Player-Surface Interaction

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SportSURF Launch Seminar
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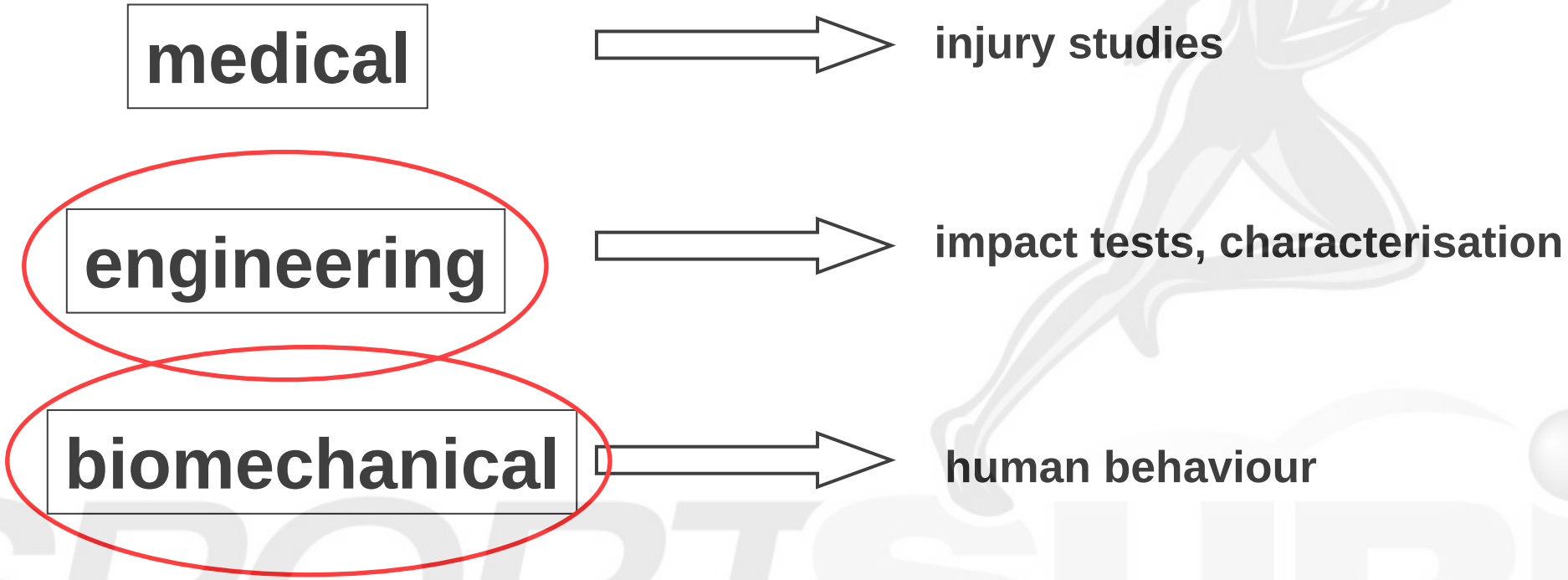
Sports Surface Studies



Question

- What properties are required in a surface?

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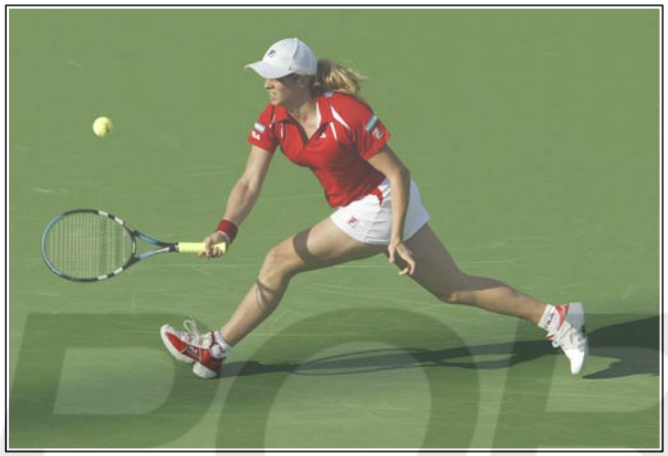
Player requirements	Surface requirements
• Optimal performance • Minimal injury	• Playability • Durability • Spatial uniformity • Temporal uniformity • Aesthetics • Sustainability

