

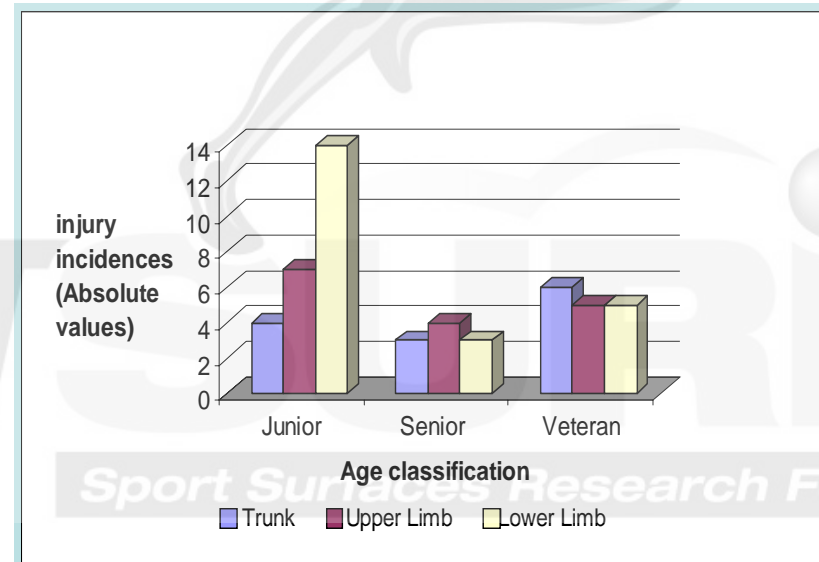


Shoe-Surface Interaction in
Tennis

Daniella Strauss

Study Impetus

- Tennis match-play
 - Year round season
 - Range of surfaces
- Participation in tennis
 - Overall increase
- Injuries in tennis
 - Site specific
 - Proportionally twice as many lower limb injuries in younger players
 - Injury mechanism



The Study

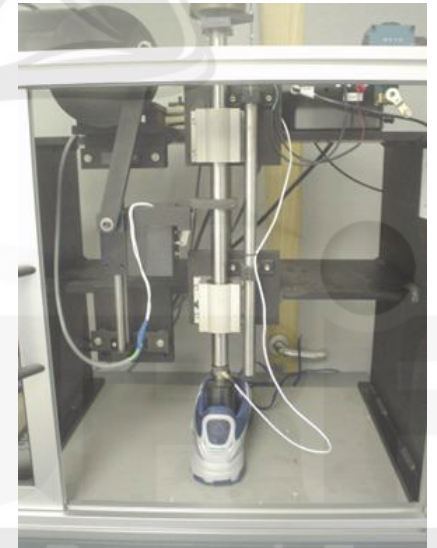
- Relationship between the mechanical properties of the independent systems and their combined effect on the tennis player

- Surfaces

- Deflection
- Stiffness

- Shoes

- Mass
- Impact Force
- Impact Velocity



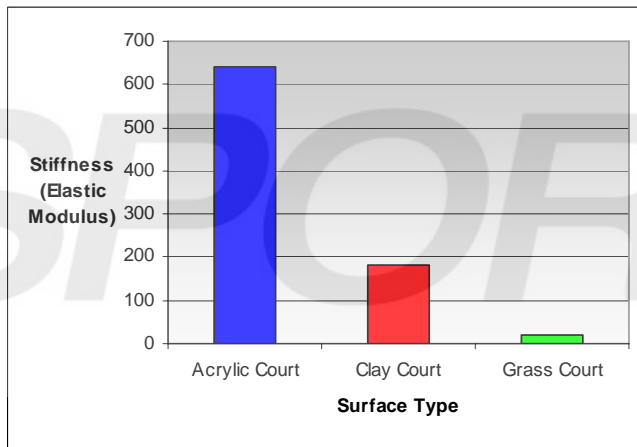
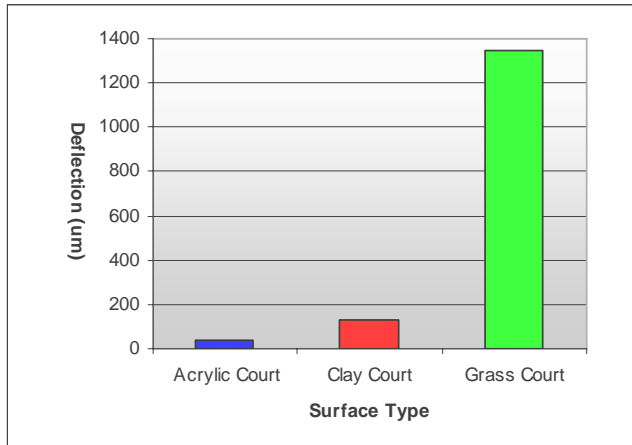
Sport Surfaces Research Forum



