

## The Anatomy of Violence

Pathological genes, a disturbed mind, social isolation and a gun culture are not enough. Mass murderers also need the individual will to pull the trigger.

By Sharon Begley <http://www.msnbc.msn.com/id/18248728/site/newsweek/print/1/displaymode/1098/>

### Newsweek

April 30, 2007 issue - Cho Seung-Hui turned his gun on himself before a neuroscientist could get him into a brain-imager and scan his cortex for aberrant activity. No geneticist had analyzed his DNA for genes associated with impulsivity, aggression or violence. And although a physician at a psychiatric hospital concluded in late 2005, after Cho had stalked two female students, that his "affect is flat and mood is depressed," no psychologist had the opportunity to ask him why he wrote such disturbing, demon-haunted plays and essays that his professor referred him for counseling last fall. No sociologist had probed how American society had shaped this 23-year-old South Korean immigrant during his 15 years in the United States.

While the temptation is to dismiss Cho as crazy and leave it at that, no one will ever know for sure why Cho murdered two fellow students in a dormitory at Virginia Tech and then gunned down 30 more people in a classroom building across campus just over two hours later. But the unasked, and perhaps unanswerable, questions show the new sophistication of research on the etiology of violence.

Not long ago, scientists invoked genes or brain circuitry, hyper-activity or brutal parental discipline or America's "gun culture" to explain horrors ranging from Charles Whitman's rampage at the University of Texas, Austin, clock tower in 1966, to George Hennard's 23 murders at a Killeen, Texas, diner in 1991, to the Columbine High School shootings in 1999. But although some people with a particular gene variant do grow up to be sociopaths, others with the same variant do not. And while some with overactivity in particular regions of the brain commit violent crimes, others do not. And if every kid who became inured to violence through Grand Theft Auto or who witnessed chronic conflict between his parents during early childhood—risk factors for violence—went on a murder spree, well, then crimes like Cho's wouldn't have network-news anchors rushing to the sites of the massacres to do their broadcasts.

Scientists who study criminal violence—that committed outside of wars and civil conflicts—now believe that its roots are equally planted in the biology of an individual, the psychology that reflects the interaction of innate traits and experiences, and the larger culture. No single cause is sufficient, none is deterministic. "It's like a kid piling up a tower of blocks," says Loyola University, Chicago,

psychologist James Garbarino, who has studied school shooters. "Eventually, it falls over. You could point to the final block and say, that one's the cause. But it's an accumulation of risk factors."

A genetically identical clone of Cho growing up with different experiences in a different environment would likely not have set an American record for mass murder: although the biology would have been sufficiently twisted, the psychology—the product of experiences interacting with that biology—would not have been. Similarly, a Cho who grew up in, say, Japan would almost certainly not have acted on his hatred and fury: biology and psychology set the stage for homicidal violence, but the larger culture would likely have prevented its execution. (Japan is not immune from heinous murders, of course: one day after the Virginia Tech shootings, the mayor of Nagasaki was fatally gunned down on a sidewalk, apparently by a mobster.) What is becoming clear is that criminal violence reflects and requires the dark hand of individual biology, life experiences and the larger cultural surround—and the will to take lives in cold blood.

When behavioral genetics was in its heyday a decade or two ago, one of its grails was a gene predisposing people to violence—and an extended family of Dutch sociopaths seemed to be just what scientists were looking for. Fourteen men in the family had committed impulsive, aggressive crimes including arson and attempted rape. In 1993, scientists reported that all 14 had the identical form of a gene on the X chromosome. The gene makes an enzyme called MAOA, which breaks down such brain chemicals as serotonin and noradrenaline. The normal version of the gene produces lots of MAOA; the aberrant form produces low amounts. Studies in animals had linked low enzyme levels to aggression, perhaps because when MAOA is in short supply the brain remains jacked up on neurochemicals in a way that induces aggression.

The "violence gene" theory soon found itself on shaky ground, however. In 2002, scientists who had followed 442 New Zealand men since their birth found that the MAOA link was not nearly as straightforward as the Dutch study suggested. Yes, men with the low-activity form of the MAOA gene were more likely to engage in persistent fighting, bullying, cruelty and violent crime than were men with the high-activity version. But that was so only if they had been neglected or abused as children. If they had not been mistreated, men with the low-activity MAOA gene were not much likelier to be violent. The gene alone was not sufficient. It was not strictly deterministic in the sense of always causing someone to become violent, but merely "permissive": if two boys are severely abused, the one with the low-activity gene is more likely to grow up to commit violent crimes, and even then only if society provides fertile ground for this weed to grow.

