



Promoting the inclusion of infants and young children with disabilities in child care

Instructor Guidelines

Brain Development: Implications for Caregivers



Philadelphia Inclusion Network a program of
Child and Family Studies Research Programs at
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April 2005

PIN ~ Philadelphia Inclusion Network

Campbell, P.H., Milbourne, S.A., & Silverman, C. (2002). Philadelphia Inclusion Network, Participant Materials.

Campbell, P.H., Milbourne, S. (2002). Philadelphia Inclusion Network, Instructor Guidelines.

Both are available from Child and Family Studies Research Programs, TJU, OT, 130 S. 9th Street, 5th floor, Philadelphia, PA 19107, 215-503-1608.
[Http://jeffline.tju.edu/cfsrp](http://jeffline.tju.edu/cfsrp)

Many people have provided ideas for training activities, content, and materials and we appreciate their input, especially from Elyse Rosen, Lalita Boykin, Kathi Nash, Francine Warton, Patricia Benvenuto, and Robin Miller, teachers who support inclusive child care for families and their young children with disabilities. Mary Mikus, Jean Ann Vogelman, and other families who work for their children to be part of inclusive communities. Susan Kershman and Terry Waslow, early intervention specialists and advocates for inclusion. A special thanks to Natalie Feller and Lillian McCuen and also to the many of you who diligently and tirelessly edited the content of the materials.



April 2005
PIN, a program of:
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SESSION OUTLINE

Topic

Topic	Activity	Time	Cum. Time
I Welcome the Group	Introduce yourself and talk briefly about PIN. Promoting the inclusion of infants and toddlers with disabilities in child care settings is a primary purpose of PIN. Review concepts of Welcoming All Children and discuss briefly how this session contributes to the idea of Welcoming Everyone.	10 min.	:10
II Video Clip: <u>10 Things Every Child Needs</u>		5 min.	:15
	Overview of Baby Brain Anatomy	15 min.	:30
III Complexity of Brain Function	#1	10 min.	:40
IV Video Clip: <u>The First Years Last Forever</u>	#2	10 min.	:50
	Break	10 min.	1:00
V Prime Times of Development		20 min.	1:20
VI Social & Physical Environments	#2	60 min.	2:20
	Video Clips (8): <u>10 Things Every Child Needs</u>	10 min.	2:30
VII Summing up			

Notes:

What you will need:

- ' Participant sign-in sheet
- ' Extra copies of the make-up assignment
- ' Extra copies of previous modules
- ' TV/VCR
- ' Video: 10 Things Every Child Needs: Robert McCormic Foundation
- ' Chart paper
- ' Markers
- ' Overhead projector
- ' Overheads
- ' Masking Tape

Session: Brain Development, Implications for Caregivers

OVERVIEW

What this workshop should accomplish:

Participants will learn about the “Prime times” of infant/toddler brain development. It is critical for a care giver to recognize “prime times” and provide opportunities to enhance learning and brain growth. It is the outside world that shapes the development of a child’s brain. Both the physical outside world and the social outside world provide opportunities for the senses to take in new and brain forming information.

Enriched physical environments have recently been shown in research to have a direct impact on the number of neurons in the brains of infants and young toddlers. Social environments allow for attachment and the development of trust and comfort. Children learn through the context of relationships. Relationships that provide warm, consistent care help infants and young toddlers grow into curious, confident, able learners. Relationships and interactions are a part of responsive care and have been shown to do far more to enhance later learning than flash cards or work sheets for example.

Notes:

From this session, participants should gain understanding about:

- i Describe the basic neurology of brain growth and development.
- i Identify the long-lasting effects of the social and physical environments on brain development.
- i Describe the impact of brain development on social relationships, speech and language, and cognition.

Notes:

BACKGROUND

Helen picks up the crying 8 month old. Tamara reads a book to a toddler. Anthony holds little Carlos on his lap while Carlos sucks from a bottle. During these interactions thousands of the very young brain cells are making millions of neural connections. Some brain cells are turned on, others are being strengthened, and new connections are being formed. Early care of infants and toddlers has a profound impact on the development of brain function, a child's ability to learn, and their ability to regulate their own emotions. We cannot see what is going on inside an infant's or toddler's brain and perhaps the greatest misunderstanding about a newborn's brain is that it is simply a small version of an adult brain. New thinking in brain research tells us that the prenatal and newborn brain is not a fully developed brain. Rather it is a brain waiting to "get hard wired", in other words it is in the process of developing and maturing. Actually, by the age of three, the brain of a child is two and a half times more active than the brain of an adult. Recent research also reveals that early experiences have a determining impact on the developing brain and on the nature and extent of adult capabilities. Additionally, brain development is not linear, growth depends on providing life experiences at "prime times" of development (prime times are also referred to as "critical windows" or "windows of opportunity"). Early development of the brain is not only shaped by physical conditions or experiences, but also by social conditions and interactions. Learning, and hence brain maturation, is acquired through the context of important relationships. As suggested in brain development literature the best way to promote the development of curious, confident, able learners is to provide the very young child with warmth, consistent care, and opportunities for attachment. Research supports nurturing brain growth and maturation, less about drilling for facts (i.e. ABC's and 123's). Brain research underscores that early emotional experiences are the foundation and seeds of human intelligence.

