

Bethel University

Spark

Human Kinetics & Applied Health Sciences
Student Works

Human Kinetics & Applied Health Sciences
Department

2023

Acute Effects of Mental Health on Concussion Testing

Annika Thompson

Bethel University, ant63435@bethel.edu

Carin Gutzwiller

Bethel University, cag27288@bethel.edu

Follow this and additional works at: <https://spark.bethel.edu/human-kinetics-students>



Part of the [Kinesiology Commons](#), and the [Sports Sciences Commons](#)

Recommended Citation

Thompson, Annika and Gutzwiller, Carin, "Acute Effects of Mental Health on Concussion Testing" (2023).
Human Kinetics & Applied Health Sciences Student Works. 9.

<https://spark.bethel.edu/human-kinetics-students/9>

This Paper is brought to you for free and open access by the Human Kinetics & Applied Health Sciences Department at Spark. It has been accepted for inclusion in Human Kinetics & Applied Health Sciences Student Works by an authorized administrator of Spark. For more information, please contact lfinifro@bethel.edu.

ACUTE EFFECTS OF MENTAL HEALTH ON CONCUSSION TESTING

TITLE: ACUTE EFFECTS OF MENTAL HEALTH ON CONCUSSION TESTING

AUTHORS: A. Thompson and C. Gutzwiller, Bethel University

ABSTRACT: The process of diagnosing a concussion starts long before any hit on the field. At the beginning of each season athletes are baseline tested using the same Sports Concussion Assessment Test 5 (SCAT5) that is used on the field when injury occurs. How they perform on this baseline test plays a major role in future diagnosis. Thirty Five male and female subjects (mean years of age 20.8 years \pm 1.6) free of concussion diagnosis came in for a total of three separate appointments. At each appointment a mental health survey, reaction time test and the cognitive portion of the SCAT 5 were administered. A Pearson correlation on SPSS found significance between immediate memory (IMMED) on the SCAT 5 and participants' performance on the mental health survey (MHST). Significance occurred between the MHST and IMMED, $p=0.047$ and $R^2=0.037$. In addition, significance between SCAT composite scores and 3 components of the SCAT5; orientation (ORT) $p= .018$, IMMED $p=.001$ and $R^2=0.267$, and digits backwards (DIGBACK) $p=.001$. Meaning, immediate memory scores have a significant impact on the individual's SCAT5 composite score. This means that even if all other areas on the SCAT5 are not impacted this is enough to alter their overall score in a way that can cause inaccurate diagnosis. These findings demonstrate the importance of requiring a mental health survey at the same time as the administration of the baseline SCAT5, this may help decrease the amount of possible misdiagnosis due to mental health struggles and its impact on immediate memory.

KEY WORDS: SCAT5, Immediate Memory, Athletics, Diagnoses, Composite

INTRODUCTION: Our research study states that if an individual presents with altered or poor mental health during their baseline concussion assessment, their baseline values present a poor

comparison point for guiding clinical decisions and diagnoses. Considering concussion tests are suggested to compare a pre-injured state to a post-injured state, it is important to recognize and take into consideration the interfering factors that have potential to influence a clinical diagnosis. If an athlete, for example, comes in on the day of their baseline assessment and presents with symptoms of high stress, anxiety, and nervousness due to a wide variety of external/internal factors it will reflect on their results with the athlete underperforming. If a month down the road they get hit and undergo a concussion exam for post-injury, their results from post-injury will be compared to their baseline and if their baseline reads the symptoms presented post-injury as normal then it will lead to inconclusive data for a proper diagnosis. Our motivation is to test the test to ensure the current safe protocol and to improve its credibility and considerations when making diagnoses for athletes safety.

METHODS

Participants were asked to come in for three appointments of approximately 20-30 minutes. The first appointment was held before the end of September with a hard cut for accepting new participants at the end of October. The second appointment will need to be conducted at least 30 days after the first and before the end of the fall semester. The final appointment will be held during January (Interim) of 2023. For each appointment, participants came to the Biokinetics Space at Bethel University. At the first appointment, a review of research procedures and potential risks will occur as well as reading and signing of this informed consent document. At every appointment participants will fill out a mental health survey, SCAT 5 concussion test, and a reaction time test.

Mental Health Survey: Participants were asked to fill out a 24-question survey from the University of Wisconsin Madison that assesses their mental health particularly the 6 emotional

dimensions of... Resilience, Outlook, Social Intuition, Self-Awareness, Sensitivity to Context and Attention. Individuals are encouraged to answer each question honestly and as accurately as possible. The questionnaire link was provided to take on their device, and a device was available if needed. The results of this test will give a score out of 7 on each emotional dimension and a short definition of what each dimension represents and means. After completing the questionnaire results were recorded electronically by primary investigators.

