Validation of arm coordination impairment tests for wheelchair rugby classification.

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Wheelchair rugby Classification

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- Developed for athletes with complete cervical SCI
- Based on impairment in muscle strength

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Wheelchair rugby Classification

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- Athletes with other health conditions and resulting impairment types are also eligible to play

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IPC position stand

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The following classifiable impairments were defined:

- Impaired strength
- Impaired range of motion (ROM)
- Limb deficiency, leg length difference
- Short stature
- Coordination impairment (i.e. hypertonia, ataxia and athetosis)

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1. IPC position stand Tweedy SM, 2009

Coordination impairment

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- Reliable and valid test for coordination impairment of the arms are not available.

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Tests clinical practice

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Many tests available described in literature, but...

- Limited to coordination impairment of the fingers and the wrist
- Specific for one medical health condition
- Activity limitation and not (coordination) impairment

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Coordination impairment

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- Currently the athlete sports class is based on the observation of activities off and on court (=expert opinion)

- → subjective
- → not restricted to coordination impairment

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Survey amongst classifiers

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Classifiers based their decision on the following activities:

- Chair skills
- Reduced ball handling
- Unable to perform fast combined activities
- No selective movement of trunk
- Decreased ability for simultaneous movement on right and left side
- Slow reaction times

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Definition of coordination

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- No definition in IPC position stand
- No available definition in the medical literature

- “To be able to contract the agonist and at the same time relax the antagonist to make a smooth, well directed repetitive movement at maximal ROM with maximum voluntary velocity in one segment and to be able to combine movements of several segments.”

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Newly developed tests

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Repetitive Movements Test:

- Testing each segment of the upper limb separately
- Each movement requires contracting the agonist and relaxing the antagonist at the same time as fast as possible

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Repetitive Movements Test

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Level	Starting position	Targets	Movement	Camera position
Fingers	Forearm and back of hand supported full length on table, elbow 90° flexion, palm facing up.	Begin=full finger extension. End=full finger flexion.	Finger flexion to full fist or maximum PROM if less. One side at a time.	Lateral.
Wrist	Forearm resting on table, palm facing down, wrist and hand over the edge of the table.	Begin=90° wrist flexion. End=90° wrist extension.	Wrist extension 10 90° or maximum PROM if less. One side at a time.	Lateral.
Forearm	Forearm and back of hand supported full length on table, elbow 90° flexion, forearm in maximum supination, palm facing up, fingers in extension.	Begin=table. End=table.	Pronation until palm on table. One side at a time.	Front.
Elbow	Forearm resting on table hand palm facing up with 45° angle between upper arm and table.	Begin=table. End= classifier's hands at 135°.	Elbow flexion to 135° or maximum PROM if less. One side at a time.	Lateral.
Shoulder	Shoulder elevation 45°, elbow extended, hand palm facing down resting on table.	Begin=table. End=classifier's hands at 135°.	Anterior flexion from start position to 135° or maximum PROM if less. One side at a time.	Lateral.

Validated clinical tests

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- Spiral Test
- Finger Nose Test

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Spiral Test

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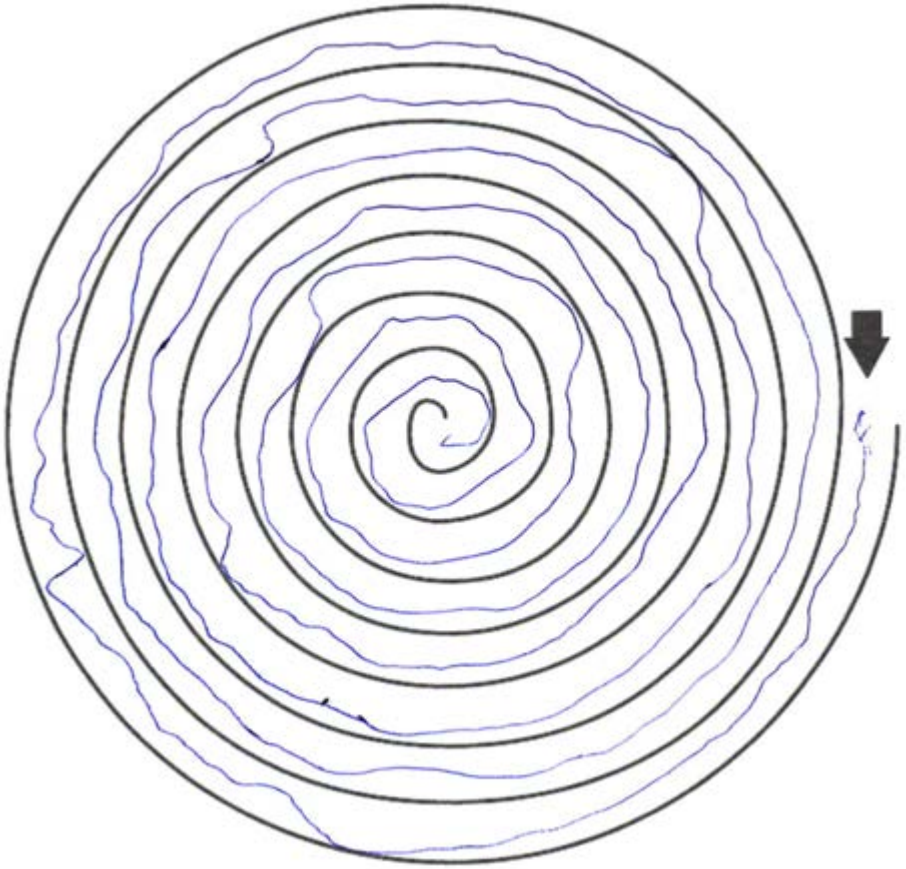

