

## THE RELEVANCE OF BRAIN RESEARCH TO JUVENILE DEFENSE

American Bar Association  
Criminal Justice, Winter 2005  
*19 Crim. Just. 51*

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### **TEXT:**

Parents, teachers, social workers, judges, and lawyers have long recognized that adolescents, despite their physical similarities to adults, differ greatly from their elders in the way they react to particular situations, especially stressful ones. Psychologists, from Jean Piaget on, have told those who work with these young people that they are still developmentally immature and cannot be expected to act precisely like adults. The late Justice Lewis Powell reminded us of this in the first of the juvenile death penalty cases, *Eddings v. Oklahoma*, 455 U.S. 104 (1982), when he opined that "Adolescents, particularly in the early and middle teen years, are more vulnerable, more impulsive, and less self-disciplined than adults . . . because adolescents may have less capacity to control their conduct and to think in long-range terms than adults." (455 U.S. at 115, n.11 (quoting TWENTIETH CENTURY FUND TASK FORCE ON SENTENCING POLICY TOWARD YOUNG OFFENDERS, CONFRONTING YOUTH CRIME 7 (1978).) Research reported in the past five years, based on the use of new technologies, has presented participants in the juvenile justice system with evidence from hard science to explain what they have intuitively known from their personal experiences.

This scientific evidence, cited extensively in several of the briefs filed in the pending Supreme Court death penalty case of *Roper v. Simmons*, No. 03-633, has broader relevance to those who practice in the juvenile court or who represent juveniles in adult courts. It also may assist lawyers representing youths to argue their points more persuasively.

### **Scientific brain research**

Since the early 1990s, a number of scientific researchers have been examining the brains of adolescents using new technologies, such as magnetic resonance imaging (MRI), initially for the purposes of discovering the causes of such disabilities as attention deficit hyperactivity disorder (ADHD) and autism, and this research has led to some important discoveries about the brains of all teenagers. Dr. Jay Giedd at the National Institute of Mental Health (NIMH) in Bethesda, Maryland, has been using high-powered MRI snapshots of the brains of about 1,800 children and teenagers taken at regular intervals for about 13 years to chart the neurological development of their brains longitudinally. He and others have tracked the individual brains of young people as they matured by observing them with MRIs at periodic intervals. (Jay N. Giedd et al., *Brain Development During Childhood and Adolescence: A Longitudinal MRI Study*, 2 NATURE NEUROSCIENCE 861 (1999).) The study shows that the frontal lobes of the brain continue to mature during adolescence. This is especially true of the prefrontal cortex, which plays a critical role in the executive functions of the brain--those involved when a person plans and implements behaviors by selecting, coordinating, and applying the cognitive skills necessary to accomplish goals.

Any disruption of functions associated with the frontal lobes in adults may lead to impairments of foresight, strategic thinking, and risk management. Impairment of frontal lobe functioning also is associated with poor impulse control, difficulties in concentration, attention, and self-monitoring, and impairments in decision making. One "hallmark of frontal lobe dysfunction is difficulty in making decisions that are in the long-term best interests of the individual." (Antonio R. Damasio & Steven W. Anderson, *The Frontal Lobes*, in CLINICAL NEUROPSYCHOLOGY 404, 434 (Kenneth M. Heilman & Edward Valenstein eds., 4th ed. 2003).) The longitudinal MRI studies done by Giedd and others indicate this executive area of the brain is one of the last parts of the brain to reach maturity. (Nitin Gogtay et al., *Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood*, 101 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCE 8174, 8177 (2004).) During adolescence, the size of the frontal lobes is not significantly altered, but their composition undergoes dramatic changes while cognitive functioning improves. One important change is that gray matter thins. (Elizabeth R. Sowell et al., *Mapping Continued Brain Growth and Gray Matter Density Reduction in Dorsal Frontal Cortex: Inverse Relationships During Postadolescent Brain Maturation*, 21 J. NEUROSCIENCE 8819 (2001) (studying age groups 7-11, 12-16, and 23-30).) A contributing factor to the thinning of gray matter is thought to be "pruning," which strengthens the connections between the remaining neurons. The MRI research reveals that in the same regions where gray matter thins, white matter significantly increases during adoles-

