

## Does Overexertion Correlate with Increased Injury? The Relationship Between Player Load and Soft Tissue Injury in Professional American Football Players Utilizing Wearable Technology

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### Summary:

Sudden increases in player workload are more important predictors of myotendinous injury in NFL players than absolute workload.

### Abstract:

#### INTRODUCTION:

The development of injury prevention strategies is of great interest in efforts to maximize athlete health and safety. Understanding the mechanisms behind soft tissue injury is crucial in order to minimize injury over the course of a football season. Training overload is one potential etiology of soft tissue injury. Increased training loads have been associated with increased odds of injury in collision sports during all phases of training. To date, the relationship of training load on injury has not been investigated in professional American football players. The primary objective of this study was to determine correlation between player workload and soft tissue injury over the course of a football season utilizing wearable GPS technology.

#### METHODS:

This was a case control study conducted using prospectively collected data of professional football players during 2 seasons from 2014-2016. Player workloads were assessed during practice sessions of the preseason and regular season using GPS tracking and triaxial accelerometry from 2014-2016. Soft tissue injuries were recorded during each season. Injuries were divided into ligament sprains and myotendinous strains. Player workload during the week of injury and average weekly workload during the 4 weeks prior to injury were determined for each soft tissue injury. These variables were also determined in uninjured position-matched controls during the same week. Descriptive statistics were used to summarize player workload by training period. Matched pairs t-test was used to determine differences in player workload for injuries and controls. Subgroup analysis was also conducted to determine whether observed effects were confounded by training period and type of injury.

#### RESULTS:

Data was obtained over 2 NFL seasons from 2014-2016. A total of 136 lower extremity soft tissue injuries were recorded. 62/136 (45%) of injuries were sustained during preseason. 62/136 (45%) of injuries were sustained by either wide receivers or defensive backs. Ankle sprains (39/65) were the most common type of ligamentous injury while hamstring strains (35/71) were the most common type of ligamentous injury. 100 injuries that had complete GPS and clinical data were included in the analysis. Injuries were associated with significantly greater increases in player workload during the week of injury over workloads during the prior month when compared to uninjured controls (193.6, 95% CI 104.6-282.5 versus 101.2, 95% CI 27.7-174.8,  $p = .0038$ ). This effect was especially pronounced during preseason training in myotendinous injuries as these injuries were associated with significantly greater increases in training compared to uninjured controls (617.0, 95% CI 318.4-915.6 versus 384.1 95% CI

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137.5-630.8,  $p = .0095$ ). This effect was not observed in ligamentous injuries.

### DISCUSSION AND CONCLUSION:

These results demonstrate that injuries in professional football players are associated with sudden increases in training load over the course of a month. This effect seems to be especially pronounced during the preseason when player workloads are generally higher and in myotendinous injuries which are more susceptible to fatigue and overuse. These results suggest a gradual increase of training intensity is a potential method to reduce the risk of soft tissue injury. Preseason versus postseason specific training programs monitored with wearable technology may assist team athletic training and medical staff with developing programs to optimize player performance.