International Wheelchair Rugby Federation

Development of Evidence Based Classification

Practical application in wheelchair rugby

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Overview

- Introduction to wheelchair rugby
- Athlete priorities
- Adjustments to IPC schedule for developing Evidence Based Classification
- Impairment testing
- Impact of impairment on activity limitation
- The principles of determining classes

Wheelchair Rugby

- Player created sport for athletes with impairments in arms and legs
- Four athletes per team on basketball court
- Manual wheelchair
- Soft cover volleyball
- Score = cross goal line with ball under control

Wheelchair Rugby

- Contact between wheelchairs is permitted
  - AND ENCOURAGED!

Wheelchair Rugby

Classification in Wheelchair Rugby

Sport specific; foundation expert opinion

- Sport class =Arm score/ 2 + Trunk score
- Arm score 0.5 – 4.0
- Trunk score = 0 -1.0
- Eligible class < 4.0
- On court ≤ 8.0

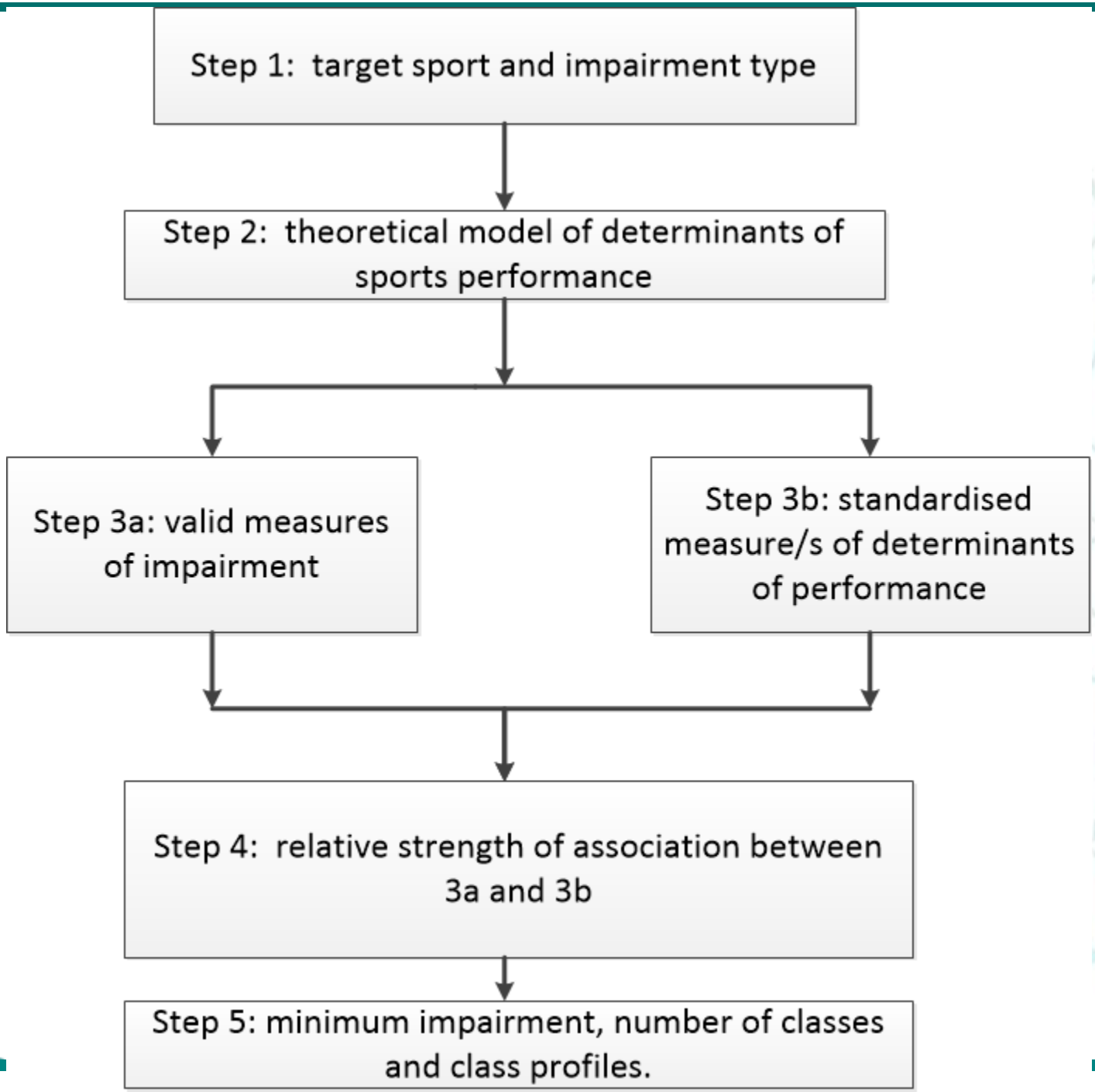
Evidence based classification?

Definition:

A system in which scientific evidence indicates that the methods used for assessing impairments and assigning class will result in classes that comprise athletes who have impairments that approximately cause the same amount of difficulty in a given sport.

Tweedy SM & Vanlandewijck YC 2011. International Paralympic Committee position stand--background and scientific principles of classification in Paralympic sport. *Br J Sports Med,* 45, 259-69.

Tweedy et all 2014. Paralympic classification: conceptual basis, current methods, and research update. *PM&R* 6(8)suppl, 11-7


Step 1: target sport and impairment type
Step 2: theoretical model of determinants of sports performance
Step 3a: valid measures of impairment
Step 3b: standardised measure/s of determinants of performance
Step 4: relative strength of association between 3a and 3b
Step 5: minimum impairment, number of classes and class profiles.