Player Requirements

- Quantify movement and loading patterns for different sports movements

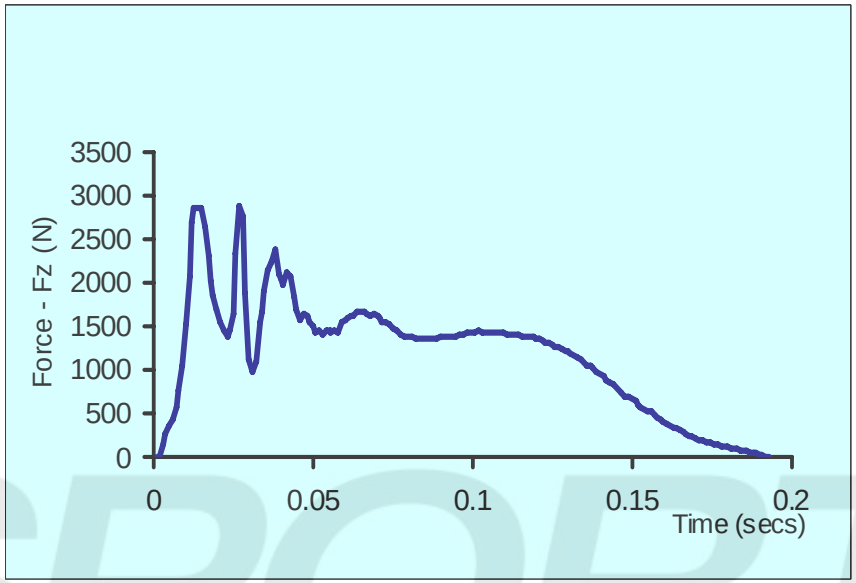


Running forehand footplant

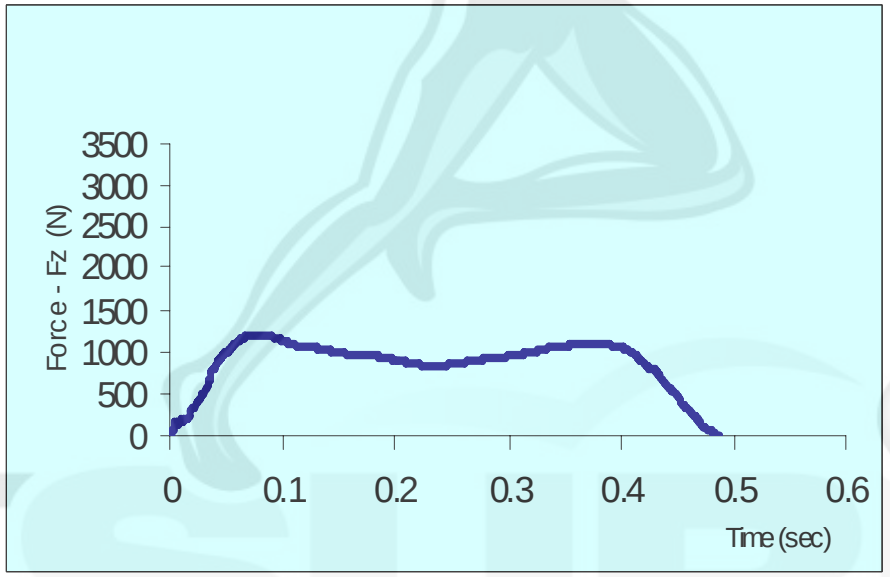
Sideways shuffle

Player Requirements

- Loading patterns for different movements



Running forehand footplant



Sideways shuffle

(Stiles and Dixon, 2005)

Player Requirements

- Manipulation of the playing surface may change the load and movement patterns

➢ Important to measure human-surface interaction for a range of surfaces

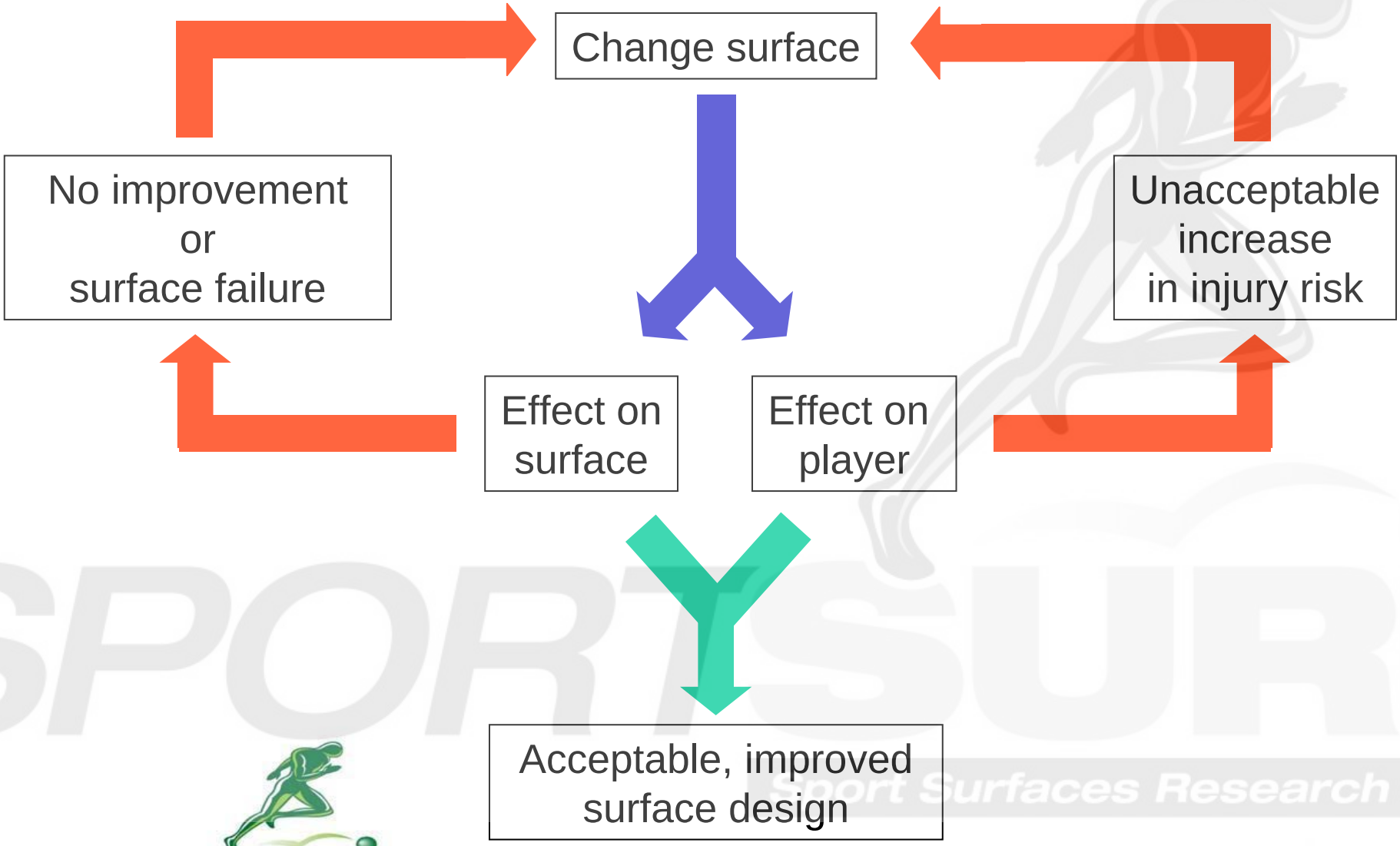
Surface Characteristics

- What are the specific differences between surfaces that influence the player?
  - Stiffness & Damping
  - Traction
  - Spatial and temporal uniformity
  - Environment

