

INTRODUCTION

- Concussion-type mild traumatic brain injuries (mTBIs)** is a temporary injury to the head resulting from acceleration or deceleration of forces or blunt trauma and are most noted in impact sports. It has been cited that between 1.6 and 3.8 million sports-related mTBIs occur every year in the United States (1;2).
- The issue of mTBI is a prevalent one; however, there is **no clear method/technique** to assess the extent of the injury as it relates to mTBI and subsequent recommendations for return to play.
- Our laboratory has utilized an objective measure to identify concussions, called **EyeStat**, a **noninvasive diagnostic tool measuring changes in blink reflex parameters**.
- The **Eyestat** is a high-speed videography-based device used to trigger, record and analyze a blink reflex. It consists of a mask, stimulation system, housing unit, camera, external controller and processor, and a user interface.
- From the displacement profile for each eyelid, differences within and between subjects were assessed for the following parameters:
 - Ipsilateral
 - Contralateral
 - Latency
 - Differential Latency
 - Lid Velocity
 - Number of Oscillations
- For the purposes of testing this device, a blink is defined as a closure of the eyelids (upper and lower) that involves a sweep of the lids encompassing 75% of the open eye surface, without lateral eye movement.
- Prior research in our laboratory cited significant differences in various blink reflex parameters between active play, concussion, and baseline; however, the number of subjects for the active play population was small (N=10).

PURPOSE OF STUDY

Identify blink reflex parameters during football practice, providing an increased understanding of the effects of this exercise on blink parameters, and thereby provide a greater understanding between baseline, active play and concussion blink reflex outcomes.

METHODS

- Subjects include 47 Division I male football players between the ages of 18-22.
- Subjects were evaluated on multiple sessions during a 2-week period of football practices.
- During various points of practice, subjects completed the blink test and had their heart rate assessed.
- Blink reflex test include the following steps:
 - Subjects placed their face against apparatus
 - Puff of air directed to the corner of subject's eye to stimulate blink
 - Five puffs administered in random fashion over 20 second period
 - Videography captured and recorded blink at a recorded rate of 280 FPS, which gave each frame a 3.5 ms window

