

Module 3: How Children Grow and Learn

Section C: Brain Research and the Developing Child

Introduction

This section of Module 3 provides a glimpse of brain research and how you can apply the information in your work with young children. Over the last decade there has been increasing research on the development of the brain in young children. New scientific methods and advances in technology allow researchers to study the brain in living people. MRI's are one method used to study brain functions in young children. This research has discovered some amazing facts about brain development in young children. This new knowledge has increased the understanding of the importance of ECE teachers and ECE programs in supporting brain growth and development in children. As teachers who work with young children it is important for you to understand some of the research results.

Learning Objectives

After you have completed this section you will be able to:

- Describe the influence of nature (heredity) and nurture (environment) on a child's development.
- Summarize the importance of relationships between young children and others and the role of attachment in young children's development.
- Name three concrete ways that ECE teachers influence brain development in young children.

Guiding Your Learning

Before you begin this section write a brief sentence that describes how the following terms influence young children's development:

Nature or Heredity

Child's environment

Brain development

Check your responses as you go through this section.

Nature vs. Nurture

The concept of which factor, nature or nurture is responsible for children's ability to learn, physical abilities, personality and other human characteristics has been a controversial topic for many years.

- **Nature** refers to the child's heredity or biological background. Heredity/Biology has programmed each child to learn and develop.
- **Nurture** refers to the child's environment that includes relationships and experiences. Children's ability to learn and develop is based on each child's relationships and experiences.

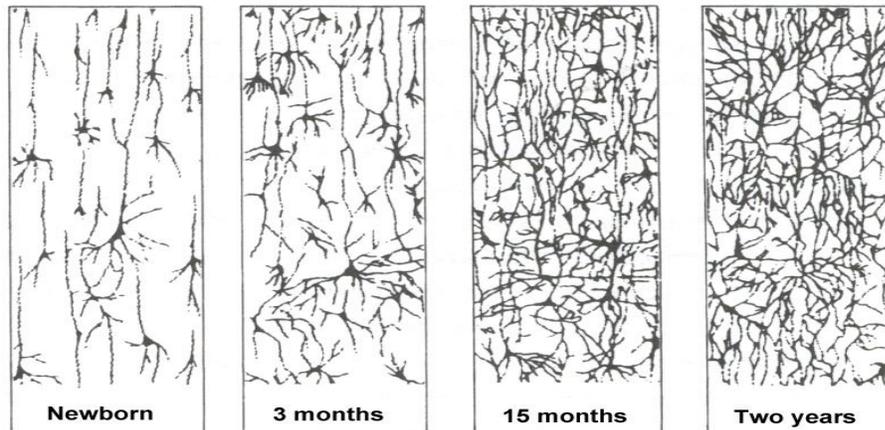
Brain development research has demonstrated the influence of both nature and nurture on the child's ability to develop, learn, and succeed in life. The brain is biologically formed to grow and develop; however, the brain develops through experiences that spark the connections within the brain. The environment and experience are responsible for fine-tuning the connections within the brain that provides the child with permanent learning.

For example: Infants are born with the ability for language; however, the infant's environment shapes the language the child learns.

You may be wondering about when brain development begins and what types of relationships and experiences help to create brain connections.

Brain Development: The Beginning

- Brain development begins within one week of conception.
- The brain is the least developed organ at birth.
- 90% of the brain's growth occurs from birth to age five.
- The brain is formed through each person's genetic make-up based on heredity. The genes provide the "basic wiring" of the brain
- The sensory messages that are the infant's first learning methods are active during the prenatal period. For example prior to birth, the infant can hear sounds.
- At birth the brain is not completely formed although the newborn has 100 billion neurons or brain cells. The brain will almost double in size and weight by the age of five. Below is an image of the number of neural connections from birth to 2 years of age.

