Impact of trunk and arm impairment on performance of wheelchair and ball activities in wheelchair rugby during competition

Viola C. Altmann MD, PhD (1), Barry S. Mason PhD (2), Prof. Victoria L. Goosey-Tolfrey PhD (2)

1 International Wheelchair Rugby Federation

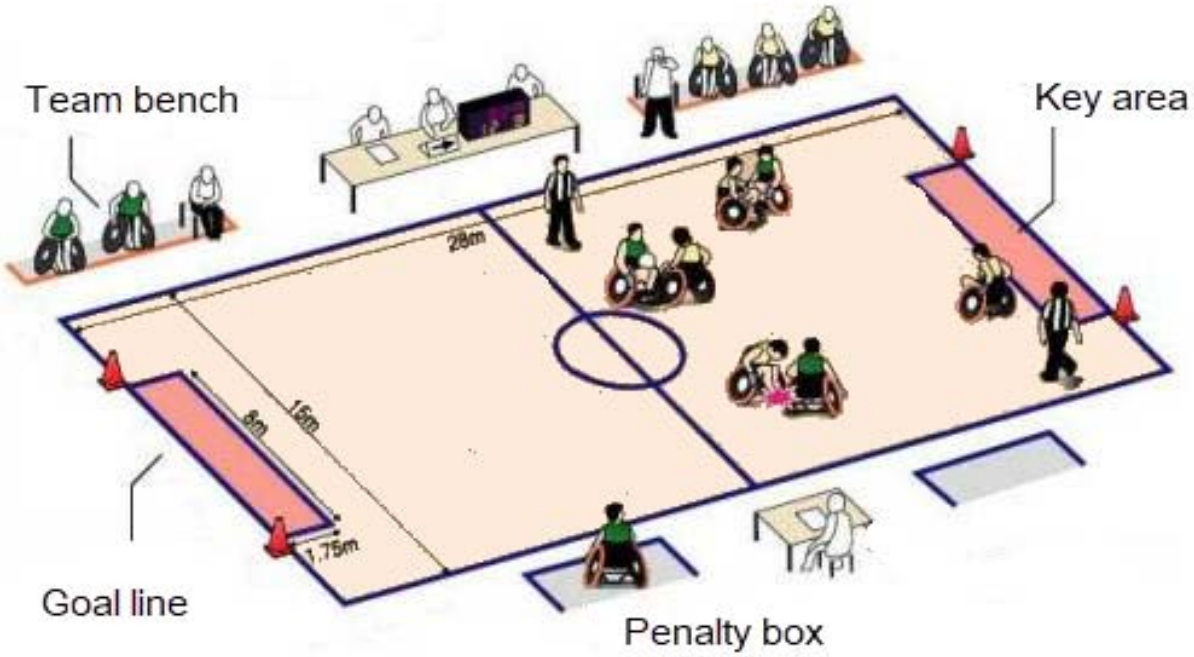
2 Peter Harrison Centre for Disability Sport, Loughborough University, UK

IWRF
International Wheelchair Rugby Federation

Loughborough University

Wheelchair rugby

Loughborough University



IWRF
International Wheelchair Rugby Federation

1. IPC position stand Tweedy SM, 2009

Wheelchair rugby classification

Loughborough University

- Developed for athletes with complete cervical SCI
- *All* athletes have some degree of impairment in at least one arm
- Trunk score 0-1.5 and arm score 0.5-3.5
- Arm score/ 2 + trunk score = athlete class
- Eligible class < 4.0
- 8.0 points on court

IWRF
International Wheelchair Rugby Federation

Evidence Based Classification (EBC)

Loughborough University

Step 1: Specify impairment types eligible for the sport

Step 2a: Develop valid measures of impairment/s (i.e., ratio scaled; reliable; precise; training resistant; specific to one impairment and account for the greatest variance in performance)

Step 2b: Develop standardized, sport specific measures of performance.

Step 3: Assess the relative strength of association between valid measures of impairment and key performance determinants.

