

Making Connections: How Children Learn

A Summary of Recent Brain Research

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Many parents, child care providers, and volunteers have instinctively understood the importance of the language activities they share with children beginning in the first years of life. These activities are not limited to reading, but also include storytelling, singing, and ordinary exchanges that take place in the course of everyday life. Now, after more than 20 years of focused study, new brain research is confirming the merit of these activities. With the help of new brain imaging technologies, brain researchers are gaining insight on how and why these activities promote early development--not only intellectual growth, but healthy social and emotional development as well. On the basis of this research, many paediatricians place such value on the stimulation children receive when read to at a young age that they have begun to *prescribe* reading to babies along with regular check-ups and vaccinations.

The neuroscience associated with this research is complicated, but its lesson is simple: babies' brains develop at astonishing rates in the years after birth. Young children have a tremendous capacity to learn from the moment they are born, but optimal development hinges on the experiences provided for them by the adults who take care of them. Scientists have long believed that reading with children creates a context in which learning can occur. Today, however, they have evidence that reading is one of the experiences that actually influences the way young brains develop--that is, the way the brain's circuitry is "wired."¹

But how does this work? At birth children have most of the brain cells, or neurons, they will need for a lifetime of learning, but these brain cells are not yet linked with the complex networks that are needed for mature thought processes to take place. In the early years, young children's brain cells form connection--synapses--very rapidly.

What causes brain cells to form connections? Genes control some of the process, but experience is also a crucial ingredient. Every time a caregiver or volunteer interacts with an infant or toddler, connections are formed. Positive interactions with nurturing caregivers--like the attention children receive when they are read to--profoundly stimulate young brains. This stimulation causes new connections to form neural pathways (we might think of as "learning pathways") and strengthens existing ones.

In the first years of life children form extra synapses. In fact, a three-year-old has twice as many connections as an adult. In the second decade of life, as children move toward adulthood, trillions of extra connections are eliminated. But this is not a random process. Those connections that have been used repeatedly in the early years have become stronger and tend to remain; those that have not been used often enough are shed.

In adolescence young people are losing connections or synapses at a rapid rate, and this may sound worrisome (especially as they approach the age when they begin to think about getting their drivers' licenses). But in fact, the process of shedding excess synapses is perfectly natural and, in fact, beneficial for the human brain. It is something like pruning plants in a crowded garden: the ones that remain can grow larger and stronger. By eliminating seldom-used pathways, the brain leaves room for sturdier, more efficient neural networks. The result is a brain whose "circuitry" is better organized and better suited for learning the more difficult concepts and skills that a young adult needs to master.

The pruning process is therefore critical to optimal brain development. It also explains why early experience is so crucial. Children whose neural pathways have been reinforced by a great deal of positive early experience--including a variety of language activities--will be better off when the brain's pruning process begins.

What Role Do Families and Communities Play?

As few as twenty years ago scientists believed that the genes we were born with wholly determined the structure of our brains. The facts recently discovered by neurologists and psychologists, however, prove that how children develop, learn, and grow depends on the critical and continual interplay between nature (or genetic endowment) and nurture (the surroundings, care, stimulation, and teachings received). And, according to Rima Shore and the Families and Work Institute, both of these influences are crucial.²

Rethinking the Brain³

OLD THINKING. . .

How a brain develops depends on the genes you are born with.

The experiences you have at a very young age have little impact on later development.

A secure relationship with a primary caregiver creates a favorable context for early childhood development and learning.

Brain development is linear: the brain's capacity to learn and change grows steadily as an infant progresses toward adulthood.

A toddler's brain is much less active than the brain of a college student.

NEW THINKING. . .

How a brain develops hinges on complex interplay between the genes you're born with and the experiences you have.

Early experiences have a decisive impact on the architecture of the brain and the nature and extent of adult capacities.

Early interactions don't just create a context, they directly affect the way the brain is "wired."

Brain development is non-linear: there are prime times for acquiring different kinds of knowledge and skills.

By the time children reach the age of three, their brains are twice as active as those of adults. Activity drops during adolescence.

Sharing books with children not only lays the groundwork for much of the language and critical thinking skills they will need later in life, it also helps prepare them for many of the emotional challenges all people eventually face. Children who have continual, healthy interactions with nurturing caregivers become better prepared--both emotionally and biologically--to deal with and learn from the stresses and disappointments of everyday life.⁴

Children seemingly placed at a disadvantage by "nature" offer dramatic proof of the brain's amazing capacity to compensate in a conducive environment. It is well documented, for example, that many children who lose language due to a stroke at a young age often recover the ability to speak because the young inventive brain is

able to shift this function to another area. Even in cases of epilepsy, where it is sometimes necessary to remove an entire side of the brain, the remaining half often begins to work overtime--taking on many of the duties of the lost hemisphere.