Evidence Based Classification

Lessons learnt in Wheelchair Rugby

Neuromusculoskeletal impairment:
Muscle strength
Range of Motion
Limb deficiency
Coordination (hypertonia, ataxia and athetosis)

→ Step 1: target sport and impairment type

Classification Survey

- Support to adjust existing classification system instead of developing new system
- Increase maximum trunk score from 1.0 to 1.5
- Include athletes with health conditions other than SCI
- Adjust current system to evaluate athletes with impairments other than muscle power that cause sport specific activity limitations
  - Coordination impairments (Cerebral Palsy)
  - Limb loss (Congenital and traumatic amputation)
- Make classification system transparent and consistent

Altmann et al. Improvement of the classification system for wheelchair rugby: athlete priorities. Adapted Physical Acitivity Quarterly 2014 31(4): 377-89 doi: 10.1123/apaq.2013-0064

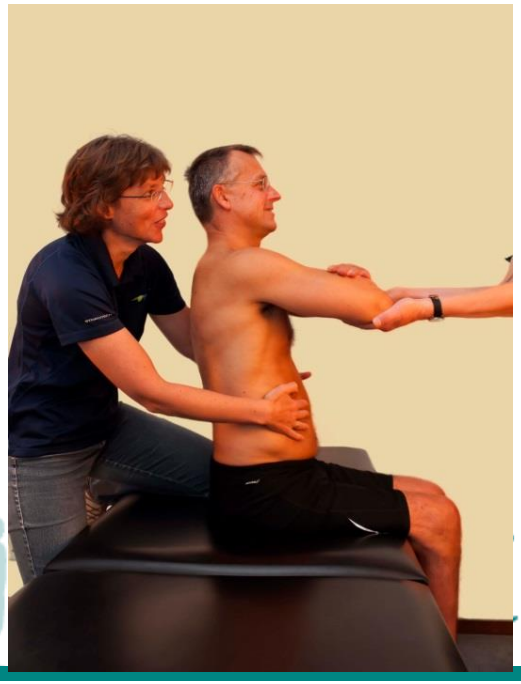
Trunk impairment

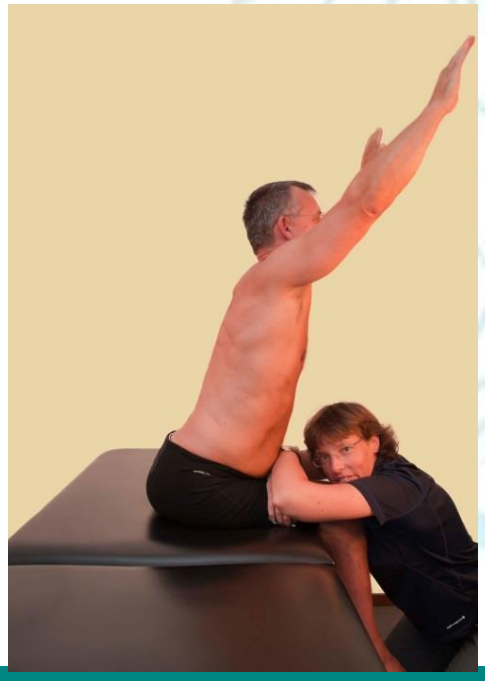
- Expert interview
- Preliminary literature review - trunk impairment tests
- Systematic literature review - impact of trunk impairment on wheelchair activities

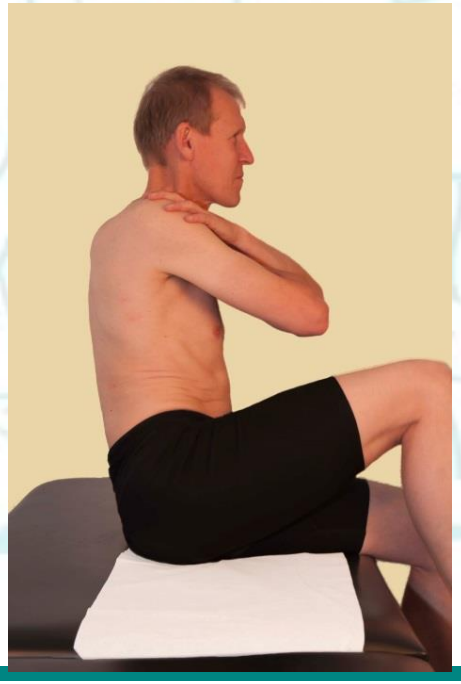
Altmann et al. The impact of trunk impairment on performance of wheelchair activities with a focus on wheelchair court sports: a systematic review. Sports Medicine Open (2016) 2:6
DOI 10.1186/s40798-015-0013-0

Trunk Impairment Classification (TIC)

- 10 tests in algorithm
- Failed test determines trunk score:
  - 0 = full trunk impairment
  - 1.5 = minimum to no trunk impairment

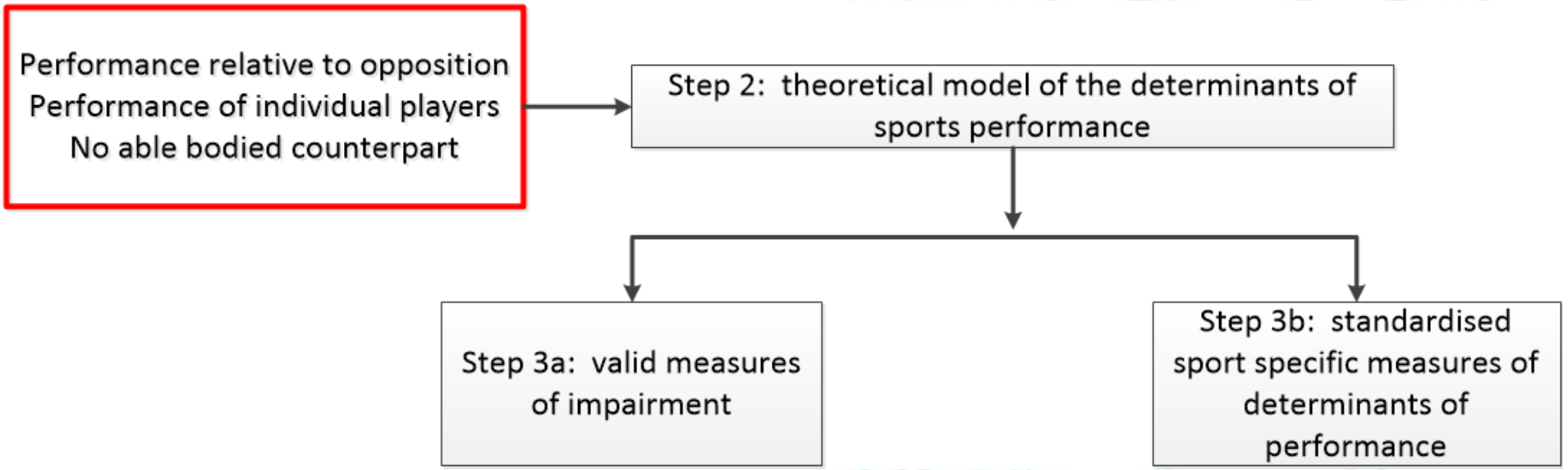






Evidence Based Classification

Lessons learnt in Wheelchair Rugby



Construct validity of the TIC

Construct validity of the TIC

- Athletes with TIC score 0 cannot sit unsupported
- Trunk muscle strength

  TIC score 0 < 0.5-1.5
- Trunk excursion in dynamic balance

  TIC score 1.5 > 1.0 - 0.5
- Not enough athletes with coordination impairment → additional testing

