

## **Title**

A preliminary study of the association between cerebral perfusion and childhood trauma in adolescents

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## **Summary**

We applied a non-invasive MRI technique, arterial spin labeling (ASL), to find regional cerebral perfusion correlates and compared them to childhood trauma in adolescents using the Childhood Trauma Questionnaire (CTQ). We observed positive correlations between self-reported childhood trauma and subcortical regions of interest (ROI). Although no statistical significance was found, the right amygdala and right hippocampus displayed the highest correlation with childhood trauma.

## **Introduction**

Childhood trauma is a known risk factor for suicidal ideation and behaviors in U.S. adolescents [1-3,7]. Various MRI studies have been conducted in order to examine neural correlates for childhood trauma [4-6,9]. However, there is still a gap in our understanding of the brain function associated with childhood trauma in adolescents. One potential indicator of brain health and function is the regional cerebral blood perfusion that can be assessed using the arterial spin labeling (ASL) technique. Guided by previous literature on the neurobiology of childhood trauma, we evaluated the correlation between childhood trauma in adolescents and three bilateral regions of interests (ROIs): the amygdala [2,8-9], the hippocampus [4-9], and the anterior cingulate cortex (ACC) [8-10]. We hypothesized that there would be a positive correlation between the blood perfusion in these ROIs and the self-rated Childhood Trauma Questionnaire (CTQ) scores.

## **Methods**

Seventeen adolescents (16.44 +/- 1.3 years, range 14-18 years, 10 females and 7 males) underwent an MRI scan that included a standard T1-weighted sequence and a pseudocontinuous ASL (PCASL) sequence (3D multi-shot fast spin echo with 8 arms of spiral readout). Data processing was conducted using the fMRIB Software Library (FSL) and custom scripts in Matlab. The T1-weighted images were used to perform brain segmentation based on the AAL brain atlas. The cerebral blood flow (CBF) was quantified in the following six brain regions (right and left): amygdala, hippocampus, and ACC. The Childhood Trauma Questionnaire (CTQ) [11] was used as the behavioral assessment.

## **Results**

We observed the following correlation coefficients between blood perfusion in each of the studied ROIs and CTQ scores: left amygdala ( $r=0.02$ ,  $p=0.93$ ); right amygdala ( $r=0.38$ ,  $p=0.12$ ); left hippocampus ( $r=0.11$ ,  $p=0.66$ ); right hippocampus ( $r=0.33$ ,  $p=0.19$ ); and right ACC ( $r=0.21$ ,  $p=0.42$ ); left ACC ( $r=0.21$ ,  $p=0.42$ ).

## **Conclusions**

We observed positive correlations between self-reported childhood trauma and several subcortical ROIs in a community sample of adolescents. Although no statistical significance was reached, the perfusion in the right amygdala and right hippocampus displayed moderate positive correlation with childhood trauma. These preliminary results are in agreement with the previous literature demonstrating that dysfunction and abnormalities in these regions are commonly implicated in heightened emotional response and trauma [8]. The correlation between cerebral blood perfusion and specific types of childhood trauma will be tested in our future studies.

## **References**

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