

Effect of Subconcussive Events on ImPACT Scores of Men's Collegiate Lacrosse Players

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Hypothesis

Concussions, or mild traumatic brain injuries, remain a public health issue with over 3 million reported annually and substantial healthcare resources utilized for treatment (1, 3). Despite sports causing 30% of concussions among 5- to 19-year-olds, no “gold standard” tool exists for diagnosing these injuries (2).

Multiple impacts over time without the presence of concussion symptoms, known as subconcussive impacts, contribute to impaired neurocognitive function (3).

Our study examines the effects of subconcussive impacts on neurocognitive function of Men's Division II Collegiate Lacrosse players. We hypothesized that athletes who received more impacts throughout the season would have decreased neurocognitive scores at post-season compared to pre-season.

Statement of Significance

Head injuries are of particular importance in young athletes, who are still developing regions of their brain into their twenties (4). Decreases in cognitive function can occur with each additional concussion, along with a prolonged recovery period and increased anxiety and depression (5, 6).

Using a widely implemented screening tool, such as ImPACT, coaches and physicians can recognize warning signs that an athlete is at risk for injury. Monitoring these subconcussive events, their effect on an athlete's physical and mental well-being, and being able to correctly assess progression, will allow physicians to take a holistic approach to the athlete's care in regards to body, mind and spirit, and guide osteopathic treatment methods.

Materials & Methods

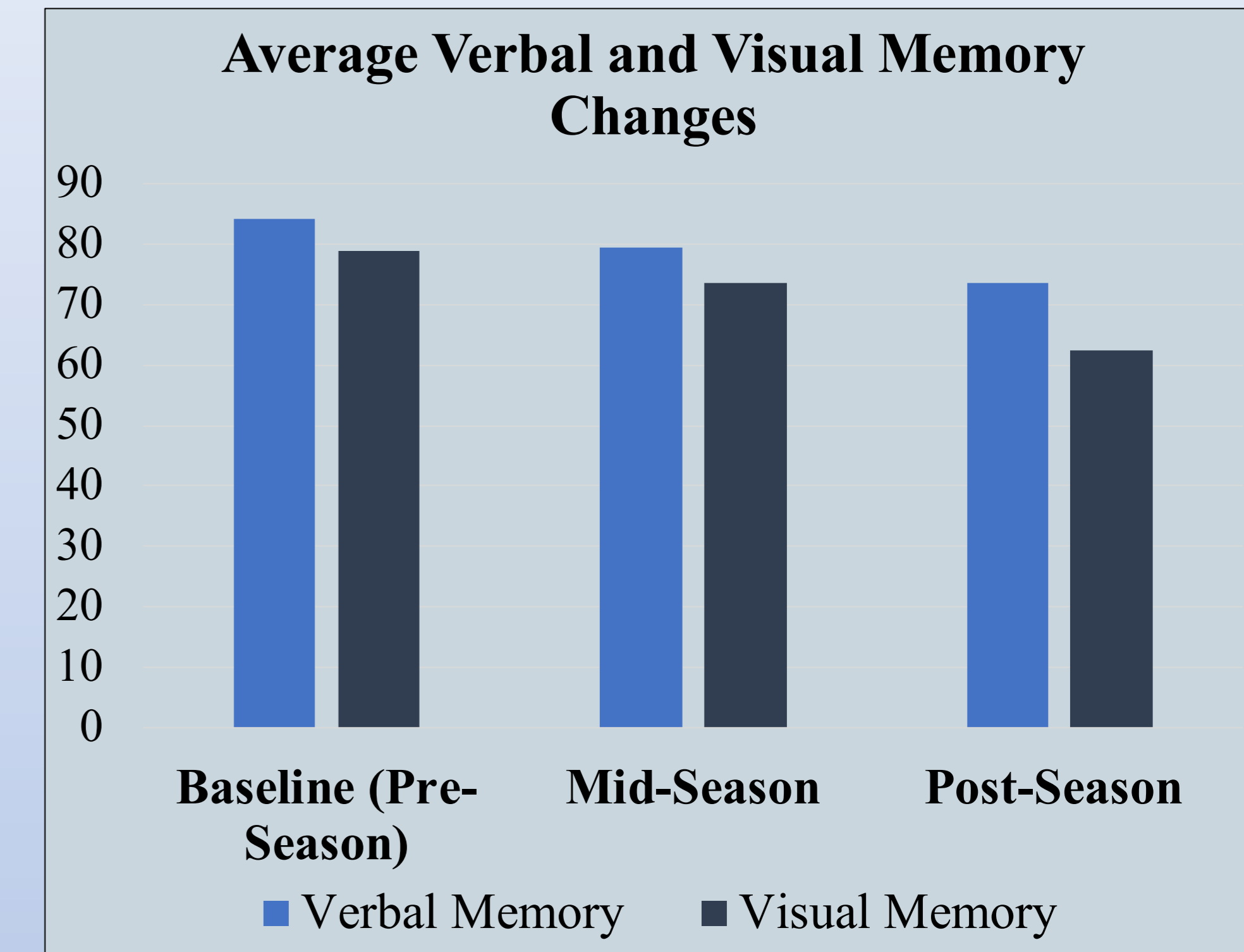
- ▶ We examined 17 athletes on the NYIT NCAA Division II Collegiate Men's Lacrosse.
- ▶ Immediate Post-Concussive Assessment and Cognitive Testing (ImPACT) was used for neurocognitive testing, and impacts were measured with Athlete Intelligence Cue Sports Helmet sensors containing accelerometers.
- ▶ Each hit and its magnitude from the Cue sensors were automatically transmitted to the AI server via Bluetooth.
- ▶ ImPACT testing was conducted at 3 different points (pre-, mid-, and post-season), and additionally by team physicians if a concussion occurred.

