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Acceleration Profile during 20-m Sprints in Elite Wheelchair Tennis Players

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Introduction (1)

- Movement patterns in wheelchair tennis:
 - intermittent,
 - multidirectional and
 - non-random
- Movement around the tennis court is particularly complicated as players are required
 - to interface with the chair, and
 - react to the movement of the ball
- Fundamental to wheelchair tennis is the ability to accelerate from
 - a stationary position (particularly when serving or changing direction) and
 - rolling starts during match-play



Introduction (2)

- Speed and distance have been measured previously in wheelchair tennis matches (Goosey-Tolfrey et al. 2005; Sindall et al., 2013)
- An additional and important aspect in wheelchair court sports, including tennis, is the ability to accelerate
- Currently, little is known about the acceleration capabilities of elite wheelchair tennis players.
 - Mason et al. IJSM 2012, Sindall et al. (velocometer; Cooper, Pittsburgh); gyroscope, local GPS



Purpose

- To determine the acceleration profile of elite wheelchair tennis players during a 20-m sprint (and during doubles match play)
- To investigate whether acceleration is an important parameter of wheelchair tennis performance
 - Differences between 3 divisions (Men, Women, Quads)
 - Relation with ranking
 - Relation with tournament results



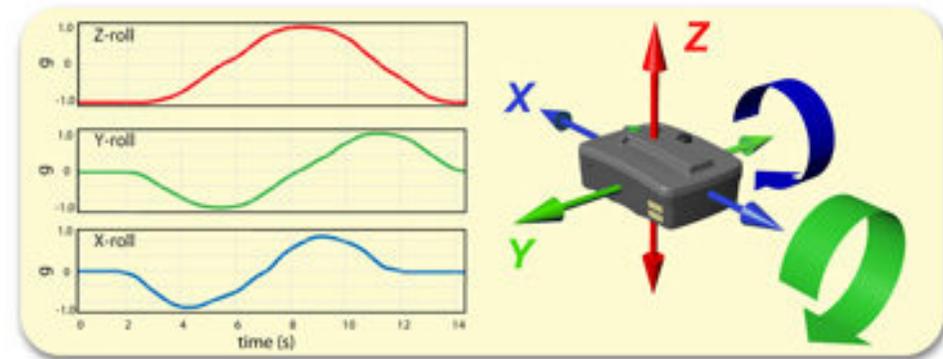
Participants

- 32 elite wheelchair tennis players
 - 14 men (M)
 - 12 women (W)
 - 6 quads (Q; all men)
- Participants 2012 Invacare Doubles Masters, Amsterdam



