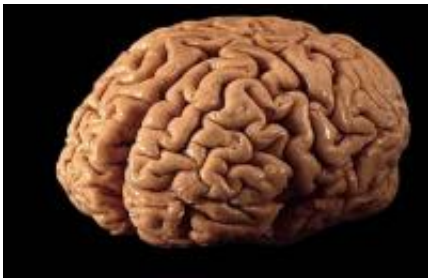


Study finds child abuse can lead to stunted brain development

February 14 2012, by Bob Yirka



(Medical Xpress) -- A small team of researchers has found that various forms of child abuse can lead to stunted development in certain regions of the brain. The research carried out by Martin Teicher, Carl Anderson and Ann Polcari, all working in the Boston area, relied on questionnaires and MRI brain scans to determine that certain parts of the hippocampus, all known to be sensitive to stress, were up to six percent smaller in adults who as children had been sexually, verbally or physically abused. The team has published their results in the *Proceedings of the National Academy of Sciences*.

The three areas affected: the cornu ammonis, the [dentate gyrus](#) and the subiculum, all located in the hippocampus, are known to be vulnerable to stress which leads to less cell development than would normally occur in the absence of abuse.

To test the relationship between [brain development](#) and [childhood abuse](#), the research team enlisted a group of otherwise healthy adult volunteers: 73 men and 120 women, all between the ages of 18 and 25. All were given questionnaires that delved into their childhood, specifically addressing issues of verbal, mental and physical abuse and other types of stresses such as the death of someone close to them or problems between parents. All were also given brain scans using an [MRI machine](#). The team then compared the answers given on the questionnaires to the possibly impacted areas in the hippocampus of each volunteer. In so doing, they found that the brain regions under study were 5.8 to 6.5 percent smaller than average for those that reported such childhood stresses.

The researchers suggest that smaller brain regions due to [childhood stress](#) may help explain the abnormally high levels of mental illness (depression, bi-polarism, anxiety, etc.) seen in adults who have endured abuse as children and why so many wind up with drug dependency problems. They also noted that one of the regions impacted, the subiculum, serves as a relay, moving information in and out of the hippocampus, which can have a direct impact on dopamine production. Those with reduced volume have been found to have problems with drug addiction and in some cases develop schizophrenia.

The researchers believe that increased stress leads to higher levels of the hormone cortisol, which in turn can slow or even stop the growth of new neurons in the brain which can result in permanently stunting certain brain regions.

The researchers are hoping their results will further highlight the damage that is done when children are subjected to adverse living conditions, leading perhaps to earlier interventions and possibly a means for developing treatments that may aid in preventing the stunting of [brain regions](#), thus helping to pave the way for a better quality of life for those

that have been abused as children.

More information: Childhood maltreatment is associated with reduced volume in the hippocampal subfields CA3, dentate gyrus, and subiculum, *PNAS*, Published online before print February 13, 2012, [doi: 10.1073/pnas.1115396109](https://doi.org/10.1073/pnas.1115396109)

Abstract

Childhood maltreatment or abuse is a major risk factor for mood, anxiety, substance abuse, psychotic, and personality disorders, and it is associated with reduced adult hippocampal volume, particularly on the left side. Translational studies show that the key consequences of stress exposure on the hippocampus are suppression of neurogenesis in the dentate gyrus (DG) and dendritic remodeling in the cornu ammonis (CA), particularly the CA3 subfield. The hypothesis that maltreatment is associated with volume reductions in 3-T MRI subfields containing the DG and CA3 was assessed and made practical by newly released automatic segmentation routines for FreeSurfer. The sample consisted of 193 unmedicated right-handed subjects (38% male, 21.9 ± 2.1 y of age) selected from the community. Maltreatment was quantified using the Adverse Childhood Experience study and Childhood Trauma Questionnaire scores. The strongest associations between maltreatment and volume were observed in the left CA2-CA3 and CA4-DG subfields, and were not mediated by histories of major depression or posttraumatic stress disorder. Comparing subjects with high vs. low scores on the Childhood Trauma Questionnaire and Adverse Childhood Experience study showed an average volume reduction of 6.3% and 6.1% in the left CA2-CA3 and CA4-DG, respectively. Volume reductions in the CA1 and fimbria were 44% and 60% smaller than in the CA2-CA3. Interestingly, maltreatment was associated with 4.2% and 4.3% reductions in the left presubiculum and subiculum, respectively. These findings support the hypothesis that exposure to early stress in humans, as in other animals, affects hippocampal subfield development.

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Citation: Study finds child abuse can lead to stunted brain development (2012, February 14)
retrieved 26 April 2024 from
<https://medicalxpress.com/news/2012-02-child-abuse-stunted-brain.html>

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