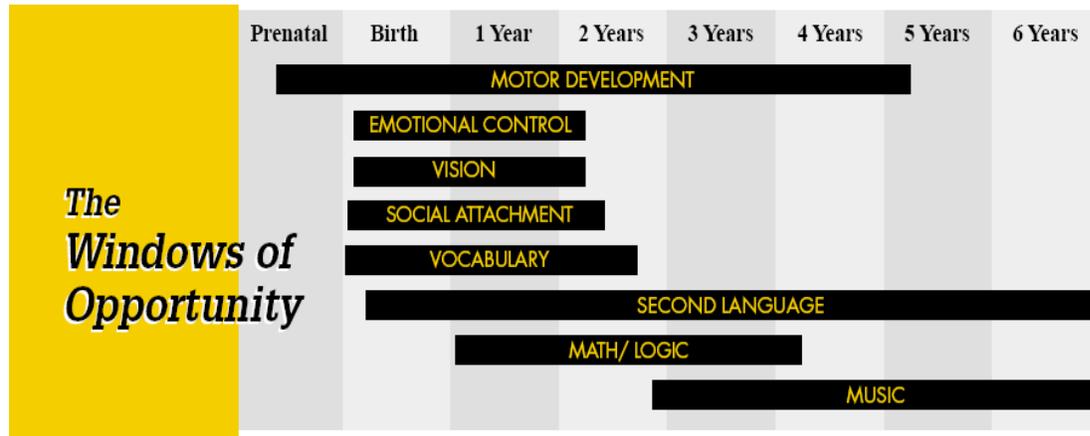


- Different areas of the brain control different functions.
 - For example large muscle development is controlled by one area of the brain. As the brain matures the infant begins to gain control of their body starting at the head and moving down to the neck, arms and legs.
 - Fine Motor development is controlled by a different area of the brain. As the child grows he/she gains control of their small muscle skills. Fine motor development begins at the center of the body and moves outward. Arm movements are first followed by, legs, hands, feet and finally fingers and toes.

The Role of Environment in Brain Development

- Brain development occurs throughout a person's life time as the brain continually takes in new information through the senses. The new information is linked to existing knowledge, modified, and retained based on the usefulness of the new information.
- Stimulating experiences influence the wiring of the brain. Young children learn by exploring their environment and engaging in active experiences that allow children to use their senses. Sensory play for infants and pretend play for older children helps to create new brain connections and reinforces existing connections that become the learning patterns for physical, language, cognitive, and social/emotional development.
- When children are engaged in an enjoyable activity they are learning.
- Experiences during the young child's life that reinforce brain connections establish brain functions. If the brain connections are not reinforced or needed the connections are "pruned" or discarded. As we age it is harder to build connections in the brain.

- There are critical periods (Windows of Opportunity) in a child's development that require specific stimuli from their environment for brain development. One example is the development of the vision system that requires light during the child's first 6 months. Another critical period involves learning a second language as well as the first language which occurs from birth to 11 years of age. After that time it is more difficult to learn a second language.



Relationships with Others

- The first 3 years of a child's life are vital in forming a foundation for healthy psychological development. During the first three years of life, the part of the brain responsible for social/emotional development is being formed. For teachers working with children under the age of 3, the focus should be on reinforcing positive brain connections in this area. This is done through responsive, nurturing relationships.
- Children's ability to learn is increased through the formation of healthy attachments between the child and parents, caregivers, and other significant people in the child's life. Warm and caring interactions are an important element in developing healthy attachments that are the basis for the child's social-emotional development.
- Relationships encourage the development of attachments that are critical for the child in developing trust, security, and a positive self-image.

What is Attachment?

Attachment is defined as the emotional bond that forms between two people that is essential for the development of healthy relationships. Attachment is particularly critical for infants who attach to their parents and primary caregivers. Infants begin the bonding process at birth and typically attach to their mothers. Research by John Bowlby defined 4 stages in the attachment process and is outlined below from simplypsychology.org:

Up to 3 months of age - Indiscriminate attachments. The newborn is predisposed to attach to any human. Most babies respond equally to any caregiver.

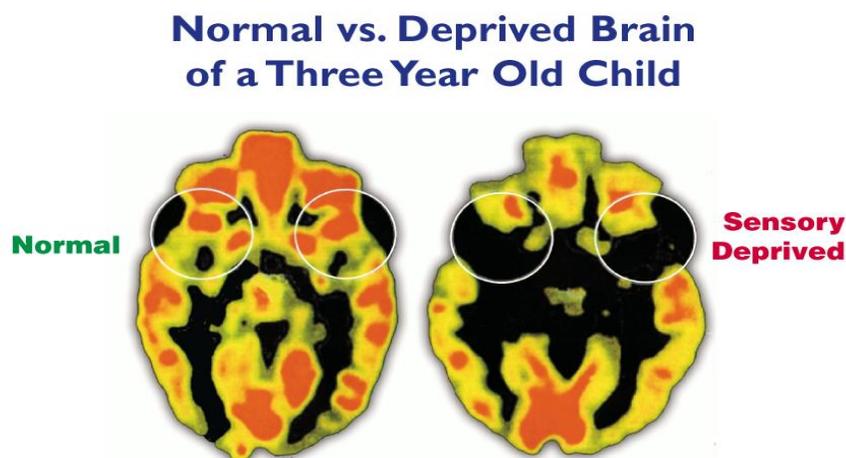
After 4 months - Preference for certain people. Infants learn to distinguish primary and secondary caregivers but accept care from anyone;

