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INVITED GUEST EDITORIAL

How Important are the First 3 Years of Life?

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Over the past 2 years, it has been nearly impossible to pick up a newspaper or news magazine or watch any of the morning news shows (e.g., *Good Morning America, Today*) without being lectured on the importance of the first few years of life. The point that has been driven home again and again is that most aspects of brain development seemingly run their course during this period of time and that unless a child is reared by near-perfect parents, attends a near-perfect preschool, has a near-perfect diet, is read near-perfect books, and listens to near-prefect music (preferably Mozart), the child's future may be jeopardized. Indeed, this view is so widespread that in the spring of 1997 the White House convened a conference to examine its veracity. Coincident with this conference, the actor and producer Rob Reiner produced a prime-time TV show on this topic starring Tom Hanks, and Reiner now produces a Web site devoted to this issue (*I Am Your Child* at http://www.yahoo.com/promotions/yourchild/). Following the White House conference, countless editorials appeared in reputable newspapers. In one piece that originally appeared in the *New York Times* and was reprinted widely throughout the United States, the parent of a 3-year-old wondered wistfully (and satirically) whether she should just call it quits, given the egregious mistakes she had made in parenting thus far.

As a reputed expert on this topic, I am sorry to say that there is little evidence to support the view espoused in the popular press. Yes, the first few years of life are important, but so are the next few years and the next few years after that. Prenatal development is important, as are genes, environments, parents, and peers. When one looks at the myriad of factors that correlate with positive developmental outcomes, one is hard pressed to point to only the first 3 years of life as holding all the cards. Certainly, there is no evidence that the door slams shut at this age.

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From what wellspring of knowledge does the view that the first 3 years of life (give or take a few months) are all-important in a child's development, particularly in regard to brain development? On the whole, the answer is studies of deprivation. The hoopla over the past 2 years followed media reports that children who spent the first few years of life in Romanian orphanages and were then adopted by capable and loving parents in the United States faired poorly. Indeed, on one of the more popular evening TV news magazines, a prominent pediatric neurologist displayed the PET scan of a Romanian child adopted late, who unmistakably (why else have it on television?) suffered brain damage and was behaviorally delayed. Seemingly overnight, the evidence seemed irrefutable that early deleterious experiences result in abnormal brain development and, thus, abnormal behavioral development.

Naturally, this is not the first time our country has been confronted with the effects of deprivation nor will it be the last. Spitz (1945) demonstrated many years ago that children reared in institutionalized orphanages suffered from what he called *anaclytic depression.* Harlow's monkey studies seemingly (e.g., Arling & Harlow, 1967) supported these findings. Recent reports do, in fact, support the claim that children who spend more than 1 or 2 years in some (but perhaps not all) Romanian or Russian orphanages do not have the same positive outcome that children who spend less time do. Finally, we all know that children who are neglected and abused suffer from a range of developmental problems, including the fact that those who are sexually or physically abused may be at an increased risk for becoming abusers themselves.

As tragic as this summary of findings is, take heart, as that is only part of the story. First, relatively ignored of late are the studies by Tizard (e.g. Tizard & Hodges, 1997; Tizard & Rees, 1975), who demonstrated nearly 25 years ago that disaster did not always await children reared in institutions; indeed, many such children did just fine on being adopted. Second, the more recent data on eastern European adoptees are nomothetic; thus, little mention is made of the fact that not all chil-

dren have poor outcomes, and in fact, many develop normally or close to normally. Third, work by Garmezy and Masten (e.g., Masten et al., in press) has repeatedly demonstrated that some children are resilient (particularly those with higher IQs), even those whose early rearing is suboptimal; unfortunately, the media reports often fail to discuss such children. Finally, studies of deprivation are notoriously poorly controlled, thereby making it difficult to apportion variance. Taking as a case in point, the situation of the adoptees from Romania, Russia, and China, we often have little information on (a) prenatal histories (e.g., did the mother abuse alcohol?), (b) why the children were placed in institutions in the first place (e.g., selective sampling may contribute to the final outcome), (c) the child's diet (even single nutrient deficiencies such as iron or B12 can reap havoc, at least temporarily, on brain development), (d) the factors that contribute to which children are ultimately adopted and which are left behind, and, (e) the child's genetic makeup (about which almost nothing is ever known), the last but not least of the contributors.

