The First Three Years: Putting the Brain Research in Context

If you’ve been working in the area of early childhood, or concerned about young children, or just listening to the news in recent years, you’ve probably gathered that there’s important new news about the first three years of life. Though psychologists have known for some time that brains are important to babies’ experiences, recent years of research show that babies’ experiences are also important for the brain.

While infants come into the world with plenty of brain cells, those cells need to get connected to each other to function effectively. Cells do this by building synapses between each other, resulting in a richly interconnected neural network. It is the experience of everyday life that prompts this critical developmental process.

And when does this all happen? The most intense period of development is between birth and 3 years of age for humans. By 2 years of age, toddler synaptic networks are as rich as those of adults. By 3 years of age they’re twice as dense as those of adults and stay that way until 9-10 years of age. At that point, unused synapses are “pruned,” i.e. eliminated to result in a leaner organizational structure—cerebral downsizing, if you will.

Super Babies

Since this critical process depends on the experiences of babies and toddlers, is there anything we can do to maximize it? That is, can Super Moms and Dads build babies with Super Brains if they expose them to the right experiences? Two recent books on the subject take very different approaches to come to the same answer to the question: not likely.

John Bruer in *The Myth of the First Three Years* looks at the research on brain development and concludes that these developmental trends for babies are almost “adult-proof.” For one thing, it’s not clear what goals we should aim for to improve on this natural process. Babies are not likely to be better off if we discovered a set of experiences that would promote development of more synapses (“my baby has more synapses than your baby”). Nor should we do something to prevent or delay the “pruning” process that reduces the number of connections in the later years. This is all part of the process of development. What’s more, according to Bruer, just about any normal environment for children provides the support necessary for successful development, whether the child lives in a condominium in Manhattan or in a yurt in Mongolia.

So why the term “Myth” in the book title? Bruer sees people exploiting the research on the first 3 years to sell useless paraphernalia to parents hoping to have brainier babies. At best, such artificial interventions are useless, and may even do harm if they distract us from the normal responsive interactions caregivers and babies thrive on. According to Bruer, serious deprivation may harm children, but normal loving parenting should provide children all the support they need for successful brain development.
Babies’ Eye View

While Bruer focuses on early brain development, Alison Gopnik, Andrew Meltzoff, and Patricia Kuhl explore the rich trends in behavioral development to show the babies’ eye view of these early years. Gopnik et al. review recent decades of research in infant development and conclude that, from birth, babies are actively trying to understand the world around them—a regular Scientist in the Crib, as their book title suggests. So what are babies working so hard to understand in those first years of life?

One problem for babies as newcomers to the world is to figure out those animated creatures out there, i.e. the people around them. How does a baby come to understand that those smiling, talking giants are people just like him or herself? Even at birth an infant will imitate an adult who sticks out her tongue. What does this require from the babies’ perspective? Some understanding that I’m a person like her, and if she has a tongue, I must have one too. From this starting point babies go on to discover that those people have thoughts and feelings that are sometimes like their own and sometimes different—a lot to learn in one or two short years, yet babies manage quite nicely.

A second challenge for babies is to figure out the properties of the physical world. By one month of age a baby sucking a bumpy (or smooth) pacifier will look longer at an object that matches the texture of the pacifier. Somewhat later if the baby hears the “boing-boing-boing” of a bouncing ball, he or she will prefer to watch a ball bouncing in synchrony with the sound, rather than one bouncing out of sync. These studies show early linking of information in the various senses—sight/touch and sight/sound in the two studies.

Babies also develop expectations about how objects move. For example, a baby who sees a ball roll behind a screen will look to the other side of the screen for it to reappear. If it appears sooner or later than expected the baby shows surprise. Other puzzles babies solve include understanding that objects exist even when out of sight, and the development of early concepts of causality.

Finally, those first years show the language explosion that is so enjoyable in infant and toddler development. At birth, babies can discriminate different speech sounds in their own and in other languages. However, in the last months of the first year those infants lose the ability to hear sound distinctions not present in their own language (e.g. “r” vs. “l” in Japanese). Early babbling is also universal across languages, but gradually drops sounds not in the native tongue. A study of the brain development underlying this process shows EEG activity in a young baby’s brain that is no different in response to own and foreign language. However, a few months later, the baby’s EEG response to the native language is localized in the left hemisphere, the language center for most adults.

These developments are just the beginning of a long process of the construction of reality that continues throughout the childhood years. Gopnik and colleagues are impressed with the intellectual activity babies bring to these complex problems. According to Gopnik “Babies are already as smart as they can be, they know what they need to know, and they are very effective and selective in getting the kinds of information they need.”

What’s a Policy Maker to Do?

If babies have the developmental process well under hand, as Gopnik and colleagues suggest, and the process of synaptic development is well supported by normal family life, is there any policy message in the “birth to three” findings?