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Finger Nose Test

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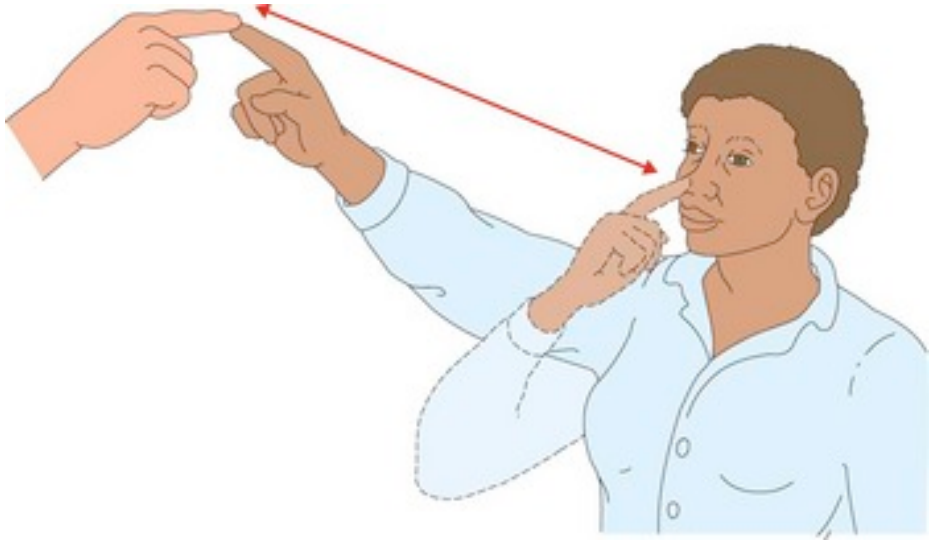

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Golden standard

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- Sports class determined by classifiers

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Study aim

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- To determine the relationship between the validated clinical tests and the newly developed Repetitive Movements Test to determine whether the Repetitive Movements Test is measuring coordination impairment.
- To determine the relationship between the newly developed Repetitive Movements Test and the sports class to determine whether the tests can be used for classification of coordination impairment in wheelchair rugby athletes.

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Methods

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- Setting: internationally certified classifiers tested athletes during the national competition.
- Participants: 39 athletes ≥ 18 years old with a health condition that can cause coordination impairment.
- Exclusion: strength impairment in the arms (MMT < 4 in MRC)
- Video analysis

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Methods

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Outcome parameters:

- Sports class
- Number of hits of the repetitive movement test in 20 seconds
- Finger-nose test: number of correct hits in 20 seconds
- Spiral test: time needed to perform the test in seconds, added with 3 seconds for each time a line was touched and with 5 seconds for each time a line had been crossed

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Methods

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Analysis:

- Pearson correlation
- Cut-off at ≥0.6, which is a moderate-high correlation

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Results

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Correlation Spiral Test and Repetitive Movements Test:
0.41

Correlation Finger Nose Test and Repetitive Movements Test:
0.31

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Results

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Correlation Repetitive Movement Test and sports class:

Joint	Correlation Left	Correlation Right
Shoulder	0.15	0.30
Elbow	0.28	0.33
Forearm	0.34	0.41
Wrist	0.24	0.36
Fingers	0.21	0.28
Total	0.38	

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Conclusion

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Correlation Spiral Test and Finger Nose Test and Repetitive Movements Test is low

→ Not measuring coordination impairment

Correlation between Repetitive Movements Test en sports class is low

→ Not wheelchair specific

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Conclusion

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Correlation Spiral Test and sports class is 0.61

→ There seems to be some face validity in the expert opinion of classifiers

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Discussion

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- Repetitive movements might be not complex enough

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Discussion

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- Repetitive movements might be not complex enough
- Compensatory movements

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Discussion

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- Repetitive movements might be not complex enough
- Compensatory movements
- Not classifiable impairments in wheelchair rugby, such as cognitive functions and vision

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Discussion

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- Repetitive movements might be not complex enough
- Compensatory movements
- Not classifiable impairments in wheelchair rugby, such as cognitive functions and vision
- Expert opinion used as golden standard

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Special thanks to

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All participating athletes

All participating classifiers

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Questions?

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