The bottom line is that studies of deprivation tell only part of the story. In addition and more to the point of this essay, studies of brain development fail to support the claim that the door abruptly closes after the first few years of life. In fact, as I discuss later, although the first few years of life represent a rapid period of brain development, they may not necessarily represent a critical period, at least not in all domains.

First, I want to discuss what is meant by the term *critical period.* This term is typically taken to mean that if a certain experience does not occur at a particular point in time, errors in development will result. A good example of this phenomenon from comparative studies might be the ability of the Zebra finch to learn its song. Unless the baby finch is exposed to the father's singing at precisely the right time, the baby bird either will not learn to sing or will sing abnormally. In contrast, the term *sensitive period* is taken to mean that a particular experience needs to occur within a somewhat broad period of time for development to proceed normally. Thus, to correctly perceive and discriminate the phonemes of one's language, the human infant needs to hear these phonemes (spoken by almost anybody) within the 1st year or so of life. Similarly, unless an infant is exposed to a normal visual world within the first 2 or so years, normal pattern vision may not develop (this is why many children born with strabismus must have their eyes corrected via patching or surgery within the first few years of life; if they do not, their binocular depth perception will be permanently altered).

As a rule, most critical or sensitive periods apply to sensory development, such as the development of our ability to see and hear. What about other domains of functioning? Although there appears to be a sensitive (but not critical) period for forming secure attachments (the first 2–3 years of life), the opportunity to form attachments per se seems more open ended. Thus, even infants experiencing profound emotional neglect will more often than not develop an attachment to a caregiver (e.g., foster or adoptive parent), and children with autism will develop an attachment relationship with a caregiver, despite profound deficits in social–emotional functioning. Moreover, it is unclear what role early attachment behavior plays in later emotional development; for example, having a "secure" attachment is not a guarantee that one will never divorce, spend time in prison, or abuse one's spouse. Lastly, how would one reconcile the fact that there are highly effective treatments (both behavioral and pharmacological) for emotional distress later in life (e.g., internalizing disorders like anxiety or depression) if one's early social relationships completely determined one's later emotional functioning?

What about the domain of cognitive functioning? Here very little is known. Although we know that chronic global deprivation (as often occurs in child neglect) can affect cognitive ability, such children are hardly deprived of only cognitive stimulation. Moreover, the data from a variety of early intervention programs (e.g., Head Start, Abecedarian) clearly suggest that cognitive development can proceed normally so long as intervention is maintained. This, of course, challenges the assumption that early experience determines later outcome.

The view of development just described accords well with what is known about brain development. To begin, I discuss a few facts. First, the primitive brain and spinal cord form within the 1st month following conception. Second, between roughly the 6th and 25th prenatal weeks, immature neurons migrate out from the primitive neural tube to make up the cerebral cortex. It is only after a neuron has found its correct location in the developing brain that it begins to develop axons and dendrites. These processes can be subverted by poor environments (e.g., exposure to drugs or alcohol) but more often are governed by genetic scripts. However, the third and most crucial element of brain development in terms of function is the completion of the wiring diagram, that is, the formation of synapses. In the human brain, this process varies from area to area, although most areas of the cerebral cortex massively overproduce synapses in the 1st year of life. However, it is the retraction of synapses that may be the sine qua non of function. Thus, it is not until the age of 5 or 6 that the number of synapses in the areas of the brain that control vision and hearing begin to resemble the adult, and it is not until mid- to late adolescence that the areas of the brain involved in higher cognitive and emotional functions (the prefrontal cortex) resemble the adult. Most important, many neuroscientists believe that this retraction process is dependent on experience. Indeed, a common model that has been

proposed is that we massively overproduce synapses to capture or take advantage of experience. It is experience that will confirm and stabilize synapses or, lacking experience, result in death of synapses or simply the lack of synapse confirmation (i.e., the synapse will form but will not be involved in any circuit and, thus, any function). The fact that synapse numbers in the prefrontal cortex remain as high as they do for as long as they do portends behavioral development: It is not until mid- to late adolescence that we as parents, teachers, and society begin to confer on children adult-like status with adult-like privileges.

