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### Comparison of Injuries Sustained on Grass and Artificial Turf by USL1 Men's Soccer Team. Part 1: Match Related Injuries

Michael Osterholt

Jason Meredith

Jenenne A. Geske

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Michael Osterholt, MD; T. Jason Meredith, MD, CAQSM; Jenenne Geske, PhD Department of Family Medicine, University of Nebraska Medical Center, Omaha, NE

### Introduction

- Artificial turf fields have gained tremendous popularity due to their durability, minimal maintenance, and ability withstand heavy use.
- Early generation Artificial turf fields were associated wit rates of injuries.
- Artificial turf fields have seen significant advancement ir technology and manufacturing leading to a much differe product from its first introduction<sup>1.</sup>
- Athlete health and safety as it pertains to playing surface reoccurring topic for debate.

## Purpose

To analyze and compare the incidence, location, and type sustained on Artificial Turf (AT) and Natural Grass (NG) play surfaces for a United Soccer League, League 1 (USL1) Men Team.

Table 1. Comparison of injury rates on artificial turf and natural grass categorized by location of injury.

Exposed Group (Artifical Turf)		Unexp	osed Group (Natural Grass)	Comparison - Artificial Turf Vs. Natural Grass				
	Incident rate per 1000		Incident rate per 1000	Incident Rate	Lower 95% Cl	Upper 95% Cl		
# injuries	person-hours (95% Cl)	# injurie	s person-hours (95% CI)	Ratio	(rate ratio)	(rate ratio)	р	
11	25.71 (14.24 to 46.42)	21	19.35 (12.62 to 29.68)	1.33	0.64	2.76	0.445	
2	4.67 (1.17 to 18.69)	13	11.98 (6.96 to 20.63)	0.39	0.09	1.73	0.215	
8	18.70 (9.35 to 37.39)	12	11.06 (6.28 to 19.47)	1.69	0.69	4.14	0.250	
48	112.18 (84.54 to 148.86)	129	118.87 (100.03 to 141.26)	0.94	0.68	1.31	0.732	
5	11.69 (4.86 to 28.08)	21	19.35 (12.62 to 29.68)	0.60	0.23	1.60	0.311	
12	28.05 (15.93 to 49.38)	35	32.25 (23.16 to 44.92)	0.87	0.45	1.68	0.676	
5	11.69 (4.86 to 28.08)	10	9.21 (4.96 to 17.13)	1.27	0.43	3.71	0.664	
14	32.72 (19.38 to 55.25)	31	28.57 (20.09 to 40.62)	1.15	0.61	2.15	0.673	
10	23.37 (12.58 to 43.44)	23	21.19 (14.08 to 31.89)	1.10	0.52	2.32	0.796	
2	4.67 (1.17 to 18.69)	9	8.29 (4.32 to 15.94)	0.56	0.12	2.61	0.463	
69	161.26 (127.37 to 204.18)	175	161.26 (139.05 to 187.01)	1.00	0.14	1.32	1.000	
	# injuries         11         2         8         48         5         12         5         12         14         10         2	Incident rate per 1000# injuriesperson-hours (95% Cl)1125.71 (14.24 to 46.42)24.67 (1.17 to 18.69)24.67 (1.17 to 18.69)818.70 (9.35 to 37.39)48112.18 (84.54 to 148.86)511.69 (4.86 to 28.08)1228.05 (15.93 to 49.38)511.69 (4.86 to 28.08)1432.72 (19.38 to 55.25)1023.37 (12.58 to 43.44)24.67 (1.17 to 18.69)	Incident rate per 1000# injuriesperson-hours (95% Cl)# injuries1125.71 (14.24 to 46.42)2124.67 (1.17 to 18.69)13818.70 (9.35 to 37.39)1248112.18 (84.54 to 148.86)129511.69 (4.86 to 28.08)211228.05 (15.93 to 49.38)35511.69 (4.86 to 28.08)101432.72 (19.38 to 55.25)3124.67 (1.17 to 18.69)9	Incident rate per 1000# injuriesIncident rate per 1000# injuriesperson-hours (95% CI)# injuriesperson-hours (95% CI)1125.71 (14.24 to 46.42)2119.35 (12.62 to 29.68)24.67 (1.17 to 18.69)1311.98 (6.96 to 20.63)818.70 (9.35 to 37.39)1211.06 (6.28 to 19.47)48112.18 (84.54 to 148.86)129118.87 (100.03 to 141.26)511.69 (4.86 to 28.08)2119.35 (12.62 to 29.68)1228.05 (15.93 to 49.38)3532.25 (23.16 to 44.92)511.69 (4.86 to 28.08)109.21 (4.96 to 17.13)1432.72 (19.38 to 55.25)3128.57 (20.09 to 40.62)1023.37 (12.58 to 43.44)2321.19 (14.08 to 31.89)24.67 (1.17 to 18.69)98.29 (4.32 to 15.94)	Incident rate per 1000 # injuriesIncident rate per 1000 person-hours (95% CI)Incident rate per 1000 person-hours (95% CI)Incident Rate Ratio1125.71 (14.24 to 46.42)2119.35 (12.62 to 29.68)1.3324.67 (1.17 to 18.69)1311.98 (6.96 to 20.63)0.39818.70 (9.35 to 37.39)1211.06 (6.28 to 19.47)1.6948112.18 (84.54 to 148.86)129118.87 (100.03 to 141.26)0.94511.69 (4.86 to 28.08)2119.35 (12.62 to 29.68)0.601228.05 (15.93 to 49.38)3532.25 (23.16 to 44.92)0.87511.69 (4.86 to 28.08)109.21 (4.96 to 17.13)1.271432.72 (19.38 to 55.25)3128.57 (20.09 to 40.62)1.151023.37 (12.58 to 43.44)2321.19 (14.08 to 31.89)1.1024.67 (1.17 to 18.69)98.29 (4.32 to 15.94)0.56	Incident rate per 1000 # injuriesIncident rate per 1000 person-hours (95% CI)Incident rate per 1000 person-hours (95% CI)Incident Rate RatioLower 95% CI (rate ratio)1125.71 (14.24 to 46.42)2119.35 (12.62 to 29.68)1.330.6424.67 (1.17 to 18.69)1311.98 (6.96 to 20.63)0.390.09818.70 (9.35 to 37.39)1211.06 (6.28 to 19.47)1.690.6948112.18 (84.54 to 148.86)129118.87 (100.03 to 141.26)0.940.68511.69 (4.86 to 28.08)2119.35 (12.62 to 29.68)0.600.231228.05 (15.93 to 49.38)3532.25 (23.16 to 44.92)0.870.45511.69 (4.86 to 28.08)109.21 (4.96 to 17.13)1.270.431432.72 (19.38 to 55.25)3128.57 (20.09 to 40.62)1.150.611023.37 (12.58 to 43.44)2321.19 (14.08 to 31.89)1.100.5224.67 (1.17 to 18.69)98.29 (4.32 to 15.94)0.560.12	Incident rate per 1000 # injuriesIncident rate per 1000 person-hours (95% CI)Incident rate per 1000 # injuriesIncident rate per 1000 person-hours (95% CI)Incident Rate RatioLower 95% CIUpper 95% CI1125.71 (14.24 to 46.42)2119.35 (12.62 to 29.68)1.330.642.7624.67 (1.17 to 18.69)1311.98 (6.96 to 20.63)0.390.091.73818.70 (9.35 to 37.39)1211.06 (6.28 to 19.47)1.690.694.1448112.18 (84.54 to 148.86)129118.87 (100.03 to 141.26)0.940.681.31511.69 (4.86 to 28.08)2119.35 (12.62 to 29.68)0.600.231.601228.05 (15.93 to 49.38)3532.25 (23.16 to 44.92)0.870.451.68511.69 (4.86 to 28.08)109.21 (4.96 to 17.13)1.270.433.711432.72 (19.38 to 55.25)3128.57 (20.09 to 40.62)1.150.612.151023.37 (12.58 to 43.44)2321.19 (14.08 to 31.89)1.100.522.3224.67 (1.17 to 18.69)98.29 (4.32 to 15.94)0.560.122.61	

Table 2. Comparison of injury rates on artificial turf and natural grass categorized by type of injury.