Altmann et al. Construct validity of the Trunk Impairment Classification system (TIC) in relation to objective measures of trunk impairment. Archives of Physical Medicine and Rehabilitation, under review

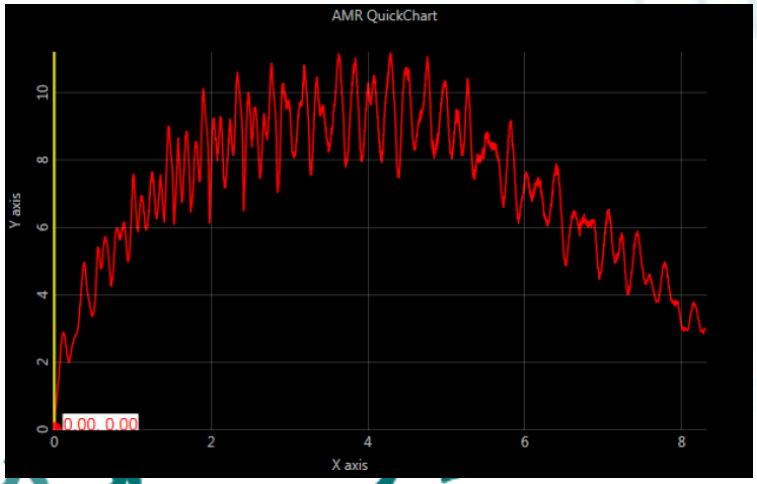
Evidence Based Classification

Lessons learnt in Wheelchair Rugby

Low number of athletes overall and per impairment type and severity
Measurement interfering with competition
Costs of transport of measurement devices and staff

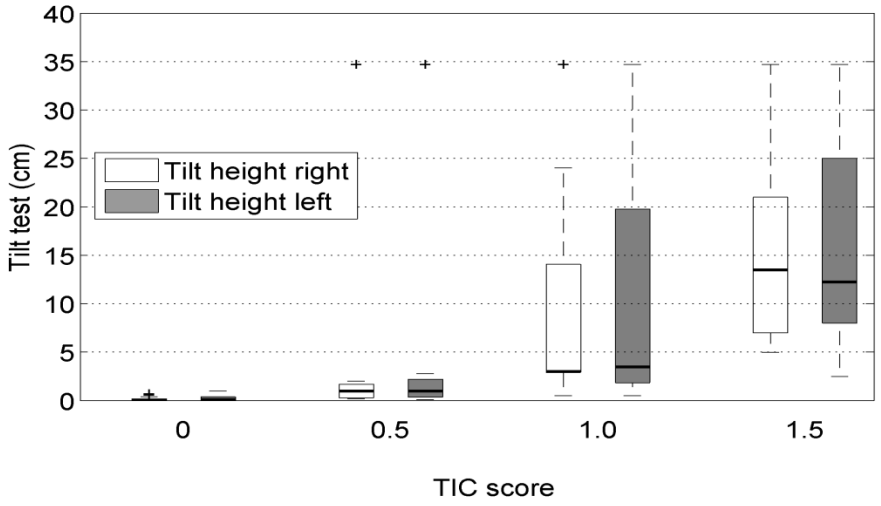
→ Step 4: relative strength of association between valid measures of impairment and sport specific measures of performance determinants

Relation between the TIC and activities



Relation between the TIC and activities

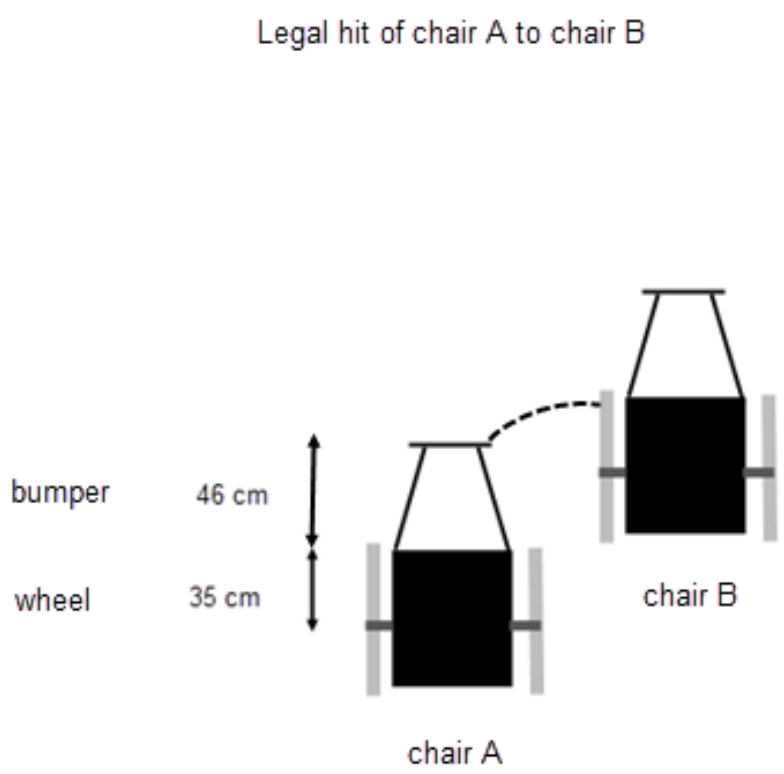
- Tilting the chair is dependent on TIC score (Kruskall-Wallis $p < .001$)

