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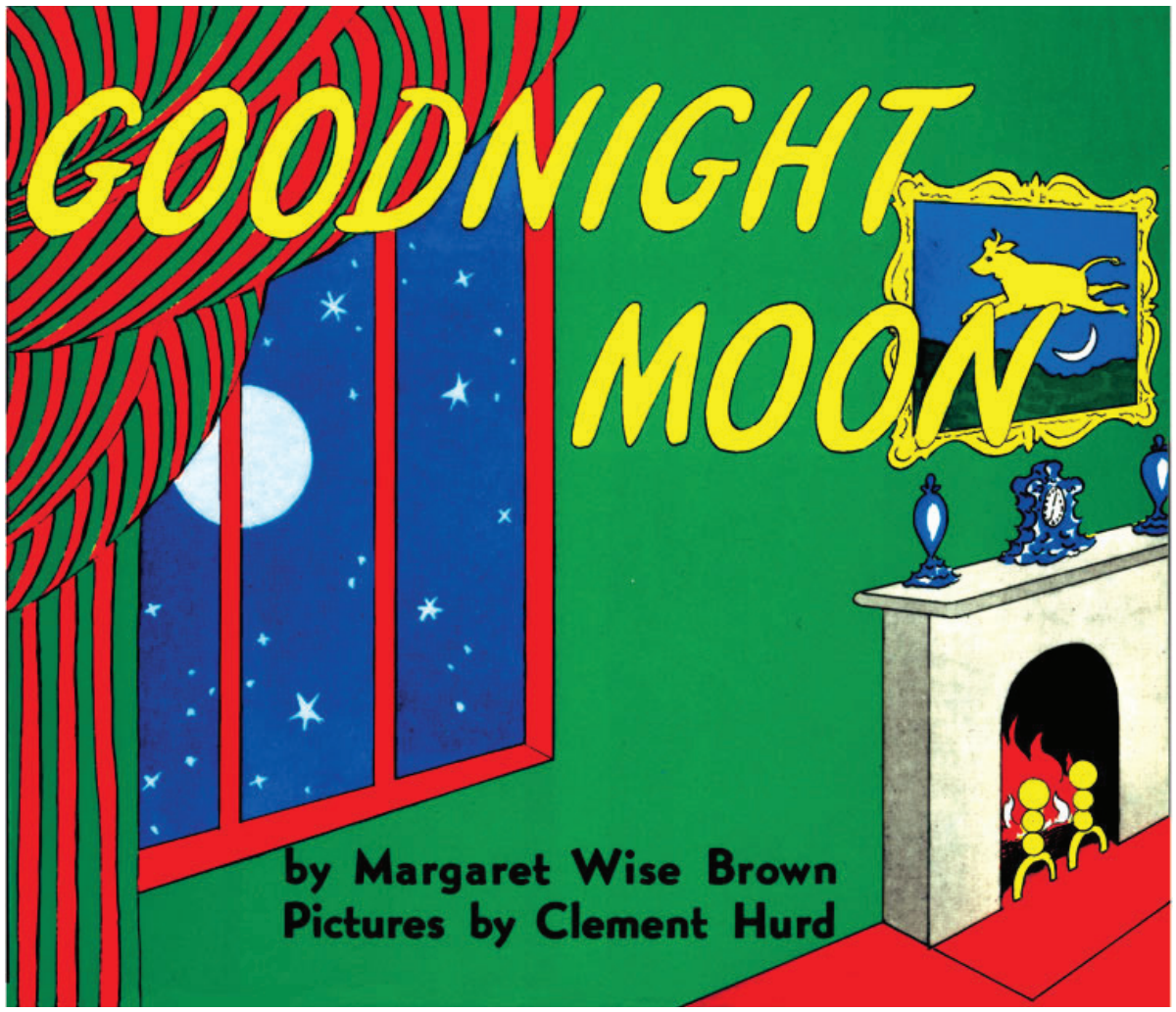
Building Baby's Brain One Story at a Time

Early Care Can Change the Course of a Child's Life

By: Mike Hoey



"Papa, tell me a story out of your mouth." It's bedtime and my granddaughter wants a Robin Hood story and so I tell her about Robin riding through Sherwood Forest on a cold winter night. Most of my Robin stories are made up and not found in the standard accounts. Telling stories is something I picked up from my maternal granddad: he liked telling me about his coal mining days.

