

CARING FOR YOUR BABY'S BRAIN WHILE IN THE NICU

A guide for you and your family

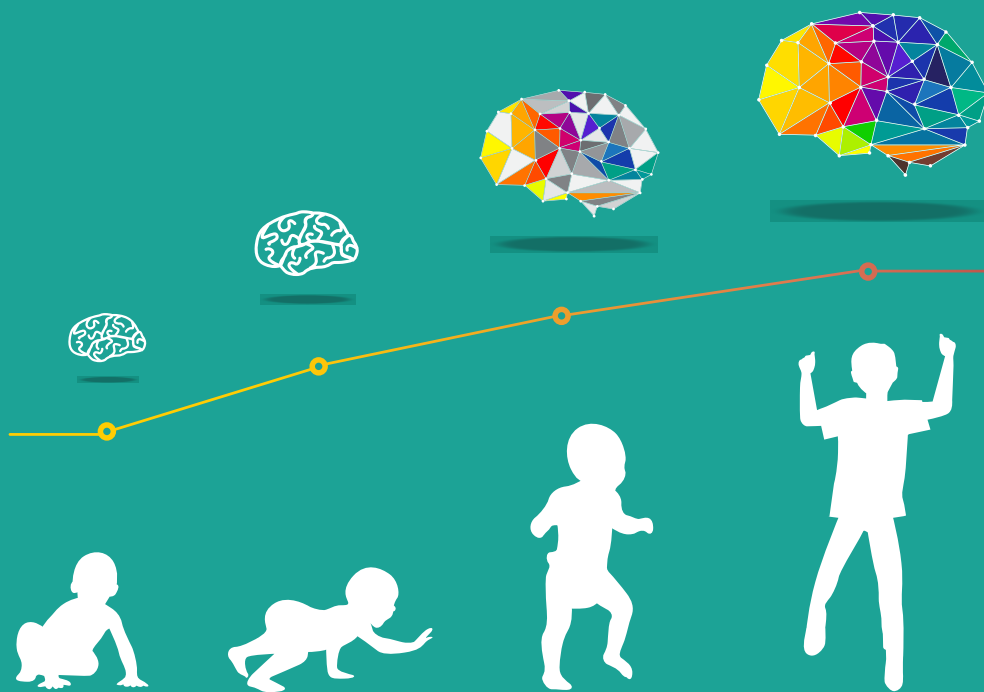



shands children's Hospital

A small scientific guide of WHY and HOW to care
for your baby's developing brain.

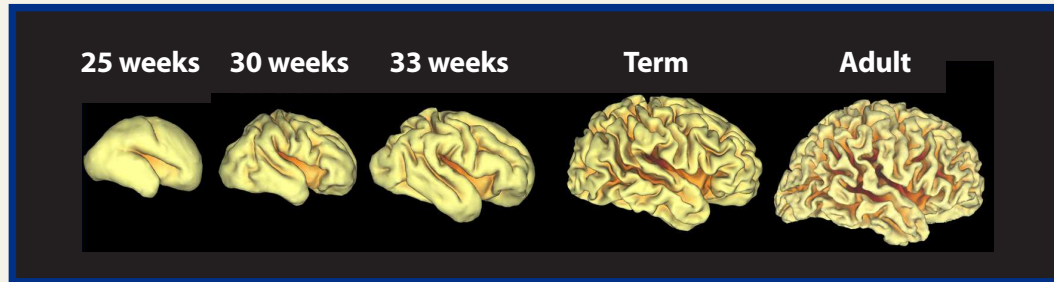
Medical science says

YOU are the MOST IMPORTANT PERSON
to help with your baby's neuro-development.



YOUR BABY'S BRAIN DEVELOPMENT

Your baby's brain develops in stages. This development naturally occurs when the baby is inside the mother's womb. The natural environment in the womb gives it adequate stimulation to develop, together with nutrition and protection.



