

HOW SAFE ARE THE NEW ARTIFICIAL TURF FIELDS?

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Shortly after the opening of the Houston Astrodome in 1965, turfgrass specialists realized the difficulty of growing natural grass indoors. The solution was the introduction of Astro-turf. AstroTurf was developed as a short-pile carpet with pad laid over a concrete surface. The advantage for the stadium owners was the very low maintenance costs. However, since its introduction many coaches, players and administrators have complained that artificial turf leads to a greater number of injuries. They feel that increased friction found with Astro-turf type fields leads to increased knee injuries. They also feel that the hardness of the AstroTurf surface causes more head injuries, especially concussions. As a result, many facilities soon removed the AstroTurf fields and replaced them with natural grass.

In 2000, “3rd generation” or synthetic infill artificial playing surfaces were introduced (e.g. FieldTurf, AstroPlay, Sprinturf, NexTurf). They are designed with long “grass” fibers infiltrated with crushed rubber or sand. The fiber base is laid over a pad, crushed stone and a drainage system. These new surfaces are designed specifically to reduce friction, lower impact forces and increase water drainage. Thus the manufacturers of these surfaces advertise that they are far safer than the old AstroTurf type fields and, in some cases may be safer than natural grass.

Since their introduction in 2000, the number of facilities using these playing surfaces has increased dramatically. Currently more than 22 Division-1 college football teams use FieldTurf and numerous high schools and recreation departments are installing game and practice facilities that include surfaces such as FieldTurf and Sprinturf, to name a few. In addition, several professional organizations have approved FieldTurf for use in competition (NFL, CFL, FIFA, MLB). Given the popularity of these fields and the product claims, an important question that needs to be addressed is “are the new 3rd generation artificial turf fields actually safe for athletes?”



POTENTIAL FOR INJURY

A major criticism of AstroTurf type fields is that their “hardness” raises the potential for head injuries [2]. Concussions often result from the head making contact with the playing surface, the head bouncing off of the field, so to speak. A recent study [3] found that impact forces measured on FieldTurf are slightly lower than those recorded on grass or AstroTurf. The Head Injury Criterion (HIC, an indicator of potential injury) values for both FieldTurf and grass were both below the score considered to be the threshold for injury and well below that of AstroTurf. In cold climates, the HIC for the grass field markedly increased to more than 2.5 times greater than the threshold for injury while FieldTurf remained low [4]. Thus, FieldTurf does not appear to increase the potential for head injury and may actually be beneficial in cold weather.

A second criticism of the AstroTurf-type surfaces is the friction between the cleat and the playing surface. When an athlete plants his/her foot on AstroTurf, the shoe often “sticks” to the turf. This results in stress to the ankle and knee joints. This rotational torque at the shoe surface is slightly greater when using cleats on FieldTurf and AstroPlay compared to grass [5]. However, the differences are relatively small and may not translate into injury risk. When athletes perform various starting, stopping and cutting maneuvers on turf, different pressures are experienced on the foot compared to grass [6]. However, total pressure placed on the foot is similar on the two surfaces. Most importantly, knee joint stress during cutting movements are slightly less when performed on 3rd generation turf than on grass [7]. This suggests that despite small differences in torque and foot pressure, stress placed on the knee may be slightly reduced when playing on artificial turf compared to grass.





When considering the shoe-surface interface, greater friction also increases traction. This, in turn, reduces the risk for secondary injury due to slips and falls. An additional consideration that is overlooked in research studies is that artificial fields have a consistent surface. Many grass fields have uneven patches characterized by ruts, divots and bare spots that typically develop over the course of a season. Such problems often develop during wet weather and when the grass field lacks routine maintenance. These uneven surfaces lead to increased risk for both major and minor ankle and knee injuries. Such potential is nearly eliminated using the artificial turf fields.

Assessing injury potential for any playing surface is difficult. However, based on the available research, it appears that the new, 3rd generation artificial turf fields do not raise an athlete's risk of head injury or increase the potential for lower limb injury. Under some conditions, the new artificial turf fields may actually reduce the potential for head and joint injury.