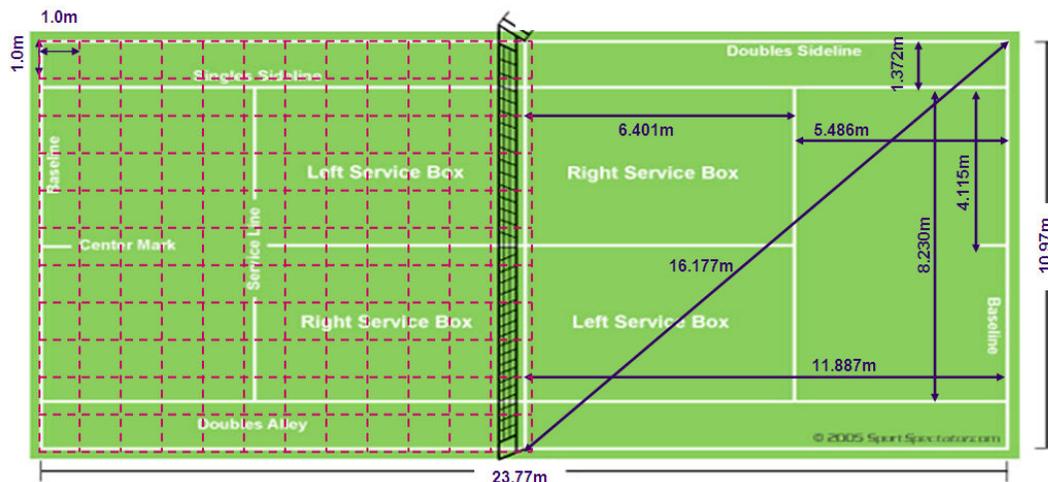
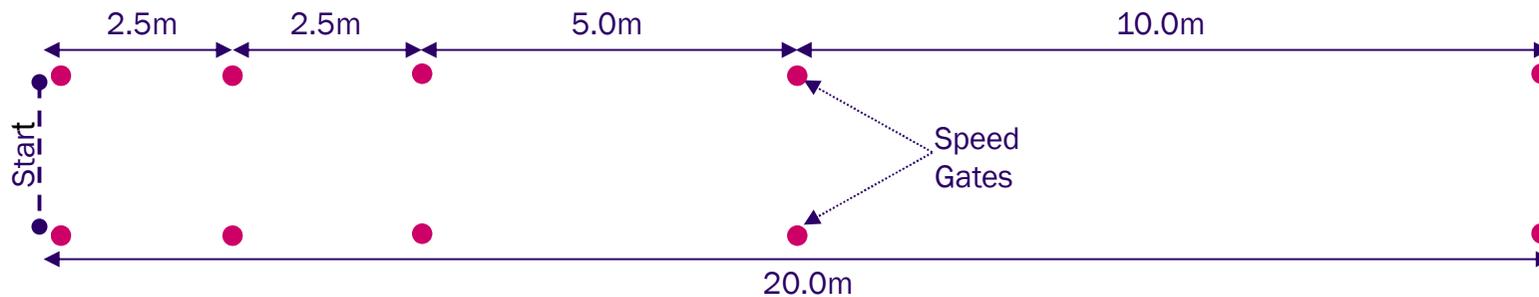
Measuring Acceleration

- During match play (data not shown today):
 - Triaxial accelerometers (Delsys Trigno Wireless) on axle of wheelchair
- During 20-m sprints
 - Accelerometers
 - Timing (speed) gates