Basic Brain Anatomy

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Notes:

In order to gain a comprehensive understanding of brain development it is important to review its anatomy in brief. As a part of the central nervous system the brain plays a vital role in bodily functions, cognition, emotional regulation, memory, motor actions and processing of sensory information. Both voluntary (such as walking and reading) and involuntary functions (for example, breathing and blinking) are controlled by the brain. The sequence of brain development can be thought of as starting from the inside out. In other words basic life functions, such as breathing, are located in the most inner part of the brain and are first to fully develop. Additionally, foundations for emotional development are located deep inside the brain and are waiting to organize the infants newly learned emotions. The brain can also be thought of as developing from the back to the front. From research we now know that the visual area in the back of the brain develops during the first two months of life whereas conscious thoughts and 'higher' thinking, the area we call our forehead, is the last part of the brain to fully develop.

The brain has two hemispheres together called the cerebral cortex. The cortex is arranged so that specific areas, called lobes, can be thought of as having a "specialty division of labor". The frontal lobe is often referred to as the CEO of the brain where higher cognitive functioning such as reasoning and intentional behavior take place. Hearing, language, and smell are associated functions of the temporal lobe. Processing of touch and sense of position and information about perception and spatial orientation are housed in the parietal lobe. Finally the occipital lobe is more or less specifically concerned with visual functions. What about memory and new learning? These functions are spread out among various structures of the cortex, mainly the limbic lobe and a structure called the thalamus, which are deep inside the cortex. These structures communicate with all other parts of the cortex to formulate long-term and short-term memories and the ability for new learning.

In addition to the division of labor of the lobes of the cortex research has

Notes:

also determined that each hemisphere (half) of the cerebral cortex has different functional specializations. The left hemisphere in most people appears to be dominant for language, mathematical ability and ability to solve problems in a sequential, logical fashion. The right hemisphere seems to be superior in musical skills, recognition of faces, and in tasks requiring spatial relationships.

The cerebellum, which sits tucked under the cerebral cortex, is a primitive brain structure and plays a vital role in balance and coordination of movement. Deep within the cerebral cortex is the thalamus and other related structures responsible for transmitting information about wakefulness, arousal, and emotional regulation. All necessary body functions, such as breathing, circulation, heartbeat and reflexes are a function of a structure called the brain stem. Of all the regions of the brain, the brain stem is the only functional area that is completely "hard wired" at birth. Rate of development of different functional areas of the brain impact the "prime times" for various learning opportunities.

Basic Neurological Development

Neurons, the building blocks of the brain, are brain cells that are waiting to connect, or synapse, and create a functional architecture that lets our brains grow and make us who we are as adults. Infants are born with over 100 billion neurons with the potential to synapse with other neurons. It is through the development of these neuronal synapses that the brain develops habits, thoughts, consciousness, memories, feelings, and the ability to learn.

During the first year of life there is a remarkable increase in the number of neuronal synapses. By puberty research shows that there is a marked reduction in the number of synapses that continue to form via a process called pruning. Therefore, it is important to remember the "prime times" of brain development in order to provide multiple and varied opportunities/experiences to facilitate the formation of neuronal synapses.

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Neurotransmitters

Chemicals in the brain called neurotransmitters enable synapses to form. Synapses allow the various parts of the brain to communicate with each other allowing us to move, think, feel, see and so on. Between 50 - 55 neurotransmitters have been identified all with differing purposes and interactions and varying levels among individuals. Examples of some neurotransmitters include Dopamine, Cortisol, Acetylcholine, and Norepinephrine. Neurotransmitter levels within the brain can be influenced by what happens around us, our experiences. For example, in a stressful situation the level of Cortisol goes up higher than normal. Studies have shown that continual increases of Cortisol levels in infants and toddlers can have irreversible and negative effects on the developing brain. Magnetic Resonance Imaging (MRI) now provides pictures of the brain which show 'stressed' brains of young children and where the brain is 'missing' parts - parts of the brain simply did not increase in size or in other words did not fully develop. With new studies research is providing hope that if intervention is provided before the child is three that some of the initial damage due to increased Cortisol levels may be altered if enriched and loving experiences and relationships are experienced.

