

We blame
teen turmoil
on immature
brains. But
did the brains
cause the
turmoil, or did
the turmoil
shape the
brains?

The Myth of the Teen Brain

By Robert Epstein

It's not only in newspaper headlines—it's even on magazine covers. *TIME*, *U.S. News & World Report* and even *Scientific American Mind* have all run cover stories proclaiming that an incompletely developed brain accounts for the emotional problems and irresponsible behavior of teenagers. The assertion is driven by various studies of brain activity and anatomy in teens. Imaging studies sometimes show, for example, that teens and adults use their brains somewhat differently when performing certain tasks.

As a longtime researcher in psychology and a sometime teacher of courses on research methods and statistics, I have become increasingly concerned about how such studies are being interpreted. Although imaging technology has shed interesting new light on brain activity, it is dangerous to presume that snapshots of activity in certain regions of the brain necessarily provide useful information about the causes of thought, feeling and behavior.

If the “teen brain” were a universal phenomenon, we would find **teen turmoil** around the world.

This fact is true in part because we know that an individual’s genes and environmental history—and even his or her own behavior—mold the brain over time. There is clear evidence that any unique features that may exist in the brains of teens—to the limited extent that such features exist—are the *result* of social influences rather than the *cause* of teen turmoil. As you will see, a careful look at relevant data shows that the teen brain we read about in the headlines—the immature brain that supposedly causes teen problems—is nothing less than a myth.

Cultural Considerations

The teen brain fits conveniently into a larger myth, namely, that teens are inherently incompetent and irresponsible. Psychologist G. Stanley Hall launched this myth in 1904 with the publication of his landmark two-volume book *Adolescence*. Hall was misled both by the turmoil of his times and by a popular theory from biology that later proved faulty. He witnessed an exploding industrial revolution and massive immigration that put hundreds of thousands of young

people onto the streets of America’s burgeoning cities. Hall never looked beyond those streets in formulating his theories about teens, in part because he believed in “recapitulation”—a theory from biology that asserted that individual development (ontogeny) mimicked evolutionary development (phylogeny). To Hall, adolescence was the necessary and inevitable reenactment of a “savage, pigmoid” stage of human evolution. By the 1930s the recapitulation theory was completely discredited in biology, but psychologists and the general public never got the message. Many still believe, consistent with Hall’s assertion, that teen turmoil is an *inevitable* part of human development.

Today teens in the U.S. and some other Westernized nations do display some signs of distress. The peak age for arrest in the U.S. for most crimes has long been 18; for some crimes, such as arson, the peak comes much earlier. On average, American parents and teens tend to be in conflict with one another 20 times a month—an extremely high figure indicative of great pain on both sides. An extensive study conducted in 2004 suggests that 18 is the peak age for depression among people 18 and older in this country. Drug use by teens, both legal and illegal, is clearly a problem here, and suicide is the third leading cause of death among U.S. teens. Prompted by a rash of deadly school shootings over the past decade, many American high schools now resemble prisons, with guards, metal detectors and video monitoring systems, and the high school dropout rate is nearly 50 percent among minorities in large U.S. cities.

But are such problems truly inevitable? If the turmoil-generating “teen brain” were a universal developmental phenomenon, we would presumably find turmoil of this kind around the world. Do we?

In 1991 anthropologist Alice Schlegel of the University of Arizona and psychologist Herbert Barry III of the University of Pittsburgh reviewed research on teens in 186 preindustrial societies. Among the important conclusions they drew about these societies: about 60 percent had no word for “adolescence,” teens spent almost all their time with adults, teens showed almost no signs of psychopathology, and antisocial behavior in young males was completely absent in more than half these cultures and

FAST FACTS

Troubled Teens

1>> Various imaging studies of brain activity and anatomy find that teens and adults use their brains somewhat differently when performing certain tasks. These studies are said to support the idea that an immature “teen brain” accounts for teen mood and behavior problems.

2>> But, the author argues, snapshots of brain activity do not necessarily identify the *causes* of such problems. Culture, nutrition and even the teen’s own behavior all affect brain development. A variety of research in several fields suggest that teen turmoil is caused by cultural factors, not by a faulty brain.

3>> Anthropological research reveals that teens in many cultures experience no turmoil whatsoever and that teen problems begin to appear only after Western schooling, movies and television are introduced.

4>> Teens have the potential to perform in exemplary ways, the author says, but we hold them back by infantilizing them and trapping them in the frivolous world of teen culture.



extremely mild in cultures in which it did occur.

Even more significant, a series of long-term studies set in motion in the 1980s by anthropologists Beatrice Whiting and John Whiting of Harvard University suggests that teen trouble begins to appear in other cultures soon after the introduction of certain Western influences, especially Western-style schooling, television programs and movies. Delinquency was not an issue among the Inuit people of Victoria Island, Canada, for example, until TV arrived in 1980. By 1988 the Inuit had created their first permanent police station to try to cope with the new problem.