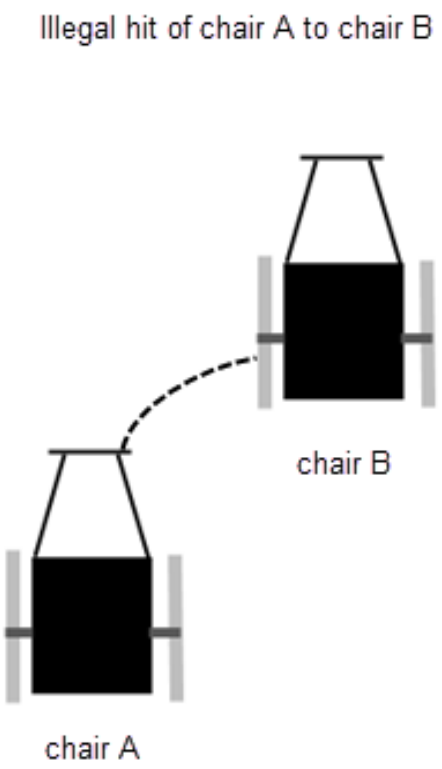


athletes in TIC score 1.0 and 1.5 can tilt chair to a relevant height

Relation between the TIC and activities

- Acceleration in the first 1-2 m. is dependent on TIC score (Kruskall-Wallis p = .0026 and p = .0012, respectively)





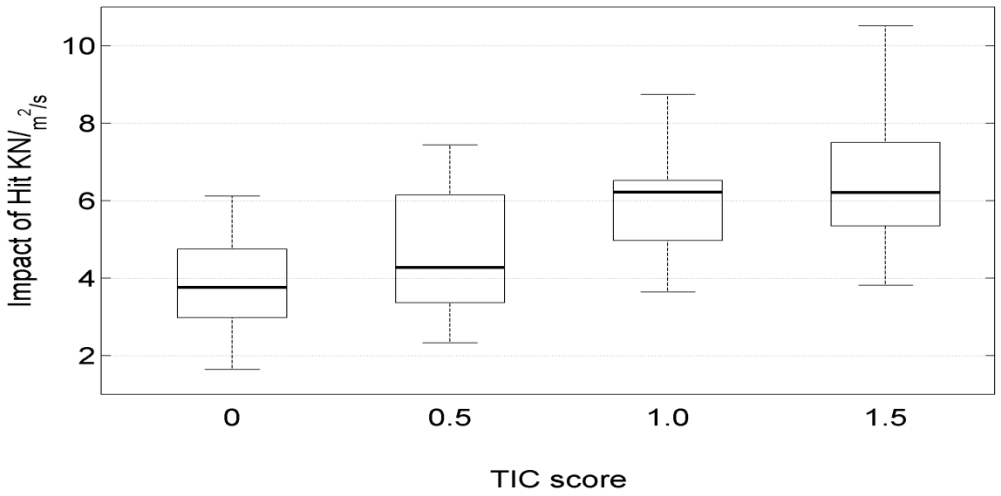
Relation between the TIC and activities

TIC score	0	0.5	1.0	1.5
0	X			
0.5	6.74	X		
1.0	4.50	10.60	x	
1.5	3.19	6.57	18.60	X

Athletes in TIC score 0.5-1.5 can push themselves beyond the reach for a hit by athletes in TIC score 0

Relation between the TIC and activities

- Sprint momentum is dependent on TIC score ($p < .001$)



Athletes in TIC score 1.0 and 1.5 can produce a higher impact in a hit than athletes in TIC score 0

Relation between the TIC and activities

- Velocity in 10 m sprint is not dependent on TIC score (Kruskall-Wallis p =.27)

  The impact of trunk impairment decreases with distance and the impact of arm impairment increases. After 2-3m, the impact of arm impairment is more important

- Velocity in a 180° turn after 10 m sprint is not dependent on TIC score (Kruskall-Wallis p =.24)

  There is a linear relation between velocity and the time to turn.