The road from genes to behavior travels through the brain. In his research on killers, Adrian Raine of the University of Southern California classifies them as either reactive, those who murder in response to an insult or slight (real or imagined), or proactive, who kill to achieve a thought-out goal such as robbery. Proactive killers show brain-activity patterns no different from that of normal, nonviolent volunteers, Raine reported in 1998. But the brains of reactive killers have clearly reduced activity in

the prefrontal cortex, the site of such "executive" functions as judgment, planning, abstract reasoning, inhibiting inappropriate or impulsive behavior and self-monitoring. "This is the part of the brain that says, 'Let's stop and think about this again'," says Raine. "It has a calming effect on the emotional regions of the brain that give rise to pent-up anger and rage." Low prefrontal activity "also means that empathy will be off," says neuropsychiatrist Daniel Amen, who heads a chain of four psychiatric clinics and who found this pattern in the brain of Kip Kinkel, who killed his parents and then shot two dozen fellow students in Springfield, Ore., in 1998 when he was 15. "How do you kill 32 people and have any kind of empathy?" he asks. "That's highly associated with decreased activity in the prefrontal cortex."

In the brains of reactive killers the eerie quiet in the prefrontal regions is paired with increased activity in the limbic regions, site of emotions. "That gives rise to aggression and less prefrontal control over that aggression," Raine says. "It's a sort of double hit that may make them more likely to act out aggressively." Also overactive is a region involved in shifting attention, called the cingulate gyrus. "You become obsessive," Amen says. "Someone with violent thoughts can't let them go. Stalking is one sign of that."

Since the early days of research on the brains of violent felons, however, neuroscience has undergone a paradigm shift. Researchers now know that life experiences and even introspection can alter patterns of brain activity. When people suffering from obsessive-compulsive disorder learn to think about their thoughts differently, for instance, they can quiet activity in the cingulate. That raises the possibility that killers' aberrant brain activity is itself the result of experiences they had or thoughts they thought, rather than something that was wired in at birth. Similarly, it used to be thought that testosterone drove aggression, and more testosterone drove more aggression. In fact, however, individual differences in testosterone levels (as long as they are within 20 percent to 200 percent of normal) do not cause differences in levels of aggression, nor do changes in a man's testosterone levels over time predict changes in aggression, Stanford University neuroscientist Robert Sapolsky noted in his book "The Trouble With Testosterone." Only levels at least four times the norm (as can occur with "roid rage") spell trouble. And just as experiences can alter brain circuitry, so behavior can alter biology: aggression can raise testosterone levels even more strongly than testosterone raises aggression.

"It would be so nice if there were a single gene or hormone or neurotransmitter or part of the brain that was *it*, the cause, the explanation" of violence, Sapolsky wrote. But "our behavioral biology is usually meaningless outside the context of the social factors and environment in which it occurs." Which means that the search for the root causes of violence must move up one level, to psychology—the interaction of biology and the life one leads.

Forensic psychologists have tried to create a profile of a "typical" mass murderer, with some success. More than 90 percent of killers, and even more mass murderers, are male. (Though that may change, just as there are now female suicide bombers in the Mideast.) Mass killers are usually 25 to 35,

though school shooters are younger. Few have a serious criminal record. Some kill for revenge, others for fame. Some give off obvious warning signs like Cho's violence-filled writings, others strike unexpectedly. Some kill people they know, others target anyone handy. Rather than being smooth, manipulative psychopaths, says Louis Schlesinger, professor of forensic psychology at the John Jay College of Criminal Justice in New York, mass killers tend to be aggrieved, hurt, clinically depressed, socially isolated and, above all, paranoid.

It is a specific kind of paranoia: a tendency to blame everyone but themselves for their troubles, to believe the world is against them and life is unfair. "They see others as being responsible for their problems; it's never their fault," says James Alan Fox, professor of criminal justice at Northeastern University. "That's why when they come to the decision that life isn't worth living, they decide to take others with them. That's who they hold responsible." In the video he mailed to NBC, Cho rants that "you forced me into a corner and gave me only one option ... Now you have blood on your hands that will never wash off." Suggesting counseling is often fruitless. "The response is, 'Counselor? Therapist? I'm the only sane person on campus'," says sociologist Jack Levin of Northeastern, who last year gave a lecture at Virginia Tech on mass murderers. "They've become so estranged from society, there's nothing you can do short of putting them involuntarily in a psychiatric hospital."

