

Incidence of Knee Injuries on Artificial Turf Versus Natural Grass in National Collegiate Athletic Association American Football: 2004-2005 Through 2013-2014 Seasons

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The NCAA ISS has collected comprehensive injury and athlete exposure (AE) data from a large sample of collegiate institutions since 1982.¹⁴ As the **largest ongoing collegiate sports injury database in the world**, the NCAA ISS has proven to be a powerful tool for researchers investigating injury trends among collegiate athletes. Data from the 2009-2010 through 2013-2014 NCAA football seasons were recently collected by the NCAA ISS. **In light of this additional data collection and the lack of consensus among previous studies, the goal of the current study is to analyze this now decade-long data set to determine the effect of artificial turf on the rates of ACL, posterior cruciate ligament (PCL), MCL, medial meniscal, and lateral meniscal injuries in NCAA American football.**

METHODS

The NCAA Injury Surveillance System Men's Football Injury and Exposure Data Sets for the 2004-2005 through 2013-2014 seasons (**10 YEAR PERIOD**) were analyzed to determine the incidence of anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), medial meniscus, and lateral meniscal tear injuries.

Injury rates were calculated per 10,000 athlete exposures, and rate ratios (RRs) were used to compare injury rates during practices and competitions on natural grass and artificial turf in NCAA football as a whole and by competition level (Divisions I, Divisions II and III).

Mechanisms of injury were calculated for each injury on natural grass and artificial turf surfaces.

RESULTS

A total of 3,009,205 athlete exposures and 2460 knee injuries were reported from 2004 to 2014:

1389 MCL (56.4% of total)
522 ACL (21.2% of total)
269 lateral meniscal (11% of total)
164 medial meniscal (6.7% of total)
116 PCL (4.7%)

Athletes experienced all knee injuries at a significantly higher rate when participating in competitions as compared with practices. **i.e. injuries occurred on competition fields at a much higher rate than on practice fields.**

Athletes participating in competitions on artificial turf experienced PCL injuries at 2.94 times the rate as those playing on grass. **NOTE: PCL injuries however represented only 4.7% of total knee injuries.**

When stratified by competition level, Division I athletes participating in competitions on artificial turf experienced PCL injuries at 2.99 times the rate as those playing on grass, and **athletes in lower NCAA divisions (II and III) experienced ACL injuries at 1.63 times the rate and PCL injuries at 3.13 times the rate on artificial turf as compared with grass**

There was no statistically significant difference in the rate of MCL, medial meniscal, or lateral meniscal injuries on artificial turf versus grass when stratified by event type or level of NCAA competition. – representing 74% of the total injuries.

Mechanism of Injury on Turf vs Grass

Contact with another player was the predominant mechanism of injury for all injury types on artificial turf and natural grass. No statistically significant difference was found in the mechanism of ACL, PCL, MCL, medial meniscal, or lateral meniscal injuries on natural grass and artificial turf, indicating that the proportion of injury mechanisms was independent of playing surface.

DISCUSSION

Our results are inconsistent with a previous study by Meyers investigating the incidence, mechanisms, and severity of college football injuries, which found a decrease in overall, minor, substantial, and severe injuries on turf. Similarly, a study of high school football injuries by Meyers and Barnhill reported a higher incidence of ACL injuries on natural grass as compared with artificial turf. These studies included only games played on third-generation FieldTurf, perhaps suggesting that this turf type is not associated with increased injury rates. **However, studies showing increased rates of knee injuries on artificial turf** have included those analyzing games played only on first-generation AstroTurf, **only on third-generation FieldTurf**, and on all types of turf combined. Additional quality studies that break injury rates down by specific artificial turf type are needed to reconcile discrepancies within the literature and determine if artificial turf indeed increases knee injury rates or if specific turf types are associated with more injuries while others are protective.

PCL injuries in our study resulted from contact with the playing surface more commonly than other knee injuries. Perhaps differences in the attenuation and cushioning properties of artificial turf and natural grass contributed to the increased rate of PCL injuries observed on artificial turf. The statistically significant increases in knee injury rates warrant further investigation into why artificial turf increases specific knee injury risk, whether specific turf types increase injury rates while other might be protective, and **strategies to improve turf substrates and prevent such injuries.**

This study has a number of strengths and limitations. **This is the largest study to date investigating the effect of artificial playing surfaces** on the incidence of knee injuries in NCAA football. Previous studies compared lower extremity injury rates on grass and artificial turf; however, these studies grouped all knee injuries, focused on 1 particular injury (eg, ACL), or **were limited by small sample size.** (REFERS TO MEYERS STUDIES)

Overall, this decade of injury data comes from only a portion of the NCAA each season and therefore may not be completely representative of college football as a whole. However, with 10 seasons of data from all 3 NCAA divisions and with >3 million AEs reported, this analysis **includes a greater proportion of NCAA exposures and injuries than any previous study investigating the effect of playing surface on athletic injuries.**

CONCLUSION

Our findings add to the growing body of evidence that playing collegiate football on artificial turf surfaces is associated with increased rates of specific knee injuries.