Neuroimaging Correlates of Aggression in Pediatric Traumatic Brain Injury

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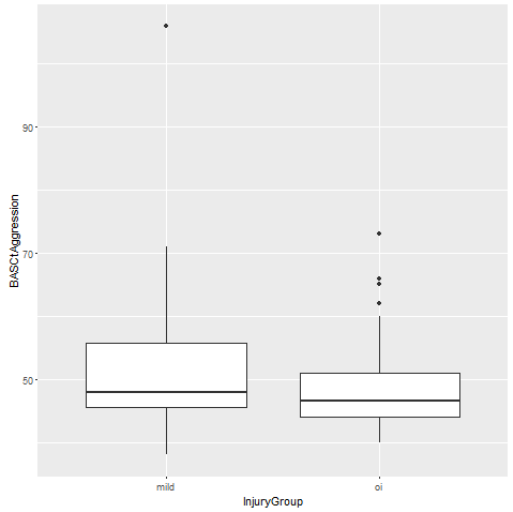
Objective

The Social Outcome of Brain Injury in Kids (SOBIK, see Bigler et al. 2013 a,b) is a multi-center pediatric TBI outcome study involving children, all of whom completed MRI, neuropsychological and social outcome measures, and were compared to those with just orthopedic injuries (OI). Social outcome was based on multiple measures, including parent ratings from the Behavior Assessment System for Children (BASC-2). The aim of this investigation was to explore initial findings between voxel-based morphometry (VBM) image analysis and social outcomes in pediatric TBI, specifically parental reports of aggression.

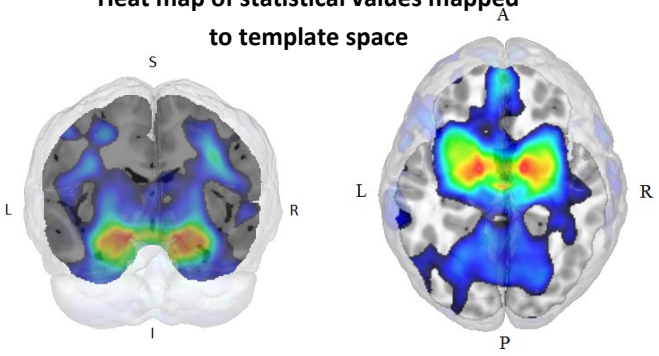
BASC-2 Aggression Scores By Injury Group



Participants & Methods

Seventy-two children with TBI and 50 OI children (8-13 years of age) underwent magnetic resonance imaging (MRI) at 1.5 Tesla. Injury severity based on the Glasgow Coma Scale (GCS) was used to further subdivide TBI into mild, moderate, and severe injury groups. Advanced Normalization Tools (ANTs, https://stnava.github.io/ANTs/) were used to warp T1-weighted images and statistical analyses were performed using the Statistical Parametric Mapping (SPM8) toolbox in Matlab (www.fil.ion.ucl.ac.uk/spm).

Heat map of statistical values mapped to template space



Posterior View **Superior View**

Decreased Volume — Increased Volume

Reynolds CR, Kamphaus RW. BASC-2: Behavior Assessment System for Children. Vol 2nd ed. Minneapolis, MN: Psychological Corporation; 2004.

Development (Grant Nos. 5R01HD048946 and 3R01HD048946-05S1). Keith Yeates, Principal Investigator

Results

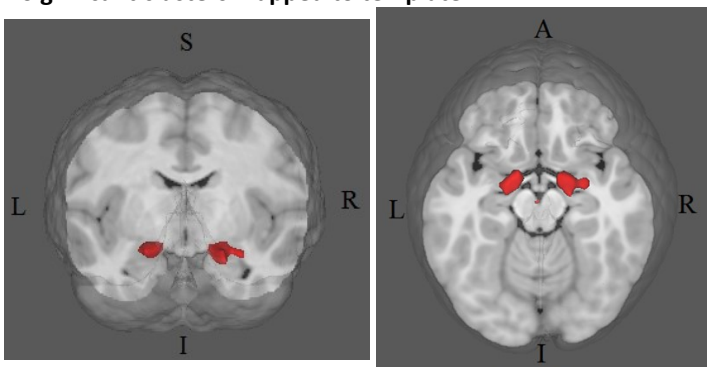
Clusters reflecting volume loss

Brain Region	Voxel Size (mm3)	MNI Peak X	MNI Peak Y	MNI Peak Z	Peak t-Value
Left Temporal Lobe	2,094	-14	-5	-11	6.34
Right Temporal Lobe	3,155	13	-5	-12	6.29

Cluster-level statistics ($p < .05$)

A significant increase in bilateral CSF was found in the mild TBI group (see Figure 4, and 5). Due to sample size limits in the moderate and severe groups no finding in those groups survived family-wise error correction.

Significant clusters mapped to template



Posterior View **Superior View**

Conclusions

Increased bilateral atrophy of the medial temporal lobe was found to be associated with increased parental reporting of aggressive behaviors based on BASC-2 ratings.