SPORTS TURF INJURY RESEARCH SUMMARY

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T.J. Serensits

Penn State's Center for Sports Surface Research

http://ssrc.psu.edu

Study	Background	Major Findings	Strengths and Limitations
Aoki, et al., 2010 Incidence of injury among adolescent soccer players: a comparative study of artificial and natural grass turfs	- Compared injuries to Japanese youth soccer players (age 12-17) on natural turf and synthetic turf (training and gameplay) - 332 participants followed for 1 year - 233 athletes on natural grass, 99 on synthetic turf - investigated acute injuries and chronic pain	- Total acute injuries: 256 on natural turf, 169 on synthetic turf - 47% of players playing on natural grass complained of chronic pain; 52% of players playing on synthetic turf complained of chronic pain - There was no difference in acute injuries on natural grass or synthetic turf in both training and gameplay - Higher incidence of low back pain (chronic) for participants training on synthetic turf	<u>Strengths</u> - Evaluated chronic pain in addition to acute injuries - evaluated youth athletes <u>Limitations</u> - small study - No mention of the manufacturer of the synthetic turf - No description of the type of natural turf and condition
Bjorneboe, J. et al., 2010 Risk of injury on third generation artificial turf in Norwegian professional football	- Compared injury rates in male professional soccer in Norway (14 teams) - Injuries were recorded by team medical staffs from 2004 to 2007	- Match injury rate: 17.0 injuries per 1000 match hours on grass, 17.6 injuries per 1000 match hours on synthetic turf (no statistical difference) - Training injuries: 1.8 (grass), 1.9 (synthetic turf) per 1000 training hours (no statistical difference) - No difference in injury location or severity	<u>Strengths</u> - Injuries reported by trained medical staffs <u>Limitations</u> - No description of field conditions

Study	Background	Major Findings	Strengths and Limitations
Ekstrand et al., 2010 Comparison of injuries sustained on artificial turf and grass by male and female elite football players	- Compared incidences and patterns of injury for female and male soccer players - 20 teams (15 male, 5 female); 767 players - Injuries from Feb 2003 to Oct 2008 - 2105 injuries (1791 male, 314 female) - 71% injuries were traumatic (acute); 29% were overuse	- No difference in the nature of overuse injuries for men or women between surfaces - No difference in incidence of acute injuries for men or women between surfaces - Trend (no statistical difference): on synthetic – men more less likely to sustain quadriceps strain and more likely to sustain ankle sprain - Trend (no statistical difference): incidence of muscle/rupture strains in matches for men were lower on synthetic turf	<u>Strengths</u> - First study to evaluate the incidence and pattern of injury for female elite players on synthetic <u>Limitations</u> - Small number of women in study - No description of natural turf conditions
Fuller et al., 2010 Risk of injury associated with rugby union played on artificial turf	- Evaluated incidence, nature, and cause of injury in rugby - 2 seasons, match injuries: 6 teams in Hong Kong (282 players); training injuries: 2 teams in English Premiership (169 players) - <u>Matches</u> synthetic turf player hours: 1360 natural grass player hours: 1040 Total match injuries: 80 (52 on synthetic, 28 natural grass) - <u>Training</u> 8924 player hours (all synthetic) Compared injury rates from Brooks et al., 2005 Total injuries (synthetic): 27	- No difference in overall incidence or severity of injuries during matches or training - ACL injuries 4 times higher on synthetic turf, but statistically there was no difference	<u>Strengths</u> - First study comparing injury rates on synthetic turf and natural grass for rugby <u>Limitations</u> - Injuries not matched with manufacturer of synthetic turf - No description of natural turf conditions

Study	Background	Major Findings	Strengths and Limitations
Meyers, 2010 Incidence, Mechanisms, and Severity of Game-Related College Football Injuries on FieldTurf Versus Natural Grass: A 3-Year Prospective Study	- 3-year comparison of game related collegiate football injuries on FieldTurf and natural turfgrass (24 universities) - 465 games - 230 on FieldTurf (49.5%), 235 on natural grass (50.5%) - Injuries evaluated and reported by certified athletic trainers	- Total injuries: 2253: FieldTurf: 1050 (46.6%), Natural grass: 1203 (53.4%) - Total injuries per team game: FieldTurf: 4.6 Natural grass: 5.1 - Minor injuries per team game: FieldTurf: 3.8 Natural grass: 4.0 - Substantial injuries per team game: FieldTurf: 0.50 Natural grass: 0.72 - Severe injuries per team game: FieldTurf: 0.27 Natural grass: 0.41 - No differences between surfaces in: Head injury Knee injury Shoulder injury - Playing on FieldTurf resulted in a general lower injury risk than playing on natural grass	Strengths - Certified athletic trainers evaluated injuries and directly reported data - Followed several universities during the 3-year period, which prevented seasonal injury fluctuations and individual team effects - Direct comparison of FieldTurf versus natural grass - Large sample size allows for more power in statistical testing Limitations - inherent variability in high-collision sport - Limited tracking of weather conditions - No tracking of field characteristics (Gmax, infill depth, etc.) - No tracking of equipment being used when injury occurred (cleat type, padding, etc.)
Soligard et al., 2010 Injury risk on artificial turf and grass in youth tournament football	- Youth male and female soccer players (ages 13-19) - tracked 60,000 athletes over 4 years in Norway Cup tournaments	- Injury rate: 39.2 per 1000 match hours (34.2 on synthetic turf; 39.7 on natural grass) - No statistical difference in overall injury risk - Lower risk of ankle injuries and higher risk of back/spine and shoulder/collar bone on synthetic turf	Limitations - Injuries reported by coaches – not trainers - No description of field conditions