} Synthetic surfaces

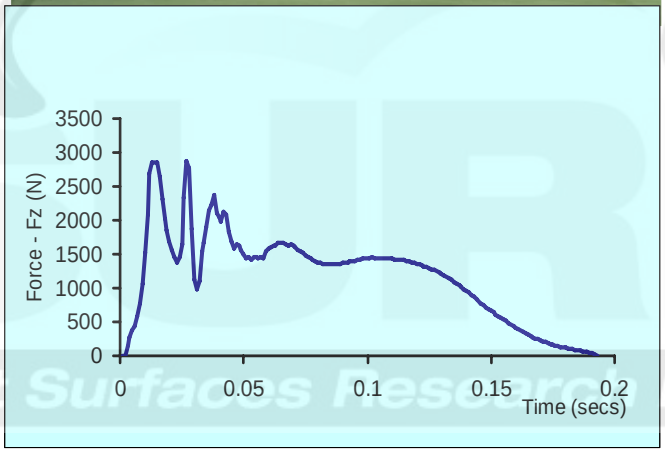
- How do these influence the player?
- How are these quantified?

Sports Surface Engineering



Biomechanical Studies: Example

- Tennis - running forehand foot plant
- Peak impact forces similar for different tennis surfaces
- No consistent changes in movement patterns



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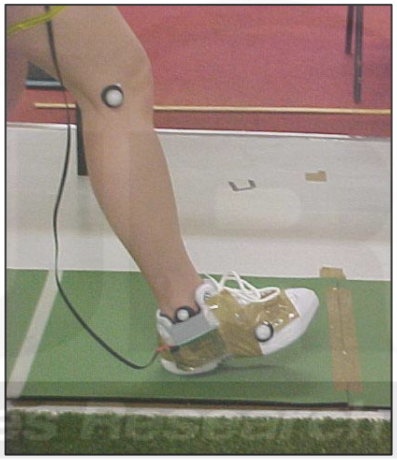
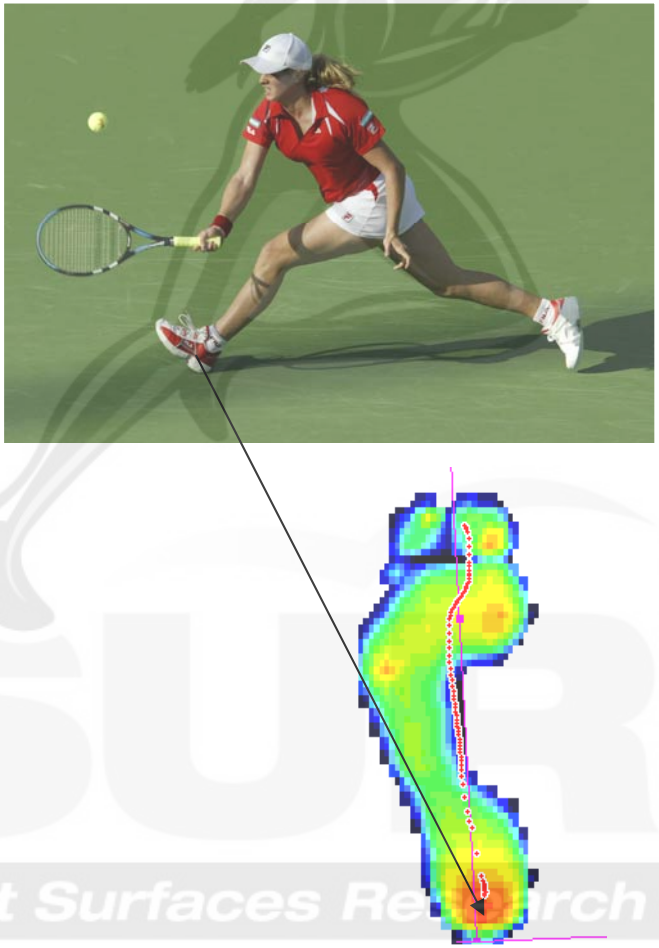
Biomechanical Studies: Example

- Tennis - running forehand foot plant
- In-shoe pressures for distinct surface conditions



Biomechanical Studies: Example

- Tennis - running forehand foot plant
- Different in-shoe peak pressure for differences in surface
- ➢ Higher peak heel pressures on stiffer surfaces



Mechanical Studies: Example

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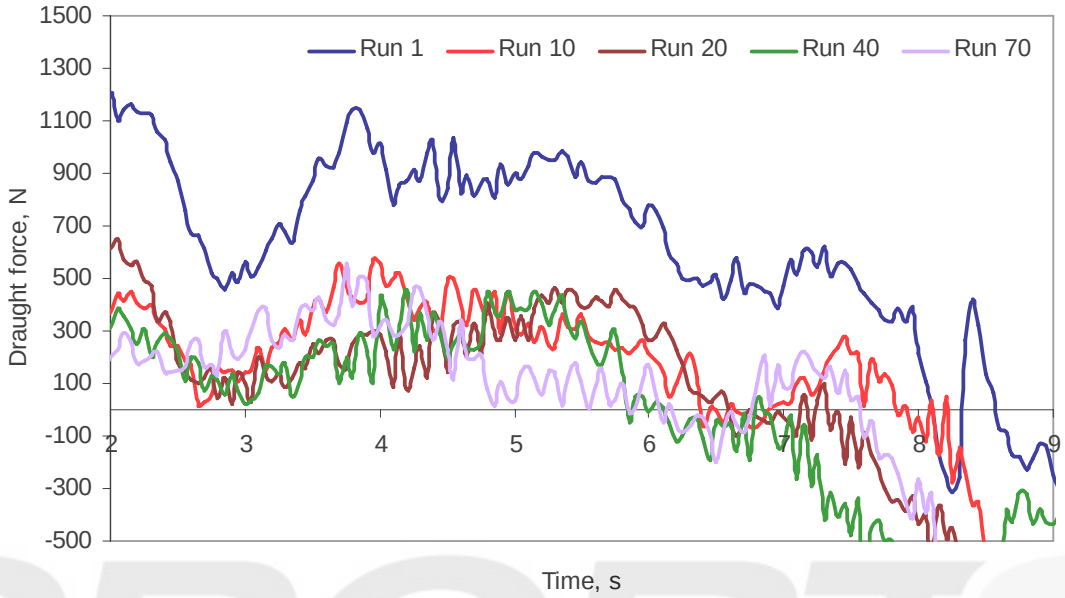