INJURY RATES

Despite that infill turf systems have been used widely for only a short time, there have been several important long term studies which compare actual injury data between artificial and natural grass surfaces. However, three key studies were recently published that examine and compare football and soccer injuries that occurred on both surfaces.

Meyers and Barnhill [1] performed a five year study of Texas high school football and FieldTurf. The study followed eight high schools that played games on grass and FieldTurf fields. Injuries were reported for a total of 240 games, 150 of which were played on FieldTurf and 90 played on grass. The investigators reported only injuries that occurred during games. Total game-related injury rates were not different between the two field types. The authors reported 15.2 injuries per 10 games for the FieldTurf and 13.8 for natural grass. Injuries to the head and knee were also similar. However, there was a tendency for concussions and ACL injury rates to be reduced on FieldTurf. It should be pointed out that it is not clear if the concussions reported were due to helmet contact with the ground or other object (i.e. helmet-to-helmet). Likewise, it is not known if the ACL injuries resulted from contact or non-contact events. The rates for minor injuries (those requiring <6 days of recovery) and substantial injuries (7-21 days) were similar for the two field types. However, the rate of severe injury (22+ days) tended to be greater for the grass than FieldTurf. Based on reports of actual injuries, the authors concluded that there is no reason to suggest that football athletes playing on FieldTurf have increased injury risk as compared to playing on natural grass. In fact, there are some indications that the risk for certain injuries (e.g. ACL and concussion) may actually be reduced.

In a second study, Ekstrand et al. [8] followed 290 male soccer players from European clubs. 3rd generation artificial turf and grass fields were used by several clubs for both training and match play. The total rate of injury was similar when playing or training on the two surfaces. This held true for traumatic injuries to the ankle and knee. When compared to teams that played and trained only on grass surfaces, injury rates between groups were nearly identical. The investigators conclude that their study provided no evidence to indicate greater injury risk playing on artificial turf. In fact, the data presented indicate that rate of traumatic injury may be reduced on artificial surfaces.

The third study, Fuller et al. [9, 10] examined injuries for soccer players using the NCAA Injury Surveillance System. The injuries were recorded for both male and female players during the 2005 and 2006 seasons. The investigators found that there were no differences in the rate, severity, nature or cause of injuries sustained on new generation artificial turf and grass. This held true for both male or female players playing during matches and training.

Fourth, a Scandinavian study [11] revealed that female soccer players are not a greater risk for injury when playing on the new artificial turf fields. More than 2000 players were tracked over the course of the 2005 season and it was found that while there was trend for more ankle injuries on turf, the overall risk of acute injuries was similar between artificial turf and natural grass.





Lastly, in a recent presentation¹, Dr. James Bradley (Head Team Physician for the Pittsburgh Steelers and Clinical Associate Professor, University of Pittsburgh Medical College) reported a marked reduction in ACL injuries during play on FieldTurf compared to grass. The data were collected by the NFL Injury Surveillance System. Dr. Bradley reported that 82% of ACL injuries occurring during practice happened on grass while only 18% occurred on FieldTurf. During games, the injury rates were identical.

Based on the studies that examined injury data and the results presented by Dr. Bradley, there is no reason to suggest that the risk of injury is increased when an athlete plays or practices on the new, 3rd generation turf fields.

OVERALL CONCLUSIONS

Based on the available evidence, it appears that the potential and risk for injury is not increased for athletes playing on 3rd generation artificial turf fields compared to grass fields. The potential for head or lower limb injury is low and similar between turf and grass fields. Research indicates that the newer surfaces do not increase injury risk for football or soccer players. In fact, some studies raise the possibility that the risk of some types of injury might actually be *reduced* by using the new FieldTurf type surfaces. Clearly the new surfaces are softer, provide more “give” than the older AstroTurf fields and may reduce the stress placed on the knee and ankle.

Clearly more research is needed to fully verify these claims. More long term studies are needed to compare injury rates on grass and artificial surfaces. More detailed information is also needed to examine specific injuries that result from contact with the playing surface. Nevertheless, at this point, there is no reason to suggest that new synthetic turf fields raise an athletes risk for injury.



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¹“Sports Medicine & Football: The 2006 Perspective,” presented at the annual meeting of the American Orthopedic Society for Sports Medicine, 2006.