What are the implications of these data for our understanding of early development? Frankly, it is not clear. We know that the brain undergoes enormous growth and development during the first 2 to 3 years of life; this should not be surprising given the enormous changes that occur behaviorally during this same time period (e.g., infants acquire language and sophisticated means of exploring the world, their cognitive abilities increase by leaps and bounds, their ability to regulate emotion undergoes a rather substantial improvement). However, one only need observe the behavioral changes that occur from 3 to 18 years to know, at least intuitively, that all is not over by age 3. Rather, the changes that appear after age 3 exist on a slower time frame, although they are every bit as dramatic and remarkable as those that occurred earlier.

Permit me to provide an analogy to the processes just described. We know that, during the 2nd through 8th prenatal weeks, virtually all the organs and systems of the body form (a period referred to as *organogenesis*). However, it is during the fetal stage (8th–40th weeks) that these organs and systems are elaborated; thus, the primitive heart becomes a sophisticated four- chambered heart, and the primitive lungs become lungs capable of supporting independent breathing. Thus, the argument I am making is that we are impressed with how fast the infant develops during its early years primarily because this is the period in which the major behavioral "systems" (e.g., language, cognition, perception) first emerge. However, it is the fine-tuning and elaboration of these systems that occur during the next decade and more that ultimately account for who the whole child is. Because this fine-tuning is more subtle than that which comes earlier in life and is more protracted (it continues throughout the rest of childhood and beyond), we take less notice. This is unfortunate, as the dramatic changes that occur in the brain long after the child's second or third birthday are in large measure brought about by the experiences the child has with his or her environment. Fortunately, the child has lots of experiences, and thus a small number of bad ones are unlikely to undermine the developmental process. Conversely, if we do not build on all that hard work of the first few years, that is, maintain the momentum of development, we could very well pull the rug out from underneath development.

Let us be clear. Yes, the brain undergoes rapid development during its first few postnatal years, but development before birth is even more rapid than immediately after birth, and development after age 3 is every bit as important and extraordinary as before age 3. Furthermore, the systems that regulate brain development can be spared the mistreatment of poor environments or, conversely, corrupted by poor environments just as easily before age 3 as after age 3. Thus, neural plasticity cuts both ways, to the detriment or to the benefit of the child.

What lessons does all this have for our understanding of child development? First, given the protracted nature of synapse formation, given that the cultivation of some synaptic circuits depend heavily on experience, and given the multitude of experiences a child has in his or her lifetime, we should be telling parents that no single experience, good or bad, will likely have much influence on their child's development (although there will be caveats to this suggestion, e.g., whether the child has been spared perinatal or genetic injury). Similarly, given the long evolutionary history our species enjoys, many of the so-called enriched experiences some parents seem so intent on providing their children with will likely not matter later in life. Thus, whether the child has the "right" mobile positioned above the crib or the right music or foreign language tape playing in the background will likely prove inconsequential in the long run; that is, the child might have a facility for languages or music (although even this is uncertain), but these experiences will not impact development broadly defined. This, in turn, should take the pressure off parents to be perfect. Third, our species would not have survived as long as it has if all of our development depended heavily on specific experiences occurring at precise points in time. Moreover, even those systems whose development is tied to sensitive or critical periods (e.g., our sensory systems) provide for some flexibility both in the quality and the timing of certain experiences. Thus, so long as our visual system receives general patterned information, we will develop pattern vision. The lesson here, of course, is that we, as parents, teachers, and role models, can make a few mistakes. Lastly, as dramatic as brain development is in the first few years, we should think of these years as analogous to building a foundation for a house. However, unless construction continues, the house will be incomplete, and its owners may never be satisfied with the final product—nor may its neighbors. Based on my perspective as a neuroscientist and developmental psychologist, I argue that our responsibility to our children must be distributed throughout the course of their lives, not focused on just the first 3 years. To do otherwise would be not only short-sighted, it would not be good science.

Recommended Readings

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