Study	Background	Major Findings	Strengths and Limitations
Fuller et al., 2007 Part 1 Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players. Part 1: match injuries	- Compared incidence, nature, severity, and cause of injuries on synthetic turf and natural turf during collegiate soccer games for men and women - 2 seasons of data from NCAA Injury Surveillance System - Teams: Men: 52 (year 1), 54 (year 2) Women: 64 (year 1), 72 (year 2) - Athletic trainers evaluated and recorded results	- Total injuries: men: 848, women: 946 - There were no major differences in the incidence, severity, nature or cause of match injuries sustained on third generation synthetic turf and grass by either male or female players	<u>Strengths</u> - Men and women athletes - Large sample size <u>Limitations</u> - No differentiation between manufacturers of synthetic turf - Limited tracking of weather conditions - No tracking of field characteristics (Gmax, infill depth, etc.) - No tracking of equipment worn when injury occurred (shoe type, etc.)
Fuller et al., 2007 Part 2 Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players. Part 2: training injuries	- same as above except training injuries instead of game injuries	- Total injuries: men: 818, women: 774 - There were no major differences in the incidence, severity, nature or cause of training injuries sustained on new generation artificial turf and grass by either male or female players.	Same as above
Steffen et al., 2007 Risk of injury on artificial turf and natural grass in young female football players	- Injury comparison of young female soccer players in the U-17 soccer league in Norway (average age = 15.4) - 2020 players from 109 teams - Injuries tracked for 1 season - Injuries monitored and reported by physical therapists	- Total injuries: 526 - Incidence of acute injuries during both gameplay and training was not different for synthetic turf and natural grass - In games, the incidence of serious injury was higher on synthetic turf than natural turf (twice as many) - Overall risk of injury is the same on both surfaces	<u>Strengths</u> - Only study to evaluate injuries related to surface type for youth (females) <u>Limitations</u> - Relatively small sample size of injuries (limited statistical power) - No tracking of extrinsic factors (weather conditions, fitness level, field maintenance, player equipment)

Study	Background	Major Findings	Strengths and Limitations
Ekstrand, et al., 2006 Risk of injury in elite football played on artificial turf versus natural grass: a prospective two-cohort study	- Injury risk comparison for elite, male soccer players on synthetic turf and natural grass - 290 players from 10 elite soccer clubs with synthetic turf; 202 players Swedish Premier League with either synthetic turf or natural grass	- Total injuries: 775 - Overall incidence of injury during training and games did not differ between synthetic turf and natural grass - Increased risk of ankle sprains during games on synthetic turf compared to natural grass (4.83 v 2.66 injuries/1000 match hours) -Lower incidence of injury for teams playing games on synthetic turf than natural grass (15.26 v 23.08 injuries/1000 match hours)	<u>Strengths</u> - Elimination of some confounding factors because one cohort played home games on synthetic turf and away games on natural grass <u>Limitations</u> - Small sample size - No distinction between synthetic turf products - No tracking of extrinsic factors (weather conditions, fitness level, field maintenance, player equipment)
Meyers and Barnhill, 2004 Incidence, causes, and severity of high school football injuries on FieldTurf versus natural grass: a 5-year prospective study	- Comparison of incidence, causes, and severity of high school football injuries on FieldTurf versus natural grass - 8 high school teams (4 teams for first 4 years, 8 teams in fifth year) - 240 total games (150 on FieldTurf, 90 on natural grass) - Injuries reported by certified athletic trainers	- Total injuries: 353 - <u>On FieldTurf, higher incidence of:</u> Zero-day time-loss injuries Non-contact injuries Surface and epidermal injuries Muscle-related trauma Injuries during higher temperatures - <u>On natural grass, higher incidence of:</u> 1-2 day time-loss injuries 22+ day time-loss injuries Head and neural trauma Ligament injuries - Majority of injuries on natural turfgrass occurred under dry field conditions.	<u>Strengths</u> - Certified athletic trainers evaluated injuries and directly reported data - Direct comparison of FieldTurf versus natural grass <u>Limitations</u> - small sample size - variability in high-collision sport - Limited tracking of weather conditions - No tracking of field characteristics (Gmax, infill depth, etc.) - No tracking of equipment being used when injury occurred (cleat type, padding, etc.)

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