Evidence Based Classification

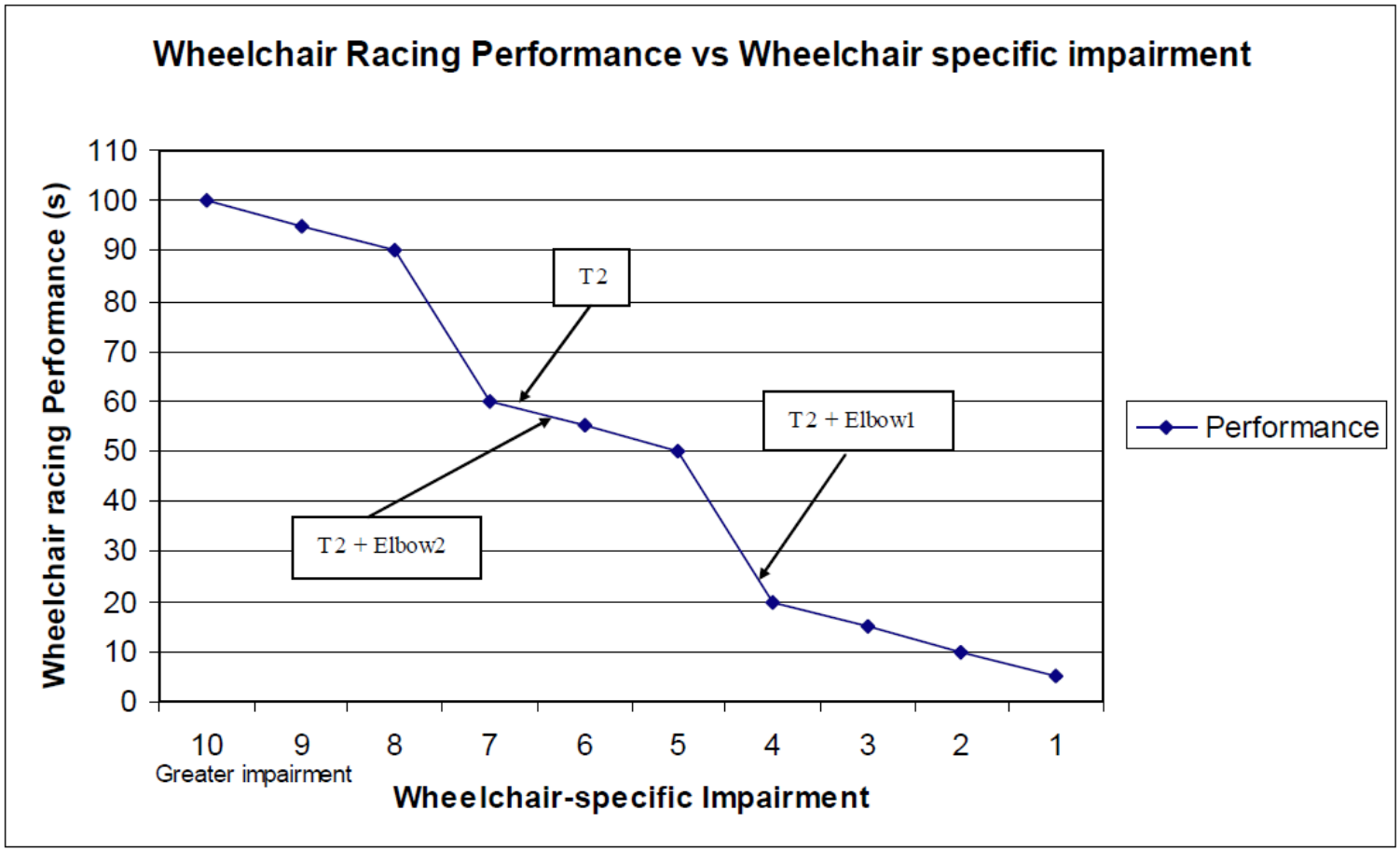
Challenges in Wheelchair Rugby

Step 4: relative strength of association between valid measures of impairment and sport specific measures of performance determinants

Step 5: Use outcomes from step 4 to determine
minimum impairment criteria
number of classes
class profiles

Existing sport with classification system that lacks face validity in at least some areas
Urge that was felt by athletes and stakeholders to change classification

Natural classes



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Definition of a natural class

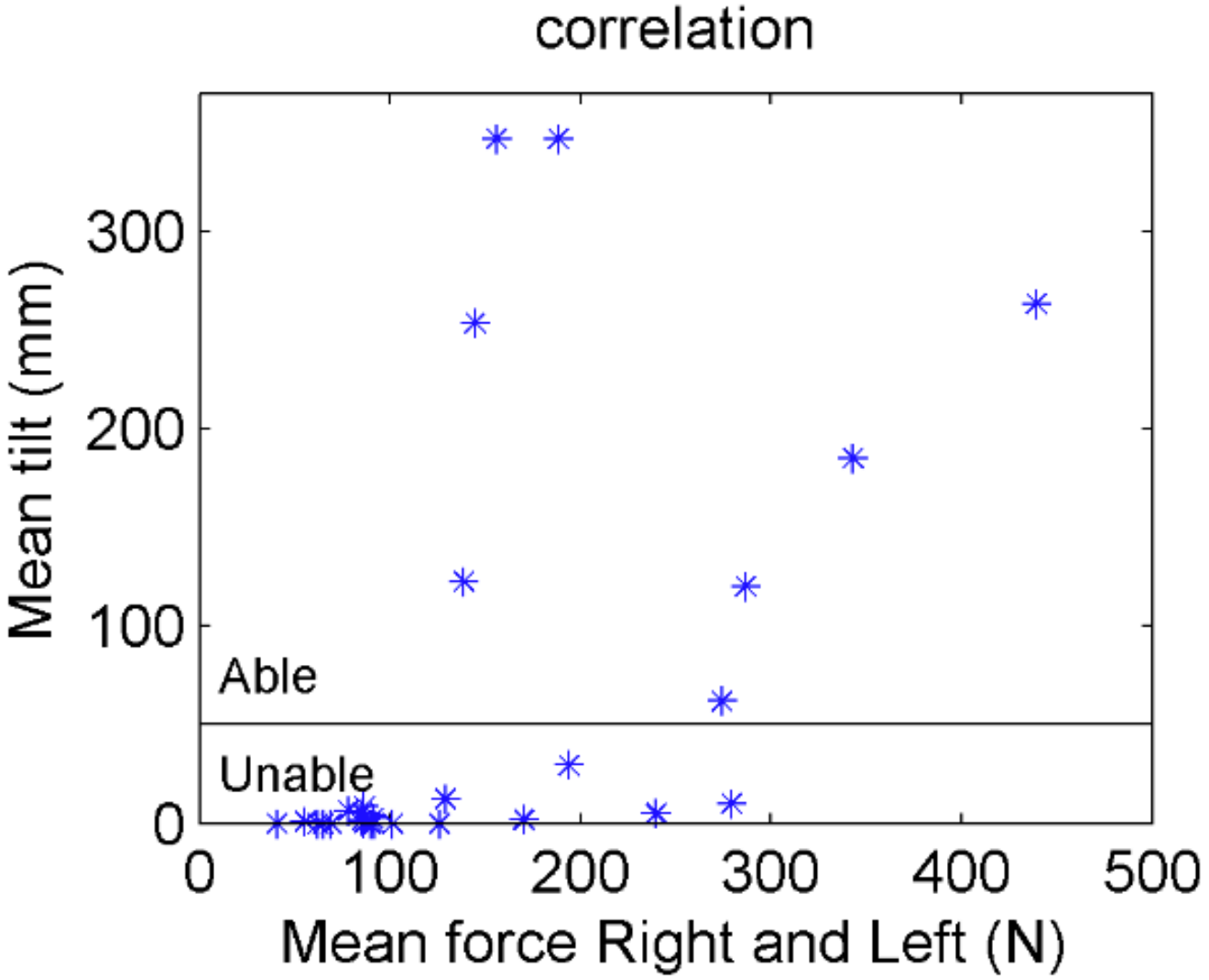
Cluster analysis based on 4 clusters

1) A significant difference between all clusters

2) Increase of the median performance of the activity per cluster with increasing trunk muscle strength