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	Exposed Group (Artifical Turf)			Unexposed Group (Natural Grass)			Comparison - Artificial Turf Vs. Natural Grass				
		Incident rate per 1000			Incident rate per 1000		Incident Rate	Lower 95% Cl	Upper 95% Cl		
Type of Injury	# injuries	person-hours (95% Cl)	4	# injuries	person-hours (95% Cl)		Ratio	(rate ratio)	(rate ratio)	р	
Fracture/Bone stress	1	2.34 (0.33 to 16.59)		3	2.76 (0.89 to 8.57)		0.85	0.09	8.13	0.884	
Joint (non bone)ligament/cartilage	8	18.70 (9.35 to 37.39)		24	22.12 (14.82 to 32.99)		0.85	0.38	1.88	0.681	
Muscle/Tendon	29	67.78 (47.10 to 97.53)		62	57.13 (44.54 to 73.28)		1.19	0.76	1.84	0.447	
Contusion	19	44.41 (28.32 to 69.62)		66	60.82 (47.78 to 77.41)		0.73	0.44	1.22	0.227	
Laceration/Skin Lesion	4	9.35 (3.51 to 24.91)		5	4.61 (1.92 to 11.07)		2.03	0.54	7.56	0.292	
Central/Peripheral Nervouse system	8	18.70 (9.35 to 37.39)		12	11.06 (6.28 to 19.47)		1.69	0.69	4.14	0.250	
Other	_	_		3	2.76 (0.89 to 8.57)		_	_	_	-	
Total	69	161.26 (127.37 to 204.18)		175	161.26 (139.05 to 187.01)		1.00	0.14	1.32	1.000	

# **Comparison of Injuries Sustained on Grass and Artificial Turf by USL1** Men's Soccer Team. Part 1: Match Related Injuries.

### Methods

in America y to	<ul> <li>This is a retrospective cohort study using inju- Team over the course of three USL1 seasons</li> <li>The team's Certified Athletic Trainer meticul</li> </ul>
th higher	related injuries requiring evaluation over the included anatomic location and type of injur
n ent	<ul> <li>geographic location and playing surface in w</li> <li>Injuries categorized by whether they occurre</li> <li>AT (exposed group). Data further subdivided</li> </ul>
ce is a	<ul> <li>injury sustained utilizing the same categories</li> <li>Player match exposure time calculated by re including extra time.</li> </ul>
	<ul> <li>Incidence rates were reported as number of</li> </ul>
	hours with 95% confidence intervals. Incider unexposed groups were compared using and
of injuries	Sterne <sup>4</sup> .
ying i's Soccer	<ul> <li>Differences were determined to be significant ratio (equivalent to relative risk) did not inclusive value of the two-sided z test for the comparis</li> </ul>

- jury data from a USL1 Men's Soccer (2020-2022).
- lously documented all match e three-year period. Information red incurred as well as the which the injury took place. ed on NG (unexposed group) versus into anatomic location and type of es as Fuller *et al*<sup>2,3</sup>.
- eviewing length of matches
- injuries per 1000 player match nt rates for the exposed and alyses as detailed in Kirkwood and
- int if the 95% CI of the incidence ude the value of 1.0 and the p rison of rates was < 0.05.

- 427.87 hours on AT
  - 1085.23 hours on NG
- an identical 161.26.
- (Table 1).
- incident rates (Table 2).
- rates (Table 2).
- statistically significant (Table 2).

- over three seasons.
- when stratifying the data by location and type of injury.
- NG.

- Study does not address injury severity.
- extrapolate brand or type of turf field.



**References:** 



### Results

• Three-year cumulative data for match exposure hours:

• Incident rates for total match related injuries on AT and NG were

• Lower limb was the most frequently injured location on both AT and NG with no significant difference in injury incident rates

• Muscle/Tendon was the most common type of injury on AT and second most common on NG with no significant different in injury

• Contusion was the most common type of injury on NG and second most common on AT with no significant different in injury incident

• Laceration/skin lesion and central/peripheral nervous system injuries were higher on AT compared to NG; however, it was not

## Conclusions

• Our study found no statistically significant differences in match related injuries among AT and NG for a Men's USL1 Soccer Team

• Additionally, no statistically significant differences were seen

• This study suggests AT may be a safe and effective alternative to

• Our research agrees with prior studies evaluating the risk of injury on AT and NG in various levels of soccer competition best

summed up by a meta-analysis performed by Williams et  $al^5$ .

### Limitations

• Although our findings could be extrapolated across all sports, this study specifically looks at men's professional soccer injuries.

• Larger data sets may elucidate statistically significant differences among location or type of injuries sustained.

• All artificial turf fields were 3<sup>rd</sup> generation fields, however, did not

