Physiological and Affective Underarousal as a Function of Mild Head Injury in University Students

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Introduction

The prefrontal cortex (PFC), especially the ventromedial PFC (vPFC), has been implicated in the modulation of emotional and autonomic responses. This region is particularly vulnerable in head trauma and, therefore, emotional responses may be at risk in this population. Consistent with this research, (see Tranel & Damasio, 1994) has shown that persons with moderate to severe traumatic brain injury (TBI) to the vPFC present with underarousal as evidenced by reduced electrodermal activation (EDA) responses and flattened affect. Furthermore, it has been suggested that individuals with moderate to severe neurological compromise are particularly vulnerable to the adverse effects of stress.

As expected, prior to any arousal manipulation (i.e., baseline) students with MHI performed more poorly on tasks of working memory (WAIS-III, 1997; DKEFS, 2002) and attention (DKEFS, 2002). However, when arousal state was manipulated students with MHI tended to perform better on a cognitive flexibility task (WAIS-III, 1997) when stressed than when relaxed in contrast to their no-MHI counterparts who performed better when relaxed than when stressed, F(1, 87) = 3.17, p = .079.

Participants

University students (N = 91); 56% self-reported MHI history

Method

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Measures and procedure

• Neuropsychological measures (memory, attention, planning, abstract reasoning, and standard intelligence); indices of arousal/anxiety; manipulated arousal (via psychosocial stressor or relaxation)

• Post-concussive symptoms (Post-concussive Symptom Checklist [PCSC])

Results

University students with self-reported MHI endorsed experiencing significantly more life stressors than those without history of MHI, r(89) = 2.51, p = .014.

Overall, university students with self-reported MHI had a diminished EDA response to the arousal manipulations as compared to the no-MHI group. The no-MHI group had more extreme and larger range of EDA responses than the MHI group (p = .05).

Discussion

Persons with mild head trauma who have not complained of, or self-identified as experiencing any neurocognitive challenges, present with a profile similar to that of persons with moderate to severe injury to the vPFC region. Despite reports of experiencing significantly more life stressors than those with MHI, students with MHI are relatively emotionally and physiologically underaroused compared to their no-MHI counterparts. Students who acknowledged a history of sustaining a MHI were significantly less physiologically responsive to the arousal manipulations of stress and relaxation and may be less responsive to stressors in their environment—which may suggest dysregulated stress responsivity. Further, cognizance is acquired by increased arousal, rather than decreased arousal, for students with MHI in contrast to those with no-MHI. Finally, increased post-concussive symptom reports were heightened for those reporting a MHI as a function of the more qualitative (i.e., intensity and duration of symptoms), as opposed to quantitative (i.e., frequency) aspects of PCS. Our findings are suggestive of persistent and subtle effects of neural disruption following mild head trauma. Lastly, age at sustaining the MHI, especially during the early teenage years as compared to other ages, may also play a role in arousal levels.

References


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Demographics

65% (n = 51) reported a previous MHI

60% (n = 44) were male at the post-acute stage (i.e., > 3 days)

Injuries occurred approximately 2 years previous

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