Cognitive Reasoning in Affective and Social Awareness related to Mild Head Injury

van Noordt, S.¹, BA (Hons.) Student, & Good, D.², Ph.D., C. Psych.
¹Department of Psychology, Brock University
²Department of Psychology and Centre for Neuroscience, Brock University

Background

It is well established that numerous individuals suffer traumatic brain injury (TBI) annually with consequent complex sequelae of affective, behavioural, and cognitive symptoms.1,2

Deficits include impaired abstract and social reasoning, cognitive inflexibility, and an inability to accurately discriminate and categorize emotions.3

The prefrontal cortex (PFC) is a neural substrate mediating higher order abilities (e.g., reasoning, affect recognition, cognitive, and behavioural flexibility) and is highly vulnerable to impact when mechanical forces are applied to the head.5

Relative to controls, those suffering head injury have shown lower performance on tasks assessing emotional awareness, especially when judging expressions of anger and emotions negative in valence.1,4,5

Mild Head Injury (MHI) puts the PFC at risk for homeostatic dysregulation which can produce an altered state of consciousness sufficient to introduce neuropsychological dysfunction.7

Subtle differences in neuropsychological and electrophysiological functioning have been implicated in competent individuals (e.g., university students), and empirical investigations into such performance effects are required.8,9

Purpose:

To examine the relationship between performance on standardized neuropsychological tests assessing cognitive flexibility, abstract and social reasoning, and affect recognition, in university students reporting history of MHI.

Hypotheses

1. Cognitive abilities will be predictive of emotional awareness.
2. Those reporting history of MHI will be significantly challenged at recognizing emotions, relative to those with no MHI, with particular difficulty recognizing negative emotions.
3. Beyond the executive status of abstract and social reasoning, MHI will predict cognitive flexibility and affect recognition.

Participants

Brock University students
• N=40; 36 Males & 4 Females
• 46% reporting MHI

MHI Criterion:
Have you ever had a head injury resulting in an altered state of consciousness (including: vomiting, dizziness, seeing stars, confusion)?

Methods

Participants
Brock University students
• N=40; 36 Males & 4 Females
• 46% reporting MHI

MHI Criterion:
Have you ever had a head injury resulting in an altered state of consciousness (including: vomiting, dizziness, seeing stars, confusion)?

Hypothesis 1: Cognitive abilities in relation to affect recognition

Regression model for entire sample did not achieve statistical significance. F(1, 39) = 0, p = 0.87

Hypothesis 2: Affect Recognition

Average Errors In Affect Recognition

Mean Errors

MHI Non-MHI

Affective Expression

MHI Non-MHI

Results

Hypothesis 3: Cognitive flexibility and emotional awareness in MHI

Predictor B SE B β t

Abstract Reasoning -9.5 5.0 -0.5 -1.8

Social Reasoning -7.4 4.8 -0.4 -1.5

MHI -3.6 2.2 -0.3 -1.6

Step 1: ΔR² = 0.04, p = 0.05

Outcome Variable: Cognitive Flexibility - F(3, 37) = 4.88, p = 0.01

Discussion & Implications

Cognitive abilities did not predict affect recognition for non-MHI group, whereas a notable significant trend was observed for those reporting MHI.

Individuals with MHI were less proficient in their ability to discriminate emotions in general, and made significantly higher errors when judging expressions of anger, relative to the non-MHI group.

Reasoning abilities predicted cognitive flexibility, however, MHI did not add unique variance.

MHI predicted success interpreting anger, over and above reasoning abilities and exploratory analyses revealed that within the MHI group cognitive flexibility accounted for approximately 25% of the variance in overall affect recognition ability.

Successful social interactions rely on the ability to discriminate subtle and dynamic expressions4 and require a properly functioning PFC.

Findings support MHI being related to dysfunction of the PFC, particularly implicating ventral regions involved in social-emotional awareness.6,9

MHI in competent populations is clearly multidimensional since self-report of mild injury significantly predicts aspects of emotion recognition, over and above executive skills such as reasoning.

Due to the heterogeneity in the etiology and impairments associated with MHI, affective, behavioural, and cognitive difficulties persist in the absence of well understood causes for the limitations.

Conclusion

Injuries to the head which introduce an altered state of consciousness are not inconsequential, as they are sufficient to produce detectable changes in neuropsychological functioning well beyond the “concussive” phase. These findings in highly competent university students indicate the usefulness of classifying head injury on a continuum of severity as milder injuries can produce similar neurobehavioural consequences as traumatic cases.

References


Acknowledgments

1. Jonas Gilchrist and Lindsey Brown, Brock University
2. Anthony Dallos, M.A. (Ph.D. Student, York University)
3. Brock University Neuropsychology Cognitive Research Lab (BUNCRL)
4. Ontario Neurotrauma Foundation (ONF)