When my own children were little, I would read them Goodnight Moon. It's a great bedtime story. With each turned page the bunny's bedroom grows darker and the night stars appear in the big window. By the time I would reach the last page, I was ready for bed and, sometimes, the kids were too.

I've always known that telling stories can create a magical bond between parent and child, but now I realize other beneficial things are going on as well. Neuroscientists are discovering that reading and interacting with young children may alter the architecture of their brains. And a story like Goonight Moon can help children break words down into sounds, which can help later as the toddler tries to distinguish between similarly sounding words.

A baby's brain develops dramatically from conception to toddlerhood, but that development is not "set in stone" by the genes inherited from ancestors. It's not "all in the genes," as the popular saying goes; rather, the baby's brain is like a sponge absorbing experiences both good and bad before and after birth. Good experiences can build a healthy brain. Negative experiences can lead to cognitive delays and behavioral problems.

The first few years of life, therefore, offer a crucial window of opportunity for a child's development. Most parents know this and watch their child's development with a mixture of delight and anxiety. If there are problems, many parents look for help and hopefully help is available. Other parents may not recognize their child's disability or need encouragement to seek help from others. My wife, Mary Beth, has devoted her entire adult life to working with infants and small children with special needs. She represents only one of the many caring professionals – teachers, therapists, doctors and others – who offer help every day to families and their children.

Great work is being done, but are we doing enough? Could we do more?

The Amazing Development of the Baby's Brain

In the womb a tiny neural tube is gradually transformed into the baby's brain and spinal cord. The production of information processing cells – neurons – begins 42 days post conception. During pregnancy an unborn baby will produce billions of neurons, more than will be produced after birth. These neurons are the "gray matter" referred to in popular literature. Each neuron includes small branch-like extensions called dendrites that receive information and longer pathways called axons that act like telephone wires to send signals to other neurons. Synapses form the final crucial connection that allows neurons to communicate with each other and thus process information.

Because of this development the unborn child is able to move limbs and fingers, as well as yawn, suck its thumb, and swallow. Basic reflexes

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such as coordinated breathing develop. Before birth, the baby's cerebral cortex, the outer layer of the brain that directs thinking and voluntary actions, begins to form.

After birth, the baby's brain continues to develop in dramatic fashion. There is an explosion of new synapses that improve communication between different parts of the brain. During the preschool years the brain size will increase four-fold. By age six the child's brain will be about 90% of its adult volume. A white fatty substance called myelin (the "white matter" of the brain) develops to coat and insulate the brain connectors (axons). Myelination is especially rapid in the first two years of life and it helps to speed up the brain's ability to process information.

Neuroscientists refer to the remarkable "plasticity" of the baby's brain as the child learns new skills. In a review of the major findings on brain development, Joan Stiles and Terry Jernigan, neuroscientists at the Center for Human Development at the University of California-San Diego, indicate that "strongly deterministic models" attempting to explain brain development have been replaced with "more dynamic and interactive models…" They note that brain development involves "the ongoing interplay of genetic and environmental factors."

—Social Play: Evan Schmitz and Gavin Bernskoetter play with a learning toy at the Special Learning Center in Jefferson City, MO.

Indeed, a growing body of research suggests that the information circuits for language development and other skills can change depending upon the quality of interaction between the parents and the child. The Center for the Developing Child at Harvard University uses the term "serve and return" when discussing the importance of this interaction:

> Serve and return interactions shape brain architecture. When an infant or young child babbles, gestures, or cries, and an adult responds appropriately with eye contact, words, or a hug, neural connections are built and strengthened in the child's brain that support the development of communication and social skills. Much like a lively game of tennis, volleyball, or Ping-Pong, this back and forth is both fun and capacity-building.

A Reality Check

In an ideal world all children would live in nurturing homes with parents who have ample time to engage their child in "serve and return" interactions. Yet even families that are comparatively well off and understand the importance of early learning can overlook the needs of their children. Parents pursuing careers and meeting other obligations get distracted and children get forgotten. But other children face even more serious challenges.

