IMPROVING MOBILITY PERFORMANCE IN WHEELCHAIR BASKETBALL

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INTRODUCTION

Mobility performance in wheelchair basketball

Game performance

Mobility performance

Physical performance
Defining mobility performance

Mobility performance

Ability of performing wheelchair-athlete activities:
- standing still
- driving
- rotating
- braking
- blocking
INTRODUCTION

Quantifying mobility performance

Observation of wheelchair-athlete activities during games

Development of Wheelchair Mobility Performance (WMP) test

Validity, reliability and responsiveness of WMP-test

Monitor and optimize mobility performance
INTRODUCTION

Optimizing mobility performance

- Athlete characteristics
- Wheelchair characteristics
- Athlete-wheelchair interaction characteristics

Mobility performance
Which athlete, wheelchair and athlete-wheelchair interaction characteristics are the best predictors of wheelchair basketball mobility performance?
Study population

- N=60 wheelchair basketball players
- 44 men, 16 women
- Mean age 25 years (range 12-50 years)
- Active at first division or international level
- Classification: N=20 ≤2.5, N=40 ≥3
Outcome variable

- Performance (time in seconds) on the wheelchair mobility performance test (WMP test), consisting of 15 tasks.
METHODS

Predictor variables

Athlete characteristics (A)
- Age
- Experience
- Classification
- Body and wheelchair weight
- Maximal isometric force
- Forearm length
- Upper arm length

Wheelchair characteristics (W)
- Wheel diameter
- Hand rim diameter
- Ratio hand rim / wheel

Athlete-wheelchair interaction characteristics (I)
Statistical analyses

• Forward stepwise linear regression analyses, to determine the best predictors (athlete characteristics, wheelchair characteristics, athlete-wheelchair interaction characteristics, all characteristics) of WMP test end-time.
Athlete characteristics

<table>
<thead>
<tr>
<th></th>
<th>Regression coefficient</th>
<th>Standardized coefficient</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant</td>
<td>107.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maximal isometric force (N)</td>
<td>-0.02</td>
<td>-0.36</td>
<td>[-0.04, -0.00]</td>
</tr>
<tr>
<td>trunk length (cm)</td>
<td>-0.39</td>
<td>-0.30</td>
<td>[-0.77, -0.00]</td>
</tr>
</tbody>
</table>

High correlations (r>0.60) between:
- Maximal isometric force: -
- Trunk length: body and wheelchair weight (r=0.61), lower leg length (r=0.77)
Wheelchair characteristics

<table>
<thead>
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<tbody>
<tr>
<td>constant</td>
<td>162.55</td>
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</tr>
<tr>
<td>wheel diameter (cm)</td>
<td>-1.46</td>
<td>-0.56</td>
<td>[-2.05, -0.86]</td>
</tr>
<tr>
<td>horizontal distance footrest – rear axis (cm)</td>
<td>0.28</td>
<td>0.28</td>
<td>[0.05, 0.51]</td>
</tr>
</tbody>
</table>

High correlations ($r>0.60$) between:
- Wheel diameter: hand rim diameter ($r=0.87$), rear seat height ($r=0.65$)
- Horizontal distance foot rest – rear axis: -
## Athlete-wheelchair interaction characteristics

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<tr>
<td>constant</td>
<td>111.36</td>
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<td></td>
</tr>
<tr>
<td>vertical distance shoulder-rear axis (cm)</td>
<td>-0.44</td>
<td>-0.51</td>
<td>[-0.65, -0.22]</td>
</tr>
</tbody>
</table>

High correlations ($r>0.60$) between:
- Vertical distance shoulder – rear axis: elbow angle ($r=0.71$)
## RESULTS

### All characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Regression coefficient</th>
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</thead>
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<td>116.22</td>
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<td></td>
</tr>
<tr>
<td>vertical distance shoulder - rear axis (cm)</td>
<td>-0.55</td>
<td>-0.66</td>
<td>[-0.77, -0.33]</td>
</tr>
<tr>
<td>vertical distance front seat height - foot rest (cm)</td>
<td>1.00</td>
<td>0.58</td>
<td>[0.53, 1.47]</td>
</tr>
<tr>
<td>maximal isometric force (N)</td>
<td>-0.02</td>
<td>-0.35</td>
<td>[-0.03, -0.01]</td>
</tr>
<tr>
<td>camber angle (degrees)</td>
<td>-1.67</td>
<td>-0.28</td>
<td>[-3.13, -0.21]</td>
</tr>
</tbody>
</table>
High correlations (r>0.60) between:
- Vertical distance shoulder – rear axis:
  - body and wheelchair weight (r=0.67)
  - lower leg length (0.67)
  - trunk length (r=0.73)
  - wheel diameter (r=0.71)
  - hand rim diameter (r=0.63)
  - rear seat height (r=0.82)
  - front seat height (r=0.64)
  - elbow angle (r=0.71)
- Vertical distance front seat height – foot rest: -
- Maximal isometric force:
  - wheel diameter (r=0.62)
- Camber angle: -
CONCLUDING REMARKS

• Results are an exploratory (statistical) analyses of characteristics to focus on for improvement of mobility performance by coaches and (bio)mechanics.

• Modifiable height characteristics and physical capacity seem to be important predictors of mobility performance.

• WMP test will be used to investigate modifiable wheelchair configurations in experimental setting.
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Thank you for your attention!