- Interaction Study
 - Surface comparison
 - Shoe comparison
 - Maximum Force
 - Peak Pressure
 - Impulse
 - Pressure-time integral



Mechanical Properties: Surfaces



Deflection***

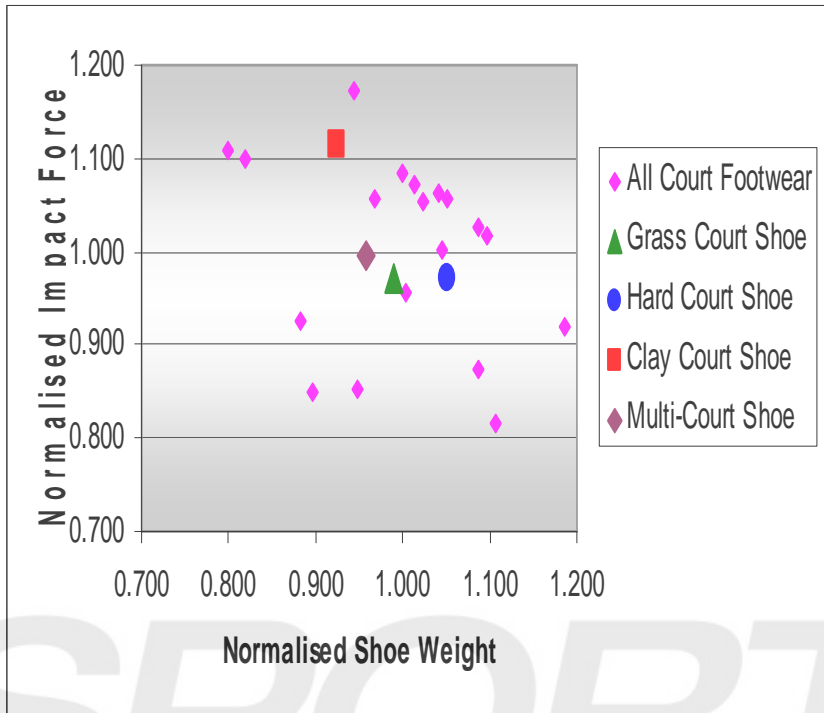
Court Type	Co-efficient of Variation (%)
Acrylic Court	23.37
Clay Court	22.37
Grass Court	35.83

Stiffness***

Court Type	Co-efficient of Variation(%)
Acrylic Court	24.58
Clay Court	21.66
Grass Court	47.24

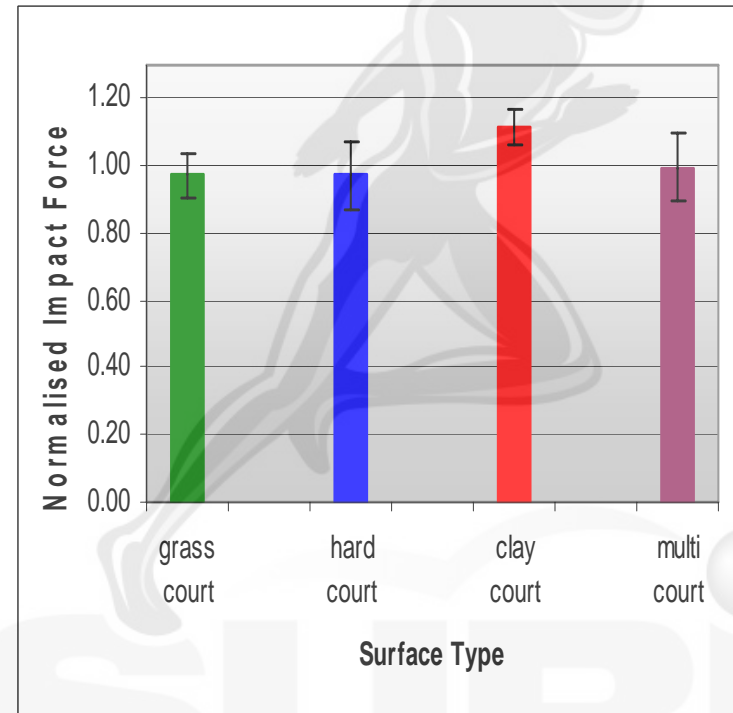


Mechanical Properties: Shoes



Relationship between tennis footwear weight and impact force (19 shoes tested).