After 7 months - Special preference for a single attachment figure. The baby looks to particular people for security, comfort and protection. He/she shows fear of strangers (stranger fear) and unhappiness when separated from a special person (separation anxiety). Some babies show stranger fear and separation anxiety much more frequently and intensely than others, but nevertheless they are seen as evidence that the baby has formed an attachment. This has usually developed by one year of age.

After 9 months - Multiple attachments. The baby becomes increasingly independent and forms several attachments.

Attachment has implications for early childhood programs. Understanding attachment helps to understand the issues of separation and stranger anxiety that is often a common occurrence in infant and toddler classrooms. Attachment relationships are based on the child's development of security and trust. Researchers have discovered that young children who feel secure and trust their environment are more likely to engage in exploration and experiences that are necessary for brain development. Consistency is a critical element in the development of relationships. Researchers discovered that young children who attend early care and education programs need to spend a minimum of 9 months with the same teacher to develop a secure and trusting relationship. Working in an early care and education program requires commitment to the children in your care.

Below is an image comparing the brain development of two 3-year-old children. One child was in a normal, stimulating environment and the other child was deprived of sensory experiences. Note the circles on the images. Those represent the part of the brain that is responsible for forming human attachments. What do you notice as you compare the two images?



Source: Newsweek, Spring/Summer 1997 Special Edition:
"Your Child: From Birth to Three", pp. 30-31.

What happens to children who are in negative or stressful environments?

- Stressful or negative environments may include instability, inconsistency, abuse, neglect, exposure to violence, high mobility of families, homelessness, and/or parental substance abuse.
- Young children who are exposed to repeated negative and stressful experiences or environments may experience slower brain development or the destruction of brain cells in certain areas of the brain. The loss of the brain cells may lead to a loss of learning and memory.
- Young children in environments of on-going stress may experience learning difficulties, delays in brain development, and issues throughout life coping with problems. A young child's brain is not fully developed and cannot respond to stressful situations in a rational manner. Young children in stressful situations need the comfort and support of caring people to assure them of their safety.

The importance of a healthy diet and brain development

- A healthy diet is important for brain development during the prenatal period and after birth. Infants require the nutrients from formula or breast milk and toddlers require whole milk to provide the fatty nutrients required for healthy brain development.
- Brain hydration is essential for learning. Water is essential to keep the brain hydrated. Young children should have access to water all day. Water can be served during snacks and meals in addition to milk or juice. This is especially important in the hot, dry Arizona climate.

Brain Development and Early Care and Education Teachers

According to the Zero to Three, a national organization for infants, toddlers, and families, young children require the development of caring and trusting relationships between the child and the child's primary caregivers, including parents and child care teachers. The following elements have been identified as necessary for healthy brain development and demonstrate the important role of early childhood educators in providing the ingredients of caring and consistency in children's growth, development, and learning.

1. Relationships are critical for young children's development. Research has found that the bond between the parents and child is important in learning and achieving developmental milestones. Relationships between the caregivers and teachers are equally important for young children who attend early learning and care programs.
2. Responsive interactions include verbal and nonverbal, expressive and receptive communication with children. This begins at birth and is a vital element in developing nurturing and supportive

environments for young children. Awareness and response to the infant's needs is a critical part of developing a responsive and caring environment.

3. Respect is created through the interactions that occur between the caregivers and the child's family. These interactions lead to the development of relationships, an understanding of their expectations, values, and beliefs, and including family routines as part of the child's experience.
4. Routines are the daily activities and interactions that make up a child's day. Routines provide young children with feelings of security and trust essential for forming and maintaining positive relationships with adults and peers.
5. Repetition is one of the strategies the brain uses to identify the connections to keep or eliminate. Routines provide opportunities for repetition of actions and words that strengthen the learning.