Consistent with these modern observations, many historians note that through most of recorded human history the teen years were a relatively peaceful time of transition to adulthood. Teens were not trying to break away from adults; rather they were learning to *become* adults. Some historians, such as Hugh Cunningham of the University of Kent in England and Marc Kleijwegt of the University of Wisconsin-Madison, author of *Ancient Youth: The Ambiguity of Youth and the Absence of Adolescence in Greco-Roman Society* (J. C. Gieben, 1991), suggest that the tumultuous period we call ado-

lescence is a very recent phenomenon—not much more than a century old.

My own recent research, viewed in combination with many other studies from anthropology, psychology, sociology, history and other disciplines, suggests the turmoil we see among teens in the U.S. is the result of what I call “artificial extension of childhood” past puberty. Over the past century, we have increasingly infantilized our young, treating older and older people as children while also isolating them from adults. Laws have restricted their behavior [*see box on next page*]. Surveys I have conducted show that teens in the U.S. are subjected to more than 10 times as many restrictions as are mainstream adults, twice as many restrictions as active-duty U.S. Marines, and even twice as many restrictions as incarcerated felons. And research I conducted with Diane Dumas as part of her dissertation research at the California School of Professional Psychology shows a positive correlation between the extent to which teens are infantilized and the extent to which they display signs of psychopathology.

The headlines notwithstanding, there is no question that teen turbulence is *not* inevitable. It is a creation of modern culture, pure and sim-

In many Western cultures, teens socialize almost exclusively with other teens.

ple—and so, it would appear, is the brain of the troubled teen.

Dissecting Brain Studies

A variety of recent research—most of it conducted using magnetic resonance imaging (MRI) technology—is said to show the existence of a teen brain. Studies by Beatriz Luna of the department of psychiatry at the University of Pittsburgh, for example, are said to show that teens use prefrontal cortical resources differently than adults do. Susan F. Tapert of the University of California, San Diego, found that for certain memory tasks, teens use smaller areas of the cortex than adults do. An electroencephalogram (EEG) study by Irwin Feinberg and his colleagues at the University of California, Davis, shows that delta-wave activity during sleep declines in the early teen years. Jay Giedd of the National Institute of Mental Health and other researchers suggest that the decline in delta-wave activity might be related to synaptic pruning—a reduction in the number of interconnections among neurons—that occurs during the teen years.

This work seems to support the idea of the teen brain we see in the headlines until we realize

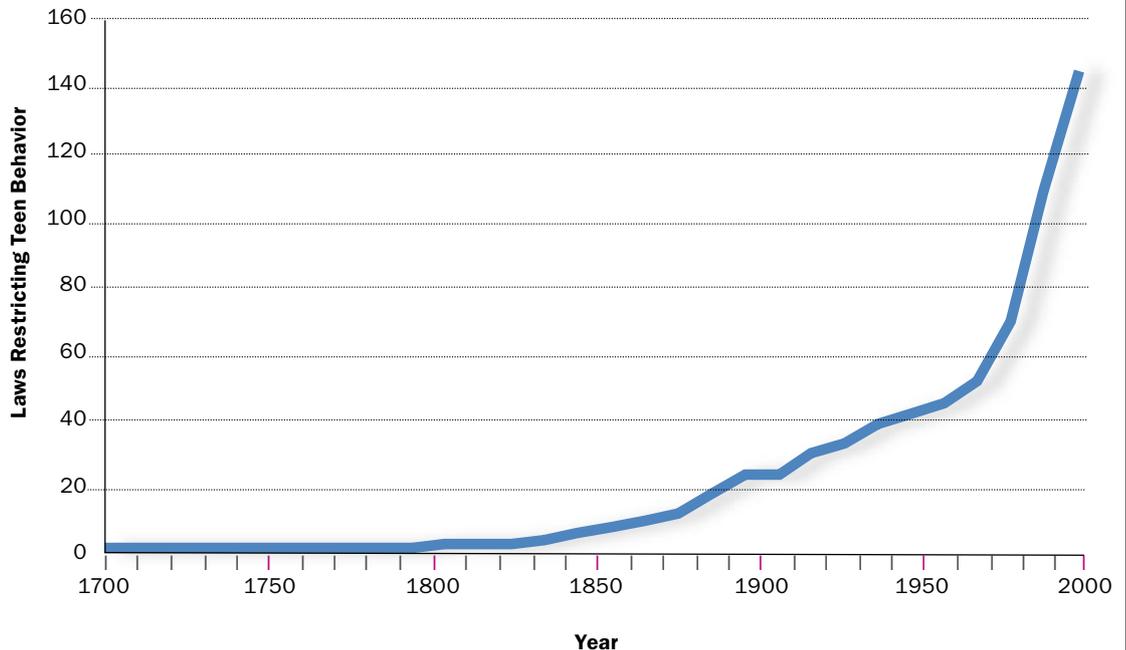
two things. First, most of the brain changes that are observed during the teen years lie on a continuum of changes that take place over much of our lives. For example, a 1993 study by Jesús Pujol and his colleagues at the Autonomous University of Barcelona looked at changes in the corpus callosum—a massive structure that connects the two sides of the brain—over a two-year period with individuals between 11 and 61 years old. They found that although the rate of growth declined as people aged, this structure still grew by about 4 percent each year in people in their 40s (compared with a growth rate of 29 percent in their youngest subjects). Other studies, conducted by researchers such as Elizabeth Sowell of the University of California, Los Angeles, show that gray matter in the brain continues to disappear from childhood well into adulthood.

