

Study: Child abuse can alter brain development

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A child views a series of faces expressing happy, angry or fearful emotions as part of a study that indicates that child abuse can affect brain development. Seth Pollak, assistant professor of psychology, measured increases in brain electrical activity as children viewed the images. Pollak says children who were maltreated produced dramatically stronger and longer-lasting responses to angry faces than other children.

For children suffering from severe abuse, anger is a danger sign they dare not overlook. Spotting it early becomes a survival skill.

A new study by a campus psychologist suggests that this survival skill is strong enough to actually trigger biological changes, altering the way the brain processes anger.

Seth Pollak, assistant professor of psychology and psychiatry and Waisman Center investigator, says the findings shed new light on the question of why traumatic early-life experiences cause so many serious problems throughout adolescence and adulthood. The research also could suggest better treatment methods for overcoming past abuse.

"Why does something that happens to someone when they're 2, 3 or 4 years old have such pervasive developmental effects?" asks Pollak. "This study is one way to find some of the underlying developmental changes caused by traumatic events."

Pollak's study looked at differences in brain electrical activity between children who have suffered specific forms of child abuse and children who have not suffered maltreatment. The study involved 28 maltreated children and 14 children who were in the control group, all ages 7–11. The children and their parents volunteered to participate after being referred by county and state child protective agencies.

In his Child Emotion Research Laboratory, Pollak developed a harmless experiment that children treat as a game, where they are shown pictures of a series of faces and asked to look

for a specific emotion. If they are asked to look for happy faces, for example, they will press a button every time such a face appears on the screen. **The range of faces in the pictures are happy, angry and fearful.**

During the game, children wear a cap with tiny receptors that can measure their brain electrical activity. **The response measured is called an Event Related Potential (ERP), which is a sharp increase in electrical activity in the brain that's created by a specific stimulus.**

In this case, the stimulus is recognizing a face the children were specifically asked to look for. Pollak was measuring a response commonly called "the aha! effect," because the brain gives off a sudden burst of electrical activity when that recognition occurs.

What was striking about the results, says Pollak, is the numbers were virtually identical for both groups of children when they responded to happy and fearful faces. **But with angry faces, the children who were maltreated produced dramatically stronger and longer-lasting responses.**

Considering the dynamics of an abusive home, Pollak says that difference makes perfect sense. "Anger becomes a very salient cue that something in the child's environment is about to change," he says. "In fact, their survival and coping may well depend on their ability to detect this change early."

But this vigilance toward anger, once a remarkable way of adapting to a threat, may later become an emotional albatross. For example, getting bumped in the hall, hearing an ambiguous comment or catching a cross look may be perceived as threatening, he says.



Seth Pollak

One of the potential long-term problems of child abuse is in robbing victims of an ability to form healthy relationships with peers and other adults. Pollak says decades of research has described these problems, but few have targeted the underlying mechanisms that cause them.

Although more research is needed, Pollak says the findings suggest that traditional therapies may not stress the right issues. An educational approach could help people better decode social situations and make healthy adjustments to their perception of comfortable or threatening environments. Pollak says having child-abuse victims focus on their reactions in real-world situations could produce positive results.

On a more fundamental level, Pollak's research is generating excitement because **it calls into**

questions the idea that emotions are biologically hard-wired in the brain. Much early evidence suggests that the core emotions -- happiness, anger, fear, surprise, disgust, and sadness -- emerge in an orderly and specific way, as if by genetic blueprint.

Studies have shown that emotions are generalized across different cultures. People use different words, but they generally call a happy face happy or a sad face sad, regardless of the culture. But Pollak says the different emotional makeup of children who suffered abuse, which is aberrant behavior in any culture, also suggests that the biological framework of emotions can be molded by a child's experience with the world.

Pollak's work, which is supported by the National Institute of Mental Health and the UW-Madison Graduate School, focuses on a persistent public health problem. In 1995, more than 1.5 million U.S. children were victims of child abuse, and more than half of that group was younger than age 7.