

INJURY RESEARCH REVIEW – NATURAL GRASS AND SYNTHETIC TURF PLAYING SURFACES

Current research (2016-2019) results pertaining to injury comparisons between artificial turf and natural grass athletic fields

Includes information on:

- :: Football divisions pertaining to the NFL, NCAA Divisions I, II, and III, and High Schools
- :: Soccer divisions including MLS, Collegiate and Youth level players
- :: Rugby at the Professional level



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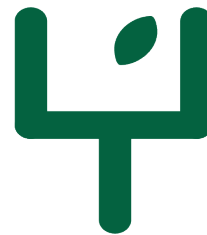
INJURY RESEARCH REVIEW – NATURAL GRASS AND SYNTHETIC TURF PLAYING SURFACES – FOOTBALL



ATHLETES EXPERIENCED HIGHER PCL (NCAA DIV. I, II, III) AND ACL (NCAA DIV. II, III) INJURIES ON ARTIFICIAL TURF WHEN COMPARED TO NATURAL GRASS, BUT NO STATISTICALLY SIGNIFICANT DIFFERENCE IN THE RATE OF MCL, MEDIAL MENISCAL, OR LATERAL MENISCAL INJURIES

A study in the American Journal of Sports Medicine (2019) investigated if there was a difference in the rate or mechanism of knee injuries between artificial turf and natural grass. A total of 3,009,205 athlete exposures and 2460 knee injuries were reported from 2004 to 2014: 1389 MCL, 522 ACL, 269 lateral meniscal, 164 medial meniscal, and 116 PCL. Athletes experienced all knee injuries at a significantly higher rate when participating in competitions as compared with practices. Athletes participating in competitions on artificial turf experienced PCL injuries at 2.94 times the rate as those playing on grass. 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. No difference was found in the mechanisms of knee injuries on natural grass and artificial turf.



HIGH SCHOOL FOOTBALL FIELDS SHOULD MINIMALLY CONTAIN 6.0 POUNDS OF INFILL PER SQUARE FOOT

A study in Orthopedic Journal of Sports Medicine (2019) investigated how artificial turf systems of various infill weights influenced game-related injuries in high school football. 1837 games were documented on various infill weights and 4655 total injuries were reported. The study found that as infill surface weight decreased, football trauma significantly increased across numerous playing conditions. There was significantly lower total and substantial traumas, concussions, shoe-surface interaction during contact trauma, surface impacts, muscle-tendon overload, cleat design



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influence, adverse weather trauma, lower extremity injuries, and turf age effect while athletes were competing on the higher (6.0 to ≥ 9.0 lb/ft²) infill weight systems compared with the lighter infill weight systems. Based on findings, high school football fields should minimally contain 6.0 pounds of infill per square foot.

TWO STUDIES MONITORING NFL PLAYERS FOUND NO SIGNIFICANT DIFFERENCE BETWEEN THE PLAYING SURFACE AND ACHILLES TENDON RUPTURE AND ACL INJURY RATES

A study in American Journal of Sports Medicine (2019) investigated if the lower extremity injury rate in National Football League (NFL) games is greater on contemporary synthetic turfs as compared with natural grass. Lower extremity injuries reported during 2012-2016 regular season games were included, with all 32 NFL teams reporting injuries. Results showed that play on synthetic turf resulted in a 16% increase in lower extremity injuries per play than that on natural turfgrass.

Achilles tendon ruptures during eight monitored National Football League seasons were evaluated to see if player position, time of injury, and playing surface influenced rupture rates. A total of 44 Achilles tendon ruptures were documented, however there was no difference between Achilles tendon rupture rates and playing surface in the games. (The Physician and Sportsmedicine, 2017)

In a study published in Orthopedic Journal of Sports Medicine (2016), researchers analyzed all publicly disclosed ACL tears occurring in NFL players between 2010 and 2013 to characterize injury trends and determine the incidence of reinjury. Type of playing surface was also documented. NFL players suffered 219 ACL injuries between 2010 and 2013. There was not a significant

difference in ACL injury rates per team games played between surfaces (0.050 for grass and 0.053 for turf fields).

A study published in the Orthopedic Journal of Sports Medicine (2016) sought to identify risk factors for NFL concussions and musculoskeletal injuries. A total of 480 games or 960 team games from the 2012-2013 and 2013-2014 regular seasons were included in the study. One of the results revealed the risk of team game shoulder injury was significantly increased for team games played on grass surfaces compared with synthetic surfaces.



RESULTS SHOWED THAT PLAY ON SYNTHETIC TURF RESULTED IN A 16% INCREASE IN LOWER EXTREMITY INJURIES PER PLAY THAN THAT ON NATURAL TURFGRASS.

A study published in American Journal of Sports Medicine (2015) systematically reviewed the available literature on risk of ACL rupture on natural grass versus artificial turf. A total of 10 studies with 963 ACL injuries met criteria for inclusion, all of which reported on soccer and football cohorts. Among these, 4 studies (753 ACL injuries) found an increased risk of ACL injury on artificial playing surfaces. All 4 of these articles were conducted using American football cohorts, and they included both earlier-generation surfaces (AstroTurf) and modern, 3rd-generation surfaces. Only 1 study in football players found a reduced risk of ACL injury on synthetic playing surfaces. No soccer cohort found an increased risk of ACL injury on synthetic surfaces. High-quality studies support an increased rate of ACL injury on synthetic playing surfaces in football, but there is no apparent increased risk in soccer.



