



# Infant Brain Development

## Making the research work for early childhood programs

by Paula Wiggins

**Editor's note:** Effective January 1, 2000, the Texas Department of Protective and Regulatory Services, Child Care Licensing requires all caregivers who work with children 24 months and younger to have one hour of new, specialized training. Caregivers must be able to recognize and prevent Shaken Baby Syndrome (SBS); prevent Sudden Infant Death Syndrome (SIDS); and understand early brain development. This training is required as part of the 15 hours of annual training for staff in licensed facilities; part of the 20 hours required for registered family and group day home providers; and one hour of the required eight hours of preservice training for staff in day care centers.

Do you ever wonder how much money people are making from the frenzy of gimmicks and techniques advertised to increase a baby's brain power?

Do you fear for teachers and caregivers who don't know what to believe about how infants develop?

Are you concerned that parents will look elsewhere for child care if you don't provide the latest and greatest?

Since 1997 we have seen an increased public awareness of ongoing research on early brain development. You may have read numerous articles and heard news reports about the latest research and wondered, "Where do I start?"

### What research shows

Early brain development focuses on children from the prenatal period to age three. Current research shows that the quality of children's interactions and experiences determine their emotional, social, and intellectual development. Those early years are key in predicting ultimate success in school and life (*Texas Kids Count*, 1999). Researchers agree that we can support healthy development of the brain in three ways:

1. good prenatal care
2. warm and loving attachments between young children and adults and
3. positive stimulation from the time of birth.

At birth, the child's brain contains 100 billion brain cells, or neurons. Few of these are connected, like those that govern involuntary reflexes such as startling and sucking. These neuron connections are made through life experiences and attachments with adults during a baby's first few years. These connections are called synapses. As more and more connections are formed, the brain becomes a complex network of synapses (*Gramann*, 1998). This is referred to as the wiring of the brain. The number of synapses develops rapidly during early childhood (*Stephens*, 1999). A three-year-old has twice as many connections as an adult. The synapses that are not

nurtured and used repeatedly are pruned back and lost (Shore, 1997).

In order for these connections to remain active and become permanent, they must be strengthened through repetition (Stephens, 1999). These experiences in the early years interact with each child's genetic makeup to determine not only how they think, but whether they become mentally retarded, sick, aggressive, or violent. Intellectual, emotional, social, and physical experiences are laid down on the trillions of connections between brain cells that make learning and memory possible (Kotulak, 1996). Rima Shore, in *Rethinking the Brain* states:

*“New knowledge about brain function should end the nature or nurture debate once and for all. A great deal of new research leads to this conclusion: How humans develop and learn depends critically and continually on the interplay between nature (an individual's genetic endowment) and nurture (the nutrition, surroundings, care, stimulation and teaching that are provided or withheld) .... And both are crucial.”*

### **The importance of attachment**

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You may be asking yourself, “What is attachment?” and “What is bonding?” Dr. Bruce Perry, renowned professor of child psychiatry, has done extensive research into infant brain development. He defines attachment as “*the nature and quality of the relationship between an infant and a primary caregiver.*” We often hear the term bonding in conjunction with attachment. Dr. Perry describes bonding as “*the process of forming an attachment.*” A caregiver can strengthen the relationship with an infant by holding, rocking, singing, feeding, gazing, kissing, and other nurturing behaviors. These are all bonding experiences.

Scientists believe the most important factor in creating attachment is positive physical contact (Perry, 1998). Children who are touched, held, and played with regularly develop brains that are larger, with stronger connections between brain cells, than those who are not (*Oregon's Child*, 1997). The *I Am Your Child* campaign has been an important catalyst for public education in the field of early childhood brain development and the importance of the first three years of life. The

campaign publishes a number of quality materials for training parents and caregivers that focus on how important it is for caregivers to provide warm, loving, and responsive care for infants.

When children receive this type of care, they are more likely to feel safe and secure with their caregivers. These strong relationships are referred to as secure attachments. Recent research has confirmed that not only do children thrive when they feel secure, but they are better able to cope with difficult situations more easily later in life. These children who have secure attachments are more curious, get along better with other children, and perform better in school than children who are less securely attached (*I Am Your Child*, 1997).