Importance for Caregivers

Brain development, or neuronal synaptic formation, groundwork is laid out by our genetic inclinations. In other words our genes tell the brain what will happen. However, the environment that infants and toddlers are exposed to will tell the brain how to make the necessary connections to help the brain grow. It is through exploration, guidance and consistent, positive, responsive care that a healthy brain will develop.

"Prime times" of brain development do not occur for the brain as a whole, rather each "division of labor", each area of the brain is ready to develop at different times during infancy and toddler-hood. Therefore it is critical

Session: Infant Toddler - Brain Development

Instructional Guide

for a care giver to recognize “prime times” and provide opportunities to enhance learning and brain growth. Between birth and age four, in order of succession, an infant is able to learn motor development, emotional control, vision, social attachment, vocabulary, second language, math/logic, and music.

The outside world shapes the development of an infants brain. The outside world comes in through the senses - vision, hearing, touch, taste, smell - allowing continued neuronal synapsing and brain development. Both the physical outside world and the social outside world provide opportunities for the senses to take in new and brain forming information.

Enriched physical environments have recently been shown in research to have a direct impact on the number of neurons in the brains of infants and young toddlers. Social environments allow for attachment and the development of trust and comfort. Research shows that secure attachments to a consistent child care provider have been associated with better cognitive and social development, greater language proficiency and fewer behavior problems. Children learn through the context of relationships. Relationships that provide warm, consistent care help infants and young toddlers grow into curious, confident, able learners. Relationships and interactions are a part of responsive care and have been shown to do far more to enhance later learning than flash cards or work sheets for example.

Notes:

Video: 10 Things Every Child Needs

Purpose: View video of basic brain development information to introduce the topic.

Sequence:

Show the first five minutes of the video [10 Things Every Child Needs](#). This segment will depict and discuss some basic information about brain development. Use this as an introduction to the next section: Overview of Baby Brain Anatomy.

Notes:

Length: 10 minutes

What you will need:

- ' Video: 10 Things Every Child Needs (first 5 minutes of video)
- ' TV/VCR

Overview of Baby Brain Anatomy: Divisions of Labor

Purpose: Participants will gain a brief introduction and overview of brain development

Sequence:

Begin the session with an overview of baby brain anatomy. Taking information from the Background section of this manual, provide participants with a brief overview of basic baby brain anatomy and the functional areas (division of labor) that exist. Refer participants to handouts -

T Brain Development from Inside to Outside & Back to Front
(2 handouts)

On each handout have participant connect the function listed with the lobe in the picture.

T Process of Prenatal Development

T Building Blocks of the Brain - Neurons

Participants will use these handouts as reference in the first activity of this session.