Second, I have not been able to find even a single study that establishes a *causal* relation between the properties of the brain being examined and the problems we see in teens. By their very nature, imaging studies are correlational, showing simply that activity in the brain is associated with certain behavior or emotion. As we learn in elementary statistics courses,

Rebels with a Cause

Laws restricting the behavior of young people (under age 18) have grown rapidly in the past century, according to a survey by the author. He found that

U.S. teens have 10 times as many restrictions as adults, twice as many as active-duty U.S. marines and twice as many as incarcerated felons.



SOURCE: THE CASE AGAINST ADOLESCENCE, BY ROBERT EPSTEIN (QUILL DRIVER BOOKS, 2007)

Studies of intelligence, perception and memory show that teens are in many ways **superior to adults.**



Young people have extraordinary potential that is often not expressed because teens are infantilized and isolated from adults.

correlation does not even imply causation. In that sense, no imaging study could possibly identify the brain as a causal agent, no matter what areas of the brain were being observed.

Is it ever legitimate to say that human behavior is caused by brain anatomy or activity? [See “Brain Scans Go Legal,” by Scott T. Grafton, Walter P. Sinnott-Armstrong, Suzanne I. Gazzaniga and Michael S. Gazzaniga; *SCIENTIFIC AMERICAN MIND*, December 2006/January 2007.] In his 1998 book *Blaming the Brain*, neuroscientist Elliot Valenstein deftly points out that we make a serious error of logic when we blame almost any behavior on the brain—especially when drawing conclusions from brain-scanning studies. Without doubt, all behavior and emotion must somehow be reflected (or “encoded”) in brain structure and activity; if someone is impulsive or lethargic or depressed, for example, his or her brain must be wired to reflect those behaviors. But that wiring (speaking loosely) is not necessarily the cause of the behavior or emotion that we see.

Considerable research shows that a person’s emotions and behavior continuously change brain

anatomy and physiology. Stress creates hypersensitivity in dopamine-producing neurons that persists even after they are removed from the brain. Enriched environments produce more neuronal connections. For that matter, meditation, diet, exercise, studying and virtually all other activities alter the brain, and a new study shows that smoking produces brain changes similar to those produced in animals given heroin, cocaine or other addictive drugs. So if teens are in turmoil, we will necessarily find some corresponding chemical, electrical or anatomical properties in the brain. But did the brain cause the turmoil, or did the turmoil alter the brain? Or did some other factors—such as the way our culture treats its teens—cause both the turmoil and the corresponding brain properties?

(The Author)

ROBERT EPSTEIN is a contributing editor for *Scientific American Mind* and the former editor in chief of *Psychology Today*. He received his Ph.D. in psychology from Harvard University and is a longtime researcher and professor. His latest book is called *The Case against Adolescence: Rediscovering the Adult in Every Teen* (Quill Driver Books, 2007). More information is at www.thecaseagainstadolence.com.

Elected achievers:
Sam Juhl, 18,
 mayor of Roland,
 Iowa and **Michael**
Sessions, now 19,
 mayor of Hills-
 dale, Mich.



Unfortunately, news reports—and even the researchers themselves—often get carried away when interpreting brain studies. For instance, a 2004 study conducted by James Bjork and his colleagues at the National Institute on Alcohol Abuse and Alcoholism, at Stanford University and at the Catholic University of America was said in various media reports to have identified the biological roots of teen laziness. In the actual study, 12 young people (ages 12 to 17) and 12 somewhat older people (ages 22 to 28) were monitored with an MRI device while performing a simple task that could earn them money. They were told to press a button after a short anticipation period (about two seconds) following the brief display of a symbol on a small mirror in front of their eyes. Some symbols indicated that pressing the button would earn money, whereas others indicated that

failing to respond would cost money. After the anticipation period, subjects had 0.25 second to react, after which time information was displayed to let them know whether they had won or lost.

