Importance of the volleyball spike jump performance

jump height  ball velocity

Forthomme et al. (2005); Ziv & Lidor (2010)
Introduction

Movement Characteristics + Determinants

Wagner et al. (2014)
Introduction

Differences between Sexes

φ ≠ °

φ
Fmax

φ
Upper body

φ
hip

φ
knee

φ
plant

v°arm

v

approach

lowering

CoM

Fuchs et al. (under review)

University of Cassino and Southern Latium

Philip X. Fuchs et al.
Stressing determinants in training is important

Aim: To identify determinants of volleyball spike jump performance in females
### Females (n=15):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean ± SD</th>
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</thead>
<tbody>
<tr>
<td>Age [y]</td>
<td>19.9 ± 3.5</td>
</tr>
<tr>
<td>Height [m]</td>
<td>1.79 ± 0.06</td>
</tr>
<tr>
<td>Mass [kg]</td>
<td>70.47 ± 11.02</td>
</tr>
<tr>
<td>Training [y]</td>
<td>8.4 ± 3.9</td>
</tr>
<tr>
<td>T [h/week]</td>
<td>11.5 ± 2.2</td>
</tr>
</tbody>
</table>
Methods

Instruments

12 Vicon MX-13
250Hz

• Cleveland marker set
• V3D model

2 AMTI force plates
2000Hz
Methods

Procedure + Analyses

• General warm-up
• Specific warm-up (test trials)
• 10 valid spike jumps per participant

• Filtering and normalising data, calculating variables
• Normality testing, Pearson’s Product Moment correlation
• 2 forward-stepwise analyses for jump height and ball velocity (without co-linearity)
Results for JUMP HEIGHT

Significant correlation results: 10 out of 42 variables

Counter movement
(RoM D knee, $r=.82^{***}$)
(RoM D ankle, $r=.69^{**}$)
(RoM ND ankle, $r=.72^{**}$)

Leg extension
(max. D knee velocity, $r=.85^{***}$)
(max. ND knee velocity, $r=.59^{*}$)
(max. D ankle velocity, $r=.72^{**}$)
(max. ND ankle velocity, $r=.75^{**}$)

Approach
(orientation step length, $r=.61^{*}$)

Arm swing
(min. ND arm-to-vertical angle, $r=.61^{*}$)
(max. ND shoulder velocity, $r=.64^{*}$)

$y = -0.21 + 4.49 \times 10^{-4} \times \text{max. D knee angular velocity} + 0.20 \times \text{orientation step length} \ (R^2=.82^{***})$
Results for BALL VELOCITY

Significant correlation results: 0 out of 22 variables

Age \( (r=.52) \)

\[ p < .1 \]

Max. joint velocities
- pelvis rotation, \( r=.49 \)
- elbow extension, \( r=.51 \)

Anthropometrics
- upper arm length, \( r=.44 \)
- forearm length, \( r=.49 \)

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Discussion

Importance for JUMP HEIGHT

Approach

(ND) arm swing

Small angles

Great RoM

Leg extension
1. Coordination > single variables

2. Biased by striking technique
   (Seminati et al., 2015)
Jump height:
- Optimise approach
- Improve arm swing
- Engage small lower limb angles

Ball velocity:
- Assessment of coordination required
- Consider variances of striking techniques