The Broken Circuit: How Childhood Trauma Rewires the Brain—and Gets Students Punished for It

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What neuroscience reveals about trauma, discipline, and inequity in American schools

The classroom fell silent as Lucas slammed his book shut and stormed out, his third outburst that week. To his teacher, it was defiance. To his brain, it was survival.

Across American schools, students like Lucas are often met with disciplinary actions such as suspension or expulsion for behaviors shaped, not by poor choices, but by neurological adaptation. Recent discoveries in neuroscience show childhood trauma fundamentally alters brain circuits involved in emotion regulation, impulse control, and executive function. Yet, many schools still interpret these behaviors as willful disobedience rather than symptoms of toxic stress.

According to psychiatrist Dr. Bruce Perry in his book The Boy Who Was Raised as a Dog, children who experience early trauma often develop overactive stress response systems, which can make them more reactive, more impulsive and less able to regulate their behavior or emotions.

This neurological shift primarily affects the amygdala, the brain's alarm system, and the prefrontal cortex, which governs reasoning and self-regulation. In a 2019 systematic review published in the *Annual Review of Developmental Psychology*, researchers found children with histories of trauma displayed heightened amygdala reactivity and reduced prefrontal control. These patterns correlate directly with behaviors schools frequently punish, such as emotional outbursts, impulsivity and inattentiveness.

Punishment, however, may deepen the damage. According to an article from the New Haven Register, in 2023, Hamden Public Schools in Connecticut reported 444 cases of physical restraint and seclusion involving just 51 students — a 60 percent increase from the year before. These practices disproportionately affect students with disabilities and trauma histories, and have been criticized for retraumatizing children. In contrast, the article says East Haven Public Schools, which implemented trauma-informed de-escalation strategies, reported a steep drop in such incidents.

This contrast reveals results of when neuroscience is applied to educational policy and shows what happens when it is not.

Understanding the Brain on Adversity

Chronic exposure to Adverse Childhood Experiences (ACEs) such as abuse, neglect or community violence can trigger a state of toxic stress. This condition activates the hypothalamic-pituitary-adrenal (HPA) axis repeatedly over time. The result is a brain stuck in

fight or flight mode. An article from the Center on the Developing Child at Harvard refers to this phenomenon as the biological embedding of adversity.

In a 2019 TED Talk, Dr. Nadine Burke Harris, a pediatrician and former California Surgeon General, described childhood trauma as one of the greatest unaddressed public health threats in the nation. Her research shows adversity does not just affect mood or learning. It accelerates cellular aging, increases inflammatory responses and alters gene expression through epigenetic mechanisms.

These changes manifest in classrooms. A child may shut down or lash out when corrected, not out of disrespect, but because their nervous system misinterprets authority as a threat. Without trauma-informed practices, these reactions are often misread as intentional misbehavior.

The Consequences of Misinterpretation

The tragic case of Katie Meyer, a Stanford University student-athlete who died by suicide after receiving a disciplinary notice, highlights what can happen when mental health and school discipline collide, according to the San Fransisco Chronicle. Her death prompted the passage of California Assembly Bill 1575, also known as Katie's Law, which mandates students facing disciplinary processes have access to a support advisor. The law acknowledges that punitive systems can have devastating effects when blind to psychological distress.

Such understanding remains the exception rather than the norm. According to USAFacts, black students, who comprise about 15% of K-12 enrollment, account for over 30% of suspension, expulsion and school-related arrests. Similarly, students with disabilities represent 13% of the student body but are involved in more than 75% of restraint and seclusion incidents. These disparities reflect the broader structural inequalities that place some students at higher risk for trauma in the first place, compounding harm with institutional neglect.

Healing Through Neuroscience

The same brain that can be shaped by trauma can also be reshaped by positive experience. Neuroplasticity, the brain's ability to reorganize itself, is strongest in childhood and adolescence. This makes schools uniquely positioned to serve as a healing environment.

Schools that adopt supportive, non-punitive disciplinary approaches report measurable gains in student behaviors and engagements. According to an article from the Washington Office of Superintendent of Public Instruction, schools implementing compassionate discipline programs reported a significant reduction in suspensions over three years. In Baltimore, schools that replaced detention with meditation reported zero suspensions in multiple academic years.

When interviewed by NPR, Dr. Pamela Cantor said, “Once children have a success behaviorally and they come to recognize that they actually do have control over their behavior and can make better choices, and you acknowledge it, then they make better choices."

A Call for Change

As a future physician-scientist and someone who has witnessed educational inequity firsthand, I believe neuroscience must guide the way we educate and discipline. Trauma alters the very circuits that govern behavior, but so can compassion, structure, and consistent relationships.

Many students are not defiant. They are dysregulated. They do not need removal, but regulation. They do not need shame, but support.

Failing to apply neuroscience to school policy is not just an oversight, it is an injustice. Understanding trauma as a biological condition rather than a character flaw allows us to create systems that are not only more effective, but also more humane.

If we want change, we must begin by recognizing what behavior truly reflects. In many cases, it is not rebellion. It is biology, and biology can be rewritten with care.