Some mass murderers may be trying to exercise power over a world they believe has left them powerless. "They often feel some great injustice has been done to them. They're angry and they want to take it out on the world," says Schlesinger. "They develop the idea that murder will be the solution to whatever their problem is, and they fixate on it." The problems can range from loss of a job (many office shootings are committed by resentful ex-employees) to a financial setback to a bad breakup. But while such travails may push the killer over the edge, he was teetering there in the first place as a result of a long string of perceived insults, hardships and failed relationships. "You don't just get a D on your report card and then open fire on 30 people," says Levin. "It takes a prolonged series of frustrations. These people are chronically depressed and miserable."

That raises the question of where the misery and the ensuing hatred, resentment and anger come from. An obvious place to look is early childhood. Studies find that up to 45 percent of boys who commit serious violent crimes by the age of 17, and up to 69 percent of girls, were inappropriately aggressive in childhood, picking fights with other kids. It is very rare for violence to show itself for the first time in a person's 20s. (It doesn't work the other way, however. Most aggressive youths mellow out and do not become violent adults, probably because circuits such as those that underlie judgment and impulse control become fully developed only in a person's late teens or early 20s.)

But the link between childhood aggression and later violence is not simply that aggression begets aggression. Instead, an aggressive child, a child with poor impulse control or pathological shyness or even an inability to read other kids' tone of voice elicits certain behaviors and treatment from peers and parents. An odd child cannot make friends. His quirks drive away other kids. He tries his parents'

patience and love. This back-and-forth between innate tendencies—blame them on genes or on brain wiring, it doesn't matter—magnifies the problematic temperament or behavior and sculpts a psyche that hurtles toward criminal violence. A 2006 study of 334 adolescents found that boys who showed reactive aggression at age 7 had become, by age 16, impulsive, hostile, socially anxious and friendless. Cho was so isolated he barely spoke to roommates, and in the ranting video he sent to NBC, he snarls, "You have vandalized my heart, raped my soul and torched my conscience."

Like the discovery that gene expression can depend on the environment, and that brain circuitry reflects life experiences, this, too, is something scientists have only recently nailed down: a child's innate temperament shapes how the world treats him, with the result that that temperament is either reinforced or modified. A child who is innately shy, and who carries genes associated with shyness, can grow up to be as outgoing and socially adept as other kids if her parents encourage that rather than her introversion.

Killers who choose a high-profile crime like Cho's are reaching for one final chance to give their life meaning. "They may think, 'I may never amount to much, but I'm going to die amounting to something. This is my final mark on the world, my final statement'," says Jana Martin, a clinical psychologist in Long Beach, Calif. "[Their] fantasy is that they will have the ultimate last word, even if they don't live to see it." The video again: "You thought it was one pathetic boy's life you were extinguishing. Thanks to you, I die like Jesus Christ, to inspire generations of the weak and the defenseless people." Although that reeks of a messianic complex, there is very little research on whether religious belief makes it more likely that someone will resort to mass murder, or less. On a national scale, the countries of Western Europe that Pope Benedict laments are turning their backs on their Christian heritage have the world's lowest rates of homicide. At the individual level, there is some evidence that regular church attendance "promotes moral integration," says Jack Levin. But extreme religiosity to the point of hearing voices and seeing visions is often linked to schizophrenia.

Young killers tend to be highly suggestible, modeling their behavior on widely reported crimes. The Columbine shootings inspired several similar plans, and in Cho's video he refers to "martyrs like Eric and Dylan," the Columbine killers. The martyr reference is telling. In the most exhaustive study of school shooters, commissioned by the U.S. Department of Education and the Secret Service after Columbine, researchers examined 37 such cases involving 41 shooters over the previous 25 years. "By the time of the shootings, a good 78 percent of the perpetrators were suicidal," says Harvard University psychologist William Pollack of McLean Hospital. "Those who survived said they wished they'd been killed by the police. They were isolated, felt bullied, harassed. They want to die."

Still, feeling chronically frustrated, blaming others for your problems and being socially isolated are not sufficient to trigger a killing spree. "If everybody in that category were a mass murderer," says Peter Sheras, a clinical psychologist at the University of Virginia, "there would be no one left on the

planet." To place the final blocks on the tower and make the whole thing come tragically crashing down, you also need the right environment.

Barely 24 hours after the Blacksburg murders, Australian Prime Minister John Howard lit into the "gun culture that is such a negative in the United States." That sentiment echoed across the globe and brought a reminder of how Kip Kinkel came to have such easy access to guns. "A psychotherapist actually suggested that his dad buy him a gun so they could have something to do together," says Loyola's Garbarino. "People in other cultures are blown away when they hear that."

Guns explain the high body count in Blacksburg and Columbine; you don't hear of many mass stabbings. But historians have long noted the American propensity toward violence independent of the ubiquity of guns. In his 1970 collection "American Violence: A Documentary History," Richard Hofstadter wrote of the "extraordinary frequency, [the] sheer commonplaceness" of violence in American history. Stanford historian Lawrence Friedman mused that it "must come from somewhere deep in the American personality ... The specific facts of American life made it what it is ... crime has been perhaps a part of the price of liberty."

