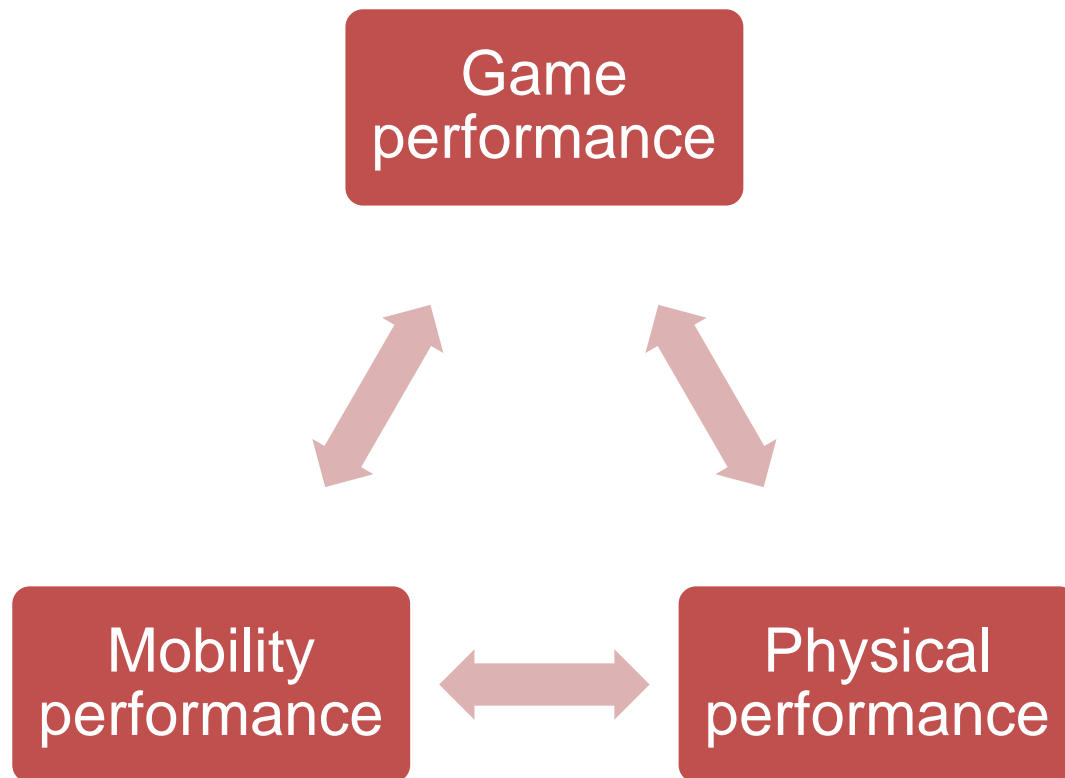


# IMPROVING MOBILITY PERFORMANCE IN WHEELCHAIR BASKETBALL

MARCO HOOZEMANS  
THOM VEEGER  
MONIQUE BERGER  
RIENK VAN DER SLIKKE  
DIRKJAN VEEGER  
ANNEMARIE DE WITTE

# INTRODUCTION

## **Mobility performance** in wheelchair basketball



# INTRODUCTION

## **Defining** mobility performance

### Mobility performance

Ability of performing wheelchair-athlete activities:

- standing still
- driving
- rotating
- braking
- blocking

# INTRODUCTION

## **Quantifying** mobility performance

Observation of wheelchair-athlete activities during games



Development of Wheelchair Mobility Performance (WMP) test



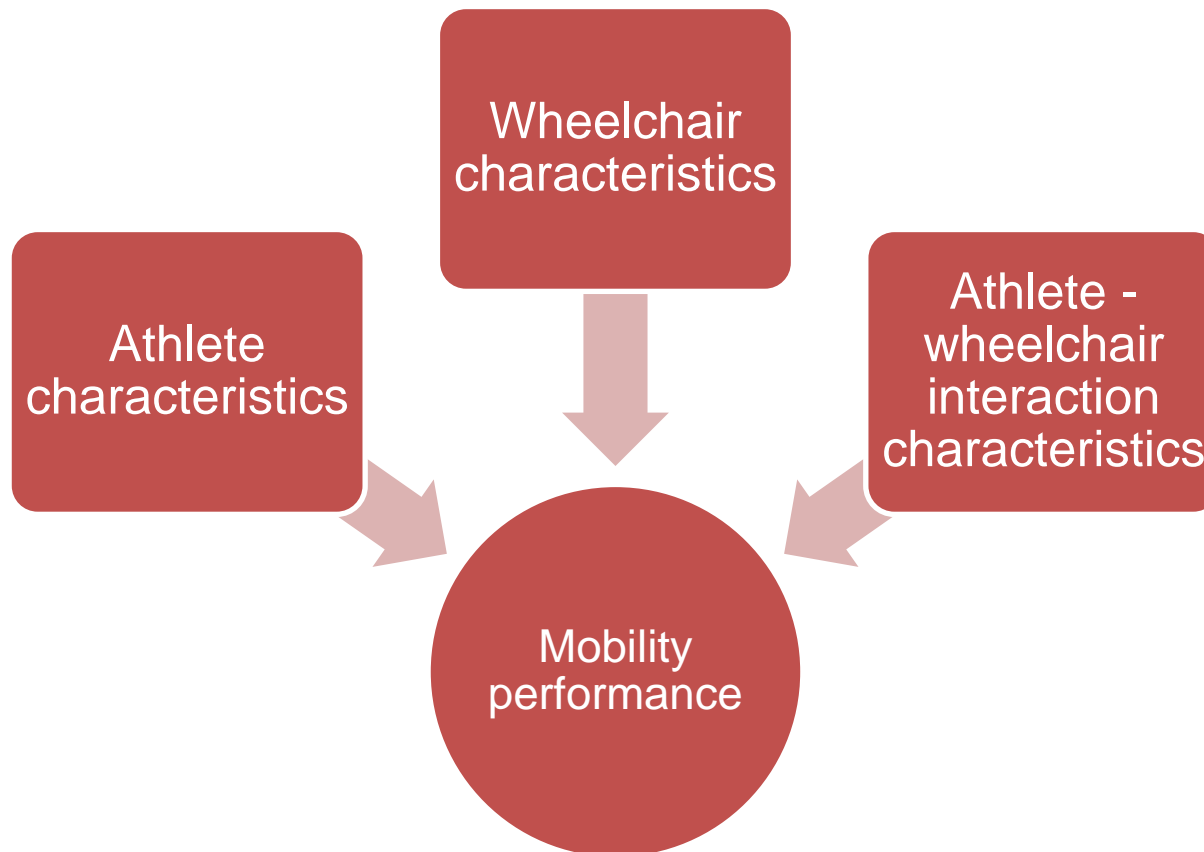
Validity, reliability and responsiveness of WMP-test



Monitor and optimize mobility performance

# INTRODUCTION

## Optimizing mobility performance



# OBJECTIVE

Which athlete, wheelchair and athlete-wheelchair interaction characteristics are the best predictors of wheelchair basketball mobility performance?