Children with disabilities, for example, have a lot to overcome and early intervention services for them are crucial. Other children face challenges that are not so apparent. Over 40% of Missouri children are born outside of marriage. Some have only one parent who works two jobs to keep food on the table. The child goes to daycare, which may or may not offer learning activities, and when the parent comes home in the evening there may be little time left for reading and similar activities.

The stresses related to growing up poor can greatly impede a child's development. A 2013 study by researchers at Washington University Medical School in St. Louis found that poverty in early childhood was associated with smaller amounts of white and gray matter in the brain. Another study by researchers at the University of Wisconsin-Madison found similar results. According to the researchers, the lagging brain development of poor children became apparent after analyzing hundreds of brain scans conducted between birth and age four.

Whether or not they are poor, children exposed to domestic violence can experience overwhelming depression and anxiety. Not surprisingly, they may lag behind in cognitive development. One study by researchers from Boston University Medical Center, King's College London and the University of Wisconsin-Madison found that "[c]hildren exposed to high levels of domestic violence had IQs that were, on average, 8 points lower than unexposed children."

Early Intervention Can Make A Difference

While all children can benefit from early learning activities, intervention is crucial for children with disabilities as well as for children living in impoverished or other difficult family circumstances. And the sooner that intervention takes place the more likely it will yield positive results.

Trained teachers and therapists, for example, can help children with disabilities catch up with other children their age so they no longer have a learning delay by the time they enter kindergarten. A study commissioned by the U.S. Office of Special Education found that 32% of infants and toddlers who had received early intervention from birth through age two did not require special education once they entered kindergarten.

Early intervention can also lessen the impact of more serious disabilities. For example, studies have shown that early interventions

can help children with mild to profound hearing loss improve their vocabulary skills and speech production. The Thompson Center at the University of Missouri offers intensive intervention for autism spectrum disorders that is improving the lives of many children.

Early intervention can be a life-changer for the children of the poor. A study by the Brookings Institute concluded that high-quality interventions "can close over 70% of the gap between more and less advantaged children in the proportion who end up middle class by middle age." Several years ago the Rand Corporation surveyed the scientific literature and issued a brief report concluding that "[w]ell-designed early childhood interventions have been found to generate a return to society ranging from $1.80 to $17.07 for each dollar spent on the program."

Earlier this year the journal *Science* published the results of a 20-year study that employed rigorous research methodologies to determine whether early intervention could help children overcome initial disadvantages. Led by Nobel Prize winner James Heckman of the University of Chicago and Dr. Paul Gertler of the University of California at Berkeley, the study focused on children from the poor neighborhoods of Kingston, Jamaica.

The researchers enrolled children ages 9 to 24 months with stunted growth into their study because of the well-documented cognitive delays associated with malnutrition. A control group of stunted children was left alone while several "treatment" groups received early childhood education. In addition, researchers established a comparison group of non-stunted children.

Jamaican health care workers visited the families in the treatment groups every week over a two-year period, encouraging the mothers to interact with the children in ways known to spur cognitive and psychosocial skills. Homemade educational toys were brought to the homes and the mothers were urged to continue with "stimulation" activities between visits. Nutritional supplements were also provided.

The researchers found that the stimulation activities – but not the nutritional interventions – had long-lasting positive effects, as measured when participants were, on average, age 22. The average earnings of members of the treatment group were 42% higher than the control group of stunted children. In addition, the treatment group had caught up in earnings with the non-stunted children. The researchers concluded that "[t]hese results imply that stimulation interventions very early in life can compensate for developmental delays and thereby reduce inequality later in life."

First Steps and Parents as Teachers

There are many different kinds of intervention that can benefit families and their children. Let's take a brief look at two of the more important ones. First Steps is the name the state of Missouri has given to the early intervention it provides to infants and toddlers pursuant to Part C of the federal Individuals with Disabilities Education Act (IDEA). The Missouri Department of Elementary and Secondary Education (DESE), which is the state administrator of First Steps, has established 10 regional points of entry that can arrange for an initial assessment of a child. Parents can call 1-866-583-2392 toll-free to request an initial assessment.