HIGH-QUALITY STUDIES SUPPORT AN INCREASED RATE OF ACL INJURY ON SYNTHETIC PLAYING SURFACES IN FOOTBALL, BUT THERE IS NO APPARENT INCREASED RISK IN SOCCER

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**OUT OF 2174
IN-GAME
INJURIES,
1.54 INJURIES PER
GAME WERE
RECORDED ON
ARTIFICIAL TURF AND
1.49 INJURIES PER
GAME WERE ON
NATURAL GRASS**

A study published in American Journal of Sports Medicine (2019) compared injury rates and rates of individually categorized types of injury experienced between artificial turf and natural grass in elite-level Major League Soccer athletes. A total of 2174 in-game injuries were recorded during the study period, with 1.54 injuries per game on artificial turf and 1.49 injuries per game on natural grass. Within injury subgroups, overall ankle injury, Achilles injury, and ankle fracture were found to have a statistically higher incidence on artificial turf. Artificial turf was found to be noninferior to natural grass for overall foot injury and forefoot injury. No statistically significant differences were found in knee injuries between the 2 surfaces.

A study in Orthopaedic Journal of Sports Medicine (2017) investigated the influence of an artificial turf field on sports injuries in a university soccer team. A total of 397 male soccer players who were members of a single university soccer team were

surveyed over a 12-year period, from April 2003 to March 2015. During this period, the team played for 4 years on a soil field (2003-2006) and 8 years on artificial turf (2007-2014). The effect of changes in the artificial turf on the incidence rate of sports injuries (injury rate per 1000 athlete-exposures) was analyzed.



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THE STUDY DEMONSTRATES A SUBSTANTIAL EQUIVALENCE IN INJURY RISK ON NATURAL GRASS AND ARTIFICIAL TURF IN ELITE PROFESSIONAL SOCCER ATHLETES DURING OFFICIAL MATCHES

After conversion to artificial turf, there was a significant increase in the incidence of upper extremity trauma. However, with the addition of rubber chips, the incidence of lower extremity muscle strain significantly declined.

A 2018 study in Scandinavian Journal of Medicine & Science in Sports studied risk factors for soccer injuries in young players aged 7-12 years. Risk factors that were analyzed included age, sex, playing position, preferred foot, and age-independent body height, body mass, and BMI. Injury risk in relation to playing surface was also analyzed. In total, 6038 player seasons with 395,295 hours of soccer exposure were recorded and 417 injuries occurred. Results found that injury risk increased by 46% per year of life. Left-footed players had a higher injury risk for training injuries compared to right-footed players. Injury risk was increased in age-adjusted taller players. Higher match-training ratios were associated with a lower risk of match injuries. Injury risk was increased on artificial turf and lower during indoor sessions compared to natural grass.

A study in the Scandinavian Journal of Medicine and Science in Sports (2017) investigated the difference in the injury incidence in male elite professional soccer players on artificial turf and natural grass. During the 2011-2012 seasons, data was collected from 36 games with 391 players on two artificial turf fields and compared with data collected from 372 players on two natural grass fields. A total of 43 injuries were recorded with 23 occurring on artificial turf and 20 on natural grass with no statistical differences. The study demonstrates a substantial equivalence in injury risk on natural grass and artificial turf in elite professional soccer athletes during official matches.



INJURY RISK WAS INCREASED ON ARTIFICIAL TURF AND LOWER DURING INDOOR SESSIONS COMPARED TO NATURAL GRASS

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**IN RUGBY MATCHES,
OVERALL
INJURY
RISK IS
SIMILAR
BETWEEN ARTIFICIAL
TURF AND NATURAL
GRASS PLAYING
SURFACES**

A study in *Journal of Sports Sciences* (2018) examined the effect of playing surface on match injury types within 157 players of 2 UK professional rugby union clubs. Over 3 seasons, 209 matches were played with 96 on artificial surfaces and 113 on natural grass. There was no difference in overall injury risk between the 2 playing surfaces. Injury incidence on artificial was 80.2 per 1000 match-hours and 81.9 per match-hours on natural grass. Natural grass surfaces showed a higher rate of concussion and chest injuries, while artificial surfaces showed a higher rate of thigh hematoma and injury to players being tackled.

A study in *Muscles Ligaments Tendons Journal* (2017) studied the influence of playing surface on injury risk in Italian elite rugby players. The group was evaluated for 23,840 minutes, with 1,440 minutes during matches and 22,400 minutes during training sessions. 37 traumatic injuries were recorded with no significant differences found in the overall risk injury between natural grass and artificial turf. 39 overuse injuries were

recorded with significant differences in the overall risk injury between natural grass and artificial turf. The study concluded that artificial turf seems to be safe in regards to traumatic injury while it seems to be a risk factor for overuse injuries.

A study in the *Scandinavian Journal of Medicine & Science in Sports* (2016) investigated the influence of an artificial playing surface on injury risk and perceptions of muscle soreness in elite English Premiership Rugby Union players. Time loss (from 39.5 matches) and abrasion (from 27 matches) injury risk was compared between matches played on artificial turf and natural grass. Abrasions were substantially more common on artificial turf, although the majority of these were minor and only two resulted in any reported time loss. Muscle soreness was consistently higher over the 4 days following a match on artificial turf in comparison with natural grass, although the magnitude of this effect was small. These results suggest that overall injury risk is similar for the two playing surfaces.