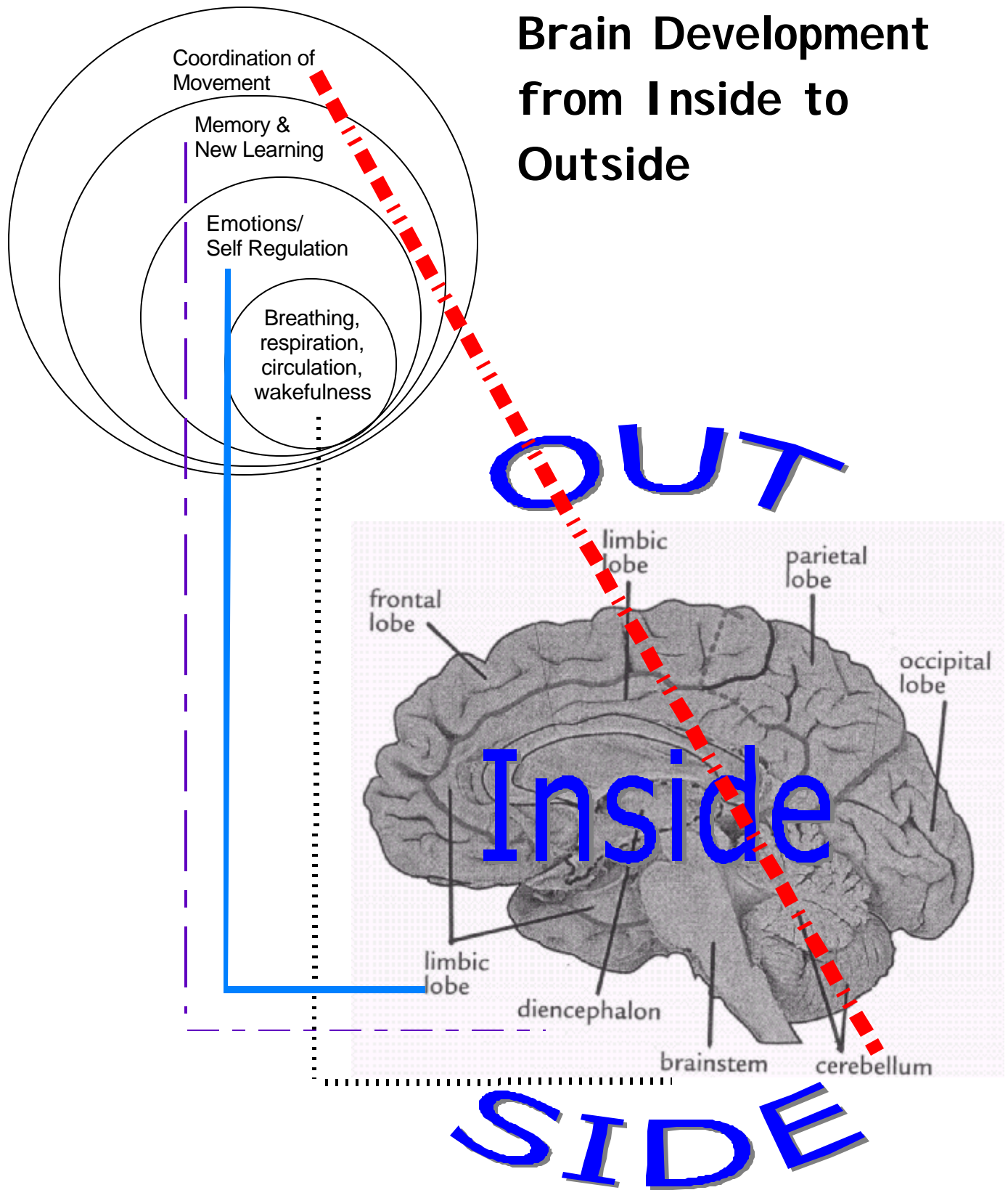
Notes:

Length: 15 minutes

