Journal of Sports Medicine and Allied Health Sciences: Official Journal of the Ohio Athletic Trainers Association

Volume 7
Issue 1 *OATA 2021 Supplemental Issue*

Article 16

August 2021

Do Memory Test Scores Improve After Organized Sport Activity?

Olivia B. Smith
Wilmington College

Erika Smith-Goodwin
Wilmington College

Jennifer Walker
Wilmington College

Do Memory Test Scores Improve After Organized Sport Activity?

Olivia B. Smith; Erika Smith-Goodwin PhD, AT, ATC; Jennifer Walker MA, AT, ATC
Wilmington College; Sport Sciences Department

OBJECTIVE

The purpose of this study was to investigate memory test score changes before and after organized sport activity to evaluate if baseline test scores were effective in reviewing concussion symptoms and scores. It is important for Certified Athletic Trainers (ATC) to know if memory scores are enhanced after the start of organized sport activity to review the effectiveness of baseline test scores when a concussion is apparent.

DESIGN AND SETTING

This study was a quasi-experiment and was conducted on football players at a division III college in southwest Ohio. The independent variables in this study were division III football players ages 18 to 23 years. The dependent variable in this study is the student athlete's change or increase in Standard Assessment of Concussion (SAC) test scores after participating in organized sport activity. Athletes underwent baseline testing during preparticipation physicals as they typically would. They were then asked to undergo another round of the same testing in the athletic training clinic after they had completed 6 consecutive weeks of organized sport activity. Such activity could include weightlifting or on field practices, as long as a coach was present. When an athlete was undergoing their second round of testing, they were all asked to stand in the same place and given the same instructions. No two participants could be in hearing distance of another to prevent one athlete getting an unfair advantage on the material. There are five different forms of the SAC test (A through E), the specific form for this research was Form C. The testing sections included in the SAC form are orientation, immediate memory, neurological screening, concentration, exertional maneuvers and delayed recall. However, for this research, only 4 of the 6 sections are used, orientation, immediate memory, concentration and delayed recall. This was done strictly due to the nature in which the baseline SAC test was given at the beginning of the sport and academic year. All questions on the SAC test were scored with a 1 or a 0, 1 meaning the participant got the question correct, 0 meaning the participant got the question incorrect. The orientation, concentration and delayed recall sections were all worth 5 points each. The immediate memory section however was worth 15 total points. In the orientation section of the test, participants were asked 5 questions, what is the month, date, day of the week, year and time is it (within 1 hour to be correct)? During the immediate memory section, participants were asked to repeat back a list of 5 words, 3 times. The participant was read the list of words between each trial. For every word they remembered, they got one point. The list of words to remember for this SAC form were baby, monkey, perfume, sunset and iron. In the concentration section, participants were asked to repeat sets of numbers in reverse order. Sets of numbers were as small as 3 or as large as 6. Each participant started out with a set of 3 numbers, if they got it correct, they moved on to a set of 4. The participant must repeat the set backwards correctly to move on to the next set length. If the participant did not repeat the set correctly, they are asked to try another set of the same length. If the participant got the second set correct, they could move on to the next set length. However, if the participant was unable to repeat either

of the 2 sets of numbers of the same length, they automatically received zeros for that set and any remaining sets. Also, in the concentration section, participants were asked to recite the months of the year in reverse order meaning they started with December and worked their way to January. To score correctly on this question, all 12 months had to be recited in the correct order on the first try. The last section that participants were tested on was the delayed recall section. In this section, participants were asked to recite the same 5 words (baby, monkey, perfume, sunset, iron) from the immediate memory section, without being reminded of what they were. For each word they could recall, they got one point. At the conclusion of the test, each section was scored and recorded in the summary of total scores section. After having scored each section, those totals were added together to find the final test score, out of 30. The participants wanted to score as close to 30 as possible.

PARTICIPANTS

A total of 99 people were asked to participate (N=99), however one was excluded before the second round of testing due to a non-sport related concussion. There was a return rate of 69% (n=70). The research was conducted using a convenience sample which resulted in a group of male athletes ages 18 to 23. 60% (n=42) of athletes responded as being 18-19 years old, while 36% (n=25) answered as being 20-21 years old and only 4% (n=3) marked 22-23 years old. Baseline SAC scores (n=68) and retest SAC test scores (n=70) were compared in this study. When asked about year of sport participation, 44% (n=31) responded as being first year collegiate athletes and 66% (n=39) responded as being returning collegiate athletes. Returning collegiate athletes was anyone in their second, third or fourth years of participation.