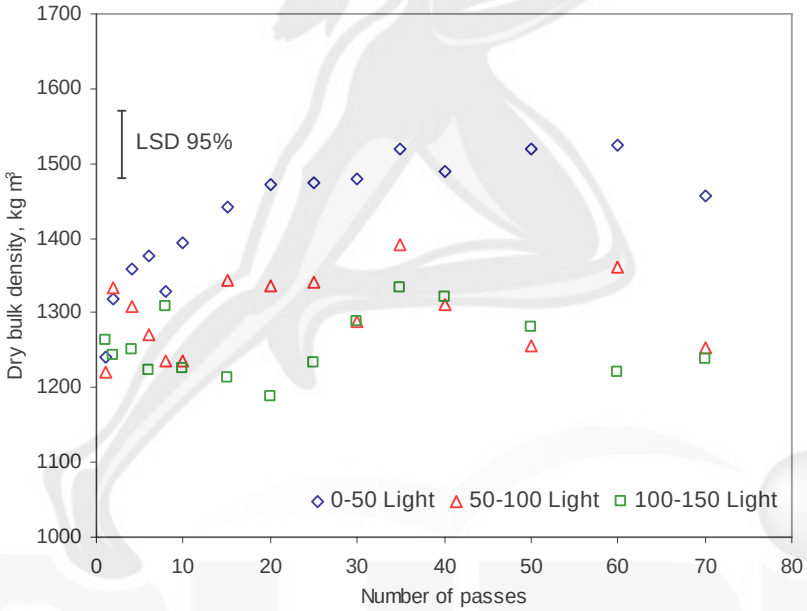

Mechanical Studies: Example

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