The implications for those who work with infants and toddlers are phenomenal. The children you work with on a daily basis depend on you as they work to establish secure attachments. You may want to read additional information by Dr. Perry about the effects of other influences on bonding and attachment such as genetics, abuse and neglect, and the environment. (See the resource section for information.)

### **Windows of opportunity**

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Research shows us that young children's brains have optimal periods of development for each function. We know that the number of connections the child's brain makes depends on the variety and richness of learning experiences the child is exposed to (*Oregon's Child*, 1997). Children learn certain skills most easily during particular windows of opportunity. These are the few weeks or months when a part of the brain absorbs new information more easily than at any other time in life. These windows are so important because each part of the brain actually grows a little larger, and a lot more active, in response to what the five senses absorb. During these first few years of life, these windows open and close quickly, making your interactions vitally important (Bower, 1998).

### **Language development**

This window is most wide open from birth to two years; but it does extend to ten years of age. During this time, children learn their primary language (*American Association for Gifted Children*,

1997). Children incorporate new vocabulary into that language even if they are not speaking. Children whose caregivers speak to them frequently know about 300 more words by the age of two than those whose caregivers talk to them less. In order to take advantage of this window, talk and sing face-to-face with babies; talk to young children often in simple words (not baby talk); connect words to objects; and repeat the babbles, noises, and words the children say to you (*Oregon's Child*, 1997).

It is vital that you speak to children using proper vocabulary. Children will model your speech. When an older infant or toddler says a word to you that may not be correct, repeat the word to the child correctly. For example, if a child points and says, "wawa" for water; you might respond, "Water? Would you like some water?" Always avoid making fun of or joking about a child's speech pattern or vocabulary. Speak to infants continually during the day, during diapering, feeding, play time, and cuddling. Remember that the window of language is open wide!

### **Visual development**

The optimal age for visual development is from birth to four years. During this time, children need to see shapes, colors, objects at varying distances, and movement. All these images help shape the brain's ability to recognize and organize visual information. The brain actually learns to see (*Bower*, 1998). Caregivers can provide a variety of opportunities to enhance visual development by putting attractive things, like mobiles and pictures, in the baby's line of sight. Make sure that the baby's eyes are always looking at something interesting. Be sure that babies older than 6 months have something near the crib that they can look at and touch, like busy boxes and baby-safe mirrors. This will also help to develop eye-hand coordination (*American Association for Gifted Children*, 1997).

### **Motor coordination**

At birth, babies can move their limbs, but in a jerky, uncontrolled fashion. From birth to age four or five, the brain progressively refines the circuitry for reaching, grabbing, sitting, crawling, walking, and running. Infants should be allowed as many opportunities to explore as safely

possible. Provide activities to stimulate crawling, rolling, pushing, pulling, and reaching (*Oregon's Child*, 1997).

Give infants ample floor time to try out their arms and legs and develop skills that will eventually enable them to sit up, crawl, and walk. Equipment such as walkers and swings often are used to contain babies when they are not in their cribs. Research shows that children's mobility is limited in these types of equipment and that they often do no more than restrain.

When babies are in their cribs, provide toys they can reach for, shake, and throw. Developmental psychologists consistently remind us that play is children's work. Playing with toys involves a kind of thinking that is critical for the development of motor skills in infants and young children.

As children grow and develop, introduce a variety of equipment to stimulate motor skills that are appropriate for the child's developmental level. The American Association for Gifted Children suggests the following toys and games for children:

**1 – 3 months** – mobiles; unbreakable mirrors attached to cribs; rattles; stuffed toys with black and white patterns; music boxes; and large colorful rings.

**4 – 6 months** – beach balls; chunky bracelets; paper streamers hanging for view; cloth or vinyl books; and playing peek-a-boo.

**7 – 9 months** – stuffed animals; nesting cylinders; pop-up toys; large dolls and puppets; bath toys; and playing pat-a-cake.

**10 – 12 months** – push and pull toys; ordinary household objects like empty egg cartons and large spoons; stacked rings on a spindle; and playing simple ball games.

**19 – 21 months** – rocking horse; toys to take apart and put back together; rubber balls; digging toys; large crayons; kiddie cars; water games; toddler puzzles; playing hide-and-seek.

**22 – 24 months** – child-size household equipment like shopping carts, lawn mowers, and vacuum cleaners for pushing; make-believe props for kitchen and wood shop centers; construction sets; blocks; action toys like airplanes and trains; baskets and purses; and containers with lids.

