

Head Impact Exposure in Youth Football Practice Drills

Mireille Kelley^{1,2}, Jillian Urban^{1,2}, Joeline Kane³, Joel Stitzel^{1,2}

¹Wake Forest School of Medicine, ²Virginia Tech-Wake Forest University Center for Injury Biomechanics, ³Wake Forest University

Abstract

Approximately 5 million athletes play organized football in the United States; 2,000 NFL, 100,000 college, 1.3 million high school, and 3.5 million youth athletes [1]. Head impacts have been studied at the high school, collegiate, and professional levels, however investigations of head impact exposure in youth football (ages 8-13) has been limited. Although impact data from youth athletes is scarce, preliminary data suggests that youth football players sustain head impacts approaching the magnitude of high school and collegiate players [1-3]. However, youth football studies have also shown that limiting contact in practice can significantly reduce head impact exposure in youth football athletes [1]. Further research is needed to identify specific drills, practice structure, and tackling techniques that can reduce head impact exposure. The objective of this study is to evaluate frequency and magnitude of practice drills within a single youth football team.

This study collected on-field head impact data from 9 individual athletes participating in a local age and weight restricted youth football team (10 and 11 year olds) over the course of a single season. Head impact data were collected and video was recorded for all pre-season, regular season, and play-off practices and games. Head impact data were collected with the Head Impact Telemetry (HIT) System head acceleration measurement device. Video recordings were used to verify head impacts recorded by the HIT System and identify drills during all practices. Drills were categorized as: dummy/sled tackling, install, kickoff practice, Oklahoma, one-on-one, open field tackling, passing drills, position skill work, multi-player tackle, tackling stations, and scrimmage.

A total of 3,761 head impacts were recorded during 36 practices and 11 games. Practices accounted for 2,171 (57.7%) head impacts. The median/95th percentile linear acceleration during practices was 20.1/56.1g. Open field tackling drills had a median/95th percentile linear acceleration of 24.6/95.68g, which was the highest magnitude of all drills practiced by the team. Despite only accounting for 2.4% of all practice head impacts, open field tackling drills accounted for 10.2% of all practice head impacts greater than 60g. One-on-one tackling drills had a median/95th percentile linear acceleration value of 22.6/64.8g. These drills accounted for 7.9% of all impacts greater than 60 g in practices, but only 5% of all practice impacts. Install was the most common drill with 1,216 impacts and had a median/95th percentile linear acceleration of 19.7/51.7g, which accounted for 56% of all practice head impacts and 43% of practice head impacts greater than 60g. The drills with the lowest magnitude impacts were passing drills and multi-player tackle.

This study demonstrates that practice drills can vary considerably in their head impact exposure. A better understanding of the contributing factors to head impact exposure at the youth level can inform teams and organizations on ways to structure their practice to limit high impact and high frequency drills and, ultimately, keep youth athletes safe.

References

- [1] Daniel, R.W., et al., Ann Biomed Eng, 2012. [2] Cobb, B.R., et al., Ann Biomed Eng, 2013. [3] Urban, J.E., et al., Ann Biomed Eng, 2013.