By the numbers, the United States should have low levels of homicidal violence, which roughly tracks a country's income. Britain, for instance, had 1.5 homicides per 100,000 population between 1998 and 2000. Japan had 1.1, while South Africa had 54. The rate of violent death in the United States was 5.9 per 100,000—above even Turkey's 2.5. Clearly, culture matters. How?

The United States is a nation of immigrants. Those who choose to pull up stakes and try their luck in a distant land "have energy and are willing to take risks," says psychologist John Gartner of Johns Hopkins University. For most immigrants, that translates into a spark and drive that lead them to success in their adopted land. For a few, however, risk-taking coupled with impulsivity may set the stage for violence, Gartner says, "and you do see more violence in immigrant nations like Australia and America." If barriers of language or culture keep an immigrant child from fitting in, it can increase the risk that he will become alienated and, given enough triggers, resort to violence.

Rates of criminal violence are higher in mobile and heterogeneous societies where it is hard to put down roots and establish the social glue that binds people into a community. The United States, of course, is a highly mobile society and, as a result, a nation of strangers. Murder and violence are also higher in nations with the largest income inequality. The United States ranks high on this problematic measure. Perhaps it was no coincidence that Cho railed that "your Mercedes wasn't enough, you brats. Your golden necklaces weren't enough, you snobs. Your trust fund wasn't enough."

As long ago as Tocqueville, observers have divined that the American character had been forged on the frontier. Far from civilization and the reach of laws, we created the cult of the rugged individual who took justice into his own hands. While it's tricky to argue that the "American character" explains a

murder spree by a Korean immigrant, living here for 15 impressionable years, Cho could not have avoided soaking in the competitive, individualistic aspects of American culture. "In this country more than others, we admire winners and we blame people for their own inadequacies," says Fox. "Mass murderers tend to be losers, people with a history of failure. The feeling of worthlessness gets internalized" in the barrage of messages that an individual's fate lies entirely in his own hands—something Asian countries view as ludicrous. If success by the usual definition proves elusive, there is another path. The Columbine shooters wrote in their diaries that they needed a certain body count to reach "movie status." In this media-soaked culture, for Hollywood—or even the most demeaning reality show—to care about your story is the ultimate validation.

The cult of the individual finds its ultimate expression in, yes, America's gun culture. "Guns are the ultimate way of being self-contained and powerful," says Sheras. No matter how the world has treated a potential killer, "if he has a gun he can automatically feel equal to everybody else."

Individualism exacerbates the sense of injustice that the aggrieved feel, something alien in low-violence countries. In Japan, people are taught to endure hardships, small and large, from early childhood. It is even part of the language: *gamanshite* roughly means "endure it." Japanese say it and are told it all the time. If they do feel angry or frustrated, "we would rather endure it and kill ourselves than kill others," says Masakazu Suzuki, a theologian and teacher in Tokyo who attended college in the United States. "We don't choose mass shooting for a public revenge, but just kill ourselves, perhaps with a note expressing anger toward those who oppressed us." Suicide rates in the Far East are nearly six times the homicide rate.

No discussion of violence in American culture is complete without mentioning blood-soaked videogames. Right after earning points for a graphic disemboweling, young players are more aggressive, but more in punch-little-sister mode than shooting up a mall. Still, there is evidence that violent games have a numbing effect. "When people stop feeling it's terrible that someone is getting hurt, that's dangerous," says Pollack.

And so the blocks stack up one by one—the biology that mass murderers carry from birth, the brain circuits laid down as they experience life, the messages they soak up from the world around them. No single experience or character trait is sufficient, no single one to blame. But even as science identifies the forces that sculpt the mind of a mass killer, explanation is neither excuse nor exculpation. Somewhere in all this is the will, the decision by the gunman to pull the trigger. Understanding that is the greatest challenge of all.

*With Anne Underwood and Mary Carmichael*

# Anatomy of a Murderer

FRONTAL BRAIN THEORY

PHYSIOLOGY OF VIOLENCE

BIOLOGY OF A KILLER'S PSYCHE

## WHY DO THEY EXPLODE?

The **shootings at Virginia Tech** left Americans wondering what could lead someone to commit such horrific acts. Neuroscience offers some clues. While **violence** clearly arises from a complex **interplay of social and psychological factors**, evidence suggests the **brain's physiology** can predispose a person to **aggressive behavior**, possibly leading an ordinary—if troubled—young man to become a killer.

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