IWRF International Wheelchair Rugby Federation

Retrieved from: Tweedy et al., PM & R 2014

Information that is lacking

Loughborough University

- Impact of trunk and arm impairment on ball activities
- Impact of trunk and arm impairment on performance in realistic game situation
- Validity of arm impairment in relation to objective, ratio scaled measures of impairment

IWRF
International Wheelchair Rugby Federation

Study aim

Loughborough University

To determine the impact of trunk and arm impairment on wheelchair and ball activities in elite wheelchair rugby players during competition

IWRF
International Wheelchair Rugby Federation

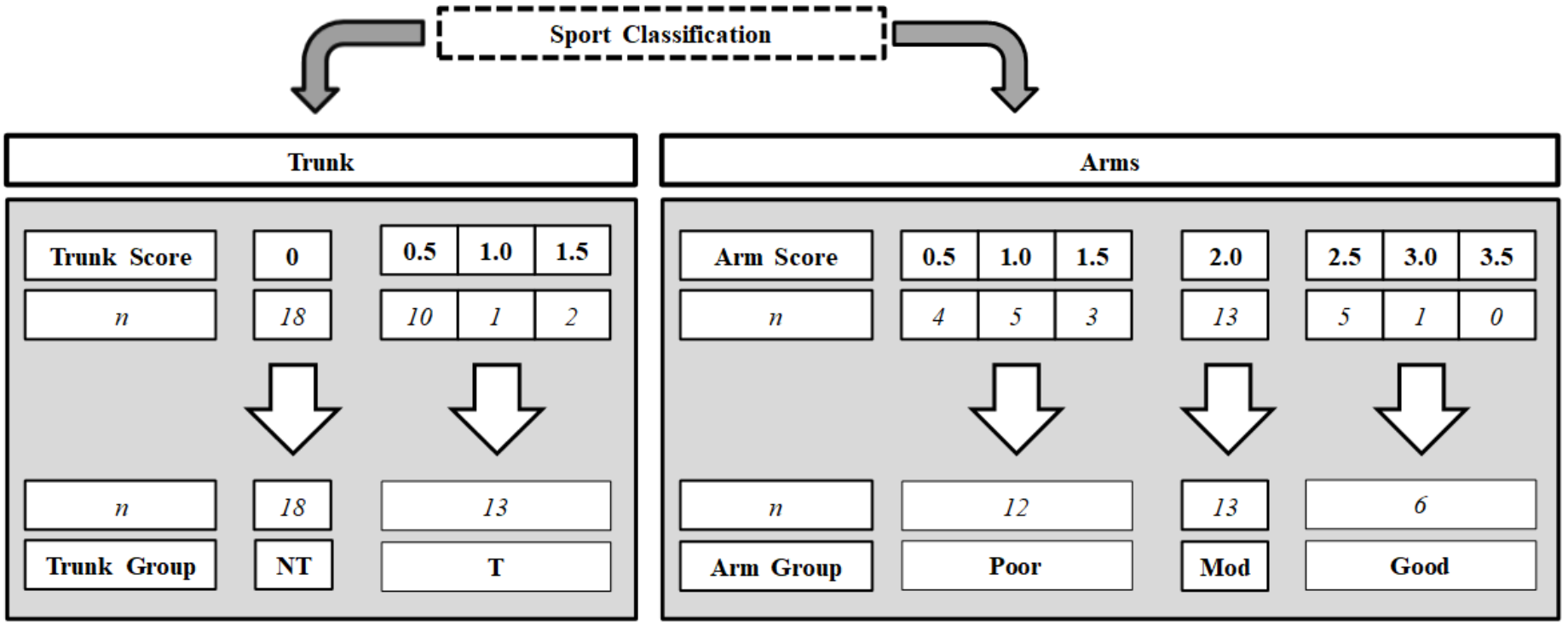
Methods

- Setting: World Wheelchair Rugby Challenge 2015
- Participants: 31 athletes from 3 world top 10 ranked teams
- 5 matches per team
- Physical data: indoor tracking system (Ubisense)[1]
- Technical data: video analysis (2 cameras)

1. Rhodes et al., Journal of Sports Sciences 2014

Methods

- Impairment of participating athletes



International Wheelchair Rugby Federation

Methods

Physical parameters

- Relative distance covered
- Peak speed
- Relative time spent in each of six speed zones:

Zone	Intensity	Speed threshold ($m \cdot s^{-1}$)
Z1	Very low	< 0.50
Z2	Low	0.50 – 1.49
Z3	Moderate	1.50 – 2.49
Z4	High	2.50 – 2.99
Z5	Very high	3.00 – 3.49
Z6	Maximal	≥ 3.50

Methods

Technical parameters

Goals total number (n), driving into the key (%), received pass in the key (%)

Catching

number of passes received (n), catch success rate (%), time spent in possession of the ball (mean time), number of loose balls recovered (n)

Passing

number of passes attempted (n), pass success rate (%), one-handed passes (%), long passes (%), assists (n), inbounds (n)

