The Novel Volumetric Quantification of the Chemobrain Phenomenon within a Pediatric Population

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The current study examined the detrimental impacts of chemotherapy on the neurophysiology and neurocognition of pediatric cancer survivors. Chemobrain is the classification of neurocognitive deterioration resulting from chemotherapy exposure. Since past research has identified working memory deficits in adult chemobrain populations, it was hypothesized that pediatric chemotherapy-exposed patients would demonstrate significantly lower working memory performance when compared to age-matched controls. Additionally, as the following neurocognitive systems are implicated in working memory, it was hypothesized that the volumes of the limbic system, basal ganglia, temporal lobe, and neurological tissues would be significantly decreased in the patient population. 26 subjects (14 pediatric chemotherapy-exposed patients and 12 age-matched controls) underwent structural MRIs and a standard n-back working memory task. Results revealed that the grey matter, white matter, and total brain volume were significantly decreased within the patient population. Additionally, significant decreases were found in the subcortical volumes of the thalamus and left accumbens, and the cortical thickness of the right temporal pole. Behaviorally, the patient population not only performed significantly lower on all cognitive measures of analysis, but additionally demonstrated significantly increased response times on all aspects of the working memory task. Correlational analysis revealed significant relationships between volumetric alterations and cognitive deficits. The present study offers novel insight into the pediatric chemobrain phenomenon and serves as the first step towards developing a neurologically safer chemotherapy as well as treatment regimes for suffering pediatric chemobrain patients.

Awards Won:

Second Award of $1,500

American Psychological Association: Third Award of $500