

# Startling Finds on Teenage Brains

By Paul Thompson

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Emotions ran high at the trial of Nathaniel Brazill in West Palm Beach, Fla., two weeks ago. Friends of slain teacher Barry Grunow called the death penalty, while a growing crowd of demonstrators outside the courthouse wielded hastily written placards reading, "A child is not a man." Jurors returned with their verdict May 16: Fourteen-year-old Brazill, charged in last May's shooting of middle-school teacher Grunow, was found guilty of second-degree murder.

A Florida grand jury had previously ruled that Brazill, who frequently looked dazed during the trial, would be tried as an adult, and if he had been convicted of first-degree murder he would have faced life in prison without parole. But Brazill's immaturity was evident throughout this incident—from the act itself of Brazill's shooting a teacher he considered one of his favorites, to his subsequent inability to give a reason for doing so, to the various quizzical looks that came across his face as the verdicts were read.

In terms of cognitive development, as research on the human brain has shown Brazill—and any other young teen—is far from adulthood.

Over the last several years, as school shootings have seemed to occur with disturbing frequency, startling discoveries have emerged about the teenage brain. The White House held a televised conference on adolescent development in May of last year, and a flurry of papers on the teen brain has appeared in top science journals. Reporters and teen advocates ask: Do the studies help explain the impulsive, erratic behavior of teens? The biggest surprise in recent teen-brain research is the finding that a massive loss of brain tissue occurs in the teen years.

Specifically, my own research group at the University of California, Los Angeles, and our colleagues at the National Institutes of Health has developed technology to map the patterns of brain growth in individual children and teenagers. With repeated brain scans of kids from 3 to 20, we pieced together "movies" showing how brains grow and change.

Some changes make perfect sense: Language systems grow furiously until age 12 and then stop, coinciding with the time when children learn foreign languages fastest. Mathematical brain systems grow little until puberty, corresponding with the observation that kids have difficulty with abstract concepts before then. Basically, the brain is like a puzzle, and growth is fastest in the exact parts the kids need to learn skills at different times. So far, all well and good.

But what really caught our eye was a massive loss of brain tissue that occurs in the teenage years. The loss was like a wildfire, and you could see it in every teenager. Gray matter, which brain researchers believe supports all our thinking and emotions, is purged at a rate of 1

percent to 2 percent a year during this period. Stranger still, brain cells and connections are only being lost in the areas controlling Page 2 impulses, risk-taking and self-control. These frontal lobes, which inhibit our violent passions, rash actions, and regulate our emotions, are vastly immature throughout the teenage years.

The implications are tantalizing. Brazill was only 13 when he committed his crime. He said he made a "stupid mistake," but prosecutors argued that by bringing a gun to school he planned the crime.

Does "planning" mean the same thing for a 13-year-old, with his diminished capacity for controlling erratic behavior, as it means for an adult? The verdict, in this case, seems to line up with the research. The jurors, by returning a verdict of second-degree murder instead of first, indicated that they believe Brazill's actions, while not accidental, were not fully thought-out, either.

Linking this maelstrom of normal brain change with legal or moral accountability is tough: Even though normal teens are experiencing a wildfire of tissue loss in their brains, that does not remove their accountability. What is clear from the research is that the parts of the frontal lobes that inhibit reckless actions restructure themselves with startling speed in the teen years. Given this delicate—and drastic—reshaping of the brain, teens need all the help they can get to steer their development onto the right path.

While research on brain-tissue loss can help us to understand teens better, it cannot be used to excuse their violent or homicidal behavior. But it can be used as evidence that teenagers are not yet adults, and the legal system shouldn't treat them as such.

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