Threatening Impairment: Assessing the Effects of Diagnosis Threat on Computerized Concussion Screening Tests

Matthew Hagler and Karen Yu
The University of the South, Sewanee, TN, USA

Can expectations of being diagnosed with cognitive impairment actually result in poorer cognitive performance—a concept referred to as diagnosis threat? For example, following a head injury, might expectations of cognitive effects in and of themselves lead to poorer performance on tests used to diagnose and manage concussions?

Prior research on the effects of expectations in this context has largely relied on participants' self-report of symptoms (Mittenberg, DiGiulio, Perrin, & Bass, 1992; Panayiotou, Crowe, & Jackson, 2011). The few studies examining actual cognitive performance yield varied results: Suhr and Gunstad (2002) found evidence for diagnosis threat, while Ozen and Fernandes (2011) saw no effect.

We extend the investigation of diagnosis threat to athletes' performance on a short battery of computerized cognitive tests increasingly used in concussion diagnosis and management—a context in which expectations of impaired performance are likely to be rather high, thus highlighting the importance of determining whether expectations influence performance on these tests.

Method

- **Participants: NCAA Division III field hockey and soccer players; 23 females, 2 males**
- **Experiment was conducted in a computer laboratory at individual computer terminals with headphones**
- **Participants read an excerpt of a news article (Neal, 2012) reporting research on cognitive impairment in contact sport athletes, selectively abridged to induce either negative or neutral expectations**
- **Participants completed a practice version and full version of the Axon Sports Computerized Cognitive Assessment Test (CCAT), consisting of four computerized playing card tasks: Detection, Identification, One Card Learning, One Back**
- **Participants completed a post-test questionnaire, including a manipulation check, demographics, and anxiety and mood inventories**

Results

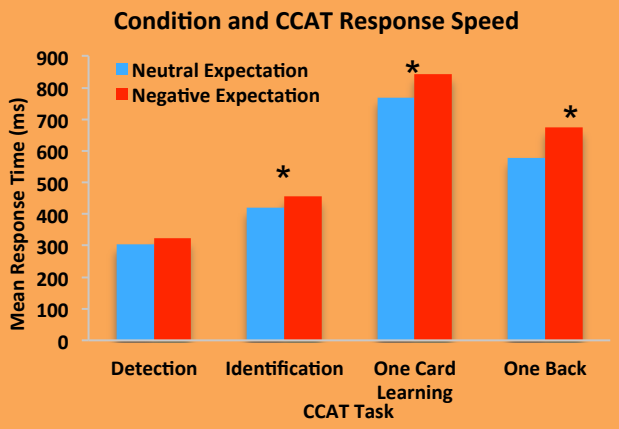

Figure 1. Mean response time (ms) for each CCAT task
***Denotes a significant univariate effect, *a* = .05**

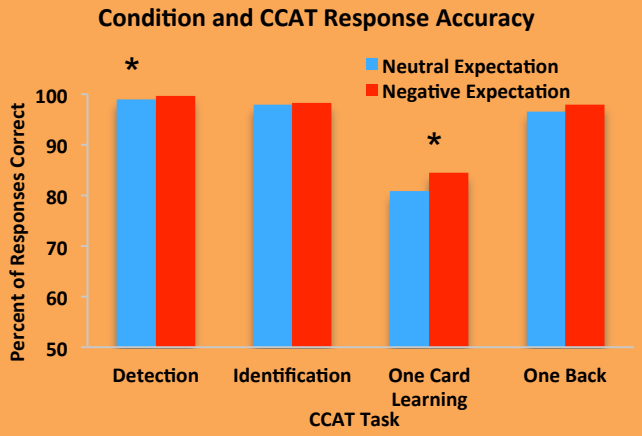

Figure 2. Mean response accuracy for each CCAT task
***Denotes a significant univariate effect, *a* = .05**

Conclusion

Participants who were primed with negative expectations responded slower but more accurately on CCAT tasks compared to participants who were primed with neutral expectations.

- **Participants who expected to perform worse might have hesitated during CCAT tasks to verify their responses, leading to a slower but more accurate performance.**
- **Diagnosis threat can differentially affect response speed and accuracy, which should be evaluated separately when interpreting results of concussion tests, as opposed to using a composite score that includes both speed and accuracy.**
- **In a real world setting, the act of taking a concussion screening test following head trauma might induce stronger expectations of cognitive impairment than we were able to produce in an experimental setting, which in turn might produce even greater performance differences.**
- **By making cognitive screening more regular and routine, we might decrease the association between testing and injury and diagnosis threat.**

References

Mittenberg, W., DiGiulio, D. V., Perrin, S., & Bass, A. E. (1992). Symptoms following minor head injury: Expectation as aetiology. *Journal of Neurology, Neurosurgery, and Psychiatry*, *41*, 611-616.

Neale, T. (2012, May 16). Season of 'head hits' may dull athletes' thinking. *MedPage Today*. Retrieved from http:www.medpagetoday.com/Neurology/HeadTrauma/32726.

Ozen, L. J., & Fernandes, M. A. (2011). Effects of 'diagnosis threat' on cognitive and affective functioning long after mild head injury. *Journal Of The International Neuropsychological Society*, *17*(2), 219-229.

Panayiotou, A., Crowe, S., & Jackson, M. (2011). An analogue study of the psychological and psychosocial processes associated with post-concussion symptoms. *Australian Psychologist*, *46*(4), 210-218.

Suhr, J.A., & Gunstad, J. (2002). "Diagnosis Threat": The effect of negative expectations on cognitive performance in head injury. *Journal of Clinical and Experimental Neuropsychology, 24*, 448-457.