susceptible to longitudinal blast-related white matter damage. This is consistent with the literature in post-concussion syndrome (PCS) and provides a potential mechanism underlying results previously reported from this sample, describing subjective cognitive complaints in the absence of objective clinical deficits. As such, therapies that target networks of emotional and cognitive control may be particularly beneficial for Veterans with bTBI.

Categories: Concussion/Mild TBI (Adult)
Keyword 1: traumatic brain injury
Keyword 2: neuroimaging: structural connectivity
Keyword 3: cognitive control
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63 A Multimodal Investigation of Attention in Pediatric Concussion

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Objective: Concussion patients frequently report increased distractibility, with more than half endorsing "concentration difficulty". Previous studies have demonstrated impairments in maintaining attention and voluntary attentional allocation in concussion patients. However, involuntary attentional allocation (distraction) is not well understood in the context of concussion. The goal of this study was to examine distraction in acute pediatric concussion patients, monitoring frontal lobe activity using functional near-infrared spectroscopy (fNIRS) – a non-invasive measure of local hemodynamic activity – to elucidate whether post-concussion distractibility is associated with the availability of attentional control resources.
Participants and Methods: Participants included concussion patients (cases; n=19) presenting to specialty care within 28 days of injury (M=8.05, SD=5.55) and controls (n=16) presenting for reasons other than concussion. Participants were 13-17 years old (M=14.83, SD=1.10) and 57.1% female. Participants completed a computerized measure of behavioral distraction (the additional singleton paradigm) while frontal lobe activity was recorded using fNIRS 4-channel split sensor. On each trial, an array of shapes (five squares and one circle) was presented, and participants reported the orientation of a line segment inside a target shape (circle). The search array included a distractor (a square that differed in color) on 50% of trials. For each participant, the fNIR signal for epochs of each trial type (distractor present/absent) were averaged and subjected to a linear regression in which the data were fitted to a hemodynamic response function (HRF).
Results: 34 participants (19 cases, 15 controls) were included in our behavioral analysis. Reaction time (RT) was significantly slower on distractor present compared to distractor absent trials; $F(1,32)=17.151$, $p<.001$. There was no significant effect of group (case/control) on RT ($F(1,32)=1.24$, $p=.273$) or interaction between group and trial type ($F(1,32)=1.05$, $p=.313$).
29 participants (15 cases, 14 controls) were included in fNIRS analyses. The effect of group and distractor presence/absence on oxygenated hemoglobin (HbO_2) was examined for each channel. A significant effect of distractor presence/absence was observed in channel 3; $F(1,27)=8.510$, $p=.007$. There were no significant effects of group or interactions between group and distractor presence/absence.
Lastly, a capture index was calculated for each participant by subtracting average RT on distractor absent trials from distractor present trials and correlated with HbO_2 (beta weights averaged across trial type) for each group at each channel. No significant correlations were observed. There was a trend towards a negative correlation for case participants, particularly in channel 1, which strengthened when an outlier was removed ($r=-.407$, $p=.149$).
Conclusions: Reaction time and frontal lobe activity – which serves as a proxy for attentional

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control resources – were significantly higher when a distractor was present. Although there were no significant differences in behavioral distraction between groups, concussion patients trended towards higher levels of frontal lobe activity. Likewise, although not statistically significant, there was a trend towards a negative correlation for cases such that more attentional control resources (i.e., higher frontal lobe activity) was associated with less behavioral distraction (i.e., smaller capture index). This suggests that concussion patients may recruit more neural resources to produce comparable behavioral responses to healthy controls.

Categories: Concussion/Mild TBI (Child)
Keyword 1: concussion/ mild traumatic brain injury
Keyword 2: attention
Keyword 3: neuroimaging: functional
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64 Comparison of Post-Concussion Symptom Network Structure at Baseline and Post-Concussion

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Objective: Recent conceptualizations of concussion symptoms have begun to shift from a latent perspective (which suggests a common cause; i.e., head injury), to a network perspective (where symptoms influence and interact with each other throughout injury and recovery). Recent research has examined the network structure of the Post-Concussion Symptom Scale (PCSS) cross-sectionally at pre- and post-concussion, with the most important symptoms including dizziness, sadness, and feeling more emotional. However, within-subject comparisons between network structures at pre- and post-concussion have yet to be made. These analyses can provide invaluable information on whether concussion alters symptom interactions. This study examined within-athlete changes in PCSS network connectivity and centrality (the importance of different symptoms within the networks) from baseline to post-concussion.
Participants and Methods: Participants were selected from a larger longitudinal database of high school athletes who completed the PCSS in English as part of their standard athletic training protocol (N=1,561). The PCSS is a 22-item self-report measure of common concussion symptoms (i.e., headache, vomiting, dizziness, etc.) in which individuals rate symptom severity on a 7-point Likert scale. Participants were excluded if they endorsed history of brain surgery, neurodevelopmental disorder, or treatment history for epilepsy, migraines, psychiatric disorders, or alcohol/substance use. Network analysis was conducted on PCSS ratings from a baseline and acute post-concussion (within 72-hours post-injury) assessment. In each network, the nodes represented individual symptoms, and the edges connecting them their partial correlations. Estimations of the regularized partial correlation networks were completed using the Gaussian graphical model, and the GLASSO algorithm was used for regularization. Each symptom's expected influence (the sum of its partial correlations with other symptoms) was calculated to identify the most central symptoms in each network. Recommended techniques from Epskamp et al. (2018) were completed for assessing the accuracy of the estimated symptom importance and relationships. Network Comparison Tests were conducted to observe changes in network connectivity, structure, and node influence.
Results: Both baseline and acute post-concussion networks contained negative and positive relationships. The expected influence of symptoms was stable in both networks, with difficulty concentrating having the greatest expected influence in both. The strongest edges in the networks were between symptoms within similar domains of functioning (e.g., sleeping less was associated with trouble falling asleep). Network connectivity was not significantly different between networks (S=0.43), suggesting the overall degree to which symptoms are related was not different at acute post-concussion. Network structure significantly differed at acute post-concussion (M=0.305), suggesting specific relationships in the acute post-concussion network were different than they were at baseline. In the acute post-

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