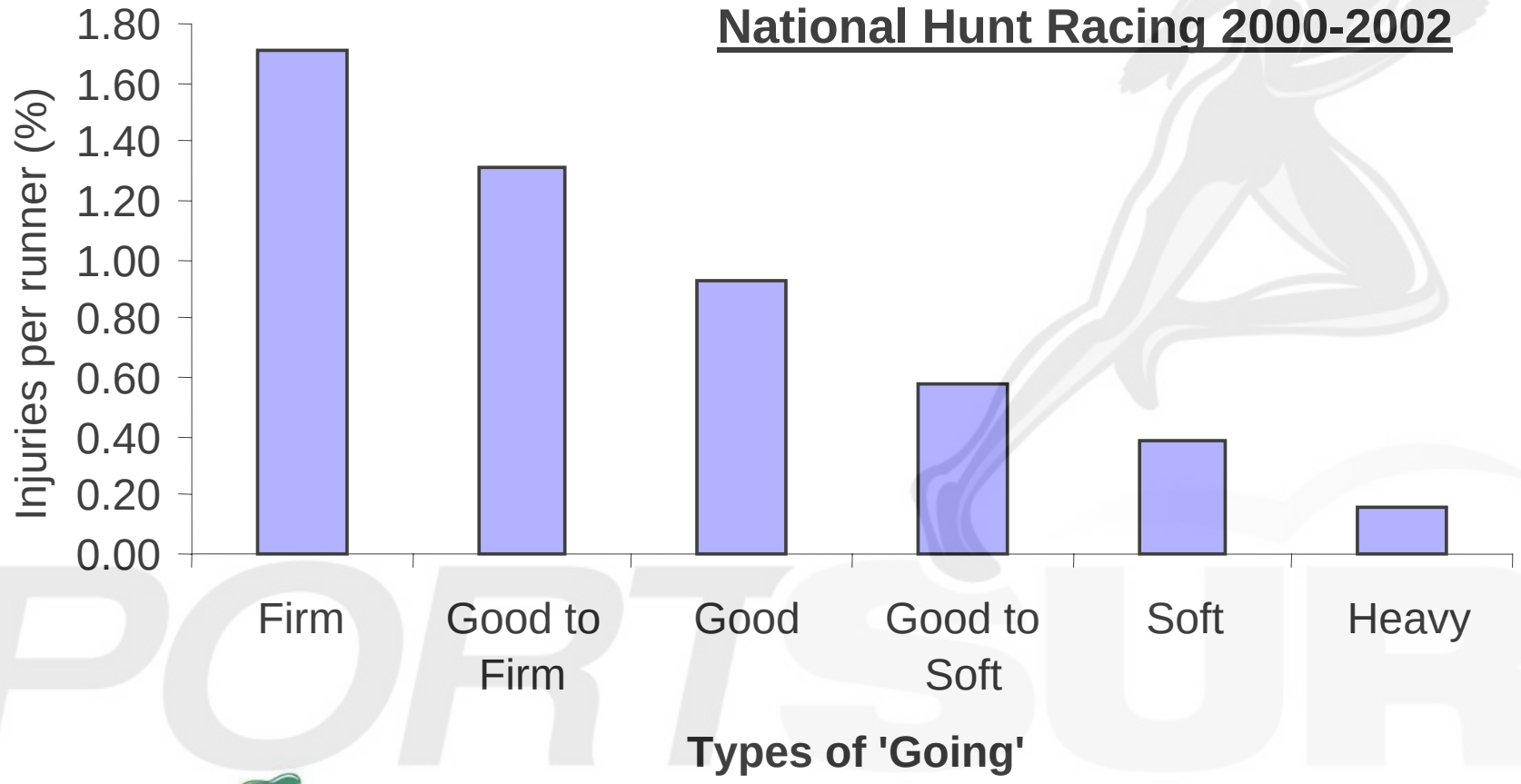
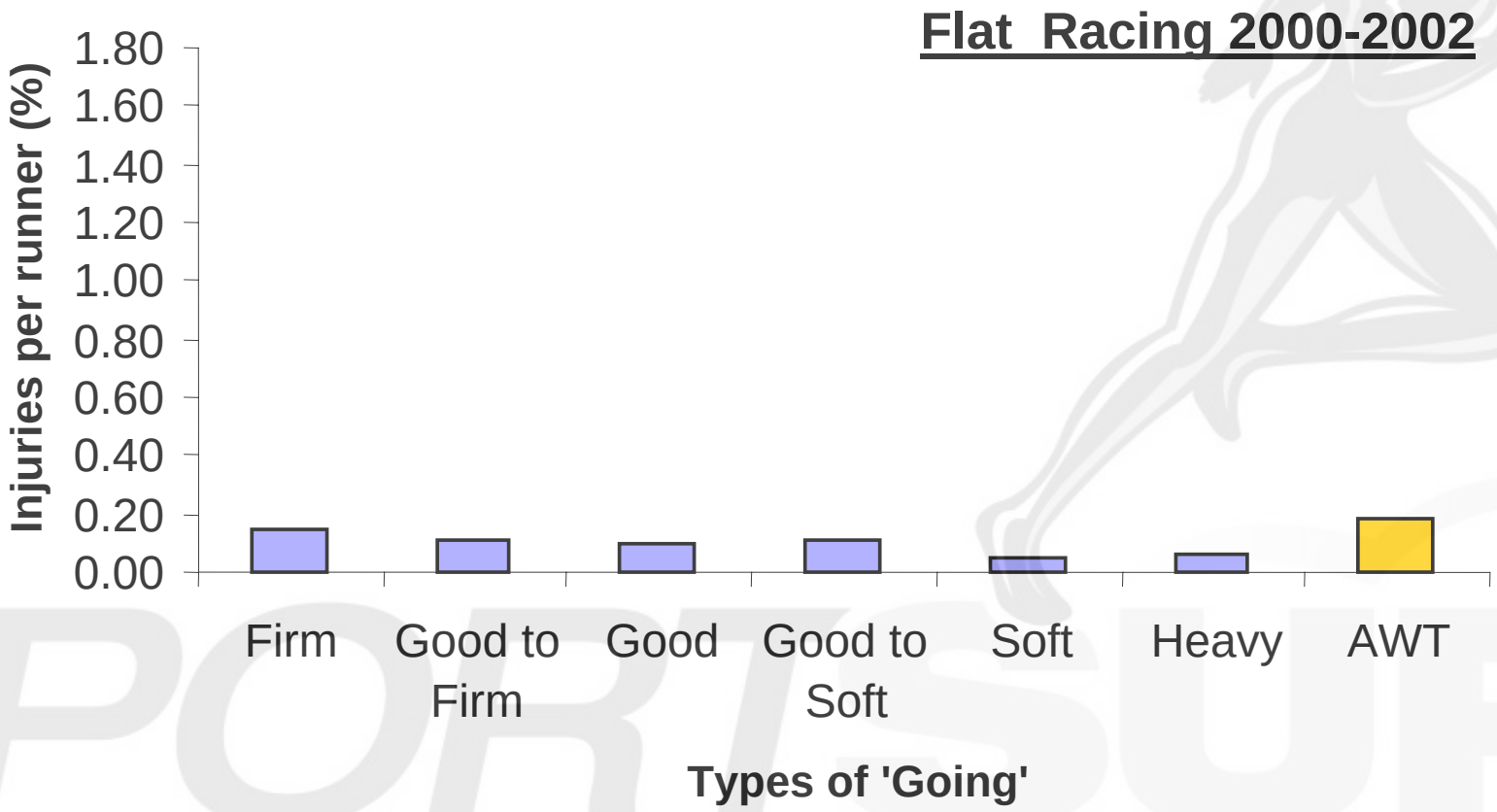