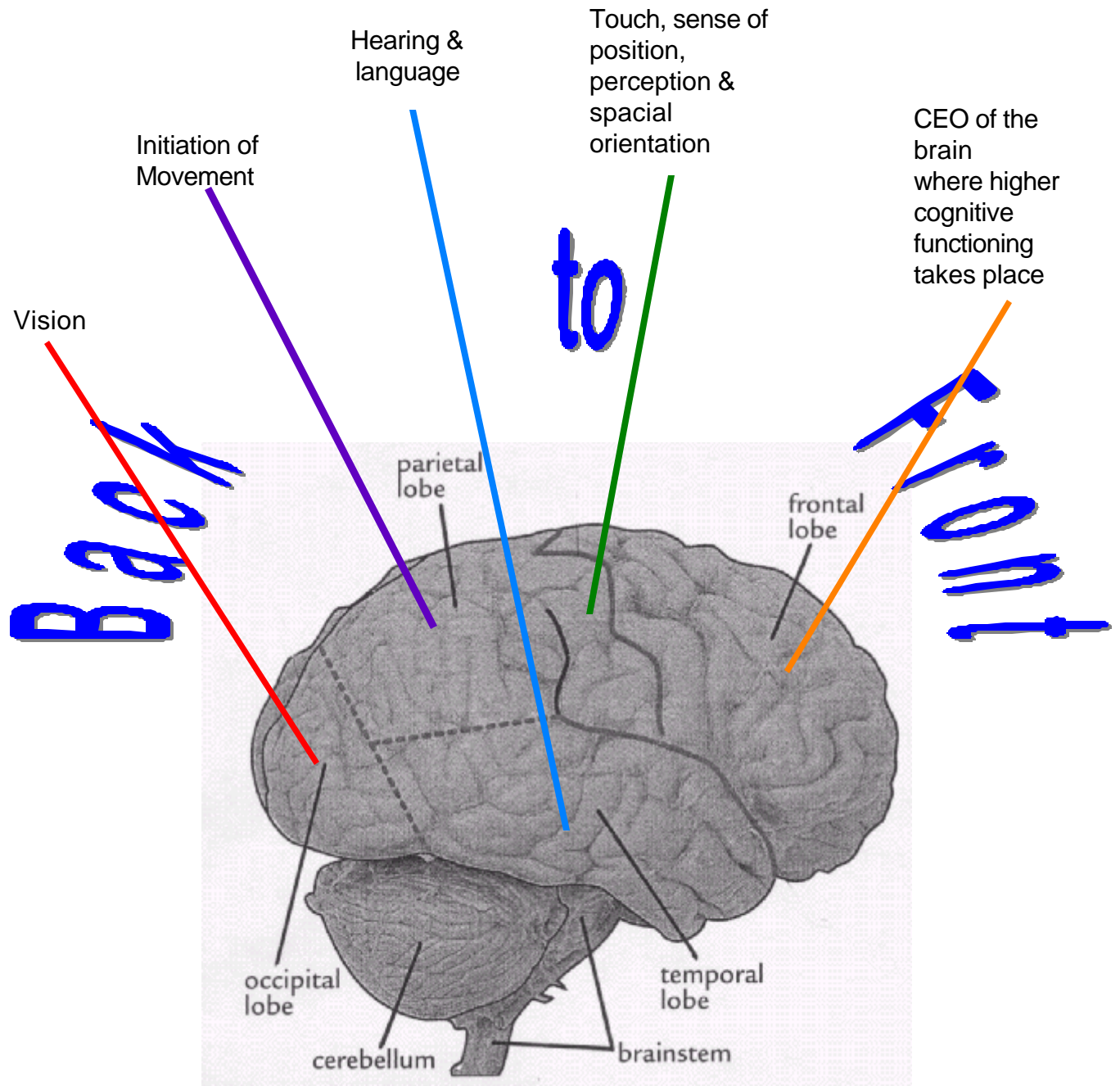
What you will need:

- ' Overhead projector
 - ' Overheads of handouts:
- Handouts:
- ' Brain Development from Inside to Outside, Participant pp. 9
 - ' Brain Development from Back to Front, Participant pp. 10
 - ' Process of Prenatal Development, Participant pp.11
 - ' Building Blocks of the Brain - Neurons, Participant pp. 12

Brain Development from Inside to Outside

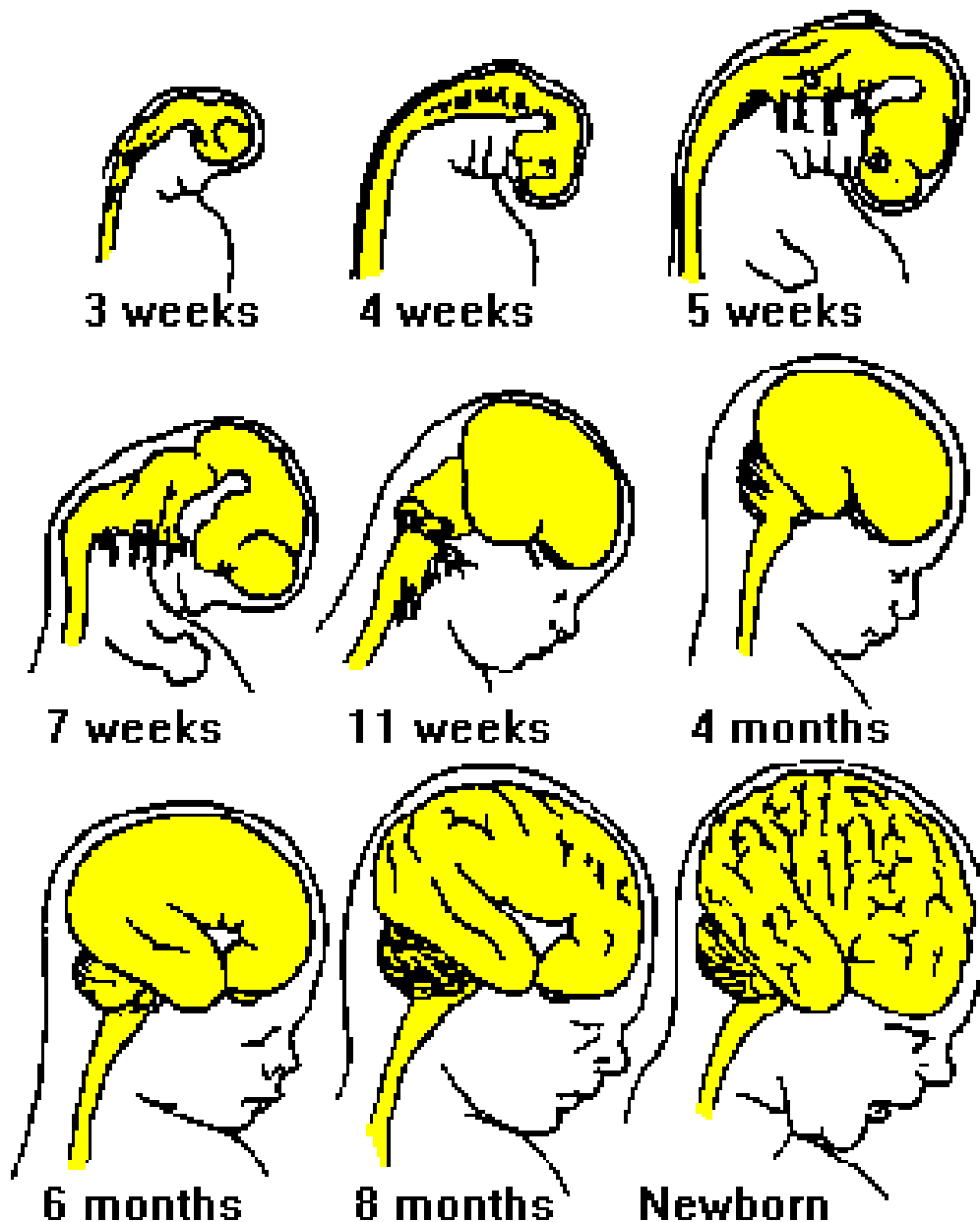


Brain Development from Back to Front



Process of Prenatal Development

New thinking in brain research tells us that the prenatal and newborn brain is **not** a fully developed brain. Rather it is a brain waiting to "get hard wired", in other words it is in the process of developing and maturing.



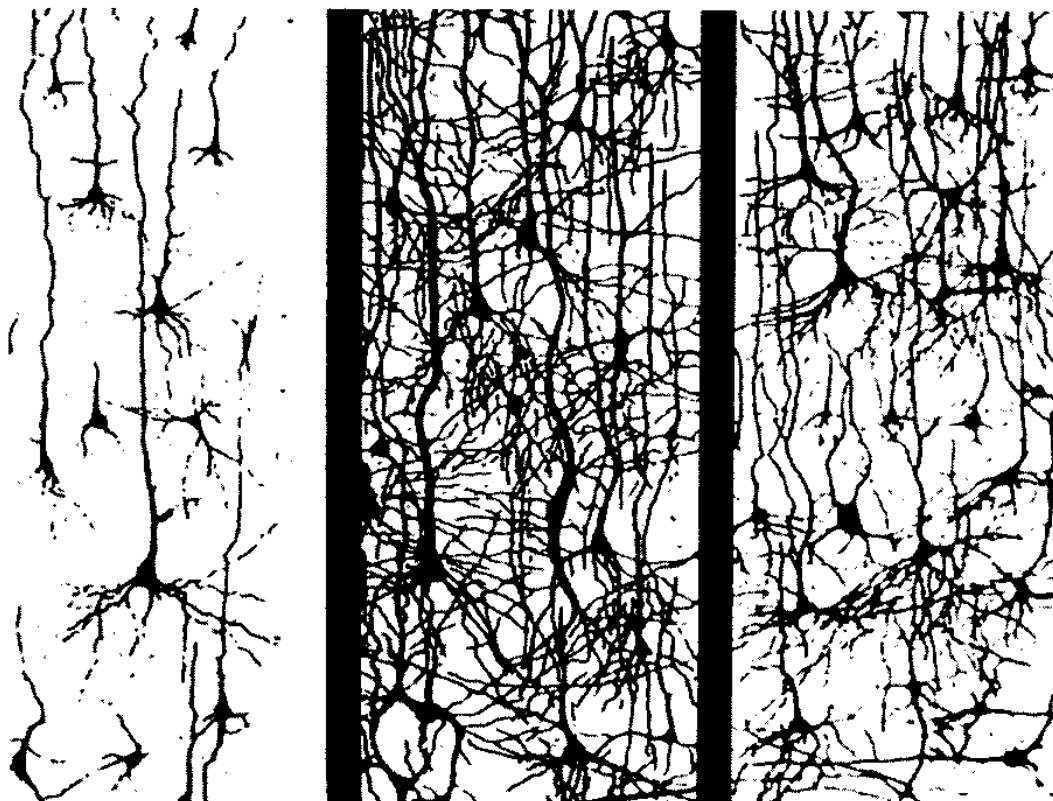
Building Blocks of the Brain: Neurons

born with 100 billion waiting to connect
pruning process development of habits, thoughts,
consciousness, memories, feelings,
and the ability to learn

At Birth

6 Years Old

14 Years Old



SYNAPTIC DENSITY: Synapses are created with astonishing speed in the first three years of life. For the rest of the first decade, children's brains have twice as many synapses as adults' brains.

Activity #1

Complexity of Brain Functions

Purpose: Participants will experience the complexity of how the brain works and what part of the brain is working at different times. Also, this activity illustrates how information from our senses needs to be communicated to the brain in order for our bodies to work.