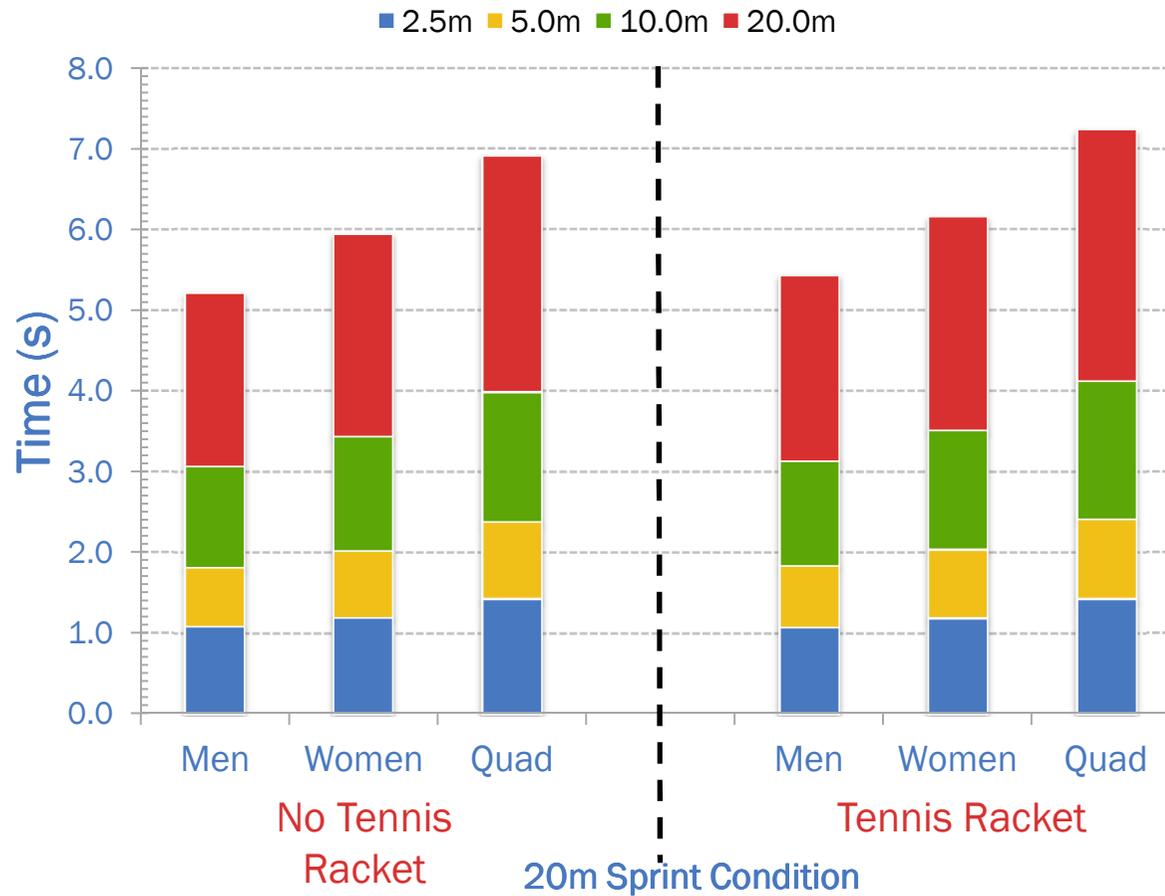
20-m Sprint Drill

- Timing over 2.5 and 5m: measure of speed off the mark, but also indication of functional strength
- Not often full-court sprint, but 20m sufficient to reach peak velocity
- The placement of the timing gates placed at intervals allows for the assessment of acceleration and changes in speed throughout each sprint