Defending

turnovers (n), blocks (n), defensive blocks (%)

Methods

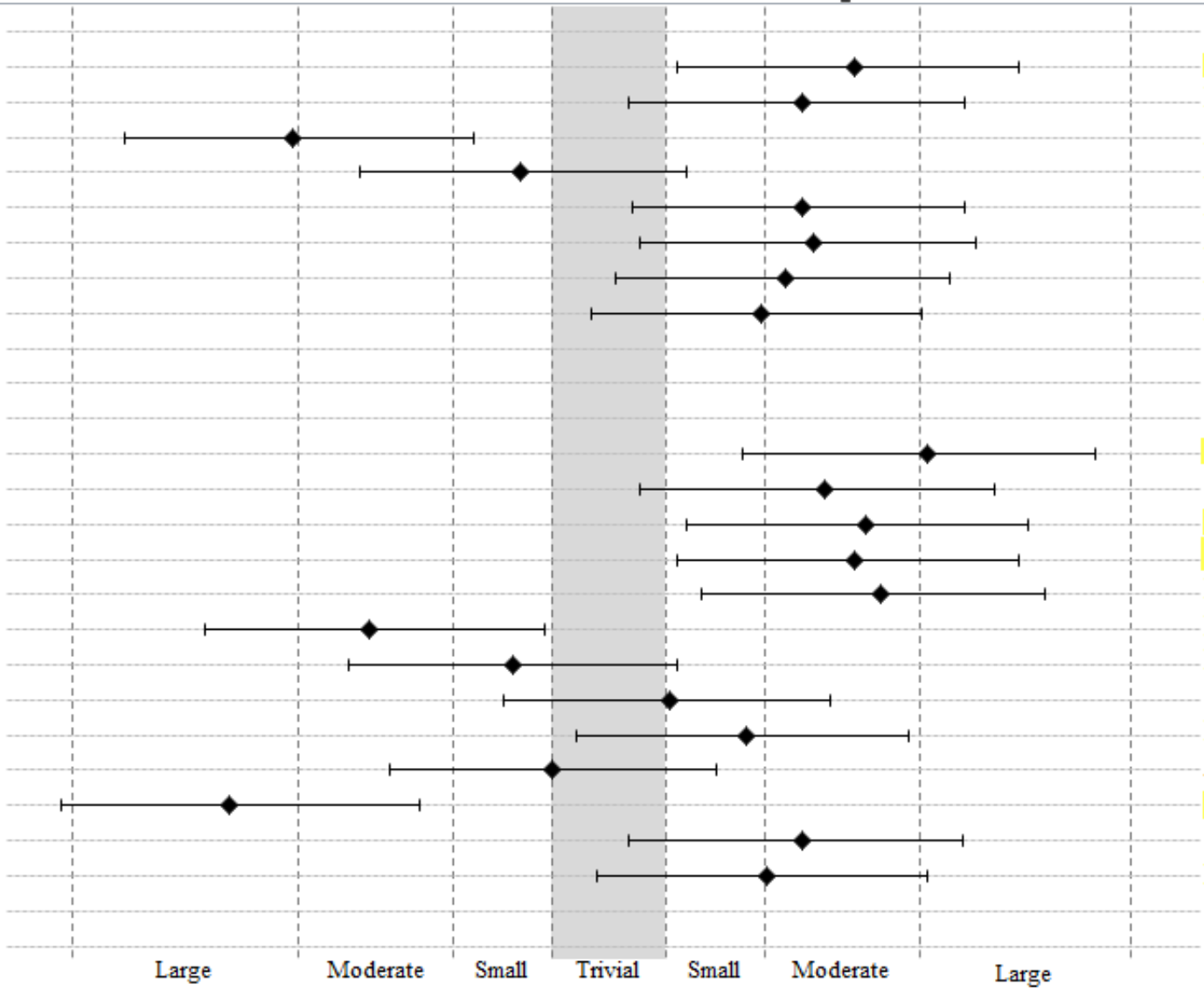
Loughborough University

Analysis:

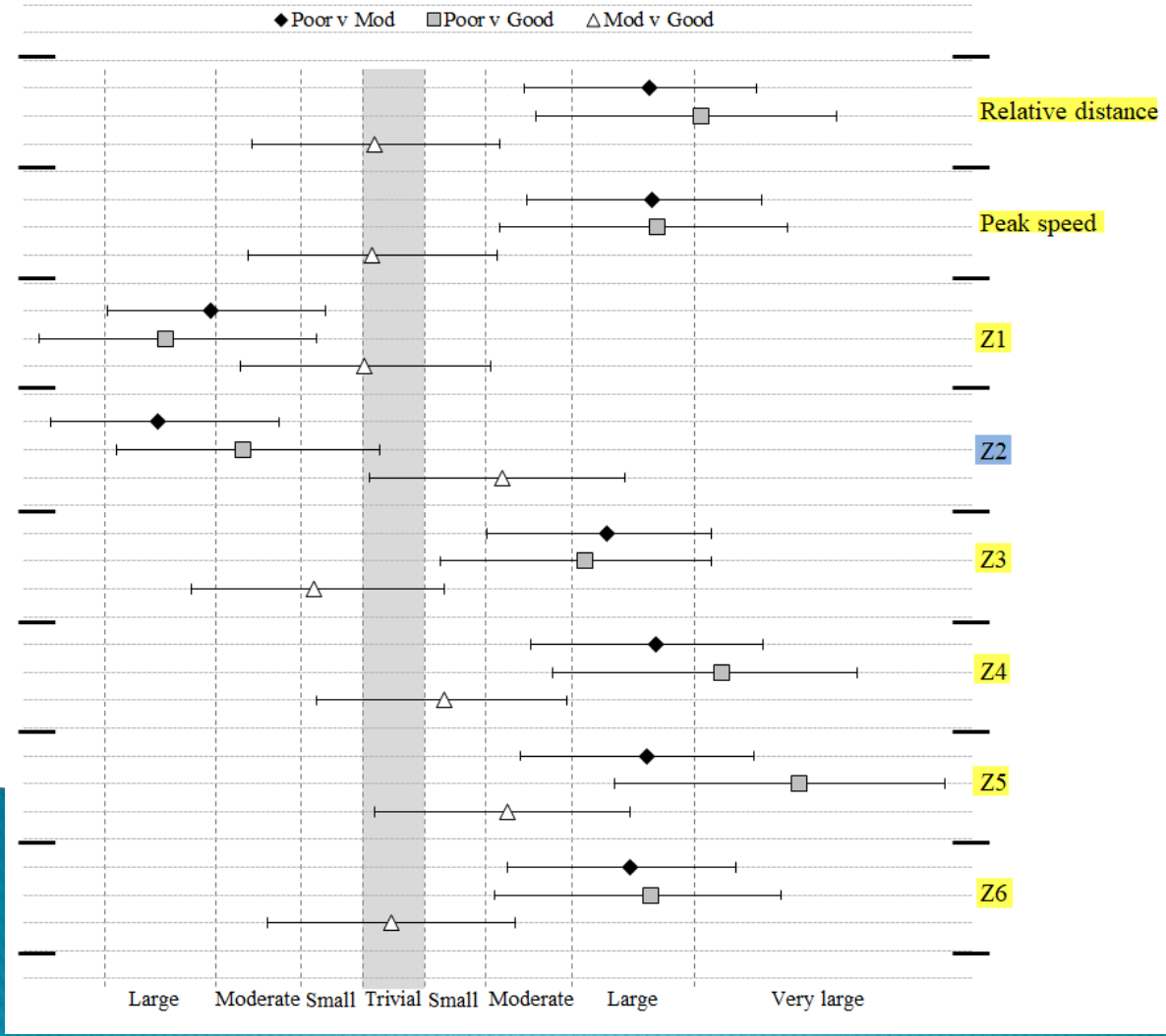
- Frequency data normalised to a 32 minutes match
- Reliablity for video data
- Multiple forward regression analysis
- Kruskall-Wallis for categories of trunk and arm impairment
- All performance parameters that were successfully entered in the regression analysis **and** showed a significant effect between trunk and arm impairment ($P < 0.05$) → Effect Size and 90% confidence intervals, meaningful if ≥ 0.2