Activity Sequence:

1. Have participants sign their name on a piece of paper. Referring to handout Brain Development from Back to Front & Inside to Outside - what part(s) of the brain are working when you sign your name?
2. If participants are right handed have them cross their right leg over their left knee. If they are left handed have them cross their left leg over their right knee. Using the handout - what part of the brain is working now?
3. Ask participants to rotate their dangling foot counter clockwise.
4. What part of the brain is working? Is anyone laughing or smiling?
5. What part of the brain is working?
6. Tell participants to continue rotating their foot counterclockwise and at the same time sign their name again on the same piece of paper.
7. Discuss the experience - what happened to their handwriting? What happened to their foot as they began to sign their name?

Notes:

Length: 10 minutes

What you will need:

Handout:

- ' Brain Development from Back to Front & Inside to Outside, Participant pp. 9 & 10

Activity #2

Prime Times of Development

Purpose: To discover the prime times of infant brain development and what caregivers can do to enhance development.

Activity Sequence:

1. Using the overhead, Instructor pp. 18 highlight the prime times of brain development.
2. Pose the question for each prime time “What can you do to support this prime time?” that may enhance development.
3. Refer participants to their handout for additional ideas and suggestions for enhancing development at the various prime times.

“Prime times” do not occur for brain development overall rather for each “division of labor” in the brain’s system. Therefore it is critical for a care giver to recognize “prime times” and provide opportunities to enhance learning and brain growth. It is also crucial to recognize that prime times overlap and do not occur in a linear sequence.

Between birth and age four, in order of succession, an infant is able to learn vision, motor development, emotional control, social attachment, vocabulary, second language, math/logic, and music.

Notes:

Length: 20 minutes

What you will need:

- ‘ Overhead projector
 - ‘ Overhead of handout: Prime Times of Brain Development. Instructor pp. 18
- Handout:
- ‘ Prime Times of Brain Development, Participant pp. 13

Prime Times of Brain Development

i Vision Birth - 6 months

What can you do?

i Movement Birth - Age 4

What can you do?

i Emotions Birth - 18 months

What can you do?

i Communicating/Talking Birth - Age 3

What can you do?

i Social Attachment Birth - Age 3

What can you do?

i Math - Logic Age 1 - 4

What can you do?

i Music Appreciation Age 3 - 10

What can you do?

Prime Times of Brain Development

i Vision Birth - 6 months

What you can do: you can help the developing connections in the brain by holding infants so she can look around. Give infants opportunities to use their eyes; give them something interesting to look at when they are in their crib, on the floor, or in an infant seat.

i Movement Birth - Age 4

What you can do: Provide opportunities for children to explore different types of movement; climbing, running, crawling, walking, swinging, spinning, rolling... Explore the movement of other things such as rolling a ball down a hill vs. up a hill, throwing a balloon vs. a playground ball. Movement over smooth, un-even, slanted, skinny surfaces will challenge children to learn coordinated movements.

i Emotions Birth - 18 months

What you can do: pick up infants and children when they are in distress/crying; respond quickly and warmly. Avoid repeatedly responding with frustration or hostility. Stick to the same caregiver as much as possible.

i Communicating/Talking Birth - Age 3

What you can do: speak to the infant/child in full sentences; talk and read to the children often because children are learning the components of speech. Explain what you are doing, like washing hands, wiping nose, setting up lunch... Talk with the children about things you see by describing them "I see a red fire truck outside the window".

i Social Attachment Birth - Age 3

What you can do: allow children to move freely or take them from their cribs so natural groupings and interactions can occur. Model positive social interaction by smiling, talking, and showing affection. Reinforce positive social interactions, for example, praise a child for finding a duplicate toy instead of taking from another child. Assign responsibility of a small number of children to one primary caregiver.

i Math - Logic Age 1 - 4

What you can do: look for opportunities to explain simple concepts like the different sizes of blocks, concepts of a few blocks, many blocks... Find opportunities to sort - all red objects or all purple paints. Establish correspondence - the fork goes next to the plate on the left side; street lights are red on top, then yellow, then green on the bottom.

i Music Appreciation Age 3 - 10

What you can do: sing simple songs and play songs that have simple melody structure. Repetition is key to building strong neural pathways, so let the children sing or hear the same songs over if they wish. Provide opportunities to hear and sing a variety of types of music and to listen to/play various types of musical instruments.

Activity #3

Social & Physical Environments: Influences on the Brain

Purpose: To explore how the outside world shapes the development of the brain.

