Handcycling Classification

INFLUENCE OF TRUNK STRENGTH ON PERFORMANCE
The Team

Rafael Muchaxo
Phd Student

Dr. Sonja de Groot

Dr. Carla Nooijen

Prof. Dr. Lucas van der Woude

Ingrid Kouwijzer
Phd Student

Prof. Dr. Thomas Janssen

The Research

Towards an Evidence-based Classification System in Handcycling [2018-2022]

• Performance differences between sport classes

• Influence of trunk strength on performance
Impaired range of motion
Strength impairment
Limb deficiency
Coordination

- Ataxia
- Dystonia
- Spasticity
Arm Strength

Grip Strength

Trunk Strength

--- Trunk stability
--- Lower limb function
--- Handgrip
--- Arm extension
+ Arm flexion

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Measures of Impairment

- Manual Muscle Test: Trunk
- Handheld Dynamometry (Microfet2)

Measures of Performance

- 20s Isokinetic sprint
- Time Trial average velocity
Measures of Impairment

MMT Trunk

Scale-based test currently used during handcycling classification

Conducted according to Daniel and Worthingham’s technique

0 Zero
1 Trace
2 Poor
3 Fair
4 Good
5 Normal
Measures of Impairment

Handheld Dynamometry

50° seating position.

Microfet2 placed on the sternum

Maximum voluntary contraction - flexion

4 trials – average force used as outcome (N)
Measures of Performance

20s Isokinetic sprint

Athlete’s handbike

5’ warm-up + 2’ rest

20sec maximal sprint

Isokinetic – limited by cadence

100rpm (H1)
130rpm (H2-H4)

Cool-down

Time trials results

Emmen World Cup 2018

Maniago World Championship 2018
n = 35 handcycling athletes (27 men; 8 women)

Sport classes

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<thead>
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<tbody>
<tr>
<td>H1</td>
<td>(5)</td>
<td>Upper limb impairments</td>
</tr>
<tr>
<td>H2</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>(17)</td>
<td>No upper limb impairments</td>
</tr>
<tr>
<td>H4</td>
<td>(12)</td>
<td></td>
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Time trial n = 32 (24 men; 8 women)
Sprint n = 24 (18 men; 6 women)
N=32 (6 UpL; 8 women)

rs= 0.24 (p=0.19)

N=26 (7 women)

rs= 0.14 (p=0.48)
N=32 (6 UpL; 8 women)

$r= 0.48 \quad r^2=0.18 \quad (p=0.005)$

N=26 (7 women)

$r=0.36 \quad r^2=0.13 \quad (p=0.07)$
Handheld dynamometry (Microfet2)

+ Ratio scale
+ Discriminative

Not isometric

Dependent on the tester
Trunk flexion

Not a significant involvement of trunk strength during handcycling in a recumbent position

Reinforced by previous multilevel analysis showing small differences between H3 and H4

Trunk is an important factor during current class allocation

Handbike setup development through the years

- Upright position
- Laying down position
Need to investigate further the variability between and within classes

Research on how other different physical impairments affect performance

Trunk stabilization vs. strapping
Thank you