INTERVENTION

Face validity was determined by a panel of experts in athletic training. The content validity of this survey was determined through a Table of Specifications (ToS) which was broken down into four sections, Knowledge of Standard Assessment of Concussion Testing**,** Concussion History, Overall Wellness and Demographics. IRB approval was obtained for this study. Descriptive statistics (frequency counts and percentages) were used. A Wilcoxon Signed Ranked test was run with grouping variables of baseline SAC test scores and retest SAC test scores. Two Chi-Squared tests were used in this study, both with grouping variables of first year collegiate athletes and returning collegiate athletes. The first test used baseline scores only, then the second used retest scores only. The results of those two tests were then compared by hand using the p values. Though the retest p value was significantly lower than the baseline value, the overall hypothesis was found to be insignificant. All tests run in this study were run using SPSS 24.0 with set alpha levels of .05 *a piori.*

MAIN OUTCOME MEASURMENT

An 11-question survey was distributed using three different 5-point Likert scales. Questions 1-8 used a Likert scale options of Strongly agree[5], Agree[4], Don't know[3], Disagree2, Strongly disagree[1]. Questions 9 and 10 had a scale of 5[th] year[5], 4th year[4], 3[rd] year[3], 2nd year[2], 1st year[1]. The final survey question used a Likert scale of 24+[5], 22-23[4], 20-21[3], 18-19[2], under 18[1]. The SAC test used in this study was form C with the highest possible score being 30 points. This test was examining orientation, concentration and delayed recall for 5 points each, while the immediate memory portion was worth 15 points.

RESULTS

It was found that there was statistical significance in this test with (Z= -2.013, p=0.044). Hypothesis two had 44% (n=31) of participants classified as first year collegiate athletes, while 66% (n=39) were classified as returning collegiate athletes. The Chi-Squared test reviewing baseline test scores and years playing a collegiate sport resulted in no statistical significance. The Chi-Squared test reviewing retest SAC test scores and years playing a collegiate sport also resulted in findings that were not statistically significant. When asked if they understood why SAC tests were administered, 93% of participants (n=65) agreed or strongly agreed, 6% (n=4) answered don't know, and only 1% (n=1) answered with strongly disagree. Athletes were then asked if they understood how SAC test scores were used in the concussion return to play protocol. 73% of participants (n=51) answered strongly agree or agree, 24% (n=17) answered don't know, 3% (n=2) answered disagree, while none answered strongly disagree. Before participating in the second round of testing, athletes were asked if they remembered taking the first round during their preparticipation physicals. 93% of participants (n=65) answered strongly agree or agree, 4% (n=3) selected don't know and 2% (n=2) selected disagree or strongly disagree. One question that really stuck out was about if the participants felt that their overall memory capabilities were better after having participated in a round of daily exercise. Of the 70 people asked, 61% (n=43) strongly agreed or agreed, but 36% (n=25) answered don't know, and 3% (n=2) chose to disagree. Participants were then asked about their concussion history. First they were questioned on having at least one diagnosed concussion at the collegiate level where only 7% (n=5) strongly agreed or agreed, 1% (n=1) chose don't know and an overwhelming 92% (n=94) chose disagree or strongly disagree. Next, they were asked about having received at least one undiagnosed concussion at the collegiate level. For this, 9% (n=6) answered strongly agree or agree, 17% (n=12) chose don't know, and 74% (n=52) selected disagree or strongly disagree. Athletes were then asked about having at least one diagnosed concussion in high school, resulting in 26% (n=18) choosing strongly agree or agree, 3% (n=2) choosing don't know, and 71% (n=50) choosing disagree or strongly disagree. The last question about concussion history asked about having at least one undiagnosed concussion in high school where 25% of participants (n=17) answered strongly agree or agree, 26% (n=18) answered don't know and 50% (n=35) chose disagree or strongly disagree.

CONCLUSION

It is clear that SAC test scores do in fact increase after 6 weeks of organized sport activity. This brings to light the question of are baseline SAC tests reliable sources to use in the return to play concussion protocol? Athletic trainers want to provide the best care possible for their athletes, therefore more research needs to be done on not only this topic, but the effectiveness of other concussion baseline tests also. It was unclear if age or years of sport experience had a link to better SAC test scores, so it is critical that we find out.

KEY WORDS: *Standard Assessment of Concussion, Concussion, Baseline, Organized Sport Activity*