FIGURES



Figure 1: A subject in testing during practice

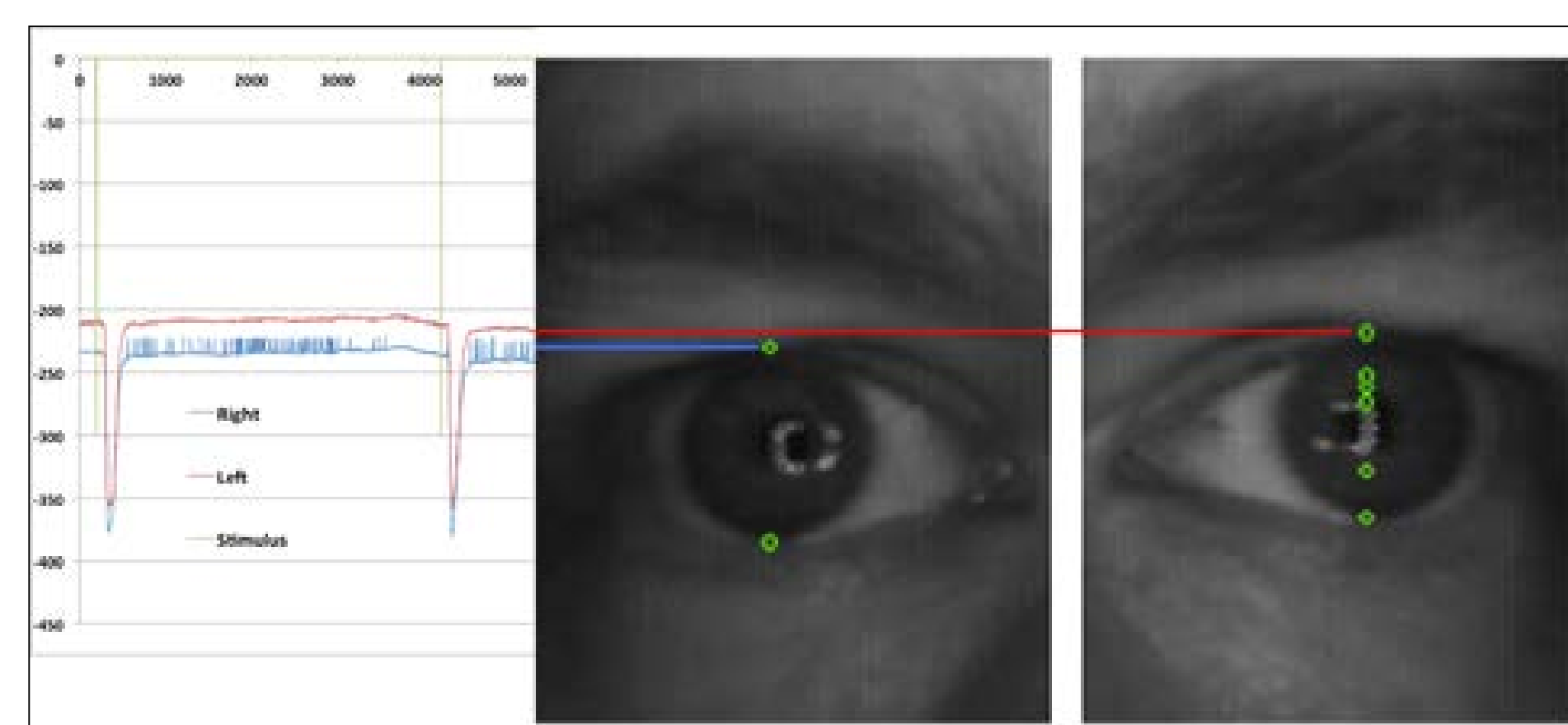
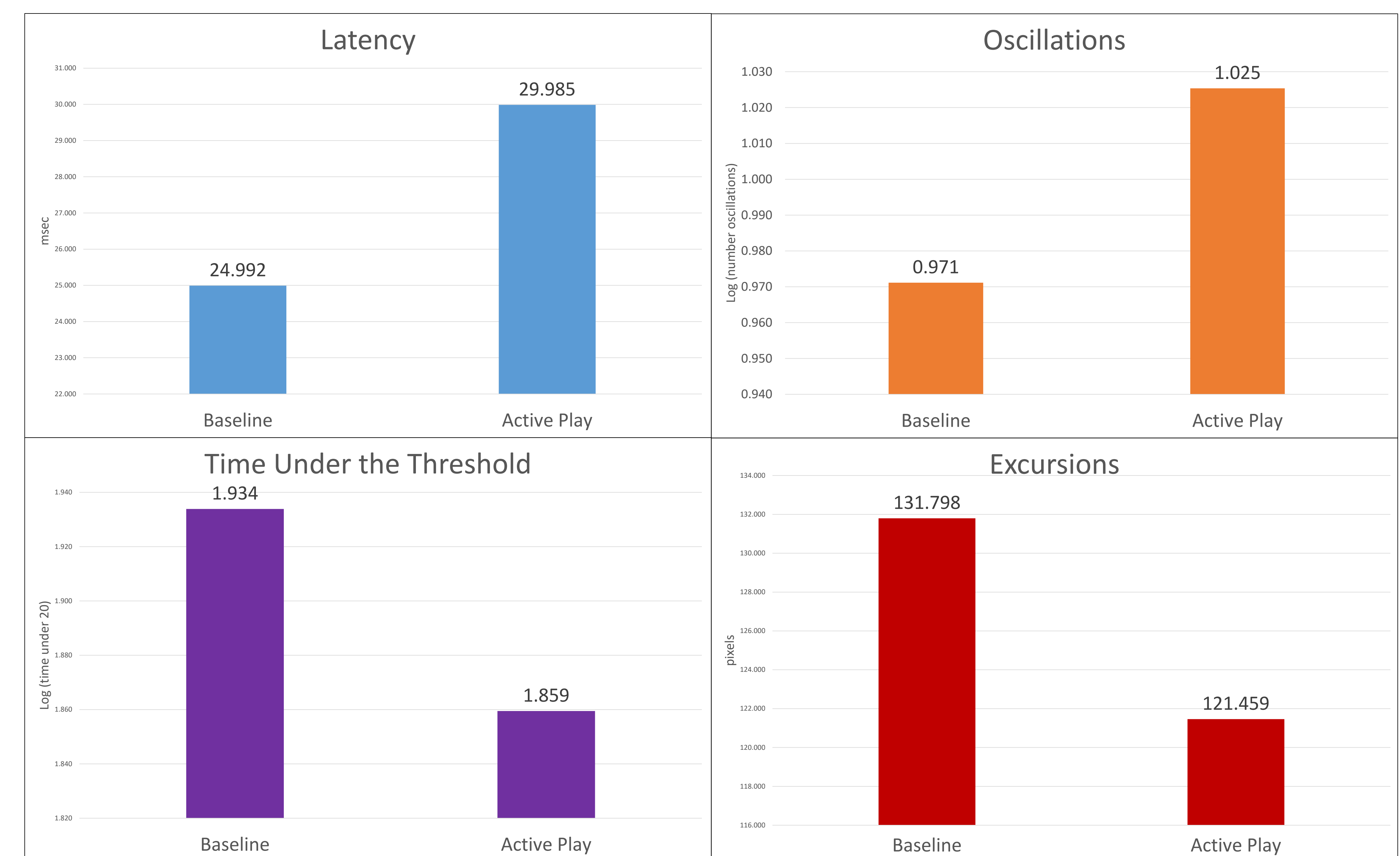


Figure 2: Eyelid location plot over a 30 second test period; right (blue) and left (red) eyelid tracking screen shot (cropped) from high speed video



Figure 3: EyeStat

RESULTS



Blink Parameter	Baseline	Active Play	Baseline-Active Play	Garner et al., 2018 Baseline-Active Play
Latency	24,992	29,985	-4.99	-5.67
Time Under the Threshold	1.934	1.859	0.07	0.05
Oscillations	0.971	1.025	-0.05	0.89
Excursions	131,798	121,459	10.34	7.86

DISCUSSION

The results of this study correlate with prior research in areas of latency, time under the threshold and excursions and support the changes in blink reflex parameters after football practice in Division I athletes. Future studies need to assess if these changes occur with individual physical activity or if it is related only to the practice of this sport.

REFERENCES

- Centers of Disease Control and Prevention. *What is Concussion?* 2015
- Centers for Disease Control and Prevention. *Get the Stats on Traumatic Brain Injury in the United States.* 2016

AUTHOR DISCLOSURE STATEMENT

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