3) A significant difference between clusters in post hoc testing

Number of classes and class profiles



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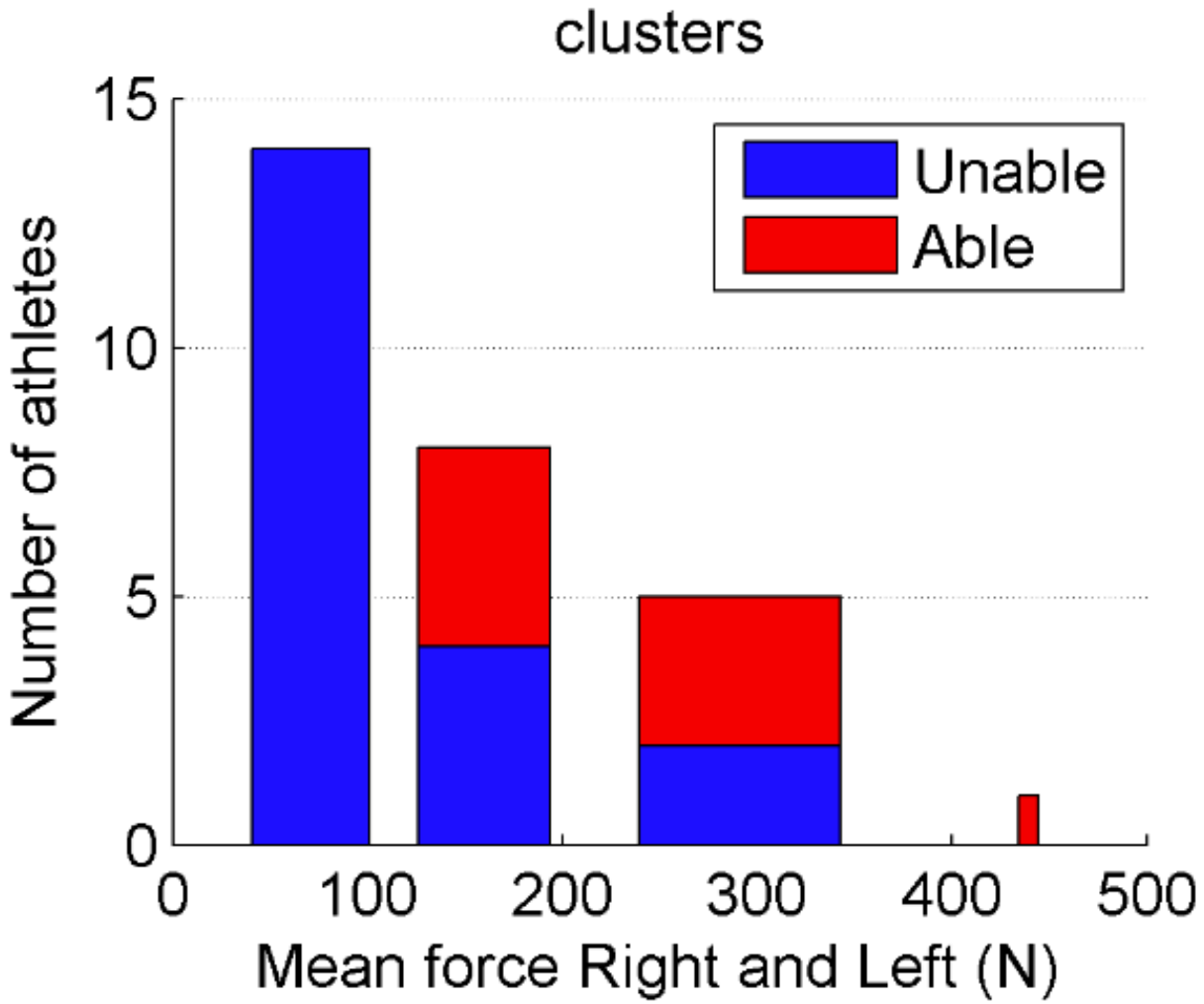

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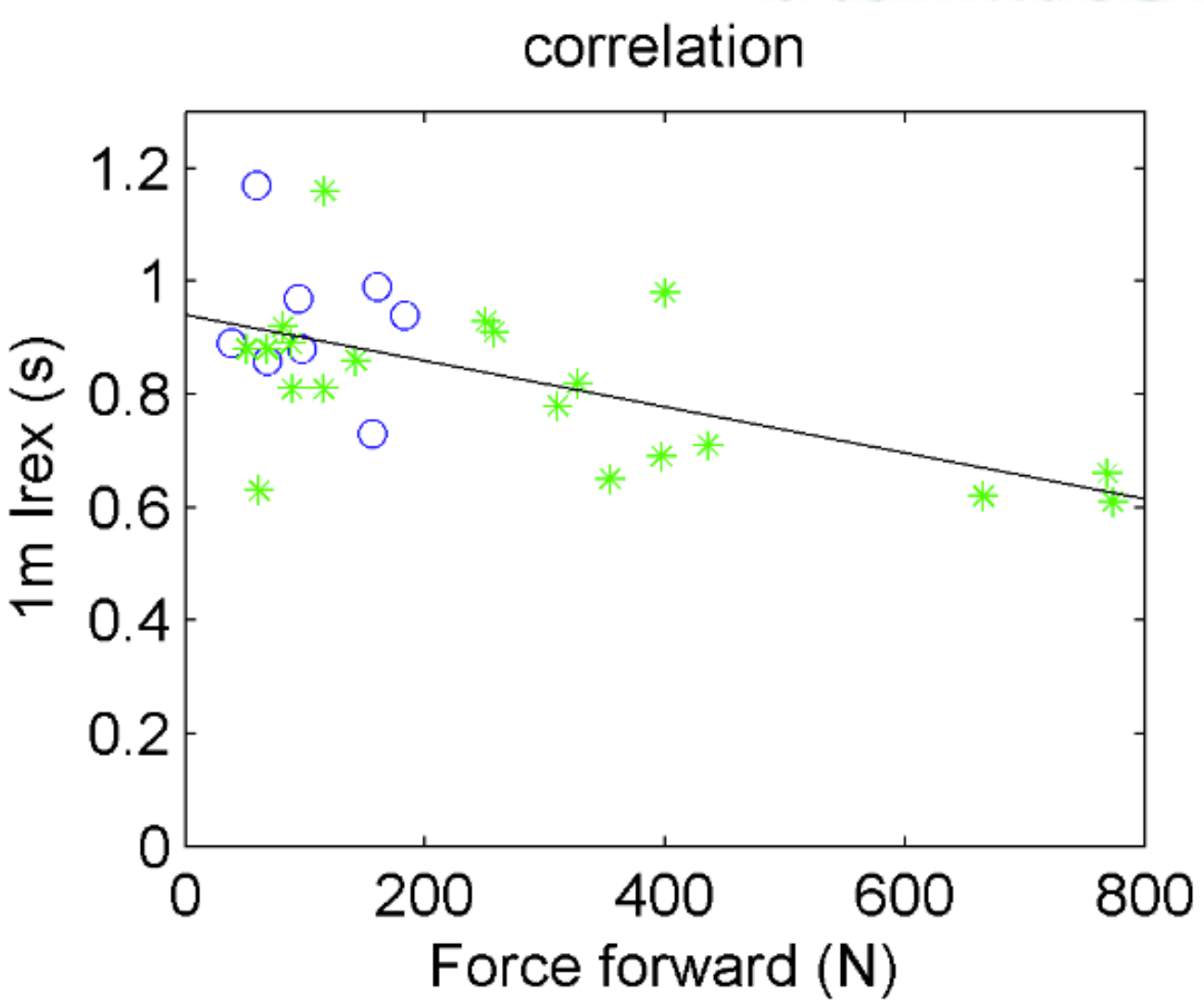