**2 – 3 years** – beginner tricycles; roller skates; easel; paints and markers; cassette players; puzzles; writing equipment; woodworking sets. (See also “Classroom materials and essentials,” *Texas Child Care*, Summer 1999.)

Of course, age-appropriate items such as books, blocks, pictures, and sensory materials are essential. Always be mindful of safety. Anything a baby can hold will likely make its way into the baby’s mouth. A way to make sure that toys are not too small for infants and toddlers is to use an empty toilet tissue tube. If the object can pass through the tube, then it is small enough that a child may choke on it.

### **The importance of quality**

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As the field of early care and education continues to expand, so does the knowledge of the characteristics of quality care. Parents, educators, and policy makers are all looking to early care experiences as a basis for implementing programs for children and they are demanding that those experiences be of high quality. According to *Starting Smart*, “increasing numbers of American infants and toddlers spend several hours each day in various child care arrangements because their parents work or attend school.” The care these children receive must promote healthy growth and development. For that to happen, child care providers must be properly trained and must provide children with appropriate stimulation. Research has shown that in the majority of infant care arrangements in this country, children are not talked to or played with enough. In addition, they do not have the opportunity to form the kind of comfortable, secure relationships with a caregiver that will promote their healthy development (1998).

Bower (1998) suggests that the following conditions mark quality child care programs:

- small group sizes and low child-staff ratios;

- consistent, primary caregivers) that children form attachments with;
- low staff turnover;
- active parent participation; and
- teachers and caregivers who are trained in child development practices.

### **What you can do**

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You can do a number of things to promote children’s healthy development and school readiness. Review these criteria and evaluate your practices.

- 1. Be warm, caring, and responsive with each child.** Infants will cry when they are trying to communicate with you. Respond to each cry in a way that tells the child, “I’m here for you.” Your responses to an infant’s cues help to build trust and security.
- 2. Talk, sing, and read to children.** You can make up stories and songs and talk about daily activities, describing what is going on and what will happen next. Avoid television and videos with infants and toddlers. Television can’t teach a child language or communication. Instead use the time to interact face-to-face with babies playing games, talking, reading, and singing together.
- 3. Encourage safe exploration and play.** Children need opportunities to develop motor skills and to gain a sense of the environment around them.
- 4. Discipline children with love and understanding.** Be consistent with rules and routines. Crying infants can be frustrating, but remember that crying is a baby’s means of communicating needs. If you feel frustrated or angry, get help from another caregiver. Trading jobs may make both of you feel relief.
- 5. Recognize that each child is unique.** Children all have different temperaments and grow at different rates. Children’s ideas and feelings about themselves often reflect your attitude toward them. They feel good about themselves when they master the challenges of everyday life, and especially good when caregivers acknowledge the effort put into these accomplishments.

**6. Establish routines and rituals.** Repeated, positive experiences help to form strong connections in the brain. Daily routines such as mealtimes and naps should be associated with positive experiences. Mealtimes are excellent opportunities to promote language and communication skills (*I Am Your Child, 1997*). Research shows a connection between sleep in infants and their brain development. As the brain develops and becomes more mature, infants develop more regular, predictable sleep periods. Infants must have a consistent, comfortable sleep location. Cribs, mats, or cots are acceptable sleep arrangements for infants depending on their developmental level (*Zero to Three, 1999*).

## Evaluation

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If you want to provide appropriate, brain-building experiences for babies, evaluate your program. Evaluation is the process of making judgments about the merit, value, and worth of your program. Start by looking at the environment; the curriculum; the materials and equipment; your assessment process; and scheduling procedures (*Phipps, 1999*). Use the materials in this article to help you. Contact early childhood professionals in your community for assistance and training. Remember, the first years last forever.

## What have I learned?

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From a child's perspective, every important caregiver is a potential source of love and learning, comfort, and stimulation. Children need experiences with caregivers who are sensitive to their emotional and physical needs. By providing consistent and responsive caregiving, you can ensure that a child will have the best opportunity for healthy emotional and social development (*I Am Your Child, 1997*). Starting from birth, a child's ability to learn can be dramatically improved if you offer these "Ten Things Every Child Needs:"

- 1. Interaction** – Consistent, long-term attention from caring adults actually increases children's capacities to learn.
- 2. Touch** – Holding and cuddling does more

than just comfort babies. It helps their brains grow.