Results: Time

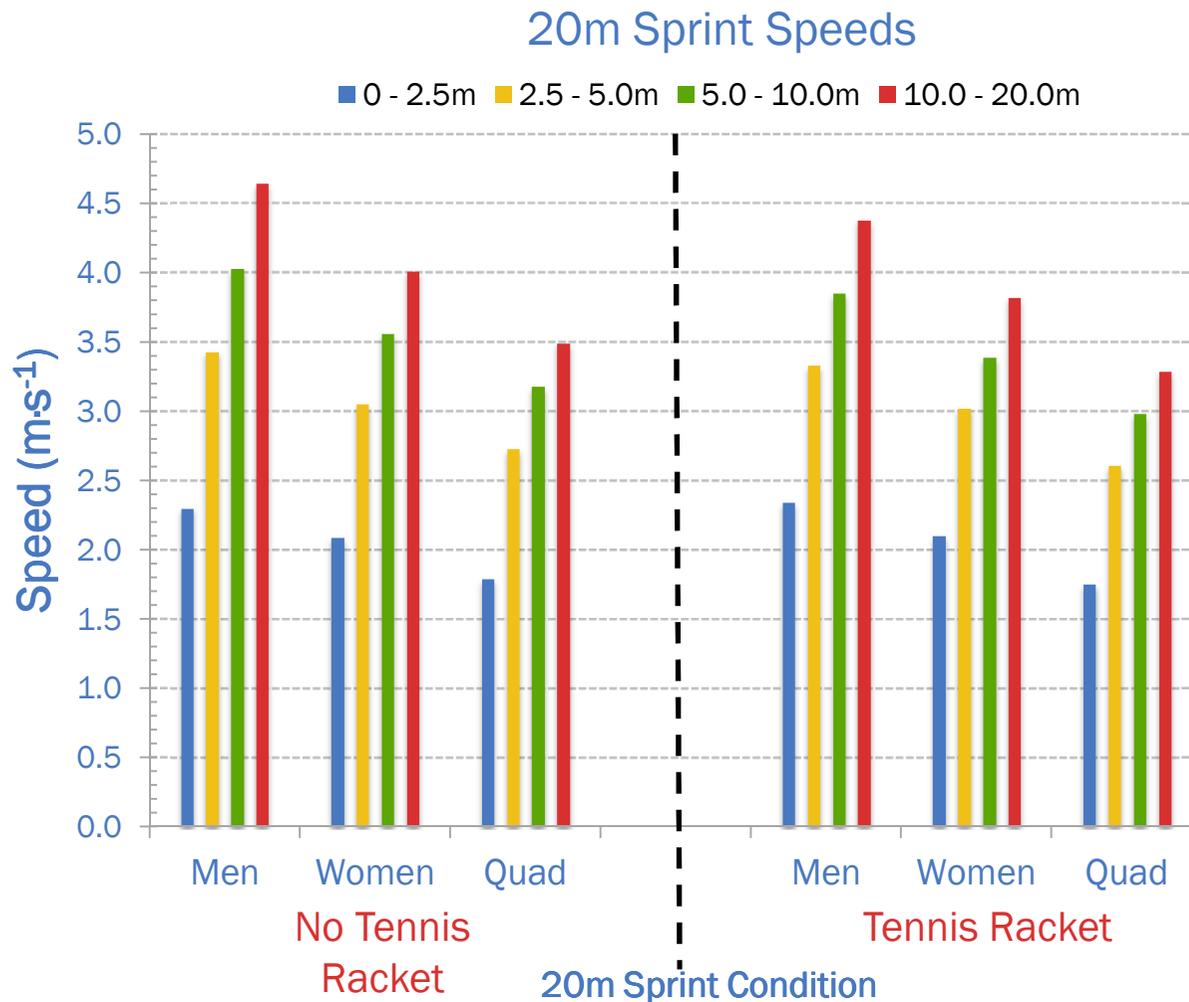
20m Sprint Times



- M > W > Q
 - all time points
- NR > R 2nd part
 - no interaction

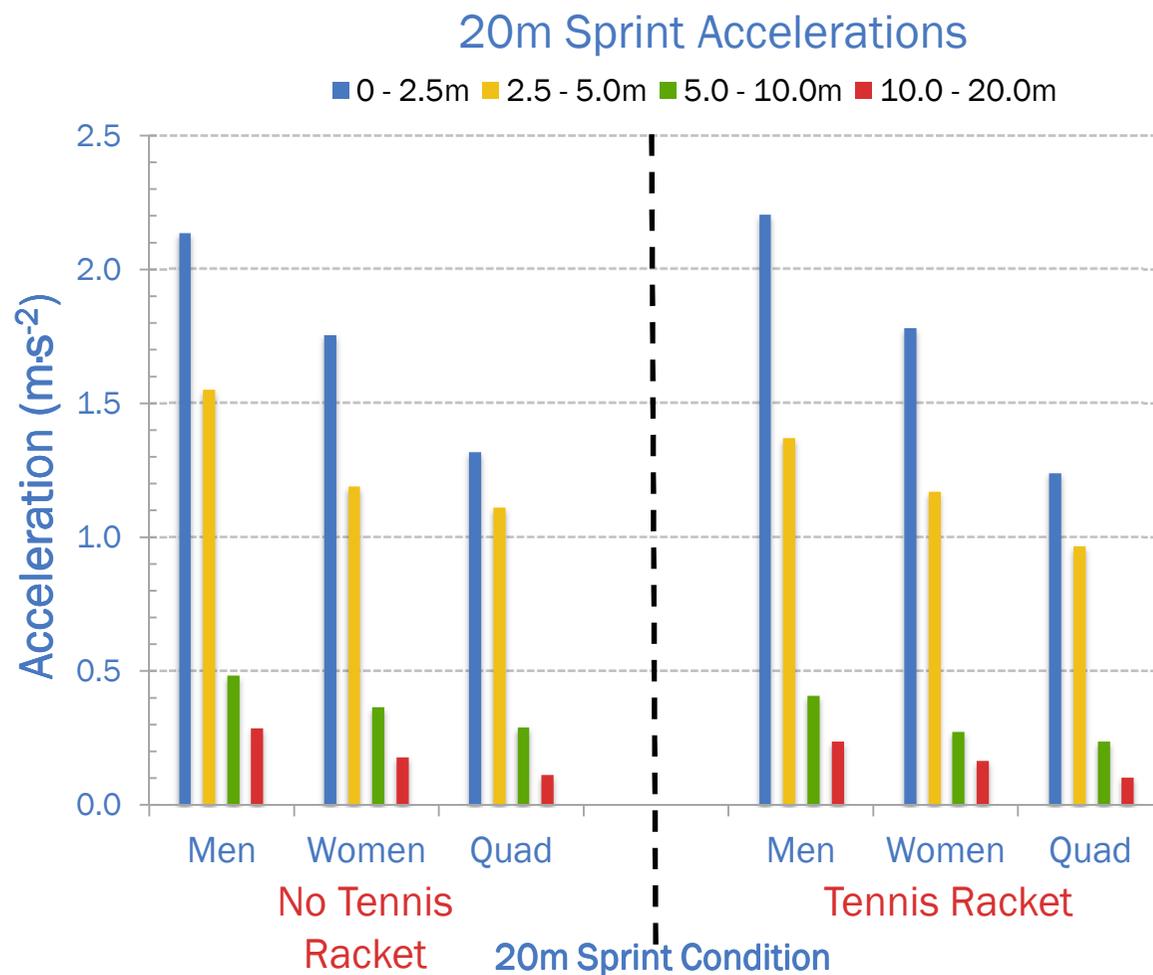


Results: Speed



- $M > W > Q$
 - all time points
- $NR > R$ 2nd part
 - no interaction