# METHODS

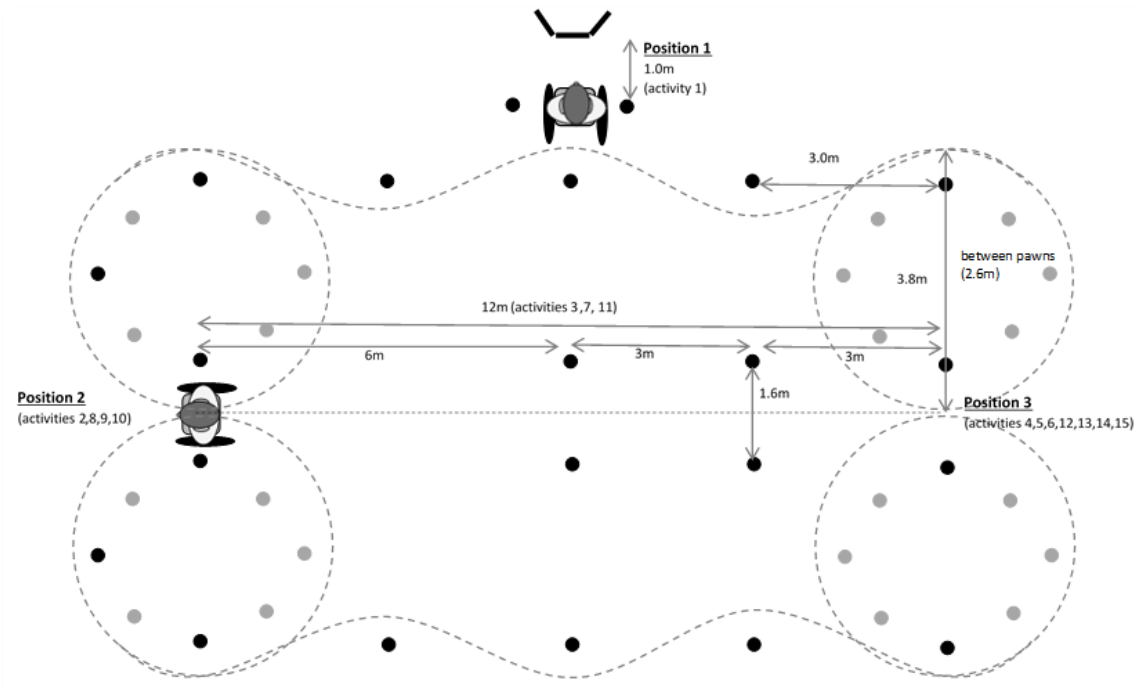
## Study population

- N=60 wheelchair basketball players
- 44 men, 16 women
- Mean age 25 years (range 12-50 years)
- Active at first division or international level
- Classification: N=20  $\leq 2.5$ , N=40  $\geq 3$

# METHODS

## Outcome variable

- Performance (time in seconds) on the wheelchair mobility performance test (WMP test), consisting of 15 tasks.





