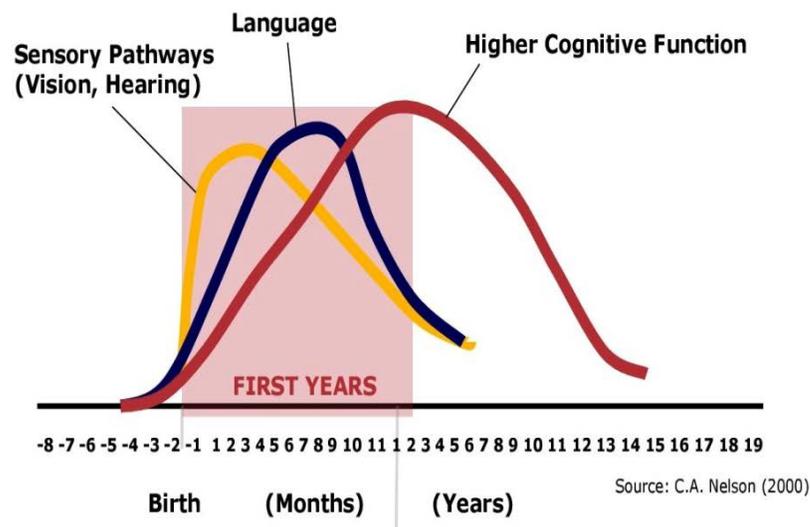


Early years of life – a window of opportunity for improving survival, thriving and transformation

Brains are similar at birth in males and females but adult brains are very different. The development of human brain is a lifelong process and at the time of birth, the development of brain is still unfinished work. Genes (nature) environment (nurture) and experience determine the development of brain. The development of brain to a large extent is determined by use, which depends on repetitive experiences. It is good if these experiences are positive and can be affected negatively if the experiences are negative or persistent. Evidence indicates that even genetic impact is modifiable by environmental influences.

Vital functions of the body necessary for survival are developed at the time of birth and are mostly dependent on genes. These vital functions depend on the functioning of brain stem and must stabilize soon after birth to sustain life. The brain development is extremely rapid in the first 1000 days (270 days of fetal life and 730 days after child birth). Therefore, this is the time when it can be influenced maximally by nature, nurture and experience. Nurture is provided by the caregiver, family and the environment. While the formation and location of basic structure neurons of the brain is complete at birth, the establishment of connections (synapses) occurs very rapidly during the first 2 years of life and there is over production of these connections during this time. After this period, unused, fragile and weak connections are pruned. Strengthening and reinforcement of brain architecture occurs through other parallel developments by processes like myelination, dendrites, and glial cell formation.

Neural Circuits are Wired in a Bottom-Up Sequence

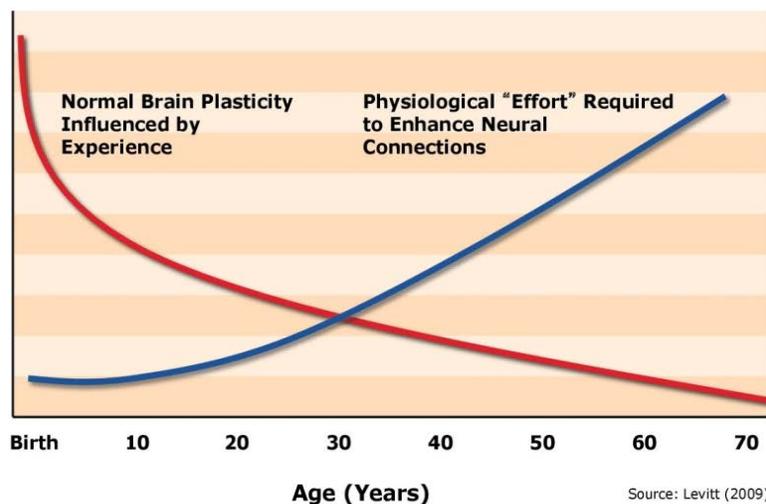


Brain is ready to develop in a systematic and programmed manner at the time of birth. Preparation of the brain depends on the functions that the body is expected to perform after being born. This happens from bottom up from simple structures to increasing complexity. Consequently there are sensitive periods which require appropriate interventions from the care givers to provide maximal opportunity for

the brain to develop. Sensory pathways develop first and therefore the development of senses of the baby should be the first priority. This is followed by language development. Caregivers should be aware of this since speaking to infants is extremely important. Caregivers should know that the infant would respond through actions and behavior and not through spoken words.

Plasticity of the brain is maximal during the period of maximal development and therefore it takes relatively less effort to influence positively the development of brain. Later in life, brain development can be influenced but it takes much greater effort to do so. Consequently the first 1000 days provides the best window of opportunity for ensuring survival, thriving and transformation. In short the plasticity of the brain is maximal in infancy and it requires less effort and resources for a positive impact. In contrast, the effort required to change a rigid brain is considerably higher.