According to Bruer, “Most often things go wrong during a critical period not because there are problems in the environment, but because of problems in the child.” For example, one of the early studies in kitten development showed permanent loss of vision in an eye that was covered from birth. Babies can be born with visual problems, such as cataracts, that could restrict vision enough to permanently harm visual development. Similarly, hearing loss can go undetected until children reach school age, shortchanging infants and preschoolers of auditory stimulation, and potentially damaging hearing in the long run. These are also critical years for language learning, which requires being able to hear the speech of those around you.
Deaf children lack access to the rich language environment of their hearing peers unless they’re introduced to sign language. As recently as 20 years ago, families with deaf children would delay language training for their children until they were of school age. However, a recent study of deaf American Sign Language (ASL) learners showed that those who don’t begin to sign until 4 years of age (or later) show a deficit in ASL even ten and twenty years later. It’s as if the only language these late learners have is a second language. However, those who learn ASL as infants and toddlers show full competence in the language.

What’s the lesson for policy makers according to Bruer? Early screening will pay off for children since early intervention can prevent long-term damage to sensory capacity. In addition, children will profit from exposure to the auditory and visual stimulation that comes with appropriate intervention. Finally, we need to ensure access to a language-rich environment for children in those critical early language years.

Gopnik and colleagues emphasize the ability of parents to meet babies’ needs through common parenting practices. For example, studies show that adults and even 4 year olds tend to speak to babies in high-pitched simplified speech termed “parentese,” an especially effective language environment for babies. In addition, caregivers and babies alike delight in responsive interactions with each other, including taking turns in vocalization and action, a perfect context for learning.

Gopnik concludes that “the scientific research says that we should do just what we do when we are with our babies—talk, play, make funny faces, pay attention. We just need time to do it.” However, with both parents working out of the home, children may be shortchanged on what they need the most: adult time, energy, and company. In addition, child care settings may have such a high child-staff ratio that adult attention is limited there as well.

What’s the policy implication here? Support adult time with infants and toddlers, according to Gopnik and colleagues. In recent years two-parent employment has become necessary for family economic stability; staying home with the kids is not a viable option in many families. However, Gopnik suggests that a government-sponsored voucher system could help parents by providing enough income to allow them to take more time off from work and spend it with their young children. Alternatively, the voucher could be used to pay for high quality care for children, with trained staff in sufficient ratios to provide children the one-on-one contact that is so beneficial for them.

Businesses can also play a role by ensuring that their employee policies allow parents flextime, family and maternity leave, and work-at-home options so parents can spend more time with their children. In this way, businesses develop a viable workforce for the future through their family-friendly policies of today. Their family-relevant policies may also provide the competitive edge they need to attract and retain a qualified workforce in the current economic environment.

After all is said and done, what does the brain research tell us about infant development and how we can support it?

- Studies show that the experiences of babies and young children promote the development of synaptic connections in the first three years.
- These processes happen in the normal course of life for young children. The responsive interaction most parents enjoy when they talk, sing, play and read with their children is an excellent context for early brain development.
- A seriously deprived environment may undermine this process. Sensory deprivation through visual or auditory impairment is one way this developmental process can be inhibited, resulting in long term negative effects for children. Children should be screened for such developmental problems at an early age, so intervention can help keep development on course.
- Business people and policy makers should review family policies to ensure that they afford parents and other caregivers the time with children necessary to provide the responsive interactions that are so beneficial for all.

Finally, the new brain imaging techniques that revealed these processes in early brain development
are sure to reveal important new findings in the years to come. Stay tuned for the evolving story as we better understand the physical development of children’s brains and how those changes affect behavior.


Key word: child development.

Resources about Children and Families

www.aypf.org American Youth Policy Forum: Features publications and policy analyses relevant to youth issues.

www.nn4youth.org National Network for Youth: Fosters vision, leadership and innovations in policy and practice to meet the challenges for today’s youth.


http://cpmcnet.columbia.edu/dept/nccp National Center for Children in Poverty: Host to the Map and Track project with state-by-state data on child and family well being.

www.aecf.org/kidscount KidsCount: This project of the Annie E. Casey Foundation tracks indicators of child well-being in each of the states, with data and analyses available online. Contact your state KidsCount project for county-level data on children.

http://census.usatoday.com USA Today: Includes many reports based on the 2000 census.

www.census.gov/main US Census Bureau: Offers census data for your use. The State Data Center at this site also links to data organizations and agencies in each of the 50 states.

www.fedstats.gov Fedstats: Gateway to statistics from over 100 US Federal agencies, including international, national, state, county and local information.

http://govinfo.kerr.orst.edu Government Information Sharing Project: Links to several government databases, including statistics on demographics, education, and economics.

www.bea.doc.gov Bureau of Economic Analysis: Offers information on economic indicators by region, state, county, and city.

www.cbpp.org Center on Budget and Policy Priorities: Analyses of economic and policy developments relevant to families. Some state-level information available.

www.spdp.org State Policy Documentation Project: Tracks policy choices on Temporary Assistance to Needy Families (TANF), cash assistance and Medicaid programs in each state.

www.cdc.gov/nchs National Center for Health Statistics: Statistical information on health behavior and health outcomes, including state-level analyses.

www.frac.org/html/news/stateofstates00key.html Food Research and Action Center: Offers state-level information on participation in federal food programs, such as food stamps, WIC, etc.

Source: Harriet Shaklee, Linda Fox, & Linda Webb, University of Idaho. Distributed at the AAFCS conference, Providence, RI.

Key words: web sites, children, youth.