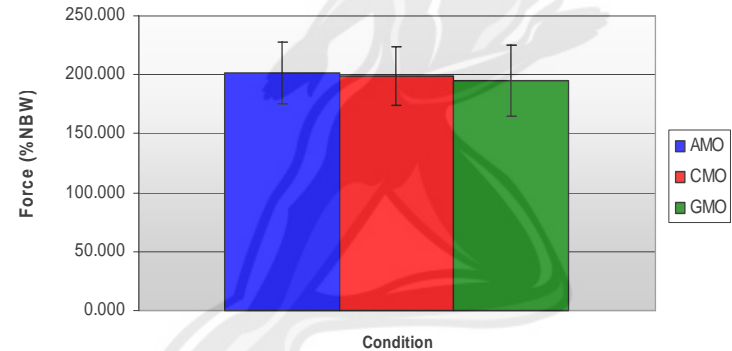
No significant differences found in impact force between any of the tested shoes



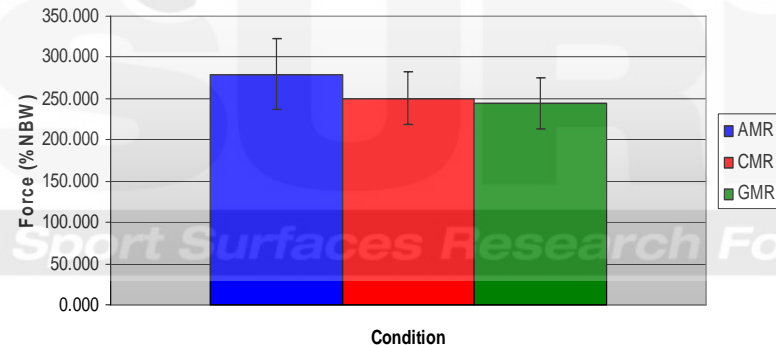
Mean Normalised impact force values for a range of tennis footwear

Interaction Study

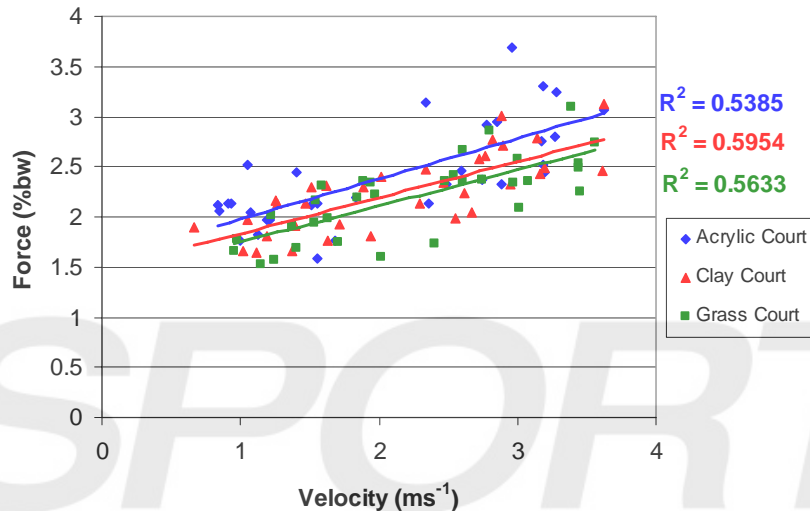
Variation in Maximum Force Across the 3 Court Surfaces during Open Stance Forehand Under the Multi-shoe Condition



Variation in maximum Force Across the 3 Court Surfaces during a Running Forehand Under the Multi-shoe Condition.***



Force Velocity Relationship on the 3 Court Surfaces



The Study Findings

- Highly significant differences in surfaces
- No significance differences in tennis footwear
- Trends on surfaces in relation to the velocity of the movements and the subsequent force production
- Significant differences are found for the maximum force experienced by players on the 3 surface types, this is only present in the higher velocity movements

Sport Surfaces Research Forum



Comments

- Movement velocity is the determining factor for increases in maximum impact force experienced
- Rather than the surface stiffness and/or footwear condition
- The players are adapting to the surface change independently of the footwear

However

- Is the footwear 'permitting' the adaptation to take place?
- Is there a change in distribution of force across the area of the foot in response to surface?



*Thank you for listening, any
questions?*



SPORTSURF

Sport Surfaces Research Forum



UNIVERSITY OF LEEDS