Sports Turf Injury Research

Tom Serensits

2011 STMA Conference and Exhibition

Austin, TX

Penn State's Center for Sports Surface Research
http://ssrc.psu.edu

Safety & Performance

Injury Research

Is there a difference in injury risk when playing on synthetic turf vs. natural grass ?

Synthetic Turf - Injuries

Sports Illustrated, November 1, 1993

A Fight Over Turf

Three recent injuries on AstroTurf have underscored NFL players' calls for a return to grass | by PETER KING

CHICAGO BEAR WIDE RECEIVER Wendell Davis looked over his shoulder into the blue sky above Philadelphia's Veterans Stadium on Oct. 10 and saw the football spiraling toward him. Davis, in full gallop, had Eagle cornerback Mark McMillian right with him, and the pass was a bit underthrown. Davis figured he would have to stop, turn and outjump McMillian for the ball.

At the precise moment that Davis planted his feet to jump for the ball, his turf shoes dug into the AstroTurf and held solid, as though they were nailed to the carpet. Davis felt something snap simultaneously in both knees, and he flopped to the artificial turf as if he'd been shot. He began screaming in pain. He tried to move his legs but couldn't. When the trainers and team doctor reached him and straightened both legs, Davis looked down to see why it felt as if someone were stabbing him in both knees with knives.

"I saw the doctor trying to find my kneecaps," Davis said last week from his hospital bed in Chicago. "They found my kneecaps up in my thighs."

The patellar tendon is the rope of tissue that keeps the kneecap in place and stabilizes the joint. Davis had severed both of his patellar tendons. On Oct. 11 the knees were surgically repaired, and Davis's legs were encased in plaster casts from thigh to ankle. He is confident that he will play football again, and his doctors are hoping for the best. For now, though, there is not much Davis can do but sit at home and read. His immediate choices: the Bible and *How to Handle Adversity* by Charles Stanley.

On the same afternoon that Davis was injured, Indianapolis Colt defensive tackle Steve Emtman turned sharply to pursue Dallas's Emmitt Smith and crashed to the artificial turf of the Hoosier Dome. His anterior cruciate ligament, medial collateral ligament and patellar tendon all ripped violently. Emtman is gone for the remainder of this season and may not be ready when camp opens in '94.

One week after Davis and Emtman went down, New York Giant wideout Mike Sherrard caught a pass and after a long run pulled up short on the artificial turf at Giants Stadium. He had partially dislocated his left hip and suffered a fracture of the hip socket. He, too, is gone for the season, and on Oct. 20 he was back in the hospital with a blood clot in his hip.

There are two factors linking the injuries of Davis, Emtman and Sherrard: None of the three had been touched by another player at the moment his injury occurred; and each injury was sustained on a field covered by artificial turf. Those circumstances have reignited the smoldering debate over the safety of artificial turf, which is currently used by 15 of the

Prescription Athletic Turf

PAT's natural, resilient surface is popular with players, and its drainage design has earned high marks from stadium managers.

How is injury risk measured?

- **Mechanical tests**
  - **Traction testers**
  - **Gmax testing**
- **Biomechanical tests**
- **Epidemiological tests**

Epidemiological Research

- Questions…..
  - Is there a difference in injury risk between playing on synthetic turf and natural turf?
  - Different types on injuries on synthetic turf?

Epidemiological Studies

- Very few studies – WHY?
  - Separate contributors to injuries
    - Contact vs. non-contact
    - Shoe type
    - Weather conditions
    - Who records the data?
    - Statistics – need large sample size

Injury Data

- NCAA Injury Surveillance System
  - Over 25 years of injury data
- High School RIO
- NFL Injury Surveillance System

Comparisons with Natural Turfgrass

Comparisons with Natural Turfgrass

Injury Studies

- **11 scientific injury studies published – infilled synthetic turf vs. natural grass (peer-reviewed)**
  - **Soccer – 8 studies**
    - **Europe**
    - **Professional players, youth players**
    - **Boys and girls**
    - **Game vs. practice**
  - **Football – 2 studies**
    - **High school**
    - **College**
  - **Rugby – 1 study**
- **So, are injuries more common on synthetic turf?**

Injury Studies - Findings

- No study found higher overall injury rate on synthetic turf
  - 1 football study – lower overall injury rate on synthetic turf

- Statistical trends
  - Ankle injuries – more and less common on synthetic turf
  - Rugby study – ACL injuries 4x more common on synthetic turf

High School Football Study (Meyers, 2004)

Synthetic turf – higher incidence of……..	Natural grass – higher incidence of…….
• Zero-day time loss injuries	• 1-2 day time loss injuries
• Non-contact injuries	• 22+ day injuries
• Surface/epidermal injuries	• Head and neural trauma
• Muscle-related trauma	• Ligament injuries
• Injuries during high temps.	• *most of injuries on dry fields

Concussions

- 10 – 20% of concussions from impact with the surface
- Meyers (2004) – higher concussion rate on natural grass
  - Dry field conditions