Data courtesy of: THE JOCKEY CLUB

Mechanical Studies: Example



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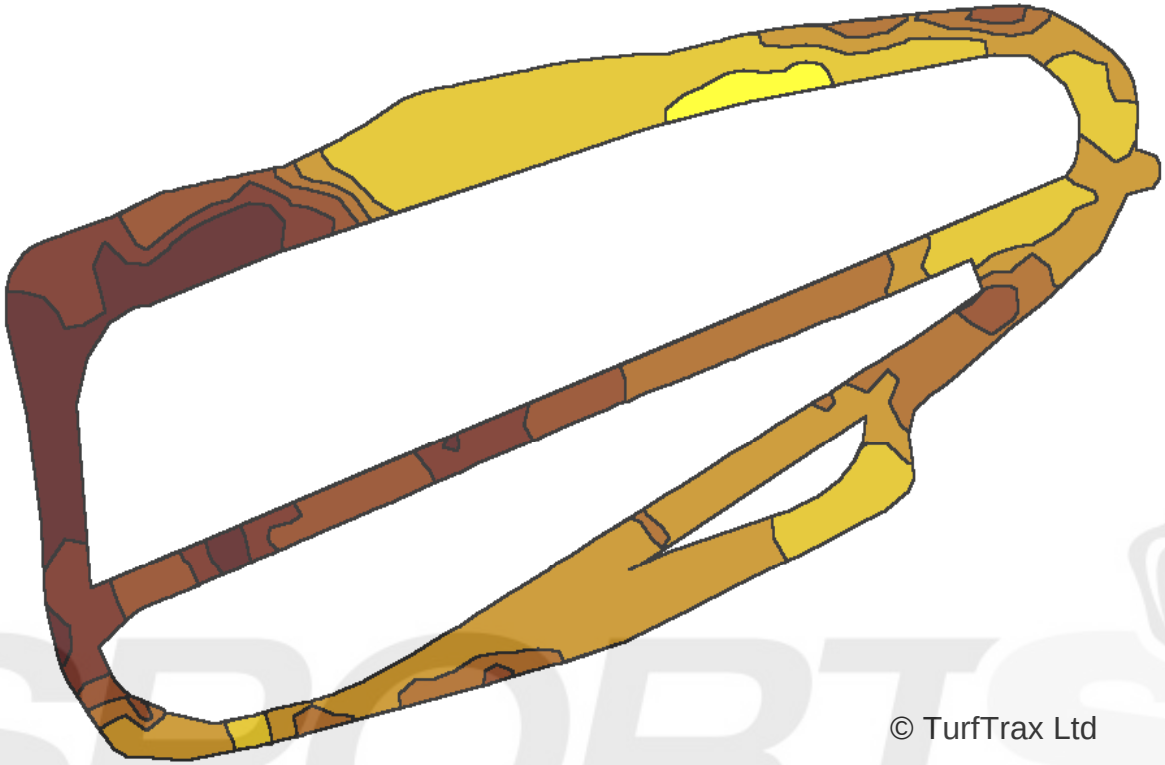
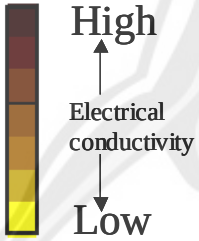
Mechanical Studies: Example





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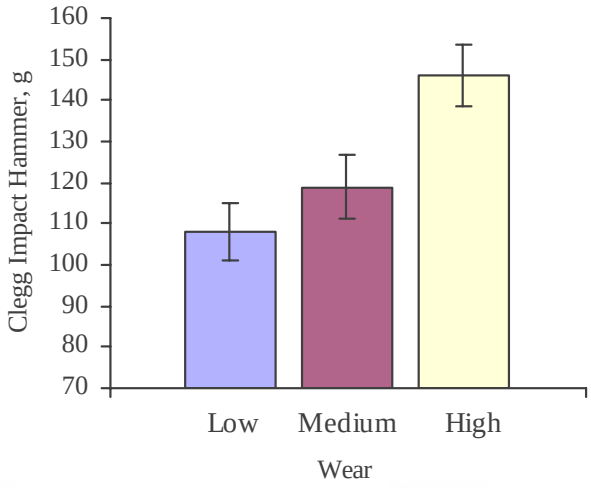
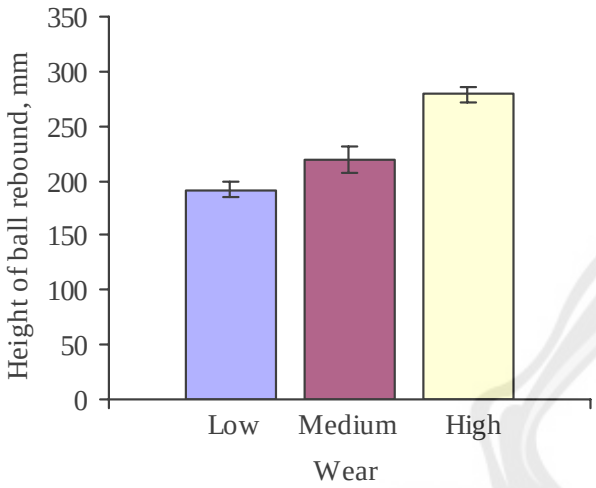
Mechanical Studies: Example

