

## THOSE DELICATE BRAINS AND TROUBLED MINDS

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The special Spring/Summer 1997 issue of *Newsweek*, one of America's most popular weekly magazines announces that, "Scientists are just now realizing how experiences after birth, rather than something innate, determine the actual wiring of the human brain." Most parents and psychotherapists may find it difficult to believe that such a statement is actually *news*, but then, there has often been a wide gap between what science can prove and common sense allows. As it turns out, at birth the brain's 100 billion or so neurons form more than 50 trillion connections, but in the first months of life, the number of synapses will increase 20 fold, to more than 1,000 trillion. Experience seems to exert its effects by strengthening synapses and synapses that are not used will wither away in a process called "pruning". A growing body of evidence shows that what happens between parents and children plays a huge role, not just in the child's psychological development but in their actual brain development. Talking "baby" talk to infants apparently helps the language centers develop properly and prepares the child for speech. Exposure to music affects spatial-temporal reasoning which is the reasoning underlying math, chess, and engineering. In one recent study published in *Neurological Research*, a group of 3- and 4- year olds given weekly piano lessons. After six months these children scored 34% above average on reasoning skills after having average scores before. Children receiving computer keyboard and mouse lessons, singing lessons, or nothing showed no change.

The downside of all this after-birth brain plasticity is that the developing brain is very susceptible to traumatic experience so that the powerful neurochemicals released as a response to stress appear to be able to produce permanent changes in the very "architecture" of the baby's brain. Dr. Bruce Perry and his colleagues are studying the effects of trauma in childhood and uncovered some disturbing findings. Regions in the cerebral cortex and in the limbic system (responsible for emotion including attachment) are 20-30% smaller in abused children than in normal kids, says Perry; these regions also have fewer synapses. Traumatized children are showing dramatic changes in basic central nervous system reflexes like blood pressure, with a 40% increase in blood pressure readings over the norm and odd responses to orthostatic changes, indicating impaired brain-stem regulation (Perry 1994, Perry and Pate 1994).

Neuroscientist Megan Gunnar of the University of Minnesota is also looking at the effects of repeated stress on children. In children already traumatized, the slightest stress, the most inchoate fear, unleashes a new surge of stress hormones like cortisol. This causes hyperactivity, anxiety and impulsive behavior. "The kids with the higher cortisol levels score lowest on inhibitory control", says Dr. Gunnar, "Kids from high-stress environments have problems in attention regulation and self-control" (Begley 1997).

A number of important studies have shown a relationship between child abuse and EEG abnormalities, not entirely related to head injuries. In one recent study of abused children by Ito and Teicher (1993), 55% of the children had EEG abnormalities as compared to 27% of the nonabused children. They also

noted a striking association in boys between abnormal EEG's and behavior problems, especially self-destruction.

Dr. Frank Putnam at the National Institute for Mental Health and his research colleagues, are performing a long-term, prospective study of sexually abused girls. His findings are very disturbing. These children are very disturbed and their degree of pathology is increasing over time. And it is not just behavioral problems that afflict these children. The rate of physical symptoms in this population is greatly increased over that of the control group. They visit doctors for colds, influenza and other infections three times as often as other children. They have substantially more stomachaches, head aches, asthma, skin problems than other children – 50-70% more. Their basic physiological measures and responses to neurohormones like cortisol and testosterone are so odd that Dr. Putnam has stated that “the biology of these two populations is so different that you cannot generalize from normal data” (Cole and Putnam, 1992; DeBellis, 1994a, 1994b, 1996; Putnam 1996; Putnam and Trickett, 1993; Trickett and Putnam, 1993).

Lest we, as adults, become too complacent about these findings, a recent study in the *American Journal of Preventive Medicine* illustrates a worrisome connection between adverse childhood events and the leading causes of death in adults. The adverse childhood events or “ACEs” fell into seven categories: psychological, physical or sexual abuse; witnessing violence against mother; living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. Seventy percent of the members of a large HMO (health maintenance organization) responded to a survey performed by the researchers. More than half of those surveyed reported at least one, and one-fourth reported two or more categories of adverse childhood experiences. The researchers found that there was a graded relationship between the number of exposure categories a person had experienced and the presence of adult diseases including ischemic heart disease, cancer, chronic lung disease, skeletal fractures and liver disease. Persons who as children had experienced multiple categories of childhood exposure were more likely to have multiple health risk factors later in life

Studies such as these have enormous implications for public policy. Nearly a quarter of families with children under 3 in the United States live in poverty – most of these families headed by single mothers. In the United States, 50% of mothers with children under 5 are in the workforce; 60% of young children are in daycare. Yet despite this high utilization, there are still no national daycare standards, leaving the most vulnerable members of our community – and our future – open to the potential long-term effects of abandonment, neglect, abuse, and exploitation.

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