IWRF
International Wheelchair Rugby Federation

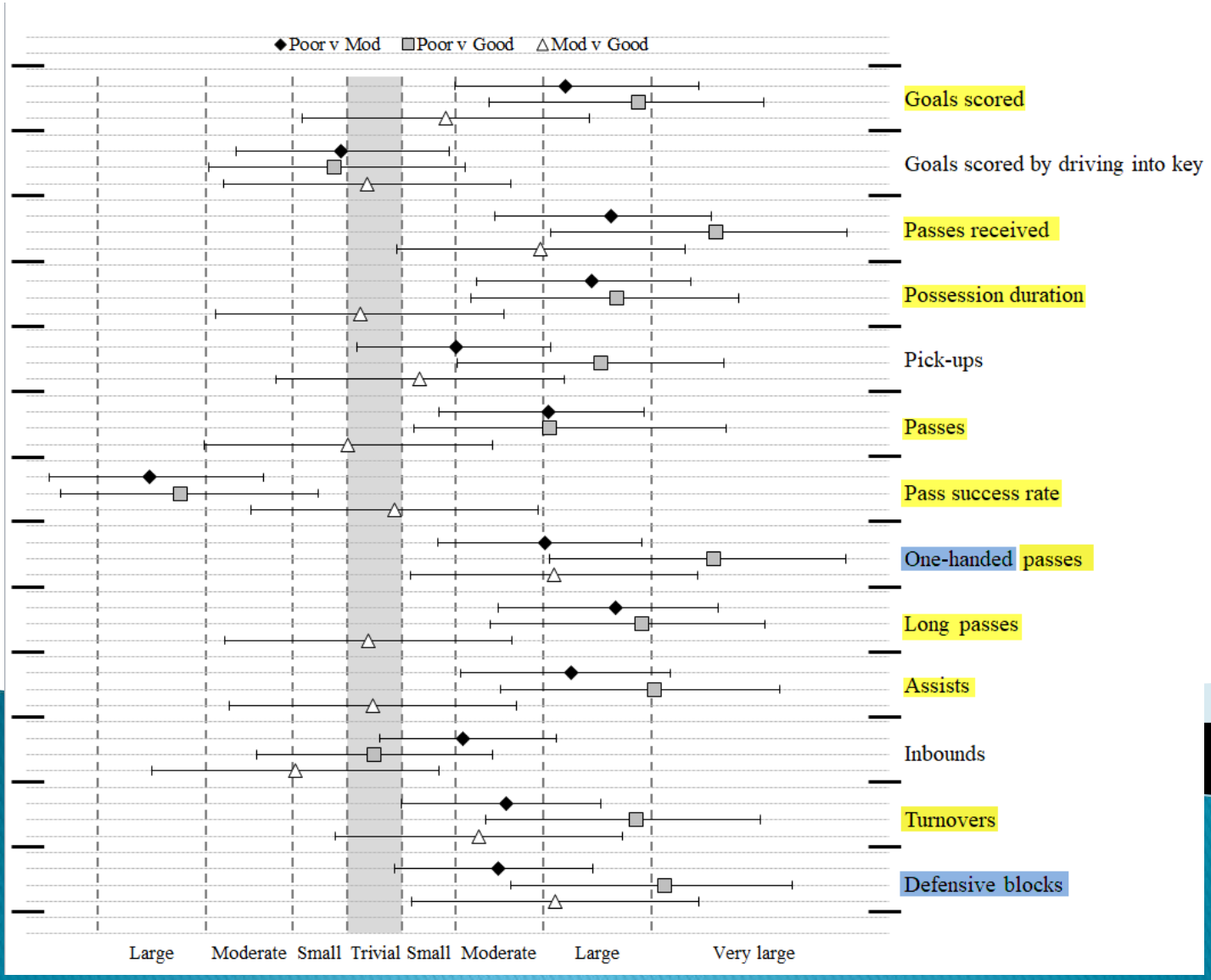
Results- trunk impairment



Results- arm impairment



Results- arm impairment



Conclusions

- Trunk and arm impairment have an impact on chair and ball activities in wheelchair rugby in realistic game situation

Conclusions

Loughborough University

- Trunk impairment has an impact on fewer activities than arm impairment
- Trunk impairment affects offensive game
- Arm impairment affects both offensive and defensive game

IWRF
International Wheelchair Rugby Federation

Conclusions

Loughborough University

- Difference in impact of arm impairment between **poor** and **moderate/good**

IWRF
International Wheelchair Rugby Federation

Discussion

Loughborough University

Limitations

- Tests for arm impairment are based on expert opinion
- Poor arm function represents three arm scores
- Impact of team line-up and role in the team are unknown

IWRF
International Wheelchair Rugby Federation

Special thanks to

Mike Hutchinson, Jan van der Scheer and Ben Stone for assistance in data collection

Sam Highighat for the video analysis

All participating teams and athletes

Financial support

Peter Harrison Foundation & UK Sport

IWRF
International Wheelchair Rugby Federation

Loughborough University