Areas of the brain that are believed to be involved in motivation were scanned during this session. Teens and adults were found to perform equally well on the task, and brain activity differed somewhat in the two groups—at least during the anticipation period and when \$5 (the maximum amount that could be earned) was on the line. Specifically, on those high-payment trials the average activity of neurons in the right nucleus accumbens—but not in other areas that were being monitored—was higher for adults than for teens. Because brain activity in the two groups did not differ in other brain areas or under other payment conditions, the researchers drew a very modest conclusion in their article: “These data indicate qualitative similarities overall in the brain regions recruited by incentive processing in healthy adolescents and adults.”

But according to the Long Island, N.Y., newspaper *Newsday*, this study identified a “biological reason for teen laziness.” Even more disturbing, lead author James Bjork said that his study “tells us that teenagers love stuff, but aren’t as willing to get off the couch to get it as adults are.”

In fact, the study supports neither statement. If you truly wanted to know something about the brains of lazy teens, at the very least you would have to have some lazy teens in your study. None were identified as such in the Bjork study. Then you would have to compare the brains of those teens with the brains of industrious teens, as well

ANDREW RULLSTAD The Ames Tribune/AP Photo (top); BILL PUGLIANO Getty Images News (bottom)

as with the brains of both lazy and industrious adults. Most likely, you would then end up finding out how, on average, the brains in these four groups differed from one another. But even this type of analysis would not allow you to conclude that some teens are lazy “because” they have faulty brains. To find out why certain teens or certain adults are lazy (and, perforce, why they have brains that reflect their lazy tendencies), you would still have to look at genetic and environmental factors. A brain-scanning study can shed no light.

Valenstein blames the pharmaceutical industry for setting the stage for overinterpreting the results of brain studies such as Bjork’s. The drug companies have a strong incentive to convince public policymakers, researchers, media professionals and the general public that faulty brains underlie all our problems—and, of course, that

ent kinds of intelligence tests, each showed that raw scores on intelligence tests peak between ages 13 and 15 and decline after that throughout life. Although verbal expertise and some forms of judgment can remain strong throughout life, the extraordinary cognitive abilities of teens, and especially their ability to learn new things rapidly, is beyond question. And whereas brain size is not necessarily a good indication of processing ability, it is notable that recent scanning data collected by Eric Courchesne and his colleagues at the University of California, San Diego, show that brain volume peaks at about age 14. By the time we are 70 years old, our brain has shrunk to the size it had been when we were about three.

Findings of this kind make ample sense when you think about teenagers from an evolutionary perspective. Mammals bear their young shortly after puberty, and until very recently so have

When we treat teens like adults, they almost immediately rise to the challenge.

pharmaceuticals can fix those problems. Researchers, in turn, have a strong incentive to convince the public and various funding agencies that their research helps to “explain” important social phenomena.

The Truth about Teens

If teen chaos is not inevitable, and if such difficulty cannot legitimately be blamed on a faulty brain, just what is the truth about teens? The truth is that they are extraordinarily competent, even if they do not normally express that competence. Research I conducted with Dumas shows, for example, that teens are as competent or virtually as competent as adults across a wide range of adult abilities. And long-standing studies of intelligence, perceptual abilities and memory function show that teens are in many instances far superior to adults.

Visual acuity, for example, peaks around the time of puberty. “Incidental memory”—the kind of memory that occurs automatically, without any mnemonic effort, peaks at about age 12 and declines through life. By the time we are in our 60s, we remember relatively little “incidentally,” which is one reason many older people have trouble mastering new technologies. In the 1940s pioneering intelligence researchers J. C. Raven and David Wechsler, relying on radically differ-

members of our species, *Homo sapiens*. No matter how they appear or perform, teens *must* be incredibly capable, or it is doubtful the human race could even exist.

Today, with teens trapped in the frivolous world of peer culture, they learn virtually everything they know from one another rather than from the people they are about to become. Isolated from adults and wrongly treated like children, it is no wonder that some teens behave, by adult standards, recklessly or irresponsibly. Almost without exception, the reckless and irresponsible behavior we see is the teen’s way of declaring his or her adulthood or, through pregnancy or the commission of serious crime, of instantly *becoming* an adult under the law. Fortunately, we also know from extensive research both in the U.S. and elsewhere that when we treat teens like adults, they almost immediately rise to the challenge.

We need to replace the myth of the immature teen brain with a frank look at capable and savvy teens in history, at teens in other cultures and at the truly extraordinary potential of our own young people today. **M**

(Further Reading)

- ◆ **Blaming the Brain: The Truth about Drugs and Mental Health.** Elliot S. Valenstein. Free Press, 1998.
- ◆ **The End of Adolescence.** Philip Graham. Oxford University Press, 2004.