Intervene Early Because the Brain Becomes Less Plastic With Development



1. Development of higher skills depends on good functioning of lower level skills

The cardinal principle is 'skill begets skill'. Higher level of functioning- memory, intelligence, cognition occurs in a positive manner if the lower level functioning has strong foundations. This is because, higher level of functioning is built on disorganized basic level of functioning e.g. speech, and the coordinated functioning of the five senses and basic motor functions. The higher level of functioning will be poor, disorganized and nonproductive if the lower level of functioning is inappropriate. The principle is that brain structure and function is built layer by layer and step by step. At this stage severe or persistent neglect, stress and trauma can contribute to negative and harmful behavior besides poor productivity.

2. Children's brains are ready at the time of birth

Brain is ready to develop in a systematic and programmed manner at the time of birth. This happens from bottom up from simple structures to increasing complexity. This development is influenced

maximally by the influence of care givers who support the baby, feed the baby, protect the child from harmful influences and teach the baby through ongoing interaction through play and communication. The care givers need to be supported by the care providers from the community facilities and the other stakeholders to maximize the gains. During this time the impact on children who are likely to get neglected and stressed stand to benefit maximally from interventions. While early post natal life requires the highest quality of inputs this is sadly neglected because of lack of facilities for counselling and support for the families.

3. Ongoing good nurturing and relationships are a key to healthy brain development

Simple repeated efforts by the care givers to bring her/his face close to that of the baby less than 1 month of age has a very powerful activating effect on brain development laying the foundation for development of sight and vision. Care givers can provide the best nurturing and establish relationship, bonding and attachment through sensitivity and responsiveness which is the basic building block for healthy brain development.



Caregivers behavior and environment during pregnancy is likely to have a much greater influence on the mother as well as the baby in the womb but the impact of her behavior, her sensitivity and responsiveness are not well understood. The expectant woman can try to have a positive mind set, remain free from tension, eat and relax. She should refrain from exposure to smoke and alcohol. She should interact with her baby in the womb as often as she can. She should avoid taking medications and exposure to unnecessary procedures. All efforts should be made to prevent premature child birth and measures should be taken to prevent or tackle intrauterine growth retardation. In the next few decades, it is hoped that advances in science would provide better understanding on the care that the expectant woman should receive and measures she should take to have the best possible outcome of pregnancy.

Following child birth, the first 2 years of life after birth are critical. This is also the time when it can be difficult to recognize and respond to the various needs of the child for survival, physical growth and mental development. The caregivers themselves need a lot of support and guidance of high quality and complexity. Even though their actions should be simple, these have to be of high quality at all times and practiced repeatedly to achieve perfection. This is no easy task. Besides food (including micro nutrients) and meeting of the basic needs of the child, it requires ongoing warmth, love, care and support from the caregivers. This not only helps brain development it also provides a strong buffer to deal with stress, neglect and negative influences. While consistent nurturing and frequent enrichment are positive for

happiness health, creativity and productivity, poor nurturing and persistent or prolonged negative experiences early in life can have long lasting negative impact. If the young child's attachment and bonding are insufficient, it affects the lower brain functions negatively leading to weak foundations that interfere with functioning of upper brain. Besides the adverse impact on architecture of the brain, there is a negative impact on neurotransmitters (chemical and hormonal).

4. Children's wellbeing is critical to brain development and learning

The wellbeing during the 1000 critical days occurs as a result of good health of the mother and the baby. It includes amongst others health, freedom from disease, protection from adverse environment, happiness (freedom from stress), satisfaction, and social relationships. It cannot be all well at all times. Sometimes stress and neglect or trauma are likely to occur. Stress can have a positive impact, provided the infant is supported by caregivers. Exposure to stress helps to build resilience which is critical component of healthy growth and development. Examples include pain following immunization, discomfort during minor illnesses, occurrence of family discord that is temporary, one of the parents or close family members going out of home for some time. This teaches development of coping mechanisms in the child and resilience as well as mastery through frequent exposure and practice. However if the support and relationship is not provided, it can lead to disruption. Chronic persistent or repeated stress is associated with smaller brain, insufficient synaptic connectivity and poor plasticity as a result of adverse effect on chemical and hormonal dysfunctioning leading to death of neurons and other key components of architecture of brain.

5. Brains must be fed well to develop optimally

Mother's health, her diet (balanced diet including micronutrients), non-exposure to tobacco and smoke (first, second and third hand exposure), rest and relaxation, positivity and remaining free of stress contribute substantially to healthy brain development. The mother's diet should comprise of adequate food including vitamins and minerals as well as essential fatty acids. Iodine is essential and consumption of iodized salt is recommended. These are likely to have a positive effect on genes also. During the first 2 years of life, good nutrition plays a very prominent role in the development of brain. Breast milk has special properties and timely as well as adequate complimentary feeding helps optimize brain development. Undernutrition especially stunting not only affect physical growth, these also have strong association with poor brain architecture and development. Besides good nutrition, sleep and relaxation are enormously important for brain development.