Injury Risk Conclusion

No difference in overall injury risk between infilled synthetic turf and natural grass

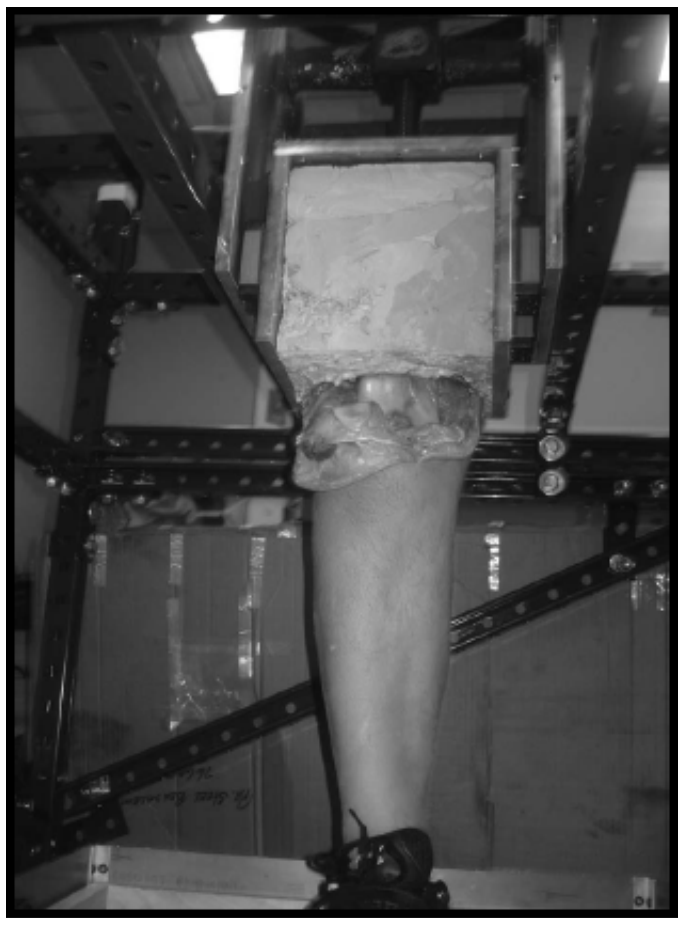

PennState
TOYOTA
PEPSI
MERCURY

Injuries on Natural Grass Fields

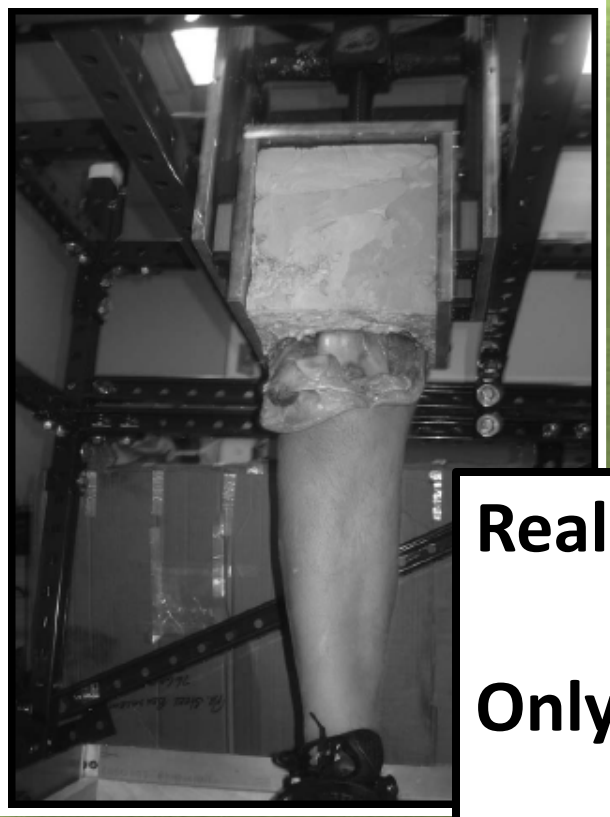
- Australian Football League
  - Dry fields = increased risk of non-contact ACL injury
- Ryegrass vs. Bermudagrass
  - More non-contact ACL injuries on bermudagrass

Additional Injury Research

- ACL injury potential using cadavers (Drakos, et al., 2010)
  - Measured ACL strain on synthetic turf and natural grass
  - Lowest strain: Screw-in cleats on natural grass
  - Highest strain: Molded studs on first generation synthetic turf



ACL – Cadaver Research



Realistic?

Only non-contact injury

Muscular stabilization in live humans

Future Research

- Continue epidemiological studies
  - Characterize surface conditions
  - Further breakdown of injury patterns
- Biomechanical testing
  - Shoe-surface interface
  - Match shoe to surface

Penn State's Center for Sports Surface Research

Website: http://ssrc.psu.edu

Facebook: "Like" Penn State's Center for Sports Surface Research

Twitter: @ PSUsportsturf