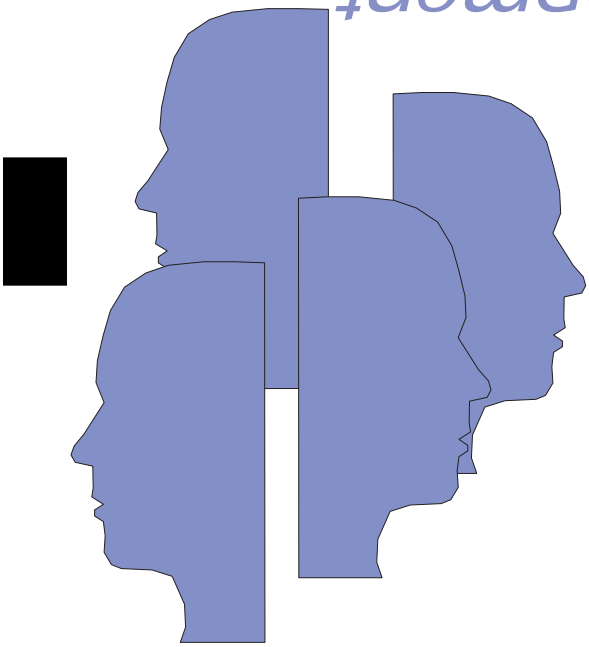
Brain Development



Brain power,

brainstorming,

brain scientist,

brain food....

many of these terms are commonly used, but do you really know the facts about that mass of electronic power on your shoulders?

Brain research is unraveling many of the mysteries of the brain

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- **What is the brain?**
- **How does the brain develop?**
- **Why do parents need to know about brain development in children?**
- **Does the brain grow faster in young children?**
- **Do we lose brain power over our lifetime?**
- **How does music affect the brain?**

There is new technology that allows scientists to see and measure the activity of the brain. These are called PET scans (positron-emission tomography). This technology has made this amazing new information about the brain possible.

What is the brain ?

The brain weighs only three pounds, looks like a gray, unshelled walnut, and is the most complex structure in our world? The brain is the body's most vital organ.

Each person is born with over 100 billion brain cells (neurons). There are enough brain cells to learn just about anything, and more brain cells are not developed after birth. Brain cells that are not used, wither away.

The brain can send signals to thousands of other cells in the body at speeds of more than 200 miles an hour.

How does early learning work in the brain?

Learning seems to peak between the ages of 3 and 10, but it continues throughout the lifetime.

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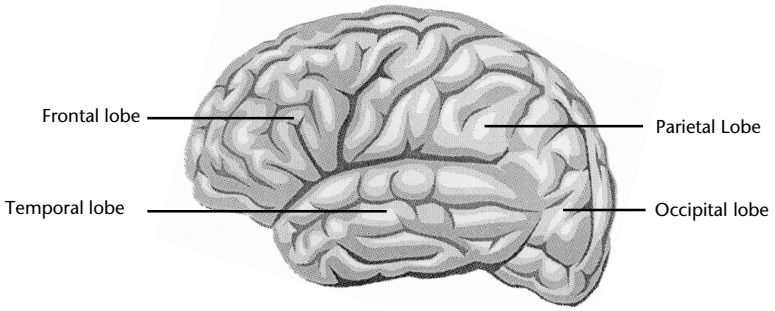
Parts of the brain:

Cerebral Cortex - This thin layer on the brain's surface that includes lobes or sections:

* ***Occipital lobe*** - processes vision; is located near base of back of head
* ***Temporal lobe*** - processes hearing, speech, language development
* ***Parietal Lobe*** - processes sensory stimuli
* ***Prefrontal lobe*** - allows us to plan and rehearse future actions; connected to the limbic area to help regulate emotions



* ***Frontal lobe*** - area where critical thinking and problem solving occur
* ***Limbic system*** - controls emotions and long-term memory
* ***Cerebellum*** - controls automatic movements and balance

Between 10 and 18 months, a baby's emotions are developed. Emotions are closely connected with long-term memory.

The brain is shaped the **most** during the first 10 years of life. Teaching music, language, and other lifelong skills will be easier during these early years.

Listening to Mozart (and other classical music) early in life exercises the same neurons used for mathematics and spatial reasoning.

How does the brain work?

Life shapes the brain's development. Warm touches and caregivers who talk positively to the infant allow the brain to take in all things around them. On the other hand, severe stress that goes on for many months or years in early childhood can actually affect the development of a child's brain.

The brain is just waiting to send out signals to other parts to connect the wiring to form what kind of person the infant will become. These connections between cells are called ***synapses***. A connection (synapse) is made depending on the stimuli or signals the brain gets from the setting.