However, since your baby has arrived early, various factors can alter its development such as:

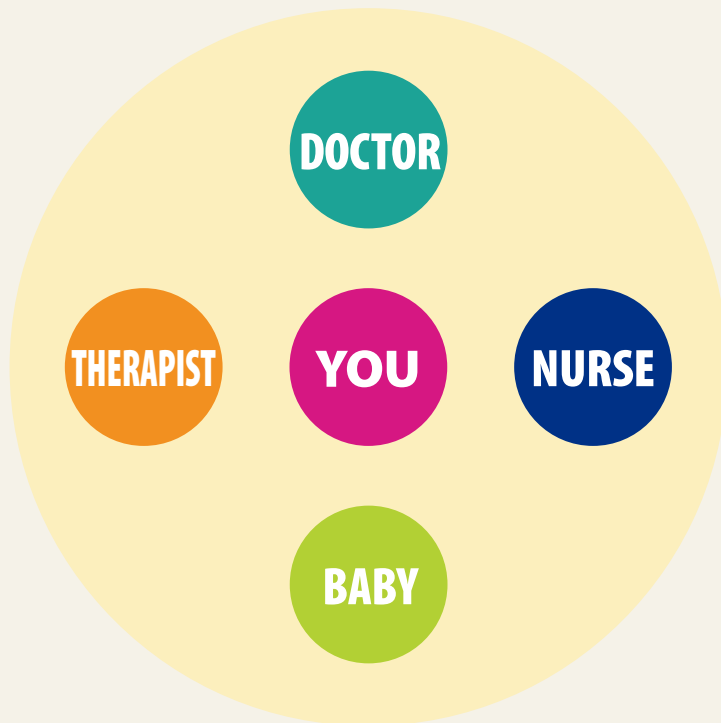
- External environment in NICU (and home after baby is discharged)
- Unfortunate events/injuries after birth while in the NICU and later

Some of the effects are reversible and some are not. However there is a window of opportunity to work and help the brain re-wire, which is most crucial in early months to years.

Research says that YOUR presence and your stimulation is very important, which begins right here in the NICU and then continues at home.

Developmental care team

You play a central role in the **developmental care team** which includes your doctors, nurses and specialized occupational therapists, or OTs.



- Your baby's doctor will tell you what you can do at each stage
- Your baby's nurse will be at baby's bedside to help you
- Your baby's therapist will show you the techniques
- ...and most importantly, your baby will tell you when he/she is ready

GETTING TO KNOW YOUR BABY

Understanding your baby's cues and knowing when he/she is ready

Your baby is ready to interact when...

- Breathing is smooth and regular
- Color is pink
- Looks comfortable with arms and legs more close to the body
- Holding hands close to face
- Awake and trying to make eye contact
- Looking around
- Cooing
- Trying to open and close their mouth
- Seeking something to put in their mouth
- Moving arms and legs smoothly

Your baby will show different signs depending on his/her stage of development. Your baby's nurse and therapist will guide you towards understanding these cues.

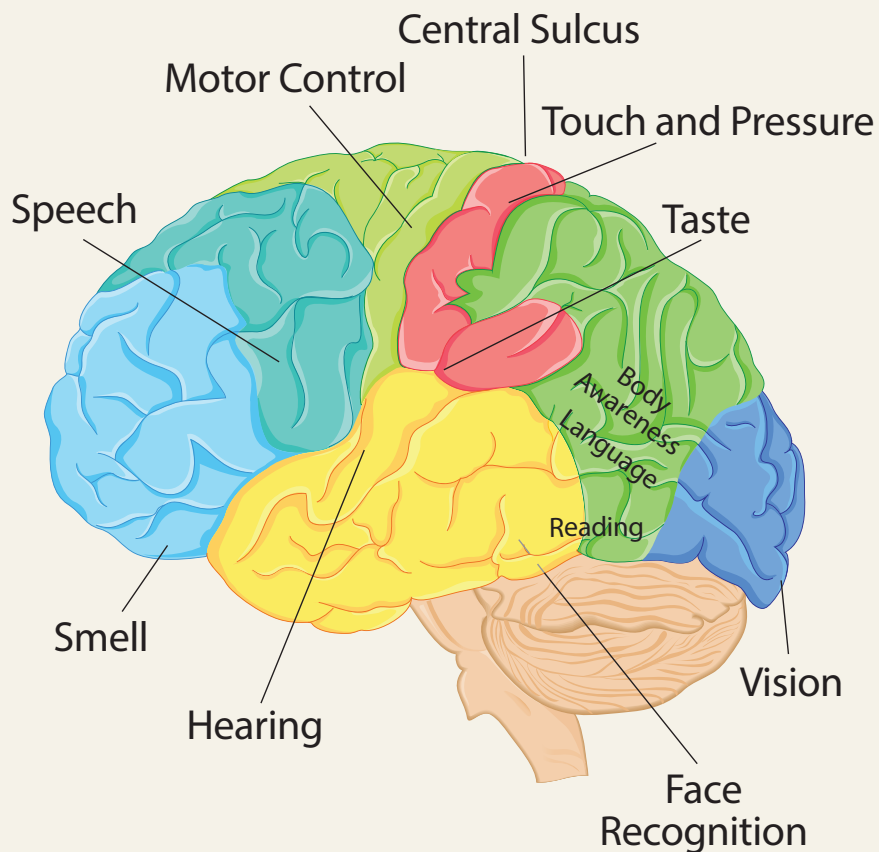
Your baby is not ready or needs a break when...

