



Standing in the halls of McLean Hospital, Martin Teicher contemplates the cost to the brain of childhood abuse. Changes in both the structure and function of the brain are tied to adult anxiety, depression, personality disorders, and risk of suicide. (Staff photo by Rose Lincoln)

Childhood abuse hurts the brain

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Abuse during childhood can change the structure and function of a brain, and increase the risk of everything from anxiety to suicide.

"These changes are not limited to physical and sexual abuse; there's growing evidence that even verbal assault can alter the way a developing brain is wired," says Martin Teicher, associate professor of psychiatry at Harvard Medical School. The ominous effects are tied to reduction in the size of sensitive areas of the brain and to abnormal brain waves that mimic epilepsy.

A thick cable of nerve cells connecting the right and left sides of the brain (corpus callosum) is smaller than normal in abused children, Teicher told a meeting of science and medical writers at Harvard Medical School earlier this month. He and his colleagues at McLean Hospital, a psychiatric facility affiliated with Harvard, compared brain scans from 51 patients and 97 healthy children. The researchers concluded that, in boys, neglect was associated with a significant reduction in the size of the important connector. It was also abnormally small in girls who were sexually abused.

"We believe that a smaller corpus collosum leads to less integration of the two halves of the brain, and that this can result in dramatic shifts in mood and personality," Teicher explains.

Brain scans also reveal decreased activity in parts of the brain concerned with emotion and attention. Patients with a history of sexual abuse or intense verbal badgering showed less blood flow in a part of the brain known as the cerebellar vermis. The vermis aids healthy people to maintain an emotional balance, but in those with a history of childhood abuse, that stabilizing function may become impaired.

Teicher points out that the vermis is strongly influenced by the environment as opposed to genetic factors. Movement stimulates it, and researchers at the National Institutes of Health found that kids with attention deficits and hyperactivity consistently show smaller than normal sizes. Teicher and his colleagues are looking into the idea that exercise might stimulate the vermis, increasing attention span and reducing hyperactivity. They plan to test this notion by comparing rocking in a hammock with more strenuous exercises.

If exercise helps, it would have an impact on a growing trend to reduce or eliminate recess and physical education in schools. Teicher suspects that children who can burn off excess energy will be better able to sit still and pay attention.

Rewiring the brain

The connection between abuse and brain addling apparently involves stress hormones. Harsh punishment, unwanted sexual advances, belittling, and neglect are thought to release a cascade of such chemicals, which produces an enduring effect on the signals that brain cells send and receive from each other. As a result the brain becomes molded to overrespond to stress. "We know that (lab) animals exposed to stress early in life develop a brain that is wired to experience fear, anxiety, and intense fight-or-flee reactions," says Teicher. "We think the same is true of people."

Researchers peek into human brains with the help of imaging techniques and instruments that record electrical activity generated when brain cells signal each other. The results of such tests allow a comparison between the structure and functioning of normal brains and those with a confirmed history of abuse. Experiments at McLean Hospital, for example, show that patients with a history of abuse are twice as likely to show abnormal electrical activity as nonabused people.

When right-handed victims of abuse are tested they show anomalies in the left side of their brains. (The left side controls the right side of the body and vice versa.) Studies of left-handers have yet to be done. The researchers believe that these left-side defects contribute to development of depression and memory problems in abused people.

Anomalies in electrical activity have been known to exist in incest victims since 1979. Teicher plans to look for such abnormalities in others who have been verbally abused and in those who witness violence at home. He and his colleagues have already found evidence of anxiety, depression, and brain differences in a study of 554 college students exposed to loud yelling, screaming, and belittling remarks directed at them. The latter include remarks like "You're stupid," "You'll never amount to anything," and "Why can't you be more like your cousin?" From this study, Teicher concludes that "exposure to verbal aggression may have effects as powerful as physical or nonfamilial sexual abuse."

Other research has revealed that electrical abnormalities in the brains of abused people are similar to those seen in patients with epilepsy. Some of these abuse victims even experience fake or pseudoseizures, although physical evidence of epilepsy is lacking. "It's puzzling," Teicher admits. "Childhood abuse can produce abnormal electrical brain activity that resembles a seizure state, but does not actually produce epilepsy."

Suicide on the brain

People who have been abused as children admit to thinking about suicide more often than those who were not abused. And researchers have found a vigorous correlation between epileptic-type brain abnormalities and thoughts of suicide. "This correlation may be stronger than that which ties suicide to depression," Teicher notes. Depression is generally believed to be the prime instability that pushes people toward taking their own lives. But a study done at the National Institutes of Health found that thoughts of committing suicide actually precede depression in abused children.

"We see terribly high levels of suicide ideation in patients that show brain abnormalities that mimic epilepsy," Teicher says. "Suicidal thoughts occur four to five times more frequently in patients with these abnormalities than in healthy people."

Childhood stress has been part of human history for a very long time, so it's hard to believe that its effects on brain development are all bad. In other words, such stress should have some survival advantage. "That's an idea that we're wrestling with," Teicher says. "Does abuse modify a brain to cope with what it predicts will be a malevolent world? Will it stimulate fight or flight responses that facilitate survival and reproductive success in hostile environments?"

Teicher and his colleagues are thinking about how these ideas might be tested in animals. Such experiments might determine if, say, lab rats who experience lots of stress at an early age do better in certain situations than those who enjoy a more placid "childhood."

At this point, however, health-care workers worry more about how to handle about a million cases of childhood abuse that they find each year. Teicher advises the earliest possible assessment, monitoring, treatment, and protection from further abuse. "The younger a child, the more plastic is his or her brain, and the greater the chance of diminishing negative changes in structure or function," he says. Researchers at McLean right at this moment are writing a proposal for a grant to study how reversible the effect of abuse might be.

"Stress-induced cascades of hormones might be eased by new anti-depressant drugs, relaxation exercises, or psychotherapy," Teicher says. There may also turn out to be some less obvious solutions. At least one study has found that martial-arts training reduces aggression. It compared the effects of table tennis, martial arts, and rugby, and concluded that martial arts squashes aggression more effectively.