Data Analysis

- ▶ ImPACT uses six different tests that evaluate word recognition, design memory, visual processing and memory, and working memory/visual response speed, with five different composite scores produced from the tests (7).
- ▶ In each of the five composite scores, the change over the pre-, mid-, and post- seasons was tested using the repeated measures analysis of variance.
- ▶ For those composite scores with significant changes, a post-hoc analysis was performed for pairwise comparison with the pre-season as a reference.
- ▶ Statistical significance was evaluated with $\alpha=0.05$.

Results

| | Verbal Memory | Visual Memory |
|--|---------------|---------------|
| Baseline (Pre-Season) | 84.1 | 79 |
| Mid-Season | 79.3 | 73.6 |
| Post-Season | 73.7 | 62.3 |
| P-value | 0.008 | <0.001 |
| Difference between Pre- and Post-season | 10.4 | 5.4 |
| P-Value for Difference | 0.017 | 0.001 |



Conclusions

- ▶ ImPACT scores for verbal and visual memory decreased throughout the season, supporting our hypothesis and previous results in our lab. The decreases could not be correlated with the number of impacts each athlete sustained, possibly due to issues with compliance among the athletes as the sensor had to be switched between two helmets throughout the season.
- ▶ Future directions of this project include determining a more reliable method to measure impacts, and obtaining a larger sample size to examine if any correlations are present among field positions.

Acknowledgements & References

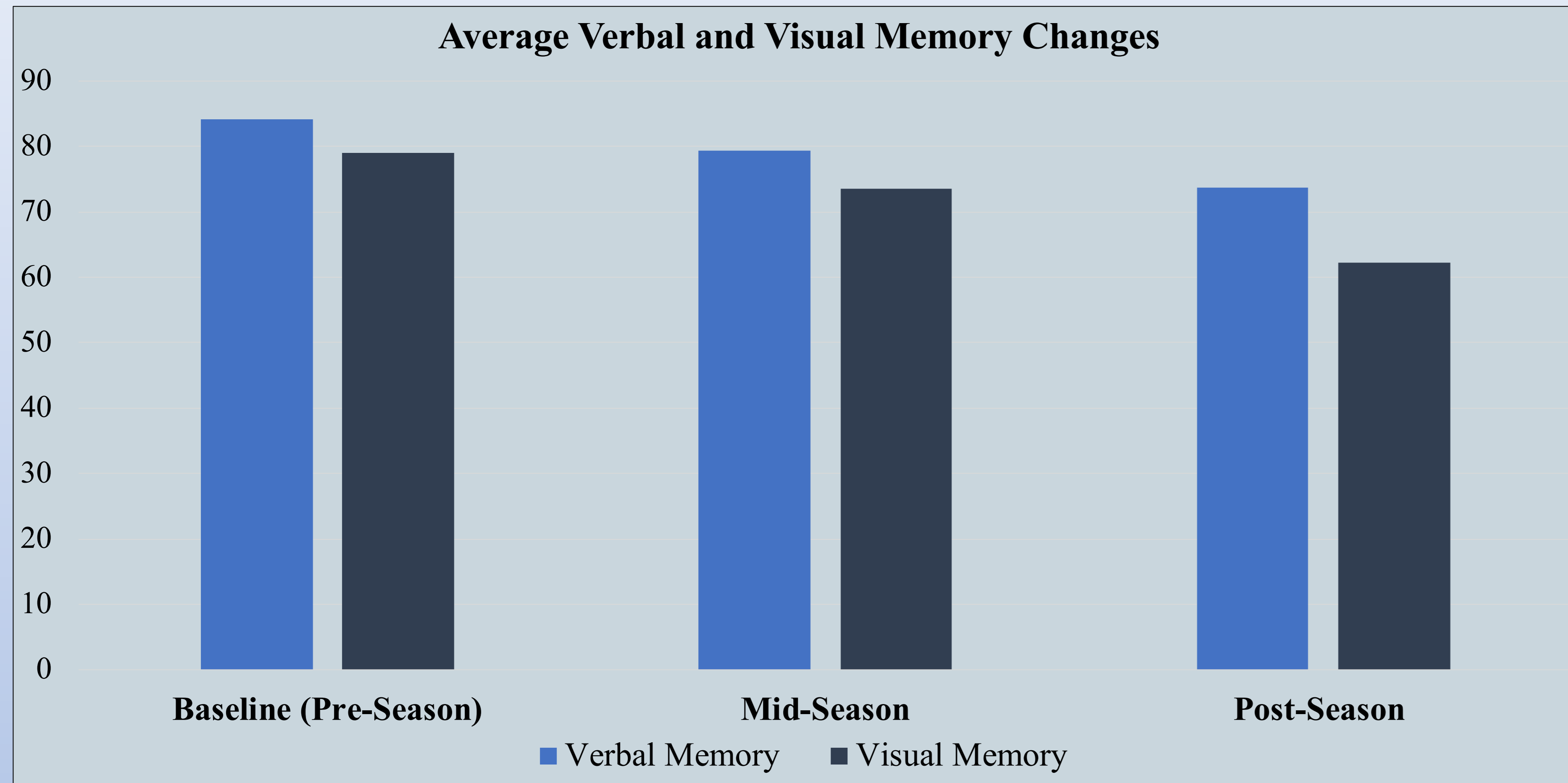
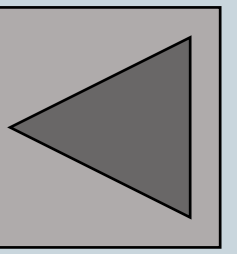
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Athlete Intelligence Cue Sports Sensor

<https://www.athleteintelligence.com/products/>

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ImPACT Neurocognitive Testing

<https://www.youtube.com/watch?v=qf8clRBtCnc>