



University of Pittsburgh
Office of Child Development

Children, Youth & Family

background

Report # 12

Brain Development: The Role Of Experience

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Brain Development

The Role Experience Plays In Shaping The Lives Of Children

Scientists have long known the brain is made up of nerve cells counted in the billions and that the cells are wired, networked, and assigned different functions. But it wasn't clear until recently, just how influential early stimulation is on the way the brain develops.

Much of brain development is biologically programmed. But stimulation and experience are aspects of development that can be influenced by parents and others.

Findings that suggest early childhood is a critical opportunity to enrich brain development gives impetus to an array of initiatives aimed at promoting healthy child development and early education.

But how much stimulation is necessary? Is more stimulation better? When is it necessary? When, if ever, is it too late? Is earlier better? How do we know we are doing the right things to promote the development of children?

This report attempts to clarify questions about brain development and what the new research shows.

Basic Functions

Brain development occurs in stages that are arranged in a hierarchical order.

Functions necessary for survival tend to develop first and require some experience at certain times to develop normally. But the stimulation needed is

fairly minimal and is very common in most environments. In most cases, infants and children receive the minimum amount of stimulation necessary for basic functions, and more does not improve development of these capabilities.

For example, unless an infant sees

For more on the stages of brain development see *Brain Development: Research Sheds New Light on This Incredible Phenomenon*, **background**, Report #11

light during the first six months of life, the nerves leading from the eye to the visual cortex of the brain that processes those signals will degenerate and die. This is a relatively narrow window. But nearly all infants are exposed to light and only minimum exposure is needed. On the other hand, more than the necessary amount of exposure to light does not improve vision.

Other windows are open longer. A warm, caring, stable relationship – usually with a parent – is an extremely important early experience without which the ability to care, love, socialize, and empathize may not develop normally. Attachment starts very early. But children have roughly their first year or so to develop a stable relationship.

Higher Functions

Higher functions are those that some people are better at than others. They include most of the social, emotional, and mental characteristics we cherish – language fluency, intelligence, social relations, and loving.

These higher functions require certain stimulation and experience to occur, but the necessary experiences are more likely to be unique to the individual and not shared with all other people. In addition, the window of opportunity is much longer and some may even be life-long.

Language development, for example, consists of a combination of basic and higher processes. Children need to experience a responsive language environment before they will develop basic language. But with the exception of unusual situations, every child experiences a responsive language environment and develops basic language.

Will infants fail to develop normal language or the ability to sing or appreciate music if special efforts are not made to talk and sing to them in the first months or year of life? The answer is, no.

Experience with a responsive language environment probably needs to occur during the first 8-12 years of life before permanent dysfunction in developing a language is likely to occur. In one case, a girl who had been locked in a closet un-

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til age 6 had essentially three guttural “words” when discovered. But after 18 months of tutoring, she developed a vocabulary, language fluency, and IQ within the normal range.

Children do differ in their ability to use language, their ability to think and conceptualize abstractly, their ability to solve problems, and so forth. Such higher skills, important for success in school and in the development of intelligence, also require experience. But not every child receives the same type and amount of experience.

And experiences that enrich these abilities do not necessarily have to occur at specific developmental periods. Rats given special toys as pups grew to have larger brains. But rats deprived of the toys until adulthood also developed larger brains.

With higher skills, providing a variety of appropriate experiences throughout childhood and beyond counts as much as how early stimulation is started and how much is given.

Is Earlier Better?

Earlier is essential for basic functions. It is better, but not so essential, for higher functions. The developmental windows of opportunity for basic functions are shorter than those for higher functions.

But even if these windows are quite long, there is something very compelling about the idea that “earlier is better.” In fact, earlier can be better even for higher functions.

Just because the window to experience a caring, stable human relationship is a few years does not mean parents should deliberately wait until then to start such a relationship. As a general rule, it is considered best to start when

No amount of stimulation, no matter how developmentally sound, can inoculate children against the debilitating effects of poor environments they may encounter, such as poor quality schools, dysfunctional homes and neighborhoods.

the developmental window swings open. There appears to be some advantages to an early start. For example, children who learn a second language earlier in their lives do somewhat better at that language than those who wait until adolescence.

That’s not to say starting early with a second language is necessary. Adults can learn a second language, it just might be more difficult for them.

But early stimulation is only better if it is developmentally sound and well matched to an infant’s or child’s capabilities and interests at the moment.

Is More Better?

For progressively higher functions, a good deal of varied stimulation over a

prolonged period of time will produce better results.

Fluid language, abstract thinking, higher mathematics, and exceptional social skills need a great deal of nurturing with progressively more complex developmentally-appropriate stimulation over a long period of time – decades, in some cases.

How Much Is Enough?

For basic functions, a little stimulation at the right time is usually enough to produce lasting benefit. A little light early on will keep the visual neurons functioning for the rest of a person’s life, even if light is not available later.

For higher functions, such as language and intelligence, much more stimulation is needed for a longer period of time. But early stimulation alone is not likely to produce permanent benefits – continued nurturing over long periods of time is needed.

Research suggests that giving children a dose of language and mental stimulation at age 4 – through Head Start, for example – will not immunize them against the subsequent effects of poor environments, including the poor-quality schools and dysfunctional homes and neighborhoods that many such children experience.

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references

This report was drawn from a summary written by Robert B. McCall, Ph.D., Co-Director of the University of Pittsburgh Office of Child Development and Professor of Psychology, with the help of Mark S. Strauss, Ph.D., Associate Director of the Office of Child Development and former Chairman of the University of Pittsburgh Department of Psychology.

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Co-Directors: Christina J. Groark, PhD.; Robert B. McCall, PhD. **Associate Directors:** Carl N. Johnson, PhD.; Mark S. Strauss, PhD.

background Editor: Robert B. McCall, PhD.; **Writer:** Jeffery Fraser (412) 731-6641, e-mail: Fraser53@msn.com

Office of Child Development, University of Pittsburgh, 2017 Cathedral of Learning, Pittsburgh, PA 15235; fax: (412) 624-1187