THE EFFECT OF CONTROLLED SURFACE PROPERTIES ON PLAYER LOADING FOR SOCCER
Introduction

- Purpose of study:
  - Investigate the effect of surface hardness and traction on player loading during a stop and turn
  - Control surface properties throughout tests
Methods (Subjects)

- 16 players of Loughborough University teams
- Average age 20 ± 1 years
- Average experience 13.6 ± 2.1 years
- On artificial turf 6.4 ± 3.7 years

- All players provided with same boots (Adidas Copa Mundial)
Methods (Surfaces)

- All surfaces:
  - Tiger turf Real Soccer 50 MS carpet (50mm)
  - ~10mm sand infill
  - ~20mm SBR infill

- 2 Hard (FR ~70%) - No shockpad
- 2 Soft (Fr ~50%) - Recticel re-bounce® uni F82.16 shockpad
- 2 High traction (~40Nm) - 1 – 2.5mm grade rubber
- 2 Low traction (~30Nm) - 2 – 8mm grade rubber
Methods (Surfaces)

- Surfaces were brushed at beginning of each test day
- Surface on top of force plate was rubbed by hand after each subject to make sure surface was even
- Advanced Artificial Athlete (AAA) and Rotational traction measurements were taken at the end of each test day
Methods (Set-up)

- 11.5m x 1.5m runway
- 12 Vicon camera’s (500Hz)
- 60x90cm Kistler force plate (1000Hz)
- High speed video
- Plug-in-Gait marker set
Methods (Protocol)

- Approach speed 12 – 14.5km/h
- 10 trials per surface
- 5 with simulated defender behind force platform to create an in-game scenario
- After each surface condition players rated surfaces on hardness and amount of grip
Surface measurements (Rotational)

Average rotational traction 3 test locations

- Soft High
- Soft Low
- Hard High
- Hard Low

Rotational traction (Nm)
Surface measurements (AAA)
Surface measurements (Infill depth)

Infill depth large FP during ST

- Soft High
- Soft Low
- Hard High
- Hard Low

Infill depth (mm)

Start  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16
High speed video
Ground Reaction forces (Fz)

- Initial peak
Ground Reaction forces (Fz)

- Push off peak

![Box plots showing ground reaction forces (Fz) for different surface conditions.](image)
Ground Reaction Forces (Fy)

- **Initial peak**
Ground Reaction Forces (Fy)

- Push off peak
Ground Reaction Forces (Fz)

- Initial peak
- Hard/High
- Hard/Low
- Soft/High
- Soft/Low

Bar chart showing the Fz (Bodyweight) for each subject (1 to 16).
Ground Reaction Forces (Fz)

- Push off peak
- Hard/High
- Hard/Low
- Soft/High
- Soft/Low

<table>
<thead>
<tr>
<th>Subject</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
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<tbody>
<tr>
<td>Fz (Bodyweight)</td>
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Ground Reaction Forces (Fy)

- **Initial peak**
- Hard/High
- Hard/Low
- Soft/High
- Soft/Low

![Bar chart showing ground reaction forces for different subjects and conditions](image)
Ground Reaction Forces (Fy)

- Push off peak
- Hard/High
- Hard/Low
- Soft/High
- Soft/Low

[Bar chart showing Fy (Bodyweight) for subjects 1 to 16]
Discussion

- No apparent difference of ground reaction forces on group level
- Some differences between surfaces on individual level
- Player perception?
- Movement strategy?
Questions?

Suggestions?

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