



MEMORY PERFORMANCE AS A FUNCTION OF ANXIETY IN INDIVIDUALS WITH AND WITHOUT MILD HEAD INJURY



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Background

While most research has focused on the recovery from sequelae associated with moderate to severe traumatic brain injury, this study examined the cognitive sequelae and emotional regulation following mild head injury (MHI) which has a much higher incidence, yet can be much less subtle and involve alterations in consciousness without extensive neural loss¹.

Typically it has been suggested that post-concussive symptoms² subside after a three month period and functioning is assumed to return to previous abilities. However, some individuals may have psychological, behavioural, socioemotional, occupational and cognitive difficulties^{3,4} that persist well beyond the first year.

Further, individuals with neurological compromise may be particularly vulnerable to stress and anxiety^{5,6,7} which can additionally interfere with and/or exacerbate their cognitive and functional success.

Purpose

Are there potential interacting effects of stress/anxiety on memory performance in persons who have sustained a MHI?

Do limitations in memory performance persist in competent individuals who have experienced a MHI (i.e. high functioning individuals such as university students) as compared to individuals without MHI as a function of anxiety?

Method

Participants

University students ($N = 50$); 30% reported history of MHI

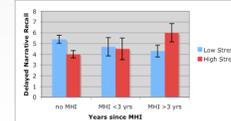
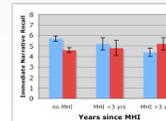
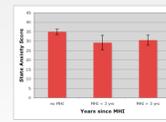
Measures and Procedure

Standardized neuropsychological tests, questionnaires, and a structured interview were administered, including:

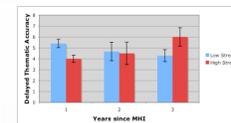
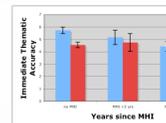
- Narrative memory - immediate and delayed (Wechsler Memory Scale®-Third Edition)
- Visuospatial memory - immediate and delayed (Rey Complex Figure test)
- Indices of anxiety - state and trait (State-Trait Anxiety Inventory)

Results

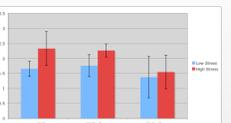
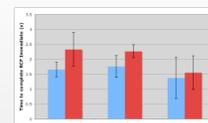
State anxiety levels differed between individuals with and without MHI, $F(1, 48) = 4.23, p = .045$, such that individuals with MHI reported significantly lower levels of anxiety than individuals without MHI.



Immediate, $F(1, 48) = 4.02, p = .050$, and delayed, $F(2, 44) = 4.03, p = .025$, narrative recall performance of individuals with and without MHI differed as a function of state anxiety and years since injury.



Similarly, recall ability for thematic material for individuals varied as a function of years since injury and state anxiety for both immediate, $F(2, 44) = 3.12, p = .054$, and delayed recall, $F(2, 44) = 3.92, p = .027$.



Time required for completion of the delayed reproduction (after a minimum 30 minute delay) of the RCF varied significantly between MHI and no MHI groups as a function of state anxiety, $F(1, 48) = 4.47, p = .040$, but only marginally as a function of years since injury, $F(2, 44) = 2.361, p = .10$ and varied marginally for time for completion of immediate reproduction of RCF for MHI but not years since injury, $F(1, 48) = 2.935, p = .09$.

Similar trends were evident for trait anxiety measures, but were not significant.

Discussion

Given the prevalence of sports-related injuries and risk-taking activities during one's teens, and the subtlety of the injuries in this study, these results demonstrate that even so-called "mild" head injuries can still have persisting implications for the well-being and cognitive performance for university students and other competent individuals.

Academic performance, in terms of memory retention of facts and semantic gist, is compromised as a function of arousal and head injury, for verbal and, perhaps, spatial material. Consistent with previous findings, heightened anxiety/arousal impairs performance, but only for individuals without MHI (i.e. Yerkes-Dodson curve). Individuals with MHI report an *underaroused* state (i.e. lower anxiety) overall compared to others and this lowered arousal was associated with poorer recollection, particularly as a function of years since injury. Individuals with MHI performed better when experiencing relatively higher levels of arousal (alertness).

Conclusions

Increased arousal advantages performance and processing speed on memory tasks for individuals with a history of MHI, however since most often these persons experience a underaroused state relative to their peers their memory for gist and facts is at risk.

These findings indicate the potential limitations of underarousal that is associated with orbitofrontal disruption and is implicated in MHI. Further, the cognitive and emotional sequelae following MHI may not be transient, and may be cumulative as a function of time and stress responses, despite both the subtle nature of the head trauma and the competency of the individuals involved (e.g. university students).

References

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