Infants And Toddlers And Brain Development

Not so long ago teachers of infants and toddlers focused on the daily routines of care giving. Many teachers did not recognize the importance of providing opportunities for young children to explore their environment and instead focused on keeping children safe and entertained by rotating the child from a playpen, to bouncy seats, and to high chairs and back to the crib. Brain research has changed what happens during a young child's day. Infants require floor or tummy time, opportunities to explore interesting materials, teachers that read stories or sing silly songs, and lots of talking to the child. The research also indicates the importance of providing not only a safe and healthy environment but one that is nurturing and consistent as well where young children can form relationships with the teacher/s that care for them. Routines make up a large portion of the young child's day. Routines provide opportunities for the teacher to focus on the individual child and are the actual curriculum for children of this age group.

Preschool Age Children and Brain Development

Preschool children continue to require opportunities to explore their classroom, listen to stories, and share their thoughts verbally and through drawings and dictation. Hands-on experiences, activities that involve problem solving, and learning to interact with others are needed to support brain growth and development. A nurturing and consistent environment is a critical element in a preschool classroom providing the children a safe and secure place to learn and play. Preschool children need opportunities to manipulate hands-on materials as they learn about language, math, and science. Teachers who support the young child's explorations, encourage conversations, and promote learning with a wide variety of interesting learning materials and experiences create an environment that positively influences brain development.

Brain Research has changed the public perception of early care and education.

Brain research has confirmed that the child's first three years are critical for life-long learning and success. Brain research has validated the importance of early brain development and emphasized that children begin learning at birth and the importance of the first five years of life. Researchers have found that significant relationships in young children's lives are important for brain development. Other research findings have indicated that the consistency of care and teacher-child relationships are critical elements in providing high quality early care and education experiences for young children. The importance of early childhood experiences and relationships has increased the awareness of the need for educated and experienced early care and education professionals who can provide consistent and nurturing environments that support learning and development.

Applying Your Knowledge

How does the information presented in this section affect your work with young children?

What is important to remember about brain development is that everything you do and every interaction you have with young children has the power to influence the child's brain development in a positive or negative manner. Awareness of early care and education theory and best practices will provide you with the tools you need to be a positive influence in children's lives.

The research in brain development is still evolving as new innovations in technology are developed. What has been learned through brain research is providing early care educators with new information that can influence their interactions and teaching strategies with young children. Take a few minutes and reflect on the brain facts in this section.

- What did you learn that is new knowledge?
- How does brain research apply to your role and responsibilities as an early educator?
- What is a new strategy that you will use in your classroom based on the information on brain development and young children?

Check Your Understanding

- ✓ Explain the influence of nature and nurture on a child's development.
- ✓ Define attachment and explain the reasons attachment is important in children's development.
- ✓ List three concrete ways early childhood teachers influence brain development.

Resources

Resources

Building Baby's Brain: The Basics <http://www.fcs.uga.edu/ext/pubs/chfd/FACS01-1.pdf>

Building Baby's Brain: Prime Times for Learning <http://www.fcs.uga.edu/ext/pubs/chfd/FACS01-3.pdf>

Zero to Three (On homepage click on the Baby Brain Map) Retrieve from <http://zerotothree.org/>

Video

"You change the first five years and you change everything" Retrieved from The Ounce of Prevention, http://www.youtube.com/watch?v=GbSp88PBe9E&feature=player_embedded

References:

Better Brains for Babies Website, University of Georgia Family and Consumer Science and Bright Start, Georgia Department of Early Care and Learning Information used in the development of this section was retrieved from <http://www.bbbgeorgia.org/index.php>

Zero to Three Training Materials on Brain Development from the Preventing Child Abuse Project

John Bowlby's Perspective on Learning and Development, M. L. Henniger, 2009, Teaching Young Children Retrieved from <http://www.education.com/reference/article/john-bowlby-attachment-stages/>

Harvard Center for the Developing Child, Science of Early Childhood (website) http://developingchild.harvard.edu/topics/science_of_early_childhood/

Module 3-Section C Worksheet

Explain the influence of nature and nurture on a child’s development.

Define attachment and explain the reasons attachment is important to children’s development.

List three concrete ways early childhood professionals can influence brain development.

1.

2.

3.