cence, likely through a process called "myelination" in which a substance called myelin is wrapped around brain cell axons, improving the connectivity of neural tracts by insulating the axon, thereby greatly speeding up the communication between cells. This allows the brain to process information more efficiently and reliably. In a study of young people ages five through 17, white matter within the prefrontal area of the frontal lobes steadily increased with age, likely reflecting the advances of myelination. (Allan L. Reiss et al., *Brain Development, Gender and IQ in Children: A Volumetric Imaging Study*, 119 *BRAIN* 1763 (1996).) Giedd's longitudinal MRI study at NIMH documented an increase in white matter continuing through the teenage years to at least age 22. (Giedd et al, *supra*, at 861-62).

Thus, there are clear neurological explanations for the difficulties adolescents have in cognitive functioning, in exercising mature judgment, in controlling impulses, in weighing the consequences of actions, in resisting the influences of peers, and in generally becoming more responsible. Perception may even be affected by this late maturation of the adolescent brain. Studies done by Harvard neuropsychologist Deborah Yurgelun-Todd using functional magnetic resonance imaging (fMRI), which actually shows brain activity while research subjects do assigned tasks, demonstrate this rather dramatically. She asked a group of both teenagers and adults to identify the emotions displayed in photographs of human faces. While watching their brain activity patterns during this task, she discovered that the adult subjects made few mistakes in assessing the expressions on the faces shown in the photographs, but the adolescents misread the emotional signals, seeing anger and hostility where none existed. The fMRIs showed the adults relied more on the frontal lobes, associated with planning and judgment, while the teenagers relied heavily on the amygdala, a structure in the temporal lobes associated with emotional reactions. Thus, the later maturation of the frontal lobes had functional effects that may influence behavior. (Interview with Deborah Yurgelun-Todd on *Frontline: Inside the Teen Brain*, (PBS television broadcast, Jan. 31, 2002).)

### **Implications of brain research**

It seems apparent from the research that the impulsivity, disregard of long-term consequences, irresponsibility, vulnerability to peer group pressure, tendency to risk-taking, and other characteristics of adolescents, especially in those who commit delinquent and criminal acts, are not just reflections of emotional immaturity, but are products of neurological immaturity as well. These characteristics are built in--literally hard-wired into the adolescent brain--and are not aberrant symptoms of moral weakness. (See Barry Feld, *Competence, Culpability, and Punishment: Implications of Atkins for Executing and Sentencing Adolescents*, 32 *HOFSTRA L. REV.* 463 (2003); Elizabeth Scott & Laurence Steinberg, *Blaming Youth*, 81 *TEX. L. REV.* 799 (2003).)

The implications of this knowledge for lawyers, judges, and others involved in the juvenile justice system or in handling those youths being tried as adults in the criminal justice system is that juveniles, even those on the cusp of adulthood, are less blameworthy, or culpable, than they are frequently judged to be. They are also inherently more vulnerable than adults to the processes of police investigations, and to the procedures of trial and sentencing. As has been noted previously in this column, the techniques widely used in police encounters with teenagers, combined with the adolescent's psychological and neurological vulnerability, make them more likely to consent to police intrusions into their liberty and to break down during police interrogations, and even lead to false confessions that result in the conviction of the innocent. There is, then, a greater need for caution in admitting evidence seized during a consensual search and confessions obtained with a *Miranda* warning (because such warnings may be poorly understood) or without, and, above all, a confession secured without the benefit of counsel. (The ABA Task Force on Youth in the Criminal Justice System urges that no teenager under age 16 should be questioned without the assistance of a lawyer.)

Such youths may also have diminished adjudicative competence and thus be less able to assist their lawyers in their defense, or make those judgments that adult defendants are expected to make, or understand what is happening during their trials and be able to act appropriately in such a setting. This is especially true when the adolescent may be developmentally disabled, or suffer from a mental disorder, or have been the product of a disrupted childhood or the victim of physical or sexual abuse, all fairly common characteristics of youth in the juvenile or criminal justice systems.

### **Conclusion**

An understanding of the neurological reasons for the way adolescents function as they do in society and in the legal system is important for those lawyers who represent young people in juvenile or family court, or in the criminal justice system. It may also be important in communicating this information to others in the course of legal proceedings involving these youths.