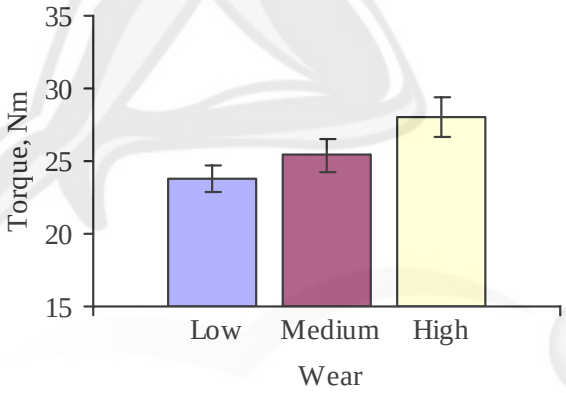
Hardness



Ball rebound

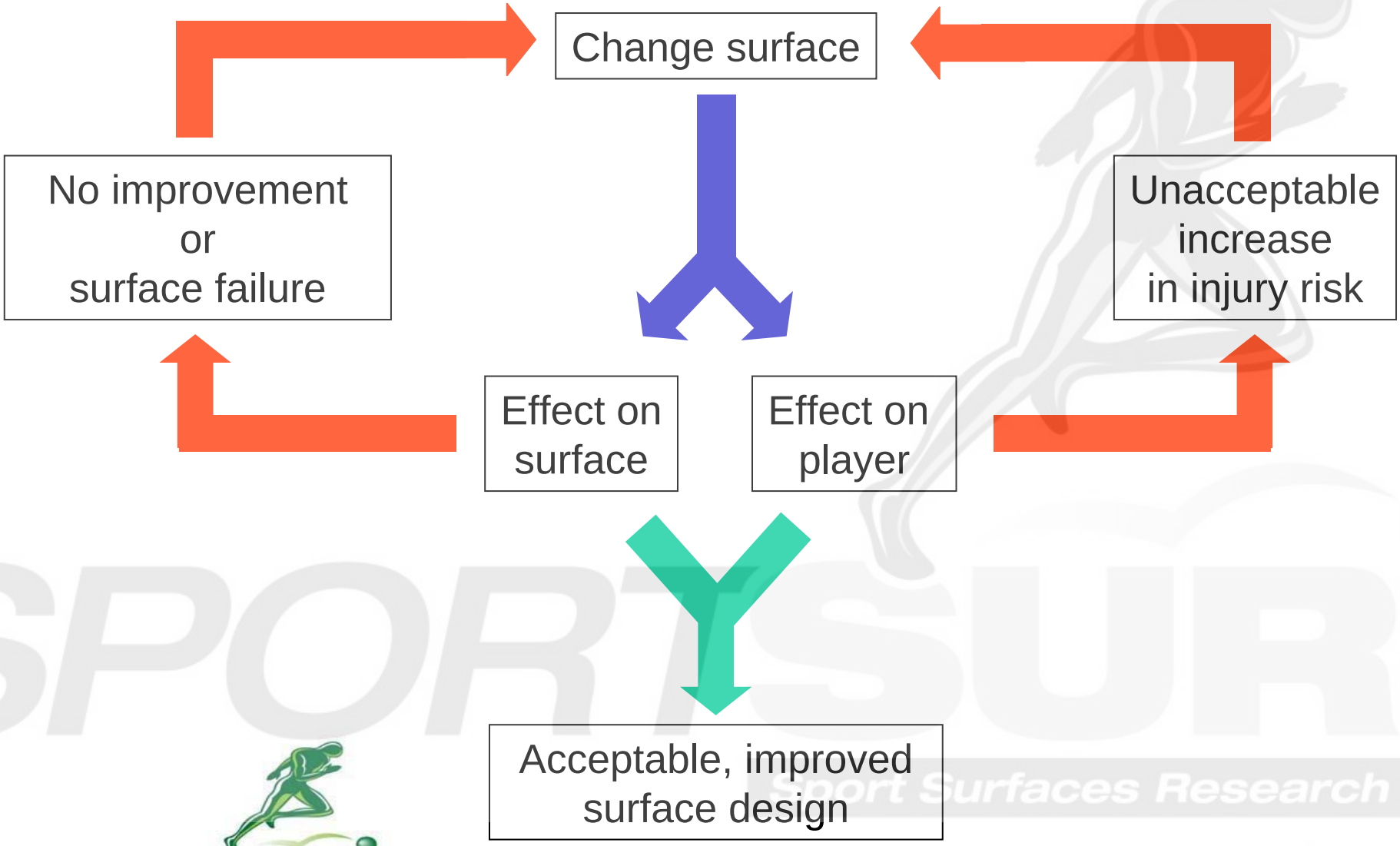


Traction

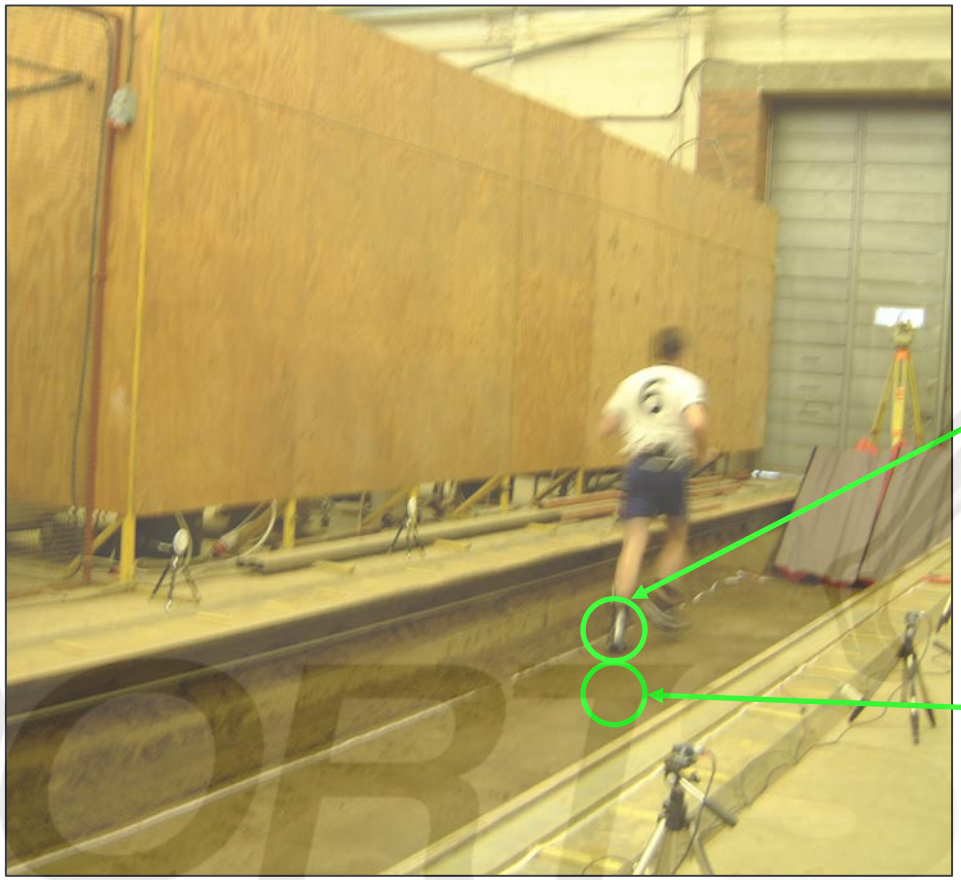


Error bars represent the standard error

Integrated Approach



Integrated Testing

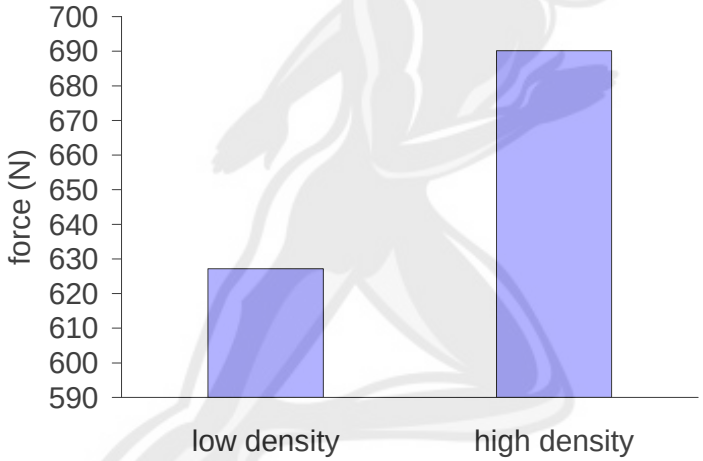


In-shoe pressure

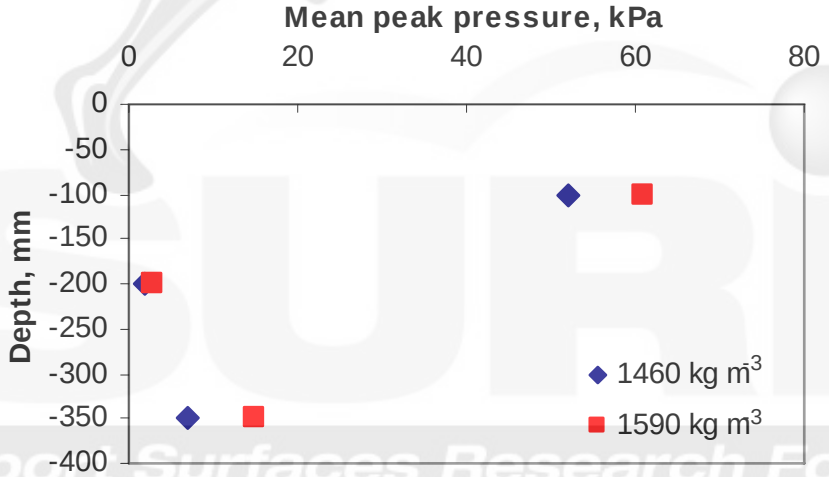
In-surface pressure

Integrated Testing

- Higher in-shoe pressures on surfaces with increased surface bulk density



- Higher surface pressures with increased surface bulk density



Natural Turf

Natural Turf

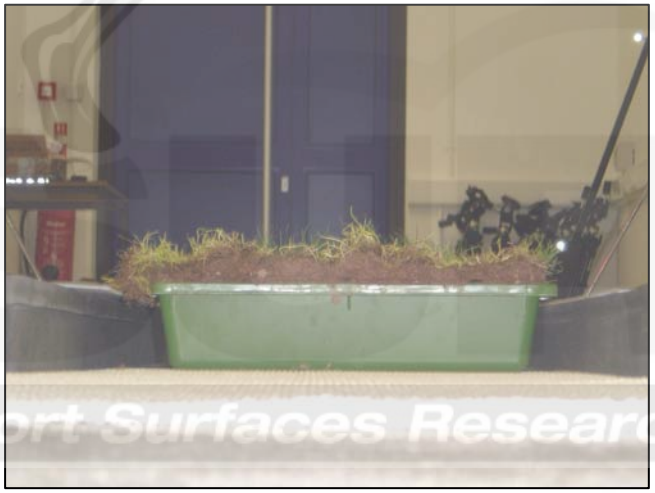