States have some discretion in determining which children will be eligible. Some disabilities are severe enough that eligibility is never in doubt. However, most children have less serious disabilities and in these instances the state of Missouri requires at least a 50% delay before a child will be deemed eligible. Over 8,800 children from birth through age two received First Steps services at some point during the course of 2013.

In order to deliver First Steps services, the state of Missouri contracts with a network of state-approved private providers. Most children receive First Steps services at home. Trained teachers and therapists work with both the parents and the child on activities tailored to address the child's specific delay or disability. See the article by my wife, Mary Beth, on her work as a First Steps teacher. The most recent review of First Steps concluded that about 70% of the children participating improved their social skills and knowledge skills and acted more appropriately than they would have without intervention.

—Speech pathologist Linda Kuebler provides speech therapy for Rosalie Butcher at the Special Learning Center in Jefferson City, MO.

Spending on First Steps has been stagnant in recent years. In fiscal year 2010 Missouri spent $25.7 million on direct services for children; by fiscal year 2014 that figure had increased by less than one million dollars, coming in at $26.6 million. This level of expenditure may provide adequate services for the children presently served, but if Missouri wanted to expand eligibility to include children with milder delays, more funding would be needed.

Children with milder delays may be able to receive help through Missouri's Parents as Teachers (PAT) program. PAT seeks to help parents become better teachers of their children and screening is offered to determine if a child has learning delays or health problems. Unfortunately, funding for PAT has declined in recent years. For

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Building Baby's Brain (Continued)

fiscal year 2006 the legislature appropriated $31.3 million and served 153,612 families, but by fiscal year 2014 funding was down to $16 million and only 50,068 families were participating.

Bringing It Back Home

I wonder how much good we could do if we focused more on helping children from the very start of their lives. It seems that we are always playing catch-up, trying to solve problems when it is too late or nearly so. Yet a growing body of research tells us just how much children can benefit from high-quality early intervention services.

No intervention by therapists or other professionals can replace good parenting, but part of the goal of intervention is to help parents become better parents. In fact, no parent is perfect and all parents can use some help. Children don't come with instructions; that information has to be sought out from others.

Where there is a strong family network help may be near at hand, but increasingly parents are isolated and must raise their children on their own. Ultimately, if we want to help the children we have to help the parents. The sooner that assistance begins the more effective it can be.

—Mike Hoey is the Executive Director of the MCC

Small Miracles: Early Childhood Special Education Teacher Reflects

By: Mary Beth Hoey

Every day I get to witness small miracles. As an early childhood special education teacher, I see firsthand the benefits of early intervention. Research shows that the brain can make important connections early in life; helping to influence those connections is what early intervention is all about.

Take Joseph, for instance. He has been diagnosed with a syndrome that would normally be very daunting for all involved. But today he is walking on his own and trying to say words to communicate with others; he is also using sign language to help enhance his communication skills. Joe likes exploring his environment, learning how toys work, and playing with kids his age. For the most part he is a happy young boy who brings delight and joy to those around him—and he is not even three yet.

Samantha has Down Syndrome, or as some of us like to say: Up Syndrome. She is barely two and crawls everywhere; she is also beginning to stand up and take steps. She doesn't use words to communicate yet, but she uses sign language to get her wants and needs known. Her best form of communication, though, is in her facial expressions; her eyes can light up the room.

—Play with Purpose: early childhood special educator, Mary Beth Hoey, works with Gavin Bernskoetter at the Special Learning Center in Jefferson City, MO.

Another young fellow, Hank, is a little boy on the autism spectrum. He takes delight in simple games that help him make a personal connection with his parents and other adults in his life. From those experiences, he notices other children and enjoys playing chase with them. He can get pretty upset at times, but with a few ideas and a little guidance he has learned to calm himself. These experiences help him learn how to deal with overwhelming situations.

All these children let us know that the brain, at a young age, can make connections that can help children and not hinder them. All these small miracles add up to make a huge difference in the lives of children and their families.

*Names have been changed to protect the privacy of the children and their families.

—Mary Beth Hoey is an early childhood special education teacher at the Special Learning Center in Jefferson City, MO. She is also the wife of MCC executive director Mike Hoey.

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