



### Functional and Structural Brain Changes across Childhood Traumatic Events

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#### Abstract

Although childhood is connected with high neuroplasticity changes, but because of the immaturity of the neural and cognitive systems, it is ready to grow developmental deviations and future susceptibility for neuropsychological disorders. Young children face cognitive, emotional, and linguistic limits that may lead them more vulnerable to post-traumatic stress disorder (PTSD). PTSD prevalence differs between adults and children. In some reports, children are nearly 50% more likely to affect by this disorder, in response to a traumatic events. Developmental viewpoint for study stressful condition across the early stage of life could increase our understanding about etiology and pathology of PTSD and other anxiety disorder. Early experience of toxic stress or traumatic events in childhood associate with high risk for various mental health difficulties, especially current and later PTSD. Biological approach to children and adult PTSD usually focuses on exploring irregularity of sympathetic nervous system (SNS) and hypothalamic pituitary adrenal (HPA) axis as two lower and vegetative stress responses and little known about its higher neural activity and its functional outcomes. Early long exposure to severe stress correlates with smaller brains volume. Using new neuroimaging techniques and analysis, research finding revealed that accumulative early life stressful events relate to structural change. These changes are detectable in prefrontal neural activity; change in the prefrontal wiring regions (like orbit frontal cortex), smaller prefrontal cortex volumes (selectively in prefrontal gray and white matter between the anterior cingulate and the frontal pole), structural change in amygdala and finally dendrites shortening and neurodegeneration in the hippocampus. On the other hand, the same and parallel research findings show all these structural changes can be correlated with functional change that impair children cognitive abilities, specifically executive function, spatial working memory, attention-span, self-regulation, and episodic memory (remembering specific events). For discovering which neural or cognitive have the main role to modulate other ones needs more research. This review will summarize developmental viewpoint results that suggest structural changes in the many regions (e.g. prefrontal cortex, hippocampus and amygdala) and also many cognitive functions may serve as a mediating mechanism which cumulative prior life stress affect susceptibility to PTSD and other anxiety disorders.

**Keywords:** Early Life Stress, Cognitive Consequence of Stress, Neural Change after Stress, Child PTSD, Early Traumatic Events.

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