- Breathing is very fast, slow, irregular or gasping
- Skin color is pale, purple/dusky
- Startles easily
- Trembles/jerky movements
- Sudden movements of arms and legs away from body
- Squirmy/restless
- Inconsolable/excessive crying
- Fussiness
- Yawning and wanting to sleep
- Looks away from you
- Does not want to engage
- Arching back

HELPING YOUR BABY'S BRAIN DEVELOP

Stimulating different areas of brain and working towards overall neuro-development

- Sense of hearing
(for development of auditory and language centers of brain)
- Sense of touch
(for development of sensory area of brain)
- Movements, massage
(for development of motor area of brain)
- Sense of vision
(for development of visual area of brain)



HELPING YOUR BABY'S BRAIN DEVELOP

Sense of hearing

Babies are able to hear as early as 25 weeks, and their hearing continues to develop as they grow. They are especially able to recognize mom's voice.

What can you do in the NICU?

- Talk to your baby in a soft and sweet voice
- Sing in soft tones
- Read to your baby
- Record your sounds and leave with your baby's nurse
- Music therapy is also highly beneficial

You can do this from a few minutes to a few hours in a day, increasing the time as he/she grows. You can continue doing this at home.

Sense of hearing later helps with development of:

- Speech
- Language
- Memory

If your baby is very sick or extremely small, he/she needs more protection rather than stimulation.

You can ask your baby's nurses to lower alarm sounds if possible.

Advocate for keeping voices low around your baby.



What will this do to baby's brain?

Research has shown that it helps with:

- Mother-baby bonding
- Forms new connections in brain
- Increases size of hearing center of brain
- Decreases heart rate and blood pressure
- Language development
- Memory development

Sense of touch (sensory stimulation)

Before the babies are born they are surrounded by fluid, which constantly gives them a sense of touch. Babies also experience different position changes and joint movements as they move around inside the womb.

What can you do in the NICU? You can start with the following depending on your baby's medical condition.

- Skin-to-skin contact
- Kangaroo mother care
- Gentle but constant touch
- Gently place your hand on arm/leg/body
- Let your baby hold onto your finger

Once your baby is about 31-33 weeks and again, depending on his/her medical condition, you can do:

- Massaging
- Very gentle rocking by holding baby in your arms
- Moving the joints
- Stretching