The brain defines who we are, and it is influenced by what we do. With proper stimulation, the synapses become stronger. Electrical chemicals are sent out that make the connections stronger and more permanent.

How parents and caregivers can nurture positive brain development

- *Give consistent loving care.*

  If a child is raised in a loving setting, they will learn to love. Children who are ignored or not nurtured will not fully develop all areas of their brains.

- *Touch infants.*

  In research with infants, it was shown that gently massaging premature infants three times per day for 15 minutes helped them gain weight, be more alert, and cry less. These infants were released from the hospital sooner than infants who were not massaged. Addition ally, low lights, skin-to-skin holding, and being near the mother's heart can improve growth and save medical costs for premature infants.

- *Pay attention to hearing and language.*

  Repetition forms connections. Talk to the baby so that he or she will begin babbling. Name what you are doing, name items, point and show expression on your face.

  Lots of ear infections can slow down language development because babies cannot hear words repeated to them.

  It is easier for children to learn two languages than it is for adults. For example, children whose parents speak Spanish *and* English create two maps and strengthen their use of both languages when both these areas of the brain are used in childhood.

- *Watch babies notice the world at 2 to 4 months.*

  Watch the health of the eyes to assure babies are taking in the colors, faces, and shapes around them. Each neuron is attaching to 15,000 other neurons during the first months. The development of vision peaks at 8 months. In research with infants, it was found that if cataracts were not removed by age 2, children were unable to see since the vision centers were not used and did not develop.

- *Look for teachable moments.*

  Every day offers windows of learning for children. When you are dressing your child, name items, colors, and count. When you are fixing dinner, let toddlers play with plastic dishes. When you can, name things that are the same, different, bigger, smaller, hot, cold. When you drive in the car, point out things like trees, cars, big trucks, and stop signs.

- *Use music because it relates to math skills.*

  By exposing children to complex musical sounds (Mozart, not hard rock), children will develop the same areas of the brain required for math and spatial reasoning. Using mazes, copying patterns, and drawing shapes has been shown to improve with exposure to complex musical sounds.

- *Know that emotional connections can be stressful or relaxed.*

  Vivid memories are often tied to emotional reactions to particular situations. The more vivid the memory, the stronger the *print* in the brain. The limbic system regulates emo tional impulses and helps us make decisions about what to do... run, cry, react, whine, turn away. If the goal in childhood is survival and coping skills around survival are taught, this will become permanent. If trust is nur tured, then this will become part of the child's nature. Neglect or trauma during childhood could cause learning and behavioral problems later on.

- *Be gently physical.*

  Children need to move their small (fingers and toes) and large (by running and jumping) body parts. Expose your child to a safe variety of physical activities as they grow. During the child's preschool years, think of all areas — climbing, splashing, slow and fast movement, hard and soft areas, different textures like clay, and and paint.

- *Mirror behaviors you want in children.*

  Children will pick up many behaviors of the adults around them. If parents voices are loud, children may be loud; if parents use soft warm touches, children will learn the same. If children see patience in adults looking for solutions to problems, they will see that learning is a process with many steps.

Summary

The power of the brain is very interconnected. In early years, children learn symbols to understand meanings. For example, outstretched arms may mean a toddler wants "up," or hugs may be a symbol of love and security. But over time, these key elements found in the emotional centers of the brain begin to organize responses to things that happen. Over time, life experiences combine to form our understanding of abstract concepts, such as justice, pride, forgiveness, anger, and security. Adults play a critical role in the lives of children. Helping children organize their world takes time, patience, and

warmth, but these efforts form the building blocks to positive, human interactions.

For additional information please refer to the following Extension publications:

Appropriate Limits for Young Children, Parts 1 and 2, FCS-455 and FCS-456

Growing Together: Infant Development, FCS-459

Growing Together: Preschooler Development, FCS-454

Quality Child Care: What does it really mean? FCS-460

Selecting Child Care: A checklist, FCS-458

Helping Children Cope with Stress, FCS-457

Also see the Family and Consumer Sciences' Web at: http://www.ces.ncsu.edu/depts/fcs

References:

Als, H., & Gilkerson, L. (1995) Developmentally Supportive Care in the Neonatal Intensive Care Unit. *Zero to Three: National Center for Clinical Programs.* 15 (6).

Greenspan, S. (1997), *Growth of the Mind.* New York: Addison Wesley.

Perry, Bruce (1995). Incubated in Terror:20 Neurodevelopmental in the "Cycle of Violence" *Children, Youth and Violence: Searching for solutions.* New York: Guilford Press.

Ramey, C. & Ramey, S.L. (1996). "Music of the Hemispheres." *Discover.*

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