

A Comparison of Artificial Turf.

Naunheim R, Parrott H, Standeven

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## Researchers find new generation of artificial turf isn't any softer

### Risk of head injury remains the same for football players

By Jim Dryden

This month, more than 130 million people will tune their televisions to football's biggest event, the Super Bowl. It's not certain which team will win, but it's a good bet that someone may be injured. In fact, injuries are common in most football games at every level. In recent years, the sport has focused its attention on the playing field as a significant source of injury, and new playing surfaces have been developed. But are the new surfaces safer? Emergency medicine researchers at Washington University School of Medicine in St. Louis have found that in terms of concussion risk, the new fields are no safer, and they may get worse over time.

Concussions are common in football. They can happen when players have helmet-to-helmet contact or when a player's head hits a goalpost, but they also occur when a player's head hits the ground. That's why it's important to make fields as safe as possible, according to Roseanne S. Naunheim, M.D., associate professor of emergency medicine at Washington University School of Medicine.



Heather Parrott, M.D., and Jay Webb measure accelerations on a frozen practice field at Rams' Park in St. Louis.

Naunheim and colleagues wanted to learn how hard various types of football fields are in order to determine whether newer playing surfaces might lower the risk of concussions and other head injuries.

They tested grass, older AstroTurf™ and newer FieldTurf™ surfaces to see which fields might be better than others in terms of protecting players from head injuries. In each case, the investigators took an accelerometer device to the field and dropped it 20 times from a height of 4 feet at various locations around the field. The self-contained, spherical device then allowed them to determine the G force impact of something hitting that surface.

"Interestingly, the hardest surface was grass on a cold day," Naunheim says. "Grass is always touted as the safest surface, but either of the artificial surfaces is safer than a frozen grass field."

Naunheim's team tested an AstroTurf™ field with a one-inch foam pad over concrete, an AstroTurf™ field with a 5/8 inch pad over concrete, a grass field and a FieldTurf™ surface, which is an artificial surface laid over a mixture of graded sand and shredded rubber. She found that the AstroTurf™ with the thicker pad and FieldTurf™ surface were about the same in terms of impact.



Roseanne Naunheim

Past research has determined that a force of 200 Gs is the level at which injury occurs. Peak Gs on the shredded rubber field were 184, compared to 183.9 on the older one-inch, foam-padded surface. The warm grass field and the AstroTurf™ field with the 5/8 inch pad had similar peak G ratings, with the warm grass field at 246 and the artificial field at 261.6. Peak Gs on the frozen grass field were 398.2.

Newer generation fields have been marketed to professional teams, colleges and high schools as a way to decrease impacts; but when they took measurements from various places on the fields, Naunheim's group found that the older, foam-padded surface was just as soft as the newer, shredded rubber-based surface. They also found that the parts of the shredded rubber surface that got the most traffic tended to get compacted and harder.

"The field's shredded rubber base appears to act just like wood chips on a playground," she says. "The longer you use it, the more compacted the subsurface becomes, so the high traffic areas of the field get harder and harder with time."

Naunheim says it's likely that the newer FieldTurf™ may help prevent other common football injuries because its fiber surface is thought to be less abrasive than that of the older AstroTurf™, making it less likely that players will get rug burns. Because the fibers are taller and spread farther apart, the newer surface also is believed to mimic natural grass and to reduce the risk of leg injuries that occur when players cut and change directions. But Naunheim's study suggests that it won't lower the risk of head injuries. In fact, as the surface becomes compacted in high traffic areas, those risks may increase.

"If you're looking for safety in terms of head injury, softer is better," she says. "But you can't make a field too soft or it would be like running on marshmallows for the players, so the ideal is to look for a middle ground that lowers the risk of head injury but isn't so soft that it's unplayable."

Standard maintenance for FieldTurf™ involves putting a device underneath the surface of the field and stirring up the rubber base every few months. But Naunheim's data suggest that the maintenance practice does not keep the newer fields from becoming hard and compacted in some areas. The field she tested was only two years old, and she says it may be necessary for the newer surfaces to be replaced more frequently in order to keep them safer.

"It's a pretty simple concept, that you protect players by putting padding down," Naunheim says. "The interesting thing to me is that our data suggest that the newer forms of padding eventually end up being as bad or worse than the older forms."

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