SCAT 5 Concussion Test: Participants were asked to perform the cognitive component of the SCAT 5 test. This test was administered electronically and a link was provided along with a device if needed. It was used under the baseline test category and for our study purposes as the baseline test for each session. There were individual scoring criteria for each administered test. Results were calculated via the testing link given to the participant which was then shared with the participant and asked to be emailed to investigators.

Reaction Time Test: Participants were asked to complete a reaction time test. The same device will be provided each appointment to keep results consistent. This test shows a stop light and the participant is directed to click the mouse pad whenever the light changes from red to green. This test consists of one practice round and then 5 real rounds that are all recorded and averaged to generate the final result. Results will be recorded by researchers immediately after completion. See the appendix for a visual example of what the test will look like.

RESULTS: A correlation test on SPSS found significance between immediate memory (IMMED) on the SCAT 5 and participants' performance on the mental health survey (MHST). Significance occurred between the MHST and IMMED, $p = .047$. The correlation test also found significance between SCAT composite scores and 3 components of the SCAT5; orientation (ORT) $p = .018$, IMMED $p = .001$, and digits backwards (DIGBACK) $p = .001$. If an individual

tests poorly on one component of the SCAT 5, it impacts their composite score. An anova test on MHST had significance of $p = .001$ showing the variation in performance on the mental health survey across three points in time. Further, a multiple comparisons test on MHST showed significance between test 1 and 2 $p = .013$ and test 1 and 3 $p = .002$.

DISCUSSION: This data indicates the significance of acknowledging mental health when administering baseline concussion tests during the pre-season. The significant link between mental health and immediate memory shows an inverse relationship between the two. This relationship explains how cognitive capabilities are in fact dependent on an individual's mental state. Meaning, when an individual presents with poor results on a mental health survey, we're more likely to see decreased performance on immediate memory. Immediate memory scores have a significant impact on the individual's SCAT5 composite score. This means that even if all other areas on the SCAT5 are not impacted this is enough to alter their score in a way that can cause inaccurate diagnosis.

CONCLUSION: The data according to this study demonstrated a statistical significance between immediate memory and the mental health survey. If an individual is struggling with their mental health, their ability for immediate memory will be impaired. In addition, there was also statistical significance between immediate memory and its effects on the SCAT5 composite score. The link between mental health and immediate memory shows an inverse relationship. This relationship explains how cognitive capabilities are dependent on an individual's mental state. Meaning, when an individual presents with poor results on a mental health survey, we're more likely to see decreased performance on immediate memory. Those with impaired cognitive abilities, such as impaired memory, will affect their overall SCAT5 composite score. Concluding that an individual's mental health at any point in time can alter the SCAT5 composite score

possibly leading to a misdiagnosis due to the composite score not accurately representing symptoms. This study may suggest the importance of taking athletes' mental health into consideration during both the baseline testing and in the event of an emergency. Mental health in general affects immediate memory and can be important to note for day to day activists outside of athletics. Potential ideas for further studies should include different mental health screening tests.

ACKNOWLEDGMENTS: Words cannot express our gratitude to our advising professor, Justin Byers for invaluable feedback and support. We also could not have completed our research without Bethel University's Biokinetics department who generously provided resources and expertise throughout the entire process.

REFERENCES: Bailey CM, Samples HL, Broshek DK, Freeman JR, Barth JT. The relationship between psychological distress and baseline sports-related concussion testing. *Clin J Sport Med.* 2010 Jul;20(4):272-7. doi: 10.1097/JSM.0b013e3181e8f8d8. PMID: 20606512.

Brain anatomy and how the brain works. Johns Hopkins Medicine. (2021, July 14). Retrieved October 17, 2022, from <https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain>

Harvard Health. (2020, July 6). *Understanding the stress response.* Retrieved October 17, 2022, from <https://www.health.harvard.edu/staying-healthy/understanding-the-stress-response>

Lumen Learning. (n.d.). *Parts of the Brain Involved with Memory | Introduction to Psychology.* Retrieved October 17, 2022, from <https://courses.lumenlearning.com/waymaker-psychology/chapter/parts-of-the-brain-involved-with-memory/>

Mental Health Conditions | NAMI: National Alliance on Mental Illness. (n.d.). Retrieved October 17, 2022, from <https://www.nami.org/about-mental-illness/mental-health-conditions>

Weber ML, Dean J-HL, Hoffman NL, et al. Influences of Mental Illness, Current Psychological State, and Concussion History on Baseline Concussion Assessment Performance. *The American Journal of Sports Medicine*. 2018;46(7):1742-1751.
doi:10.1177/0363546518765145

Where are memories stored in the brain? (2018, July 23). Queensland Brain Institute - University of Queensland. Retrieved October 17, 2022, from <https://qbi.uq.edu.au/brain-basics/memory/where-are-memories-stored>