Mild Head Injury and Underarousal: Effects on Decision-Making
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Background

Globally, approximately 57 million individuals are hospitalized annually due to head trauma, with 80 to 90% of patients given a classification of “mild”1-4. Moderate to severe injuries typically introduce a broad sequence of physical, cognitive, behavioural, and affective complications which limit optimal social functioning.

During closed head injury events, the ventral prefrontal cortex (VPFC) is highly susceptible to functional disruption due to its proximal relation to the orbital bones of the skull. The VPFC, including the orbitofrontal (OFC), are involved in processing socio-emotional information, modulating affective arousal, and regulating adaptive behaviour with respect to environmental demands1-9.

Clinical and traumatic cases suggest that OFC dysfunction is associated with a propensity toward disinhibited antisocial behavior and atypical choice characteristics in socio-emotional contexts such as developing less time to considering moral dilemmas and being more likely to commit moral transgressions10,11.

Trauma to the VPFC does not necessarily disrupt the ability to do one to emotionally respond to the environment, but has been shown to relate to attenuated anticipatory somatic responses associated with the affective/motivational significance of future events11,12.

There is little debate about the functional consequences in individuals who present with physical evidence of neural injury, but there is a paucity of research into the potential socio-emotional ramifications of milder injuries. Competent individuals who report a history of MHI resulting in an altered state of consciousness (ASC) present with impaired neuropsychological performance13,14,15 and atypical electro-cortical responses16,17.

Thus, functional disruption of the brain can lead to performance limitations in the absence of observable tissue damage and Mills that produce an ASC may be sufficient to produce neuropsychological and neurophysiological impairments.

Purpose

To examine the relationships between neuropsychological performance, physiological arousal, and decision-making behaviours in university students, who do and do not report a history of MHI.

Hypotheses

1. The MHI and non-MHI groups do not differ in their general cognitive performance.
2. Those reporting a history of MHI will self-report a higher propensity for disinhibited and antisocial behaviours.
3. History, and severity, of MHI will be related to poorer decision-making.
4. The MHI group will be physiologically underaroused, relative to the non-MHI group particularly when anticipating potential consequences to future decisions.
5. Individuals who report a history of MHI will spend less time deciding on a course of action, and demonstrate less reticence, for personal moral dilemmas.

Methods

Forty-four Brock University students (33 females, 11 males), with 41% (n = 18) reporting a history of MHI resulting in an ASC, participated in this study. History of MHI did not relate to impaired cognitive performance, or annually due to head trauma[1], with 80 to 90% of injuries given a

Measures

Psychophysiological:
- Design Fluency
- Iowa Gambling Task (IGT)
- Moral Decision
- Electrodermal Activity (EDA)
- Self-Report Psychopathy Checklist (Antisocial Behaviour & Erratic Lifestyle)

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

Results

Hypothesis 1: Cognitive Performance

Errors Committed Across Conditions of the Design Fluency Task

Results

Hypothesis 2: Social Behaviours and Decision-Making

Investigating self-reported disinhibited and antisocial behaviours revealed that non between group comparisons achieved statistical significance. Similarly, overall decision-making performance did not vary as a function of MHI. However, self-reported injury severity was associated with decision-making performance.

Hypothesis 3: Moral Judgements

There was a main effect ofJudgment Type (F1,7,7.51) = 8.55, p = .011 (T-score) and a significant interaction (F1,7,7.51) = 8.55, p = .011 (MHI vs. non-MHI). Compared to non-injured individuals, the MHI group was significantly faster to make a judgment while personal dilemmas, (17) = 2.23, p = .03; and made these decisions as quickly as personal transgressions. Non-MH subjects were more reluctant to make perceptions than personal decisions.

Conclusions

Together, these findings support the argument that a history of MHI can differentially impact psychological and physiological mechanisms which sustain adaptive social decision-making.

Examining patterns of neuropsychological/physiological limitations in university students who have sustained milder injuries provides insight in the capacity of brain function which is not masked by more extensive and complicated traumatic injury.

The current results reflect findings from more traumatic injury cases, suggesting that head injury can be placed on a continuum of brain injury severity.

References

4Morales et al. (2007) Medicine
18Patno et al. (2001) DCFSP San Antonio, TX: Psychological Assessment.