Classification of athletes with coördination impairment in Wheelchair Rugby

Impact Coordination Impairment on sport specific activities

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Athletes with Coördination Impairment

Athletes with:

- **Hypertonia**: 86%, Motor cortex damage, muscles appear stiff/tight.
- **Athetosis**: 6%, Basal ganglia damage, continue unvoluntary movements.
- **Ataxia**: 6%, Cerebellum damage, characterized by shaky movements.
Relation Research and Classification

This study: Evidence based practice*

Integration of:
→ (1) clinical expertise/expert opinion with
→ (2) the best available external evidence
→ (3) athletes preference.

Breukelen, K. van (2017). Impact of Trunk Impairment; On sport specific activities that determine performance in WR.*
Current problem IWRF-classification:

- No specific assessment protocol,
- No specific tests for coordination yet (in Manual),
- While more and more athletes with coördination impairment on the WR court (Team NL: 4 athletes)
Lack of standardized assessment till now leads to:

1. Different approaches between classifiers
2. Lack of reliability between classification panels
3. Increased possibility of different outcomes

= unwished practice which undermine the faith in classification.
Purpose study

• Presenting a theoretical/practical *frame of reference*, (this presentation)
• Generating practical *instruments* for the classification of athletes with coördination impairment.
Methods study

• Assessment of 30 athletes with coördination impairment coming from the sports WR, WB, PCH and HC (period 2016-2018).

• (a) Repetitive Movement Tests,
• (b) ASAS testing,
• (c) Filmed during national and international competition.
Results study (1)

• *Physical Assessment*: ROM limitations, accuracy limitations, reduced speed of movements, ‘catches’ found in ASAS scoring: summarised to 2 main concepts of coördination impairment:

• Concepts (A) *‘Co-contraction’* and (B) *‘Dissociation inability’* were found useful in analysing the movement pattern of athletes with coördination impairment, and...
Results study (2)

• Concepts ‘Co-contraction’ and ‘Dissociation inability’ were transformed into an assessment protocol / practical tool for the classification of these athletes:
  1. An (additional) assessment form when classifying athletes with coördination impairment.
  2. A document/article explaining the classification protocol
Definition Coördination Impairment

• (A) The inability to: contract the agonist and at the same time relax the antagonist, to make a smooth, well directed, repetitive movement at maximum voluntary velocity and adequate ROM in one body segment. The opposite happens: Co-contraction

• (B) The inability to: combine opposite movements of several body segments at the same time (extension in one segment and flexion in the other segment): Dissociation inability.

• (Altmann & Groeneweg, 2016; van Breukelen et al., 2015; Sanger et al., 2003).
Co-contraction
one body segment:
Arm
+
Dissociation
inability
two body segments:
Arm-Trunk
Dissociation
(Arm-Hand)
Dissociation inability (Arm-Hand)
Concept of ‘Maximal Effort’
Eligibility testing / Physical Assessment

*RMT, Repetitive Movement testing* in:

- shoulders, elbows, forearm, wrist and fingers.
- location + severity: amplitude/accuracy + movement speed

*Research Altmann (2018):* forearm pro-supination score < 66 in 20 sec and/or wrist flexion/extension score < 68 in 20 sec = coordination impairment which do give the, maximum, 3.0 handscore.

(3.5 is a normal arm/hand)
Mirror movements

• “Mirror movement refers to simultaneous contralateral, involuntary, identical movements that accompany voluntary movements”.

• Proves that the coordination impairment is reflected in hands and arms.

Impact

Classification: the association between:
(1) Measure of impairments and
(2) Determinants of sport performance

• The *impact* of the impairment on the sport-specific activities in WR:
  • (1) Pushing
  • (2) Ballhandling
Impact Co-contraction/Dissociation inability on Wheelchair Pushing:

1. Pushing forward: (a) -frequency, (b) -volume
2. Pushing reverse
3. Braking/Turning
Impact Co-contraction

• Arm pushing frequency
  
  o **Normal**: frequency of, at least, 2 strokes each second.
  o **Decreased**: 1.5 strokes each second can be seen already as a ‘decreased’ pushing frequency.
  o **Limited**: 1 stroke each second, is (very) limited.


Impact Co-contraction

Arm Pushing Volume:

• **Co-contraction** of the elbow (biceps/triceps) impacts the angle between contact point hand on the wheel and release hand of the wheel
Impact Co-contraction

Arm pushing Volume

• the hands will go back to the rear earlier, after one push.

• **Result:** the amount of power will be less and the end speed will be decreased.
  - Power = Force * Velocity = Force * Displacement/Time

Arm-pushing volume

Pushing Profiles CP-athletes in WR

0.5
- elbow: 90°
- wheel contact: ≤ 45°

1.0
- elbow: 120°
- wheel contact: 45° - 60°

1.5
- elbow: 150°
- wheel contact: 60° - 90°

2.0
- elbow: 170°
- wheel contact: ≥ 90°
Impact Dissociation Inability

2 Body segments unable to execute opposite movement patterns:

(1) Arm extension leads to wrist/fingers extension
(2) Arm extension leads to Trunk extension
Dissociation inability: overflow extension left wrist/fingers
Dissociation inability: overflow extension right wrist/fingers
Reverse Arm-pushing

• Observation in Technical/Observational Assessment:

Can the athlete combine opposite movement patterns in the reverse pushing:
  o execution of only the *pulling* (flexion) movement or
  o also the *pushing* (extension) movement?
Impact Co-contraction/Dissociation inability on Ballhandling

One-handed: throwing/catching, dribbling, pick-up ball, fingertip test
Two-handed: chestpass, pop-up
Co-contraction (one body segment: Arm) + Dissociation inability (two body segments: Arm-Trunk)
Dissociation inability: preferred two-handed dribbling
Dissociation inability: preferred twohanded receiving
Dissociation inability: preferred use other hand
Final Class Determination

Classification Formula WR: \( UE + Tr = \text{final class} \)

(UE = Upper Extremity, TR = Trunk)

\( UE = Pp \) (pushing profile) + Bp (ball handling profile)

Central question: how is the arm/hand acting during Pushing & Ballhandling.
Impact
Co-contraction/Dissociation inability
on
Trunk movements
Trunk Rotation

Physical assessment: may pass test 4, rotation

On court however.... co-contraction can prevent rotational movement.

→ Rotation to one side can only be done with relaxation of the other side at the same time.
Trunk Lateral Flexion

**Physical assessment:**
may pass trunk test 5, lateral flexion

On court however....
co-contraction can prevent effective use lateral flexion.

→ Lateral flexion to one side needs relaxation other side at same time
Class Danny?
Coordination impaired athletes

• Lack of standardized assessment till now leads to:

1. Different approaches between classifiers
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Example:
Danny’s national class: 3.0 (UE 2.5 + Tp 0.5)
Danny’s international class: NE (UE 3.0 + Tp 1.0)
Take home message

• Classifiers have to work with one protocol, one standardised assessment when evaluating athletes with coordination impairment,
• To prevent a variety of classification outcomes.
• Hopefully this work can be helpful to accomplish this.

Thank you