Sprint performance, trunk muscle strength and trunk classification in wheelchair rugby and basketball athletes.

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Background

Tweedey and vanlandewijck (2011):
• Evidence based classification
• Impairment – Performance (equipment)
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• Evidence based classification
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The relation between impairment type and sport specific activity limitation has to be known for an evidence based classification system in paralympic sports.
Background

Wheelchair rugby

New trunk classification system
Isolate the relation between trunk strength and sprint performance
Theoretically: All athletes are optimal trained

- Steps in relation
Theoretically

- Steps in relation
- Clear classes

![Diagram showing steps in relation and clear classes with impairment on the x-axis and sport specific activity on the y-axis, divided into classes 1, 2, 3, and 4.]
Theoretically:

- Steps in relation
- Clear classes
- Even introducing little variation there are clear classes
Purpose

Study the association between a 10m sprint (sport specific activity) and trunk muscle strength (impairment) and their relation with trunk score in the new trunk classification system for wheelchair rugby.

• Differences in strength and sprint between classes?
• Stepwise relation between strength and sprint?
Methods (Participants)

- 25 wheelchair athletes from the Netherlands and Belgium (Rugby and basketball).
- At least 1 year of experience
- Classified according to the new trunk classification.
Methods (tests)

Sprint tests
- 10m sprint test (3 times)
Methods (tests)

Sprint tests
- 10m sprint test (3 times)
- 10m – turn – 10m test
  (2 correct left turns and 2 correct right turns)
Methods (tests)

Muscle strength

• Maximal isometric in 4 directions (maximal value):
  • Forward / Backward
  • Left / Right
• All tests were performed 3 times.
Methods (statistics)

- Intraclass correlation coefficient (ICC) was used to indicate the reliability of the measurements (sprint and force tests)
- The best sprint tests and strength tests were used in the analysis
- Kruskall-Wallis test to indicate differences in sprint and strength between trunk classes.
- Association between sprint and strength tests was explored (correlation coefficient or clusters)
Results (sprint tests)

**ICC**
10m: 0.98  
Turn test: 0.98

**10m versus turn test**
- $R^2 = 0.94$
- $V_{10m} = V_{\text{turn}} \times 0.75 + 0.34$
Results (10m sprint test)

No significant differences between classes

Larger group of 43
### Results (strength tests)

<table>
<thead>
<tr>
<th>ICC</th>
<th>Forward</th>
<th>Backward</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.98</td>
<td>0.85</td>
<td>0.98</td>
<td>0.89</td>
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</tr>
</tbody>
</table>
## Results (strength tests)

**ICC**

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<th>Right</th>
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<td>0.98</td>
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</table>

**Correlation coefficient**

<table>
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<tr>
<th></th>
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<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>Forward</td>
<td>0.96</td>
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<tr>
<td>Left</td>
<td></td>
<td></td>
<td>0.98</td>
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</table>
Results (strength tests)

Forward

Backward

<table>
<thead>
<tr>
<th>Trunk class</th>
<th>Force (N)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>200</td>
</tr>
<tr>
<td>1</td>
<td>400</td>
</tr>
<tr>
<td>1.5</td>
<td>600</td>
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</table>

<table>
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<tr>
<th>Trunk class</th>
<th>Force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>0.5</td>
<td>1000</td>
</tr>
<tr>
<td>1</td>
<td>1500</td>
</tr>
<tr>
<td>1.5</td>
<td>2000</td>
</tr>
</tbody>
</table>
Trunk strength – 10m sprint

\[ r = 0.39 \quad (p = 0.052) \]

- Trunk muscle tests (N)
- Velocity 10m sprint (m/s)

- trunk score 0
- trunk score 0.5
- trunk score 1.0
- trunk score 1.5
Conclusions

• Sprint tests and strength tests had a high reliability.
• Differences in trunk muscle strength between trunk classes.
• No clear association between sprint performance and trunk muscle strength.
Discussion

• Other impairment factors (arms, strapping) play a more important role.
• Strapping reduces the effect of impairment.
• Wheelchair rugby athletes have different impairment types (CP, SCI, etc).
• Not all athletes were optimal trained.
Discussion

However, could we expect steps in the relation between isolated impairment and sport specific activity?
Discussion

Important strength parameters for velocity:

• Trunk
• Arms
  • left / Right
    • Lower / Upper / hands

Already results in 7 parameters
Discussion

Trunk  Upper Arm  Lower Arm

velocity

force

1/3  1/3  1/3  1/6  1/3  1/2

7 classes  12 classes
There are too many factors that play a role to find a stepwise relation between an isolated impairment and sport specific activity in paralympic sports such as wheelchair rugby.