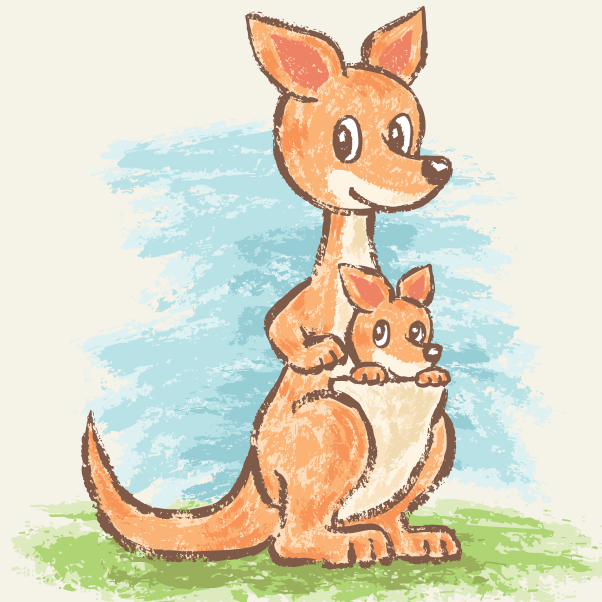
These are specialized techniques and will be shown to you by your baby's therapist on when and how to do.



What will this do to baby's brain?

Research has shown that it helps with:

- Mother-baby bonding immensely
- Increases brain maturation
- **Kangaroo mother care has especially been shown to:**
 - Lower risk of death
 - Decreases risk of infection
 - Stabilizes heart rate, breathing and blood pressure
 - Helps with temperature control and blood glucose levels
 - Decreases risk of hospital admission and helps you start breast feeding
 - Decreases their pain and improves oxygen saturation
 - Leads to increased head growth
- Decreases risk of depression in mother
- **Massaging and stretching:**
 - Helps with weight gain and calcium deposition in bones
 - Improves coordination
 - Improves muscle tone
 - Decreases length of hospital stay



Visual stimulation

The visual system starts to develop when baby is in the last trimester and is not yet well-formed at birth. This is especially true if baby is born early. Vision rapidly develops during the first few months after birth. Hence, during early phases in NICU when your baby is extremely small, eyes have to be protected from light and any kind of stimulation as much as possible.

What can you do in the NICU? When your baby is medically stable and is able to open their eyes and starts showing interest, you can:

- Start with making direct eye contact for a few seconds to minutes
- Talk and sing to your baby while maintaining eye contact
- Bright objects can be introduced later
- Different patterns with contrasting colors also helps

What will this do to baby's brain?

Research has shown that it helps with:

- The eyes and brain have special nerves associated with the visual system in the brain that are highly influenced by visual stimulation after birth
- This not only helps the visual system but also aids in the growth of hearing and coordination centers within the brain
- Increases bonding with your baby which later helps in forming a strong mother-baby relationship



References:

1. Gabis LV, Hacham-Pilosof K, Yosef OB, Rabinovitz G, Leshem G, Shilon-Hadass A, Biran Y, Reichman B, Kuint J, Bart O. **The influence of a multisensory intervention for preterm infants provided by parents, on developmental abilities and on parental stress levels.** *J Child Neurol.* 2015 Jun;30(7):896-903.
2. Smith G, Gutovich J, Smyser C, Pineda R, Newnham C, Tjoeng T et al. **Neonatal intensive care unit stress is associated with brain development in preterm infants.** *Ann Neurol* 2011; 70(4): 541–549.
3. Brett J1, Staniszevska S, Newburn M, Jones N, Taylor L. **A systematic mapping review of effective interventions for communicating with, supporting and providing information to parents of preterm infants.** *BMJ open* 2011
4. Vanderberg et al. **Individualized developmental care for high risk newborns in NICU: A practice guideline.** *Early Hum Dev.* 2007 Jul; 83(7):433-42. Epub 2007 Apr 30. Review
5. Melnyk BM, Feinstein NF, Alpert-Gillis L, et al. **Reducing premature infants' length of stay and improving mental health outcomes with the Creating Opportunities for Parent Environment (COPE) NICU program: a randomized controlled trial.** *Paediatrics* 2006;118(5): e1414–27.
6. Rosemary C White-Traut, Michael N Nelson PhD, et al. **Effect of auditory, tactile, visual, and vestibular intervention on length of stay, alertness, and feeding progression in preterm infants.** *Development and Child Neurology* 2002
7. Kanagasabai PS, Mohan D, Lewis LE, Kamath A, Rao BK. **Effect of multisensory stimulation on neuromotor development in preterm infants.** *Indian J Pediatr.* 2013 Jun;80(6):460-4. PubMed PMID: 23288407.
8. White-Traut, R. C. and Nelson, M. N. (1988), **Maternally administered tactile, auditory, visual, and vestibular stimulation: Relationship to later interactions between mothers and premature infants.** *Res. Nurs. Health*, 11: 31–39. doi: 10.1002/nur.4770110106
9. Holditch-Davis D, White-Traut RC, Levy JA, O'Shea TM, Geraldo V, David RJ. **Maternally Administered Interventions for Preterm Infants in the NICU: Effects on Maternal Psychological Distress and Mother-Infant Relationship.** *Infant behavior & development.* 2014;37(4):695-710. doi:10.1016/j.infbeh.2014.08.005.11.
10. White-Traut RC, Rankin RM, Yoder JC, Liu L, Vasa R, Geraldo V et al. **Influence of H-HOPE intervention for premature infants on growth, feeding, progression and length of stay during initial hospitalization.** *J Perinatol* 2015; 35: 636–641.
11. White-Traut R. **Reduced healthcare utilization at 6-week corrected age among premature infants after the H-HOPE Mother-Infant Developmental Intervention.** *J Obstet Gynecol Neonatal Nurs* 2013; 42(S1): S87.
12. Katherine Randa and Amir Lahava **Maternal sounds elicit lower heart rate in preterm newborns in the first month of life.** *Early Human development* 2014
13. Alexandra R. Webba, Howard T. Hellerb, Carol B. Bensonb, and Amir Lahava **Mother's voice and heartbeat sounds elicit auditory plasticity in the human brain before full gestation**15. Loewy J, et al. **The effects of music therapy on vital signs, feeding, and sleep in premature infants.** *Pediatrics.* 2013;131(5):902-18.
14. Picciolini O, et al. **Early exposure to maternal voice: effects on preterm infants development.** *Early Hum Dev.* 2014; 90(6):287-92.
15. Scher M, Ludington-Hoe S, Kaffashi F, Johnson M, Holditch-Davis D, Loparo K. **Neurophysiologic assessment of brain maturation after an eight-week trial of skinto-skin contact on preterm infants.** *Clin Neurophysiol* 2009; 120(10): 1812–1818.
16. Ellen O. Boundy, Roya Dastjerdi, Donna Spiegelman, Wafaie W. Fawzi et al. **Kangaroo Mother Care and Neonatal Outcomes: A Meta-analysis:** *Pediatrics* 2016
17. AN Massaro, TA Hammad, B Jazzo2 and H Aly. **Massage with kinesthetic stimulation improves weight gain in preterm infants.** *Journal of Perinatology – Nature* 2009
18. N, Giannakouloupoulos X, Bond C, Clow A, Glover V. **Changes in plasma cortisol and catecholamine concentrations in response to massage in preterm infants.** *Arch Dis Child* 1993; 68: 29–31.
19. **Behavioral analysis of preterm neonates included in a tactile and kinesthetic stimulation program during hospitalization.** Ferreira AM1, Bergamasco NH. *Rev Bras Fisioter.* 2010
20. Farroni T, et al. **Eye contact detection in humans from birth.** *Proc Natl Acad Sci U S A.* 2002; 99(14):9602-5.
21. Hyde DC, et al. **Visual stimulation enhances auditory processing in 3-month-old infants and adults.** *Dev Psychobiol.* 2010;52(2):181-9.
22. Holditch-Davis D, White-Traut R, Levy J, Williams KL, Ryan D, Vonderheid S. **Maternal satisfaction with administering infant interventions in the neonatal intensive care unit.** *J Obstet Gynecol Neonatal Nurs.* 2013

Contributions:

Safoora Syeda, MD – Child Neurology resident

Diomel de la Cruz, MD – Neonatologist

Suman Ghosh, MD – Child Neurologist

Elayne McNamara – Occupational therapist

Daphna Barbeau, MD – Neonatology fellow

Special thanks to NICU parents and babies for contributing the pictures

