

**The importance of early brain development****Brenda Fitzgerald, MD**

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I believe early brain development is the *most important* predictor of health and well-being in a person's life. Genetics are important but they are only the blueprint; they are not the construction.

The brain is built in an ongoing process that begins before birth and continues into adulthood. In the last month of pregnancy there is a tremendous growth spurt that increases the brain size by one-third. The practical consequence of the interruption of this process is demonstrated by the fact that standardized test scores at third grade are significantly different for children delivered at 37 weeks versus children delivered at 39 weeks.

Simple neural connections form first. Repeated stimulation of those neural connections strengthens the pathway or synapse. In the first few months of life there are 700 to 1000 new neural connections formed each second. Early experiences have an exceptionally strong influence on brain architecture. Exposure to rich learning experiences can have a positive influence on early brain development but exposure to external stress or poor nutrition can have negative influences which make this a period of great opportunity and great vulnerability.

It also suggests that the earlier we intervene the greater our chances for success and the later we intervene the harder it becomes to change the outcomes. (1)

There is a second aspect to brain development that is also important. Repeated stimulation causes strong synapse formation but lack of repeated stimulation results in pruning and those early connections that are not stimulated simply fade away and are no longer available for use.

The groundbreaking work of Hart and Risley (University of Kansas, 1995) is a dramatic illustration of these principles of early brain development. Betty Hart and Todd Risley were at the forefront of educational research in the 1960s War on Poverty. They were frustrated that early interventions for children who had fallen behind in language skills did not bring them up to grade level with children who were not living in poverty.

The researchers shifted their focus and started a purely observational study to see if they could ascertain what was

missing. They observed 42 families from different socio-economic backgrounds for one hour per month starting when the children were seven months of age and continuing until the end of the third year of life. They did not find a difference in race, gender or basic care - diapers were changed and babies were fed - but there was a dramatic difference in the number of words (stimulations) that children heard. A 30 million word difference by the end of the third year of life. Children in the lowest income group heard 600 words an hour compared to 2000 words an hour in the highest income group. That difference had profound consequences. They could measure the difference in the number of words a child knew at 18 months and by the end of three years those babies with the most stimulation knew over twice as many words as those in the lowest group. (2)

The number of words at three years is a strong predictor of the ability to read by third grade. A child who cannot read on grade level by third grade is four to six times more likely to not finish high school. Up to third grade a child learns to read and after third grade he reads to learn. If a child cannot read his textbooks at third grade he often falls further and further behind. Nearly 70 percent of Georgia third-graders are not reading on grade level by third grade. That is a public health crisis.

There are profound and diverse consequences of these facts.

Brian Rostron reports in Vital and Health Statistics (3) that men at 25 years of age with a college degree live 16 years longer than those who have not completed high school. Women with a college degree live 12 years longer than

women who haven't graduated high school. The Bureau of Labor Statistics for 2015 reports that those with less than a high school education earn a weekly average salary of \$493 with an unemployment rate of 8 percent compared to those with a professional degree earning \$1,730 per week and an unemployment rate of 1.5 percent.

Income is the most important factor in deciding the social determinates that have so much influence on health outcomes - from Adverse Childhood Experiences (ACEs) to chronic disease.

A recently published study from United Health Foundation's Health Rankings for Women, Infants and Children (4) revealed the influence of income in all races. Twenty-four percent of Hispanic children living below the Federal Poverty Level (FPL) had multiple ACEs compared to 14 percent of Hispanic children living 400 percent above the FPL. For non-Hispanic Whites, 47 percent of children living below FPL had multiple ACEs versus 9 percent living 400 percent above the FPL. And the outcome was the same for non-Hispanic Blacks – 38 percent of children living below the FPL had multiple ACEs compared to 12 percent of children living well above the FPL.

The overall message for me is that brain development that results in educational achievement is profoundly important and can be influenced by a child's parents and caregivers. I believe this applies to *all children*.

Children whose parents cannot read can still talk to them and stimulate brain development. Visual language also promotes brain development for the deaf and hard of hearing. Christine Yoshinaga-Itano, Ph.D., a professor of Speech, Language and Cognitive Science at the University of Colorado Boulder, reports that if identified and stimulated early enough, deaf and hard of hearing children

graduate at the same level as their hearing peers. Dr. Ami Klin at the Marcus Autism Institute in Atlanta has done remarkable work with early identification and intervention of children with autism and related disorders.

Early brain development is critical. The pace at which neural connections are made in the first few months of life isn't repeated so that means we need to get it right the first time. Early brain development is the foundation for a healthier, educated, prosperous future for Georgia and the world. And it all starts with language and talking with your baby.

#### References

- 1 <http://developingchild.harvard.edu/science/key-concepts/brain-architecture/>
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- 3 Brian L. Rostron et al., "Education Reporting and Classification on Death Certificates in the United States," *Vital and Health Statistics Series 2*, no. 151 (2010): 1-16.
- 4 <http://www.americashealthrankings.org/>

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