6. Brain develops and becomes strong through repeated use

Human brain develops and becomes progressively strong through repeated use. Vision and speech touch and balance early in infancy (especially during neonatal period) are good examples of this principle. Brain connections develop and become stronger through repeated use and stimulation. Since different areas of the brain develop at different times, their stimulation and use should be timed appropriately. These are called the sensitive periods and windows of opportunity. This requires finesse and a mature understanding which should be provided through properly timed interactions between trained motivated providers to care givers. Repeated use leads to development of plasticity of the brain which depends on experience and response. During the first few months, close eye to eye contact between the care giver and the child, touch, and hearing are the most powerful senses. The repeated and correct use of the five senses is the key to success in ensuring mother baby interaction. Learning is

strengthened remarkably through multi sensorial stimulation in early life. The principle of multi sensorial stimulation is even more rewarding in babies who go through stress, trauma and neglect. Examples include low birth weight and premature babies, babies born with birth defects, prolonged hospitalization early in life, and lack of acceptance of the baby by the parents for different reasons.

7. Language development literacy and numeracy

Communication between the mother and the child begins even before birth, speech development has already begun soon after birth. Around 3-4 months age children begin to recognize local language and by 9-10 months have great sensitivity and responsiveness to spoken language. However, communication through expressions and vocalization has begun long before that since the baby successfully expresses the needs and happiness or discomfort and anger. The baby communicates fairly well even without speech. This indicates the development of language. It is very important for the care givers to understand the child's cues and this is best learnt through keen observation, trial and error. The care givers should be very conscious of this important window and maximize the appropriate use of communication and spoken language through repeated exposure. The experience about abilities to learn a second language and a rich vocabulary are strong evidence that make a compelling evidence for very early home based teaching and learning through play that incorporates speech. Language, numbers and space are closely related to each other. These are closely intertwined. The use of fingers is a very powerful method for teaching numbers early in life since it provides concrete opportunities for learning. This can be reinforced by numerous objects used in day to day life. In the learning of language, numeracy and space emphasis should be on combining of many and varied opportunities e.g. fingers, real objects, rhymes and music in a creative way. Picture books and story books is an excellent way to promote learning and should be started early in life (even before one year age). Caregivers should stay away from teaching of language and numeracy through the use of paper, blackboards and trying to teach through memory development.

The care givers must be vocal and always combine spoken language with all play and activities when interacting with the child. The spoken language should be clear, spoken slowly and repeated in early life. The caregiver should observe the child's response and learn the cues. These cues and responses of the child would help the caregiver understand that the child is understanding the language and responding without the use of speech. There are many different ways in which the child responds and keen caregivers are able to decipher the child's responses.

8. Self-control and regulation

Nurturing is the key driving force for self-control and regulation and should be started soon after birth of the baby in the newborn period. Newborn baby has a very limited capacity to overcome fear, trauma, rage etc. Even though they are not able to express it, they can react adversely to shouting, family violence, shaking, rough massage, smoke or strong odor. This is most commonly manifested by crying in the newborn baby and the caregivers struggling to solve this problem. Both the child and the caregiver have to learn to tackle it and this can be done by improving the understanding of the newborn behavior, providing support and spending time with each other as much as possible. Even if the caregiver cannot understand the child behavior e.g. crying, the care giver can at the minimum bring the child close to them and support them by holding the child close to them. However, if this support and relationship gets interrupted the ability of the child to cope and regulate would be compromised. An example of self control and regulation is crying. Most of the newborn babies cry. They should be provided support from

the caregiver but with passage of time, they will learn to deal with the numerous stresses that contribute to crying. Another prominent issue relates to sleep which is very important for optimum functioning of the brain and the body. Here again, the caregivers must be aware of the need to provide support and closeness but allow flexibility based on the young infant behavior. The sleep cycle takes some time to establish. In a few weeks after birth the baby develops a sleep cycle.

9. Children learn from watching and copying

Ongoing trial and error and copying by the child as well as the caregiver is the hallmark for learning and development especially in early years of life. The caregiver should never overestimate his or her capacity. Practice should reinforce watching. Copying should be an ongoing effort to correct mistakes. However, it is important not to get traumatized or frustrated if the performance or the responsiveness does not occur as per family or social expectations. Copying operates through activation of mirror neurons that help to learn through observation trial and error. The ability to imitate is present at the time of birth although it is not consistent and it may be crude. The responsiveness and ability of the newborn infant should not be ignored by the caregivers. Demonstration and return demonstration is a very effective learning tool and must be used starting in very early life. Caregivers need good quality support and guidance to make it happen so that it becomes worthwhile and meaningful.

10. Learning by doing through play

An essential part of good nurturing is shared attention that ensures engagement to facilitate learning by doing. Repeated practice makes a person perfect. This helps to reinforce positive learning and cut out the negative experiences and prevent confusion. This requires readiness on the part of the care giver and the child. Learning is best when it occurs through play which is well known to accelerate learning process through a response to curiosity, drives spirit of exploration, develops creativity and helps child and the care giver to focus attention. Learning through play should be done only when it is fun for both the child and the caregiver. Play can be with toys, household objects and it can also be imaginary. The last one should be used later after infancy and not early since the higher functions of the brain have not yet developed in the infant. Household objects and home made toys or play material are recommended. Through play, the child and the care giver can learn through copying each other and master skills through correction of mistakes made.

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