# METHODS

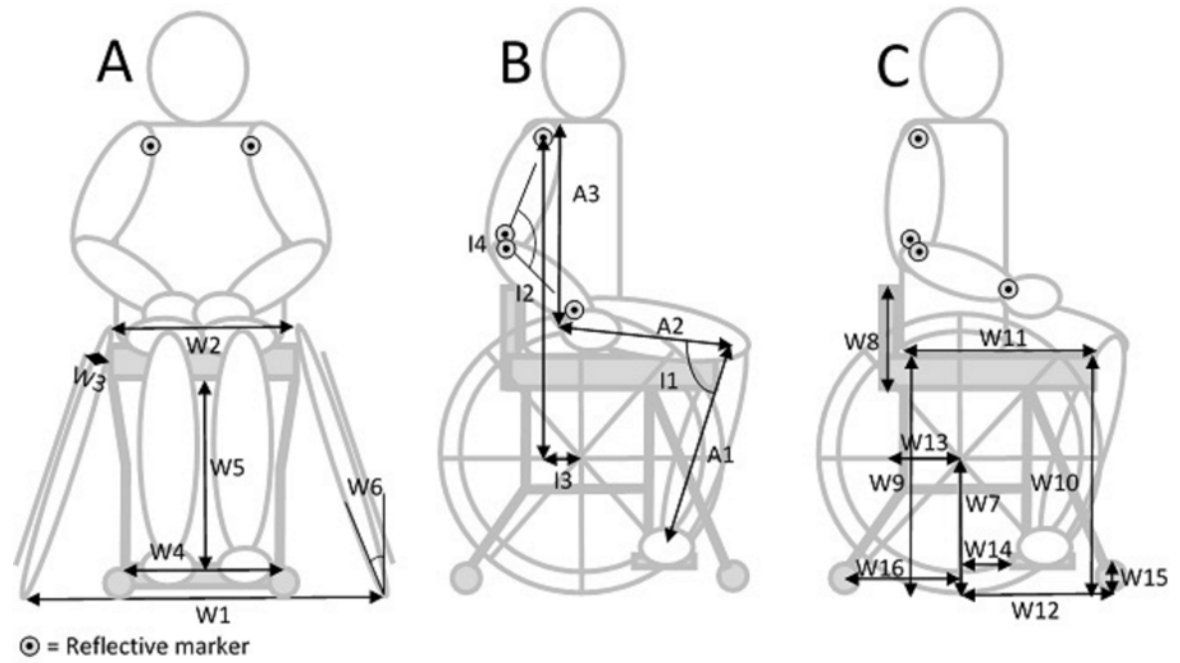
## Predictor variables

### Athlete characteristics (A)

- Age
- Experience
- Classification
- Body and wheelchair weight
- Maximal isometric force
- Forearm length
- Upper arm length

### Wheelchair characteristics (W)

- Wheel diameter
- Hand rim diameter
- Ratio hand rim / wheel



### Athlete-wheelchair interaction characteristics (I)

# METHODS

## Statistical analyses

- Forward stepwise linear regression analyses, to determine the best predictors (athlete characteristics, wheelchair characteristics, athlete-wheelchair interaction characteristics, all characteristics) of WMP test end-time.

# RESULTS

## Athlete characteristics

	Regression coefficient	Standardized coefficient	95% CI
constant	107.29		
maximal isometric force (N)	-0.02	-0.36	[-0.04, -0.00]
trunk length (cm)	-0.39	-0.30	[-0.77, -0.00]

High correlations ( $r > 0.60$ ) between:

- Maximal isometric force: -
- Trunk length: body and wheelchair weight ( $r = 0.61$ ), lower leg length ( $r = 0.77$ )

# RESULTS

## Wheelchair characteristics

	Regression coefficient	Standardized coefficient	95% CI
constant	162.55		
wheel diameter (cm)	-1.46	-0.56	[-2.05, -0.86]
horizontal distance footrest - rear axis (cm)	0.28	0.28	[0.05, 0.51]

High correlations ( $r > 0.60$ ) between:

- Wheel diameter: hand rim diameter ( $r = 0.87$ ), rear seat height ( $r = 0.65$ )
- Horizontal distance foot rest – rear axis: -

# RESULTS

## Athlete-wheelchair interaction characteristics

	Regression coefficient	Standardized coefficient	95% CI
constant	111.36		
vertical distance shoulder-rear axis (cm)	-0.44	-0.51	[-0.65, -0.22]

High correlations ( $r > 0.60$ ) between:

- Vertical distance shoulder – rear axis: elbow angle ( $r = 0.71$ )