⁵According to UCLA paediatric neurologist Dr. Donald Shields, "if there's a way to compensate, the developing brain will find it."⁶

Take the example of Brandi Binder, a 13-year-old living in Colorado Springs, who developed severe epilepsy at the age of six and had to have the entire right side of one portion of her brain removed. Afterwards she lost all control of muscles on the left side of her body, the side controlled by the right side of her brain. However today, after years of therapy and hard work, she is an A student and excels at math, art, and music--skills usually governed by the right side of the brain. While her recovery has not been 100% complete (she has not yet regained use of her left arm) it comes very close and, more than that, it demonstrates the adaptive powers of the early childhood brain. For this and other reasons, the debate that has long engaged philosophers--whether nature or nurture dominates development--no longer perplexes scientists. "It's not a competition," says Dr. Stanley Greenspan, a psychiatrist at George Washington University. "It's a dance."⁷

The key, then, is for families, teachers, and communities to work together and start reading to children early. According to Dr. Reid Lyon, Chief of the Child Development and Behavior Branch at the National Institutes of Health, most conventional intervention efforts (which begin after the third grade) begin too late. Not that these children are beyond help, by any means, but Lyon's research shows that reading efforts are much more effective the earlier they are implemented. According to his research a 12 year-old child will need between four and five times more "intervention time" than a 5 year-old child with similar reading problems.

Children in Poverty

In America today at least one in four children under the age of six is growing up in poverty. Poverty can certainly affect the kind of environment in which young children grow, and the early experiences they have. It has an impact on the kind of nutrition expectant mothers and their children receive, their access to medical care, and the safety and predictability of the physical environment. It can also affect the stress levels experienced by parents and other caregivers. Finally, children who grow up in poverty are more likely to be exposed to drugs and alcohol (before they are born, and in their homes after birth), as well as violence and abuse. None of these conditions is limited to economically disadvantaged children, but they are more likely to occur.

Research by Alan Sroufe and his colleagues at the University of Minnesota have established that children growing up in poverty are more prone to developmental delays and learning difficulties than other children. Today, new insights into the brain are helping to explain this phenomenon. It is now known that early experiences (both positive and negative) can have a decisive impact on early brain development. Poverty influences these early experiences. Epidemiological surveys, for example, confirm that the risk of poor school readiness and reading problems are highest among families of the lowest socio-economic status.⁸

But as the Families and Work Institute demonstrated in their recent study, risk is not destiny. A number of children (including those in the study by Sroufe and his colleagues) have exhibited remarkable resilience. Many factors appear to affect children's capacity to thrive in circumstances where others do not, but strong, secure relationships with consistent caregivers appear to be the most important. Research suggests that these secure, warm relationships have a protective effect, helping to buffer children from later stress. By the same token, children who are deprived of such relationships early in life are especially vulnerable to stress as they move through childhood, and may experience developmental delays.

Why Young Children Need Your Help

Research proves the first years of life are crucial to a child's development. In reality, these are the years children receive the least attention from the educational world. Many young children are in child care programs with staff who are underpaid, lack training in early childhood and brain development, and may be responsible for too many children.⁹

Well publicized findings by the Cost, Quality, and Child Outcomes Study Team, for example, found "most child care settings are of mediocre to poor quality" and the nation's youngest children are the "most likely to be in unsafe, substandard care." Furthermore, the care given to one third of our country's children is not only less-than-optimal, but in fact *detrimental* to their development.¹⁰

Things, however, *are* being done and many of these children are being systematically helped by thousands of individuals and groups in public and private child care organizations, preschool, Head Start, Early Head Start, and Even Start family literacy centres all over the country. When choosing a classroom or set of classrooms, you will likely be faced with many different options depending on the community in which you live. The pages that follow offer information on a number of resources which may be of use.

Notes

- 1 Rima Shore, *Rethinking the Brain: New Insights into Early Development*. Families and Work Institute, 1977, ix.
- 2 Shore, x.
- 3 Chart from Shore, 18.
- 4 *ibid.*
- 5 Shore, 36.
- 6 Nash, Madeline. "Fertile Minds." *Time*, February 3, 1997, 54.
- 7 Nash, 52.
- 8 Shore, 48.
- 9 Newberger, Julee. "New Brain Development Research--A Wonderful Window of Opportunity to Build Public Support for Early Childhood Education!" *Young Children Magazine*, 52:4, 8.
- 10 Cost, Quality, and Child Outcomes Study Team. 1995. *Cost, Quality, and Child Outcomes in Child Care Centers*. Denver, CO: Department of Economics, University of Colorado at Denver.