

WPI

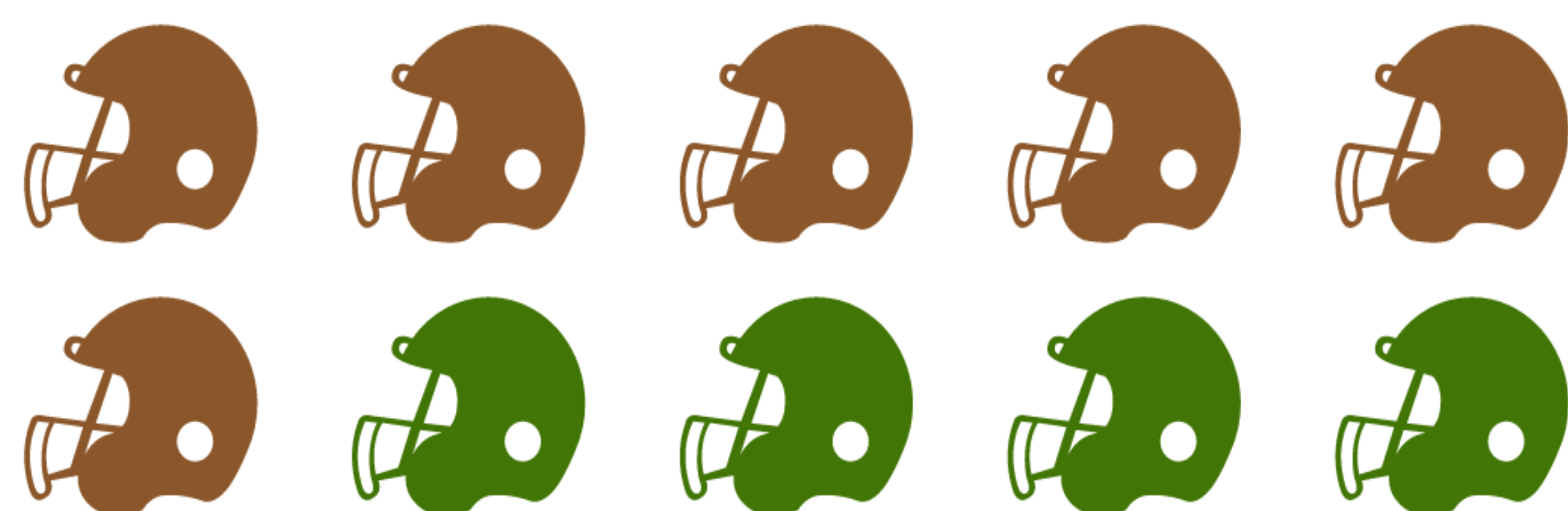
# Flag on the Play: Using Technology to Tackle Self Reporting of Concussions in Collegiate Football

Samantha Havel (BME), Benjamin Schmitt (CS), Frank Kennedy (ECE), Anne Cater (CHE)

Advisors: Professor Stoddard and Professor Rao



## Problem



**43% of college football players fail to report** their concussions in order to remain in a game, resulting in **mental and physical impairments** that can lead to **death**

## Impact on Players

Decrease in Cognitive and Motor Activity

Long Term Mental Illness and Suicide



**Multiplied Risk of another Concussion**

## Solution:

### Sensors and Tests Take Self Reporting Out of Play



#### 1. OPTICAL IMPACT MONITOR

The optical impact monitor uses an accelerometer to measure impact velocity. The OIM also monitors eye movement to mimic how the brain moves during impact.

#### 2. NANO COMPOSITE FOAM

Nano composite foam uses triboelectric response to measure impact and the amount of energy transferred to the head upon impact.

### App: The Concussion Playbook

1. Receives Data from Player Sensors and alerts when a potential concussion is detected
2. Provides quick, sideline concussion testing and analysis.



#### Baseline Testing

Visual, and Short-Term Memory Tests (Memorizing words, recite)

Tests will provide scores, used for analysis in the event of brain trauma.

#### Sideline Testing

Similar to baseline, quick short-term and visual memory tests

Will immediately recommend taking a player out or not

#### Post-Test Analysis

Compares baseline and post sideline test scores

Recommends a doctor visit if deemed necessary

## Implementation and Assessment: The Playbook

**NCAA**

Partner with the NCAA for case study testing

Implement helmet sensors to sample of Division 1 players

Collect data to assess accuracy of sensor to detect concussions

Device with app given to a sample of Division 1 trainers

Collect data to assess accuracy of short 5-minute test

Evaluate, modify, and revise the sensor app system

## Acknowledgements

Mara Brown – Assistant Athletic Trainer at Clark University  
Songbai Ji – Professor in Biomedical Engineering at Worcester Polytechnic Institute  
Scott Sperone – Football Defensive Coordinator at Worcester Polytechnic Institute

## Key References

Baugh, Christine M., Kiernan, Patrick T., Kroshus, Emily, Daneshaver, Daniel H., Montenegro, Phillip H., McKeen, Ann C., Stern, Robert A. (2015). Frequency of Head-Impact-Related Outcomes by Position in NCAA Division I Collegiate Football Players. *Curadeau, G. A., Sharma, N., & Rovin, R. A. (2011). Development of an iPhone application for sideline concussion testing. Neurosurgical Focus, 31(5), E4. doi:10.3171/2011.8.FOCUS11186*  
McCrea, M. (2001). Standardized mental status testing on the sideline after sport-related concussion. *Journal of Athletic Training, 36(3), 274.*