- **Playing challenges**
  - degradation with use
  - weather influences
  - inconsistent properties

- **Maintenance challenges**

Maintenance Challenges

Natural Turf

- **Challenges for study**
  - degradation over time (use, conditions, …)
  - siting in a laboratory environment



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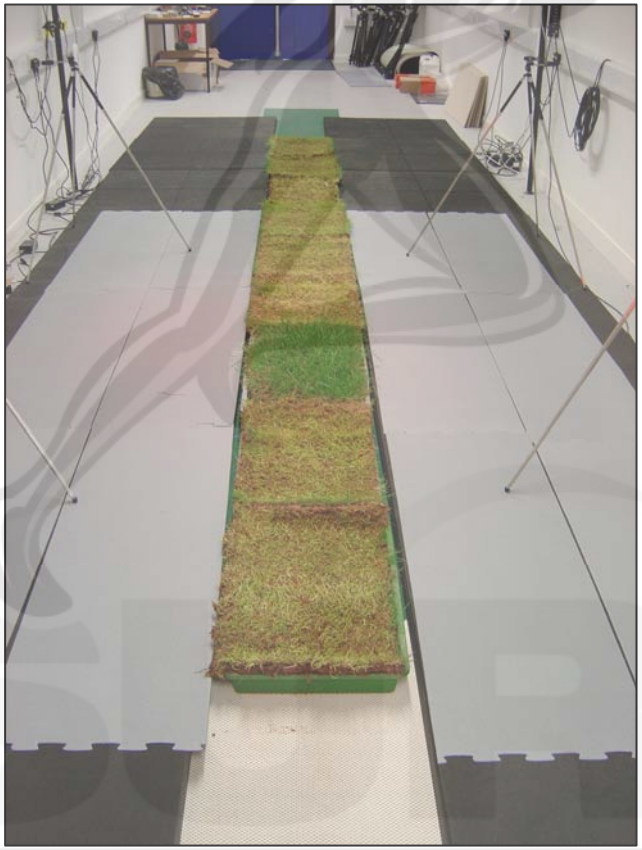

Conclusions

- Biomechanical and engineering studies provide useful information on player and surface behaviour

- To understand player-surface interaction, an integrated approach is preferred

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