

**Paper 60: Effect of Mouthguard Type on Severity of Concussion During Game-Related College Football Competition. A 16-Season Prospective Study**

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**Objectives:** Prior studies have either claimed or disputed the role of mouthguard protection in reducing the incidence of concussion. Other than investigating a decrease in concussion rate, no long term studies have specifically compared the effect of type of mouthguard protection on the severity of concussion. The increasing incidence of head trauma in sport, the potential for long-term traumatic brain injury, and concerns of rising medical costs, dictate a focus on variables that may influence concussion severity in contact sports. Therefore, this study quantified the effect of mouthguard type on severity of concussion during game-related college football competition.

**Methods:** 40 universities were evaluated over 16 competitive seasons (2006-2021) across all Football Bowl Subdivision (FBS) conferences. Mouthguard type was divided into two groups based on dentist-fitted and self-fitted (generic/boil and bite). Outcomes of interest included concussion severity (simple: 0-10 days time loss, complex: > 10 days time loss), injury category, player position, injury situation, injury mechanism, elective imaging, and playing surface. Data were subject to multivariate analyses of variance (MANOVA) and Wilks'  $\lambda$  criteria using GLM procedures, and expressed as incidence rates (IR) per 10 game season.

**Results:** Of the 2,332 games documented, 9,563 total injuries were reported, resulting in 708 (589 simple, 119 complex) concussion cases, consisting of 653 player-to-player contacts and 55 player-to-surface impacts. MANOVA indicated significant main effects of mouthguard type by concussion severity ( $F_{1,705} = 3.587$ ;  $P = .028$ ), player position by team ( $F_{2,705} = 3.551$ ;  $P = .029$ ), player position by skill position ( $F_{8,699} = 2.373$ ;  $P = .016$ ), and injury mechanism ( $F_{6,701} = 4.467$ ;  $P < .001$ ). Post hoc analyses indicated a significantly lower ( $P = .023$ ) incidence of complex concussions [1.3, (95% CI, 0.9-1.6) vs 2.1 (1.7-2.5)], with a significantly higher ( $P = 0.014$ ) occurrence of simple concussions [8.7, (95% CI, 8.4-9.1) vs 7.9 (7.5- 8.3)] while wearing dentist-fitted versus self-fitted mouthguards, respectively. Although significantly greater ( $P < .05$ ) incidences of concussion were documented across offensive teams [4.3, (95% CI, 3.8- 4.8) vs 3.3 (2.9-3.8)], quarterbacks [0.9, (95% CI, 0.6-1.2) vs 0.3 (0.2-0.6)], and players tackled above the waist [2.8, (95% CI, 2.4-3.3) vs 1.7 (1.4-2.1)] than observed across other teams and injury mechanisms while wearing dentist-fitted as compared to self-fitted mouthguards, respectively. The majority of these cases, however, were diagnosed as simple concussions. Of the 1,150 games (49.3%) played on a 3-layer artificial turf ( $\geq 9.0$  lbs/ft<sup>2</sup>) infill system and 1,182 games (50.7%) played on natural grass, surface-related concussions on artificial turf ( $n = 26$ ; 3.7% of total concussions; 21 simple, 5 complex concussions) and natural grass ( $n = 30$ ; 4.2 % of total concussions; 23 simple, 7 complex concussions) were minimal and less severe on both surfaces than often perceived.

**Conclusions:** The significantly lower incidence of complex concussions documented with dentist-fitted mouthguards during college football competition may reflect greater shock absorption and redistribution of energy during head impact due to more optimal fit and fabrication when compared to self-fitted mouth protection, translating to less severity of trauma and more expedient return to play. This longitudinal study directly compares and addresses type of mouthguards as they relate specifically to concussion severity. Although findings of this study may be generalizable only to this level of football competition, further research is warranted into lower levels of competition, e.g., high school, youth football, where the use of self-fitted mouthguards is prevalent.

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