

Are injuries on synthetic turf still a sore subject?

IT IS RELEASED EVERY FRIDAY during the NFL season. It can have a bigger influence on a game than a coach's game plan. It is one of the first topics discussed by announcers before a game even begins. It is...the injury report.

While injuries in the NFL steal the headlines, sport-related injuries are often an unavoidable fact of life for athletes at all levels. In addition to the physical pain and loss of playing time, according to the US Consumer Products Safety Commission, sport-related injuries to children alone cost the public more than \$49 billion per year. Certainly some injuries are inherent to

sport, but others may be influenced by a number of factors, including the playing surface.

Many of us can remember back to the days of "cookie-cutter" stadiums and the hard, abrasive synthetic turf that went with them. It was not uncommon to hear athletes complain about the toll those surfaces took on their bodies and research reports confirmed higher injury rates on first-generation (non-infilled) synthetic turf than on natural turf. But, as synthetic turf has evolved to produce a surface that more closely resembles natural turf, has injury risk also changed? The perception of many is that it has not. For example, in the 2010 NFL Players Playing Surface Opinion Survey, 82% of players felt that synthetic turf was more likely to contribute to injury than grass. But is perception reality?

ANSWERS

With an increasing number of injury-tracking research studies being published, we are finally able to begin answering that question. But, before we get into the results of these studies, it is important to keep one thing in mind. Any time comparisons are made between synthetic and natural turf, the condition of the playing surfaces are not typically reported. As you can imagine, lumping all natural turf fields into one group can be problematic as field conditions can greatly vary. The same can be said for synthetic turf. So, it important to not just look at the results of one study and draw conclusions, but consider these studies collectively because many factors, both those measured and those not measured, can affect results and conclusions of any one

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study alone. Latching onto one particular finding or one particular study may not tell the whole story.

The majority of research studies comparing injury rate on infilled synthetic turf and grass have examined soccer injuries in Europe. A wide demographic of soccer players have been analyzed in these studies, ranging from youths to professionals. In addition to injuries occurring in games, several studies also tracked injuries during practices and training. The overall conclusions of the nine published studies tracking soccer injuries is



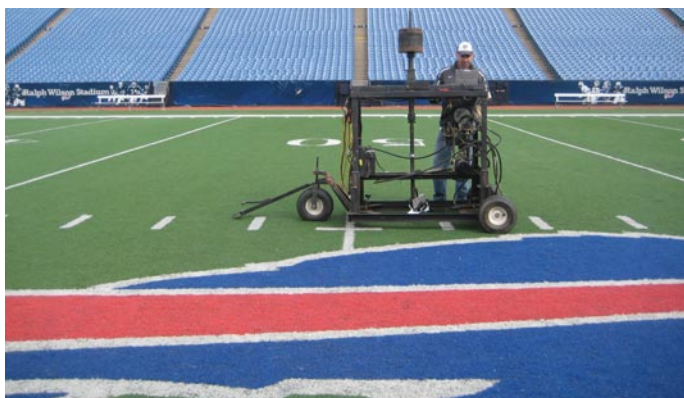
>> **BIOMECHANICS TESTING** in progress at Penn State's Sports Surface Research Center.

that there is no difference in overall injury risk when playing on infilled synthetic turf compared to natural grass.

In other words, the number of injuries occurring on synthetic turf and natural turf were comparable. A recent study tracking injuries to rugby players also found the same result. There was some evidence of different types of injuries occurring on each surface in many of these studies, but because of relatively small sample sizes, results were not considered to be statistically significant.

There have been two published studies examining injuries that occurred during football games, one tracking injuries in high school and the other in college. The high school study tracked injuries suffered by high school football players in Texas over a 5-year period. Just as in the soccer studies, overall injury risk was comparable between the playing surfaces. Additionally, this study further broke down injury occurrences into several categories and found several differences. For example, epidermal (skin breaks) and non-contact injuries were found to be more common on infilled synthetic turf while ligament injuries occurred more frequently on natural turf. The same researcher conducted a similar study on collegiate football injuries and found a slightly lower overall injury rate on synthetic turf compared to grass.

While we are unaware of any published scientific research study showing a higher injury rate on infilled synthetic turf, a report released by the NFL in the spring of 2010 contradicts the results of



>> PennFoot, a device developed at Penn State used to measure rotational traction and linear traction on turfgrass.

the previously described studies. The NFL Injury and Safety Panel reported considerably higher incidences of knee and ankle injuries on infilled synthetic turf than on grass. Currently, only an abstract from this study has been released and the full study has yet to appear in a scientific journal. When and if that study becomes available, it will be interesting to compare the complete data set with the other studies that found no difference in injury risk.

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itations. It can be difficult to isolate the cause of the injury and the conditions at the time of injury. For example, what type of shoes was the athlete wearing? What were the weather conditions at the time of the injury? Did the athlete aggravate a previous injury? Other methods to predict injury have been developed to eliminate some of these questions. But, not surprisingly, these methods also have their advantages and disadvantages.

Mechanical traction testing is probably the most common method to measure the potential for lower extremity injury. At Penn State, we use Pennfoot to measure traction on both synthetic and natural turf. Several other universities have also developed similar devices. These machines can be outfitted with any type of shoe and can generate large volumes of traction data. What they cannot do is determine if a field is "safe" or "unsafe". While there is evidence that excessive levels of rotational traction lead to a higher risk of knee and ankle injuries, we do not know at what level injury becomes significantly more likely to occur. Consequently, it is difficult to draw conclusions related to injury risk based solely on traction data. Data obtained with these devices does allow us to make comparisons from surface to surface and from one shoe to another. For example, data that we have generated shows higher levels of traction on non-infilled synthetic turf than on infilled synthetic turf and grass, which correlates well with the injury tracking studies, which showed higher injury rates on the earlier, non-infilled generation of synthetic turf.

The use of human subjects (both alive and cadavers) can also provide information related to injury risk. Sensors have been placed on different parts of the body and forces have been measured with sophisticated computer and camera systems. While comparing playing surfaces with these methods is still in its infancy, research studies using human subjects offer valuable insight into the stresses felt by actual athletes. However, just as with mechanical testing, it can be difficult to correlate this type of data to actual injuries.

So, is the perception of an increased injury risk on infilled synthetic turf reality? The results of the published scientific research papers show little evidence of increased injury risk on infilled synthetic turf. Of course, each injury occurrence is unique, making it difficult to make broad conclusions that apply to all circumstances. But, based on the data from the published studies, there is little difference in overall injury rate between playing on infilled synthetic turf and grass. Additional research will hopefully provide further insight into different injury patterns on these surfaces as well as appropriate injury prevention techniques such as shoe selection.

As part of our Sportsturf Scoop video series, we have a video focusing on injury risk available on our website at <http://cropsoil.psu.edu/ssrc/sportsturf-scoop>. Links and summaries for each of the injury studies are also available on our website. ■

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