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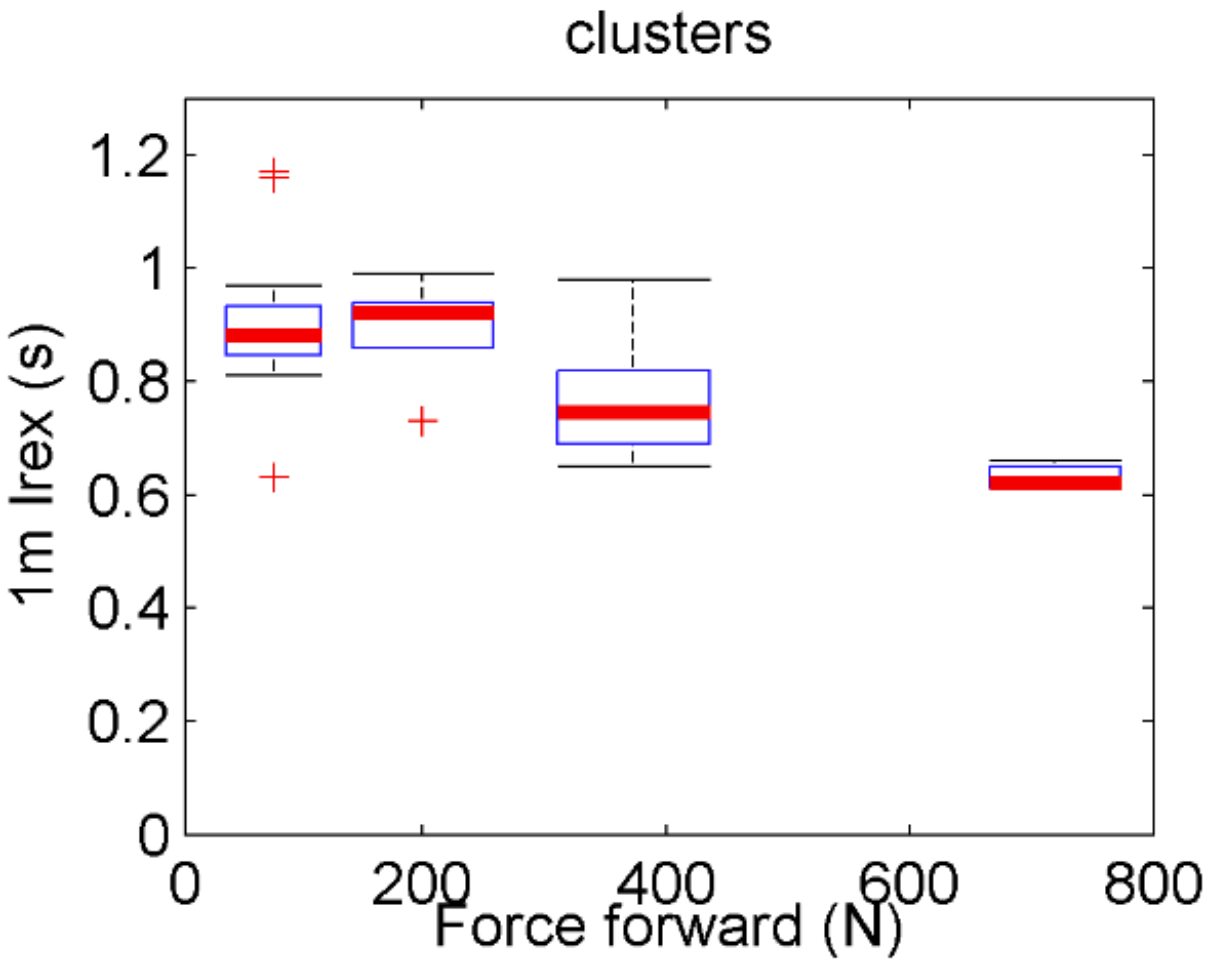

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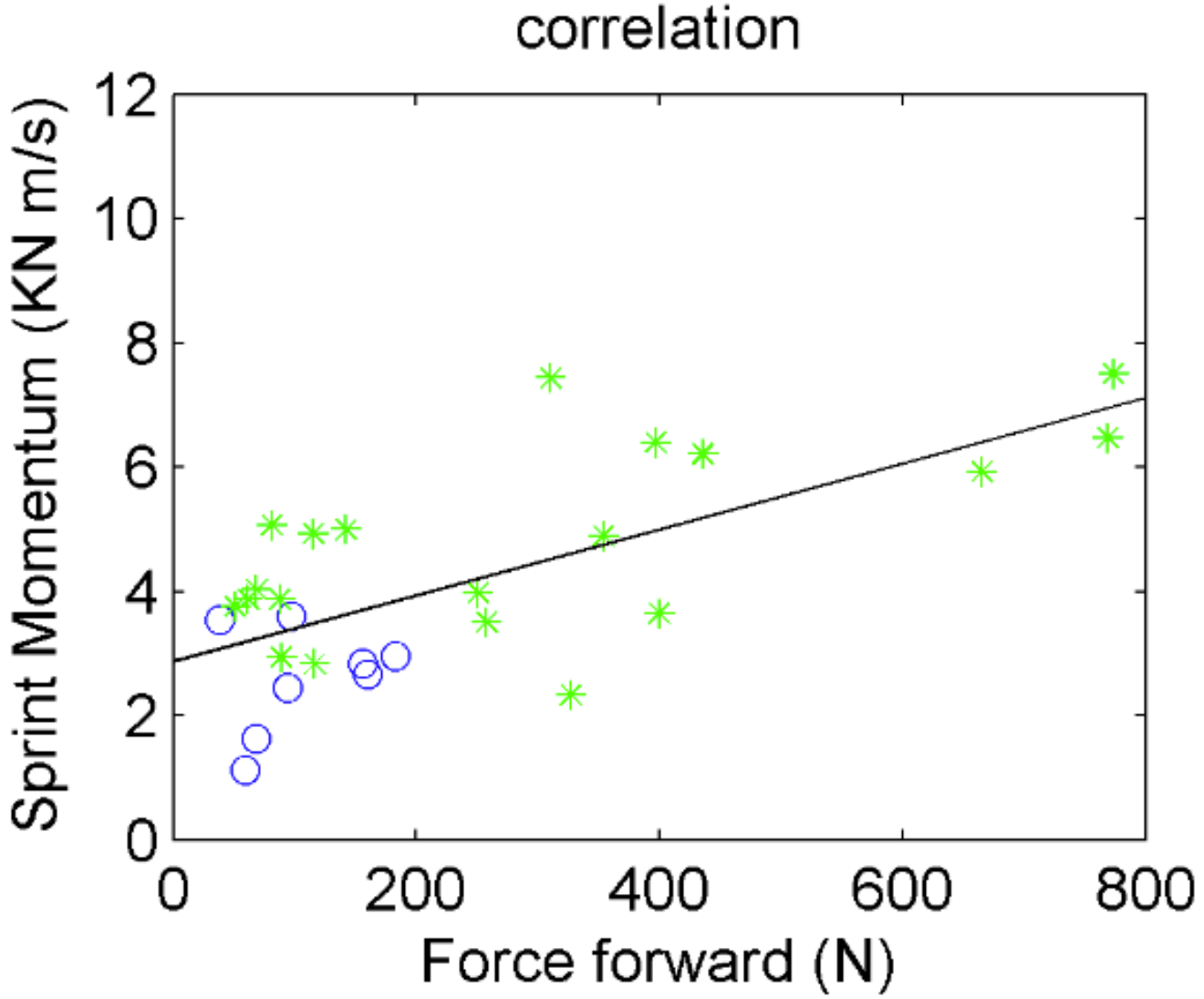