Activity Sequence:

1. Discuss how the outside world shapes the development of an infants brain. The outside world comes in through the senses - vision, hearing, touch, taste, smell - allowing continued neuronal synapsing and brain development. Both the physical outside world and the social outside world provide opportunities for the senses to take in new and brain forming information.
2. View, in order, the following 8 clips from the video tape 10 Things Every Child Needs stopping for four minutes between segments:

Interaction.....	2 minute clip
Touch.....	2 minute clip
Stable Relationships.....	2 minute clip
Self Esteem.....	2 minute clip
Communication.....	2 minute clip
Play.....	2 minute clip
Music.....	2 minute clip
Reading.....	2 minute clip

Between each clip stop the tape and have pairs of participants (or small groups) record on flip chart paper two key points that they heard discussed on the video clip. Quickly do a round robin and have one person from each group read aloud the two key points they recorded. Emphasize that brain development is influenced both by the people caring for them (social environment) and by the way in which the physical environment is set up (softness, access to toys, lighting, sounds, etc).

Notes:

Length: 60 minutes

What you will need:

- ' TV/VCR
- ' Video: 10 Things Every Child Needs (eight clips)
- ' Chart paper
- ' Markers

Summing Up

This discussion will assist participants to reflect on what they learned today and will also briefly preview the next session. Be sure that all materials are collected and replaced into proper containers.

Review:

Have participants imagine that they are sharing lunch with a co-worker who is not a part of this group. The co-worker asks, "What is this training program about, anyway? What did you learn?"

Pause for at least 30 seconds. Ask participants how they would respond. Allow participants to volunteer, then ask others what they might add.

Repeat:

Date and time of the next session.

Highlights of next session:

Evaluation:

Have participants complete the evaluation form "What Did You Learn Today?" and collect them.

Notes:

Length: 10 minutes

Announcement:

T Date of next session

What you will need:

· Evaluation forms

References and Resources

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Shore, R. (1997). Rethinking the brain: New insights into early development. New York: Families and Work Institute.

Viadero, D. (1996). Brain trust. Education Week, Sept. 18, 1996.

Willis, C. (1997). Your child's brain: Food for thought. Little Rock, AR: Southern Early Childhood Association.

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Web sites:

Websites are a valuable resource for learning more about particular areas and for downloading information that can be used in training. Many websites are linked to other websites, providing easy access to related sites. However, website addresses may change. These lists are a place to begin exploring!!

The most up to date listing of resources may be found at

http://www.fpg.unc.edu/~scpp/nat_allies/na_resources.cfm or

www.nectac.org

I Am Your Child Campaign
335 North Maple Drive, Suite 135
Beverly Hills, CA 90210
(310) 285-2385
<http://iamyourchild.org>

Families and Work Institute (Publication: Rethinking the Brain)
330 Seventh Avenue, 14th Floor
New York, NY 10001
(212) 465-2044
(212) 465-8637 (fax)
<http://www.familiesandwork.org>

The Ounce of Prevention Fund
(Resource paper: Starting Smart)
122 S Michigan Avenue
Chicago, IL 60607
(312) 922-3863
<http://www.bcm.tmc.edu/civitas/links/ounce.html>

Boston Child Health and Development Connection
This web resource developed by the Department of Pediatrics at Boston Medical Center helps parents, service providers and children access information and services that promote healthy child development.
<http://www.bostonchildhealth.org>

Erikson Institute

This independent institution of higher education prepares child development professionals for leadership positions.

<http://www.erikson.edu>

Raleigh News and Observer

An in-depth series of feature articles on brain development that appeared in the Raleigh News and Observer is available here:

<http://www.news-observer.com/2little2late/stories/day1-main.html>

Time Magazine

Visit this site to view the Time Magazine special report entitled, "Fertile Minds":

<http://cgi.pathfinder.com/time/magazine/1997/dom/970203/cover0.html>

University of Georgia

Building Baby's Brain, a series of articles on brain development, was developed by the University of Georgia:

<http://www.fcs.uga.edu/pubs/current/FACS01-CS.php3>

University of Washington

Designed to teach children about neuroscience, this site is appropriate for both adults and children:

<http://faculty.washington.edu/chudler/dev.html>

ZERO TO THREE

If you are concerned about your child's development and/or are looking for resources on particular issues (ranging from breast feeding to safety), visit the resource list at ZERO TO THREE's web site:

<http://www.zerotothree.org/brainworks/caregivers.html>

What Did You Learn Today?

1. Did you make any changes in your classroom since last session? Explain
2. List 2- 3 main points you learned from this session.
3. I am leaving this session with a better idea about how to:
4. What is one thing you plan to do differently in your classroom before the next session?