# RESULTS

## All characteristics

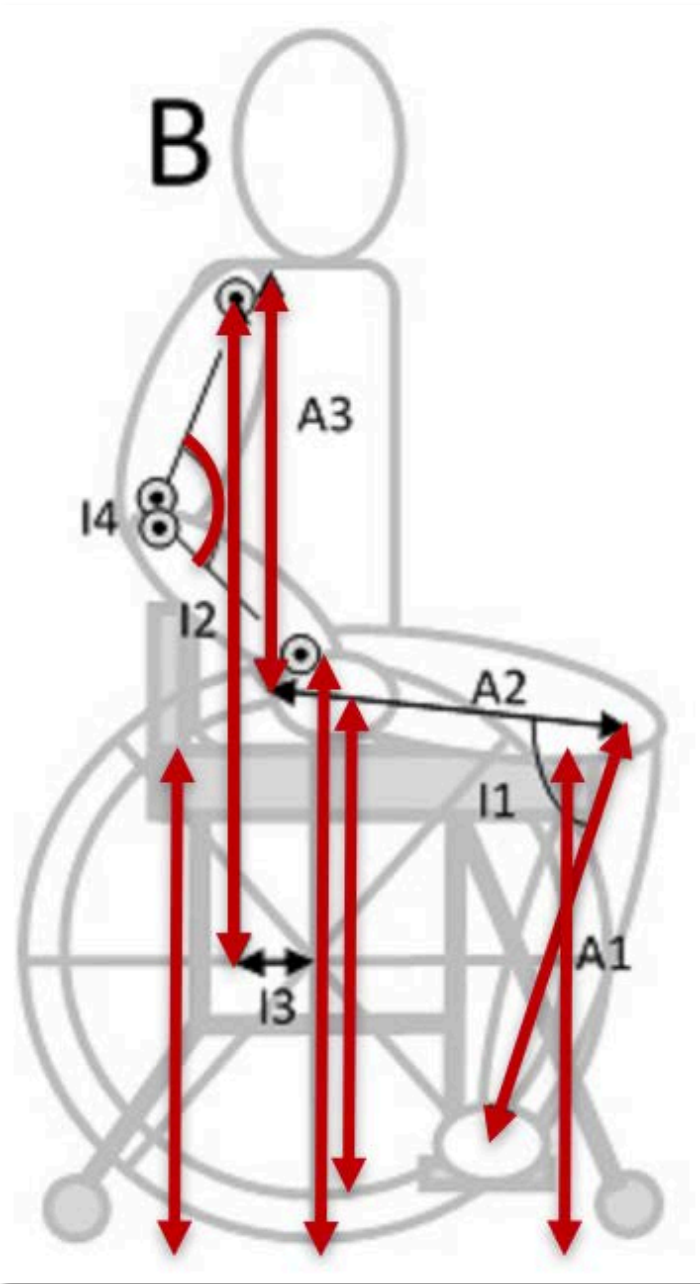
	Regression coefficient	Standardized coefficient	95% CI
constant	116.22		
vertical distance shoulder - rear axis (cm)	-0.55	-0.66	[-0.77, -0.33]
vertical distance front seat height - foot rest (cm)	1.00	0.58	[0.53, 1.47]
maximal isometric force (N)	-0.02	-0.35	[-0.03, -0.01]
camber angle (degrees)	-1.67	-0.28	[-3.13, -0.21]

# RESULTS

## All characteristics

High correlations ( $r > 0.60$ ) between:

- Vertical distance shoulder – rear axis:
  - body and wheelchair weight ( $r=0.67$ )
  - lower leg length (0.67)
  - trunk length ( $r=0.73$ )
  - wheel diameter ( $r=0.71$ )
  - hand rim diameter ( $r=0.63$ )
  - rear seat height ( $r=0.82$ )
  - front seat height ( $r=0.64$ )
  - elbow angle ( $r=0.71$ )
- Vertical distance front seat height – foot rest: -
- Maximal isometric force:
  - wheel diameter ( $r=0.62$ )
- Camber angle: -



# CONCLUDING REMARKS

- Results are an exploratory (statistical) analyses of characteristics to focus on for improvement of mobility performance by coaches and (bio)mechanics.
- **Modifiable height characteristics** and **physical capacity** seem to be important predictors of mobility performance.
- WMP test will be used to investigate modifiable wheelchair configurations in experimental setting.



# CONCLUDING REMARKS

- Results are an exploratory (statistical) analyses of characteristics to focus on for improvement of mobility performance by coaches and (bio)mechanics.
- **Modifiable height characteristics** and **physical capacity** seem to be important predictors of mobility performance.
- WMP test will be used to investigate modifiable wheelchair configurations in experimental setting.

**Thank you for your attention!**