- Identification of the objects in the environment

VISUAL EXPERIENCES IN NICU



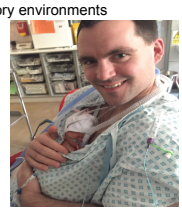
- REM sleep is essential for visual development
- Bright light or sudden changes cause physiological instability: apnoeas and bradycardias.
- Post term insufficient light leads to myopia.

RECOMMENDATIONS

- Protect the preterm infant from bright or direct light.
- Be careful where you place toys and pictures in the incubator.
- Near darkness <25 lux
- From 32 weeks 200 lux max (1-2 hours per day increasing to max 8 hours as approaching term)
- Natural light wherever possible.
- Avoid fluctuations.
- Protect sleep cycles and especially REM sleep.

PARENTS ARE THE MOST APPROPRIATE SENSORY ENVIRONMENT

Skin to skin offers an opportunity for multi-sensory environments which support development.



- Touch (skin to skin, temperature)
- Chemosensory (scent and taste)
- Hearing (hear beat)
- Vision (protected by parent)

- Our Sensory systems develop in a sequence.
- Sensory experience is essential for development.
- We all respond to sensory input differently.
- It is essential to have a good understanding of infant behavioural cues.





