MILD HEAD INJURY AND FRONTAL LOBE DYSFUNCTION AS PREDICTORS OF DISINHIBITION

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Background

The frontal lobes occupy the largest area of the neocortex and consist of several functionally different areas. Previous research has consistently shown that the frontal lobes, particularly the orbitofrontal cortex (OFC), are most susceptible to damage during traumatic brain injury (TBI). OFC has been implicated in behavioral as well as emotional regulation and extensive damage to this area is associated with behavioral disinhibition[1, 2], impulsivity and lack of concern with negative consequences [1]. Given that 15% of persons who have sustained a mild head injury (MHI) also experience persistent neurocognitive and physical complaints, it is possible that MHI can lead to behavioral dyscontrol but to a lesser degree than severe TBI. The purpose of this study was to investigate the relationship between executive function, individual differences, MHI and behavioral disinhibition.

Hypothesis 1:

People who report sustaining at least one MHI will also report higher levels of impulsivity, and more specifically behavioral disinhibition.

Hypothesis 2:

MHI will predict behavioral dyscontrol even after executive functions, as well as self-reported individual differences in lifestyle and behavior, are factored out.

Method

Participants

90 undergraduate Brock University Students volunteered to participate in a study titled *Executive Functions and Decision Making*. Majority were right handed (*N*=82), non-smokers (*N*=87) and lived with roommates (*N*=51).

Participants without MHI (*N*=43)
- •34 females (79%)
- •*M* =20.81 (*SD*=2.36) years old

Participants reporting MHI (*N* = 47)
- •18 males (38%)
- • *M* =20.47 (*SD*=2.04) years old
- • 59% (*N*=28) reported a concussion
- •80% (*N*=38) reported having only one injury

Materials in order of presentation

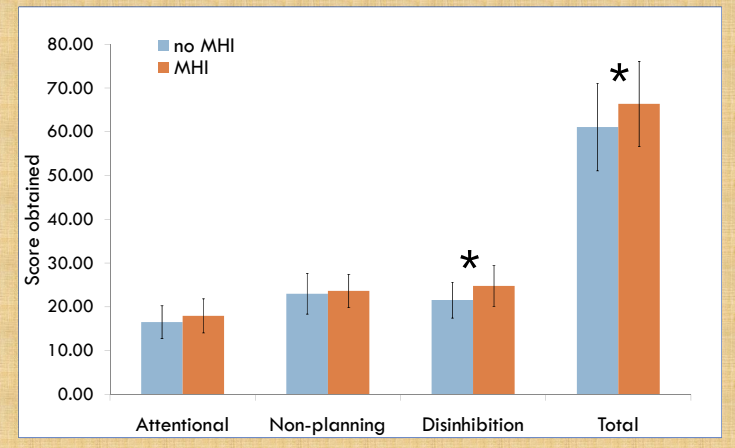
Executive Function Measures:
- •Letter Number Sequencing (WMS-III, 1997)
- •Comprehensive Test of Non-verbal Intelligence (CTONI, 1996), pictorial analogies
- •Trails 3 (A; Delis–Kaplan Executive Functioning Scale, 2002)

Mild Head Injury classification:
- "Have you ever hit your head against a surface or an object sufficient to alter your consciousness (e.g. loss of consciousness, vomiting, dizziness)?"
- "Did it result in a concussion?"

Barrat Impulsiveness Scale: BIS-11[3] – Cronbach's α for this sample is 0.81
- •Motor/Disinhibition subscale (α = 0.68)
- •Non-planning subscale (α = 0.61)
- •Attention subscale – (α =0.68)

Self-Reported Psychopathy Scale: SRP-III R11[4] (α =0.90)
- •Erratic Lifestyle subscale (α =)
- •Antisocial Behavior (α =)

Results



*p < .05

Figure 1. Self-reported impulsivity for MHI and non-MHI groups

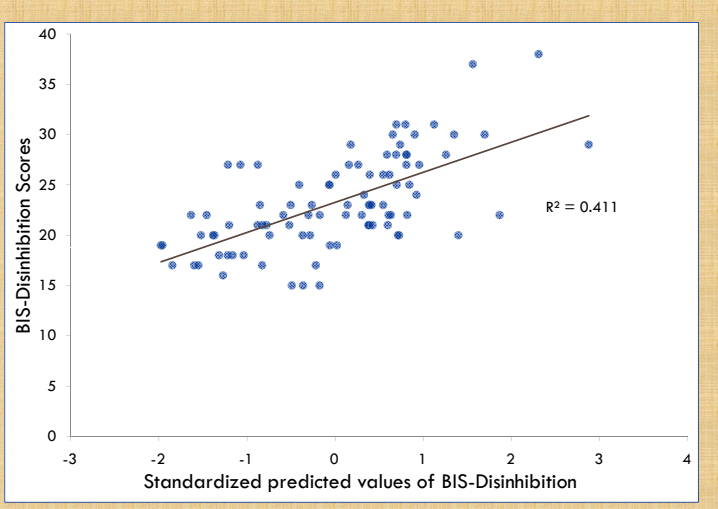


Figure 2. MHI predicted disinhibition beyond executive functioning, erratic lifestyle and antisocial behavior.
R^2 = 0.411, F (6, 82) = 9.52, p < .001

Proposed Model

Executive functions, erratic lifestyle as well as antisocial behavior and MHI accounted for 10.4% (p = .025), 27.8% of variance (p < .001) and 2.8% (p = .05) of variance in BIS Disinhibition scores, respectively.

Discussion

In summary, although participants in the MHI group reported higher levels of impulsivity across all three subscales of BIS-11, they did not present with an impulsive personality and differed significantly only on the measure of behavioural disinhibition. Additionally, while behavioral disinhibition was predicted by executive functions, self-reported erratic lifestyle and antisocial behavior, impressively, having sustained a MHI was still a significant predictor of disinhibition.

While, both erratic lifestyle and antisocial behavior are also significantly related to MHI and can be a consequence of the injury, the model treats these as pre-existing differences between the groups so the unique relationship of MHI and behavioral disinhibition can be isolated. The results suggest that MHI is associated with behavioral disinhibition above and beyond executive function or self-reported individual differences in lifestyle and antisocial behavior. Moreover, the chosen executive function measures were not significantly related to the self -report of MHI but were associated with erratic lifestyle measured by the subscale of SRP-III further supporting the unique relationship between MHI and behavioral disinhibition.

Conclusion

Cognitively competent individuals (i.e. university students) who have experienced a mild, but notable, head injury, present with impulsive behaviours, which cannot be explained by differences in executive functioning, self-reported erratic lifestyles or antisocial behaviours.

References

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[4]Paulhus, D.L., Hemphill, J.D., & Hare, R.D. (in press). Self-Report Psychopathy scale: Version III. Toronto: Multi-Health Systems.

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