Big Data in Sport and Movement Science – Challenges and Opportunities

Schmidt, Nolte & Jaitner, Institute for Sports and Sports Science
Performance related data acquisition

Movement (phase) duration: ms to minutes

Data acquisition rates depending on device and movement duration:
100 to 2000 samples/s

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Muscle activity synergies during running at different speed and slope (Jaitner et al. 2010)

378 trials (≈ 8 subjects x 5 conditions x 10 steps)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Individuals</th>
<th>Speed/Decline</th>
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<tbody>
<tr>
<td>Level running at 4, 5 and 6 m/s</td>
<td>100%</td>
<td>78.6%</td>
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<tr>
<td>Running at 5 m/s [+5°/±0°/-2°]</td>
<td>97.7%</td>
<td>88.2%</td>
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<tr>
<td>Slope running [+5°/-2°]</td>
<td>99.3%</td>
<td>82.1%</td>
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<tr>
<td>All trials</td>
<td>92.9%</td>
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Injury prediction and prevention in teamsports (e.g. football)

Biomechanical Screening

65 Youth Elite Soccer Players
25 Youth Elite Handball Players

12 month injury documentation (FIFA consensus)

approx. 100 parameters

Injury incidences/status

movement patterns (e.g. GRF in running)

interaction

prediction

injury specific risk factors
Interaction of risk factors

Schmidt, Nolte & Jaitner, Institute for Sports and Sports Science
Performance analysis of jumping and sprinting

Schmidt, Nolte & Jaitner, Institute for Sports and Sports Science
Further research questions

- movement pattern adaption following motor learning or training
- gait pattern variability and adaption following short time interventions (e.g. balancing, wobbling)
- identification of pathologic gait/running pattern (that result from injuries or may cause overuse injuries)
- motor control strategies and muscle activation variability in gross motor movement

Big Data in Sport and Movement Science: Interdisciplinary Opportunity and Challenge

Schmidt, Nolte & Jaitner, Institute for Sports and Sports Science