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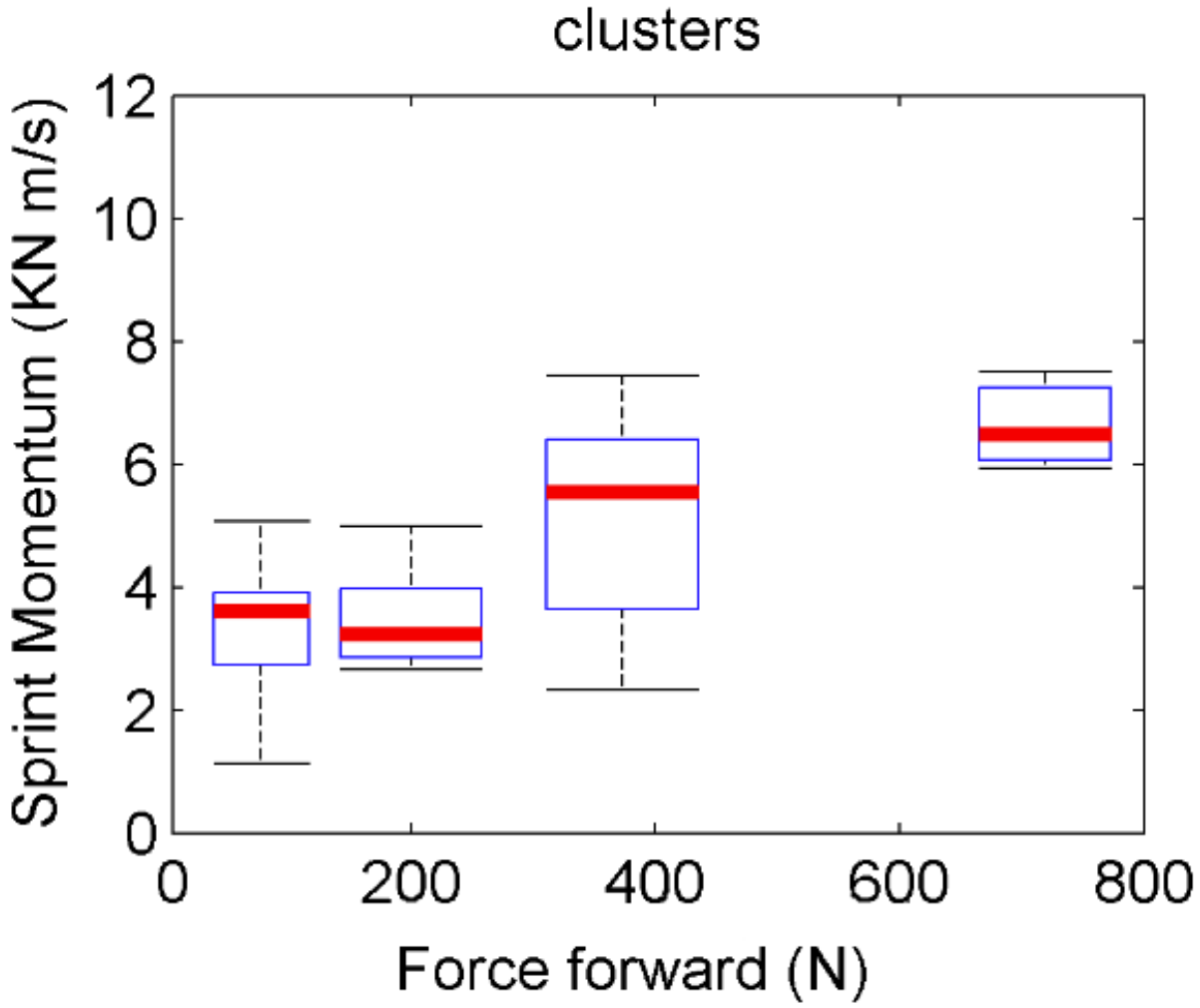

Conclusion

- Trunk impairment impacts on wheelchair activities that affect proficiency in rugby
- The TIC provides four scores for trunk impairment; construct validity was supported for three scores
- Trunk impairment measured by TIC impacts on wheelchair activities and there is evidence to continue the use of four scores

Conclusion

- Based on the current research, no natural classes could be determined.
- Additional research is needed:
  - Coordination impairment of the trunk
  - Relation between trunk impairment and ball activities
  - Determine relative impact of trunk and arm impairment on chair and ball activities

THANK YOU!

- All athletes and classifiers who volunteered
- Gehandicaptensport Nederland
- Double Performance
- Hollister