

It is always fascinating to see research on brain function that confirms some of what we see when ministering to survivors. The following is an article that you may find worth examining and researching further. Tom

<http://www.sciencedaily.com/releases/2007/07/070726184910.htm>

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Severe Trauma Affects Kids' Brain Function, Say Researchers

Science Daily — The first study to examine brain activity patterns in severely traumatized children showed their brains function differently than those of healthy children, say researchers at the Stanford University School of Medicine and Lucile Packard Children's Hospital.

The study hints at the biological underpinnings of the disorder called PTSD, or post-traumatic stress disorder. It also provides a valuable benchmark with which to assess the effectiveness of potential therapies.

"Now we can see some real neurological reasons for the impulsivity, agitation, hyper-vigilance and avoidance behaviors that children with untreated PTSD often exhibit," said Victor Carrion, MD, child psychiatrist at Packard Children's. "The fact that their brains appear to be working differently may indicate a deficit for which other areas of the brain are trying to compensate."

Some children with PTSD, for example, cut or burn themselves as a way of coping with their feelings. The researchers found that affected children who had also cut or otherwise injured themselves exhibited unique patterns of activation in a portion of the brain involved in the perception of pain and emotions.

It's not yet clear whether the brain differences are caused by the interpersonal trauma, such as sexual or physical abuse, experienced by the children or if pre-existing differences make some children more susceptible to developing PTSD after traumatic events than their more resilient peers.

Carrion, who is also associate professor of psychiatry and behavioral sciences at the Stanford School of Medicine, is the lead author of the research, which was recently published online in the journal *Depression and Anxiety*.

The researchers used an experimental technique called functional magnetic resonance imaging, or fMRI, to compare brain activation patterns in 16 children with symptoms of PTSD with the patterns seen in 14 age- and gender-matched non-traumatized children as they performed a simple decision-making task. The fMRI analysis detects changes in blood flow and oxygenation that correlate with increased neuronal activity in different regions of the brain.

To conduct the test, study subjects were placed inside the fMRI machine - a body-sized, narrow, hollow tube - and then asked to push a button each time a letter other than X flashed on a screen in front of them. Because Xs were introduced only after a string of non-Xs, the test is a good way to measure what's known as response inhibition, or a subject's ability to suppress the natural tendency to push the button as soon as any letter appears. Response inhibition is often difficult for children and adults with PTSD.

MRI tests can leave some people feeling claustrophobic and frightened and the experience can be particularly difficult for children already struggling with past trauma. Carrion and his colleagues used a special "mock MRI" machine at Packard Children's to familiarize the study participants to the sights and sounds of the imaging procedure before conducting the real experiment.

The researchers found that, although the two groups accomplished the task equally well, they used different parts of their brains to do so. The children with PTSD symptoms showed less activity than their non-traumatized peers in the left middle frontal cortex, an area known to be involved in response inhibition, and more activity in several other areas of the brain including a region involved in emotional awareness known as the insula.

"We found that affected kids who injured themselves-a subgroup of our study sample-had more activity in the insula than did kids who did not injure themselves," said Carrion. "What's more, we found a very good correlation between the levels of activation of this structure and the severity of PTSD symptoms experienced by the child."

People with PTSD often have trouble paying attention and responding appropriately to experimental tasks, perhaps due to heightened physiological arousal arising from their traumatic experience. As a result, many children with PTSD symptoms are diagnosed with attention-deficit hyperactivity disorder, or ADHD. But it's difficult to tell whether the two disorders are truly related, or if they simply have overlapping symptoms. Functional imaging like fMRI may allow researchers to finally solve the mystery. More importantly, it may help doctors devise better therapies.

"It may be possible to redirect the brain's altered processing functions," said Carrion. "Ideally we will one day be able to compare brain images from before and after treatment to determine what works, or doesn't work, for kids with PTSD. All is not lost."

Carrion's Stanford colleagues on the study include research associate Amy Garrett, PhD; Vinod Menon, PhD, associate professor of psychiatry and behavioral sciences; and Allan Reiss, MD, the Howard C. Robbins Professor of Psychiatry and Behavioral Sciences. Carl Weems, PhD, a research associate at Stanford when the work was done, is now associate professor at the University of New Orleans.

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Note: This story has been adapted from material provided by Stanford University Medical Center.