- 3. Stable relationships** – Firm attachments with parents and other caregivers buffer stress.
- 4. Safe, healthy environments** – Areas are free of lead, loud noises, sharp objects, and other hazards.
- 5. Self-esteem** – Children need respect, encouragement, and positive role models from the beginning.
- 6. Quality care** – Trained child care professionals can make a difference.
- 7. Play** – Children explore and discover through play.
- 8. Communication** – Talking to babies builds the verbal skills they need to succeed in school and later in life.
- 9. Music** – Rhythmic songs and rhymes expand the world, teach new skills, and offer a fun way to interact with children.
- 10. Reading** – Build language, enhance thinking skills, and create a lifelong love of books by reading. (*Adapted from the McCormick Tribune Foundation and WTTW-TV, 1997*).

Quality care and early education are vital components of each child's life. The types of experiences received in these programs can produce long-term, positive effects for our children (*Texas Kids Count, 1999*).

Use the following questions to test your knowledge about early brain development. They can be used on an individual basis or as talking points for a group discussion.

## Discussion questions

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1. Discuss how synapses are formed in the brain.
2. What effect does repetition of activities have on these synapses?
3. How does the concept of secure attachments apply to the child care setting?
4. Discuss the impact of the five senses on the child during the "window of opportunity" for

visual development, language development, and motor coordination.

5. What are some ways that you can encourage visual development?
6. What are some ways that you can encourage language development?
7. What are some ways that you can encourage both small and large motor development?
8. What are some characteristics of quality child care you can identify within your program? What are some areas that can be improved upon?
9. Discuss how giving children the opportunity to play relates to helping a child's brain to grow.
10. Why is it important to evaluate your program for infants and toddlers?
11. Describe what a classroom or group care setting for infants or toddlers would look like if you met the "Ten Things Every Child Needs."
12. How will you apply the research findings regarding early brain development on a daily basis?

## References

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*The First Years Last Forever*-CD-ROM. Beverly Hills, Calif.: I Am Your Child, 1997.

*Quality Child Care: Making the Right Choice for You and Your Child*. Beverly Hills, Calif.: I Am Your Child, 1997.

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## About the author

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## **Resources for teachers and parents**

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*First Impressions: Ready For Life*-video. Dallas: KERA-TV, 1999.

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"The Amazing Brain." *Scholastic Early Childhood Today*, March 1999.

## **Internet Resources**

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American Association for Gifted Children  
[www.jayi.com/jayi/aagc/main.html](http://www.jayi.com/jayi/aagc/main.html)

First Impressions  
[www.firstimpressions.org](http://www.firstimpressions.org)

I Am Your Child  
[www.iamyourchild.org](http://www.iamyourchild.org)

National Association for the Education of Young Children  
[www.naeyc.org](http://www.naeyc.org)

National Child Care Information Center.  
[www.nccic.com](http://www.nccic.com)

National Zero to Three Organization  
[www.zerotothree.org](http://www.zerotothree.org)

Parent Partners  
[www.parentpartners.com](http://www.parentpartners.com)

Parenting Information Center  
[www.parentinginformation.org](http://www.parentinginformation.org).

Dr. Bruce Perry and the Civitas Academy-Baylor College of Medicine  
[www.bcm.tmc.edu/Civitas/](http://www.bcm.tmc.edu/Civitas/)

Take Time for Kids-Texas Department of Health  
[www.tdh.texas.gov/ttflk/takehome.htm](http://www.tdh.texas.gov/ttflk/takehome.htm)

University of North Texas-Center for Parent Education  
[www.unt.edu/cpe/](http://www.unt.edu/cpe/)

## **Video resources that are free or low-cost**

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*First Impressions: Ready for Life*

KERA  
3000 Harry Hines Blvd.  
Dallas, TX 75201  
(214) 740-5476

*I Am Your Child-The First Years Last Forever*

P. O. Box 15605 Beverly Hills, CA 90209  
(310)-285-2385  
[www.iamyourchild.org](http://www.iamyourchild.org)

*Ten Things Every Child Needs*

McCormick Tribune Foundation Attn:  
Ten Things  
435 N. Michigan Ave, Suite 770  
Chicago, IL 60611  
1-888-683-2224

*The Whole Child: A Caregiver's Guide to the First Five Years*

Contact your local PBS Station