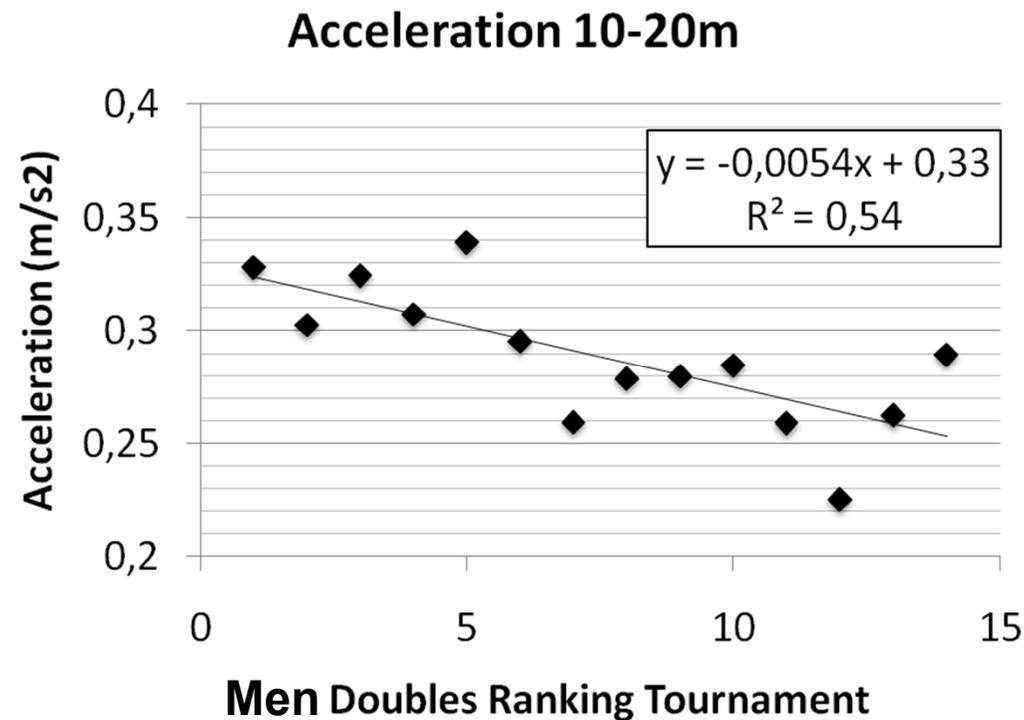
Results: Acceleration



- M > W and Q
- W and Q overall not sign different; larger differences during first part
- with racket, differences smaller
- Maximal acceleration higher in M than in W and Q (17.8 ± 3 , 14.2 ± 3 , 14.0 ± 2 m.s⁻²)

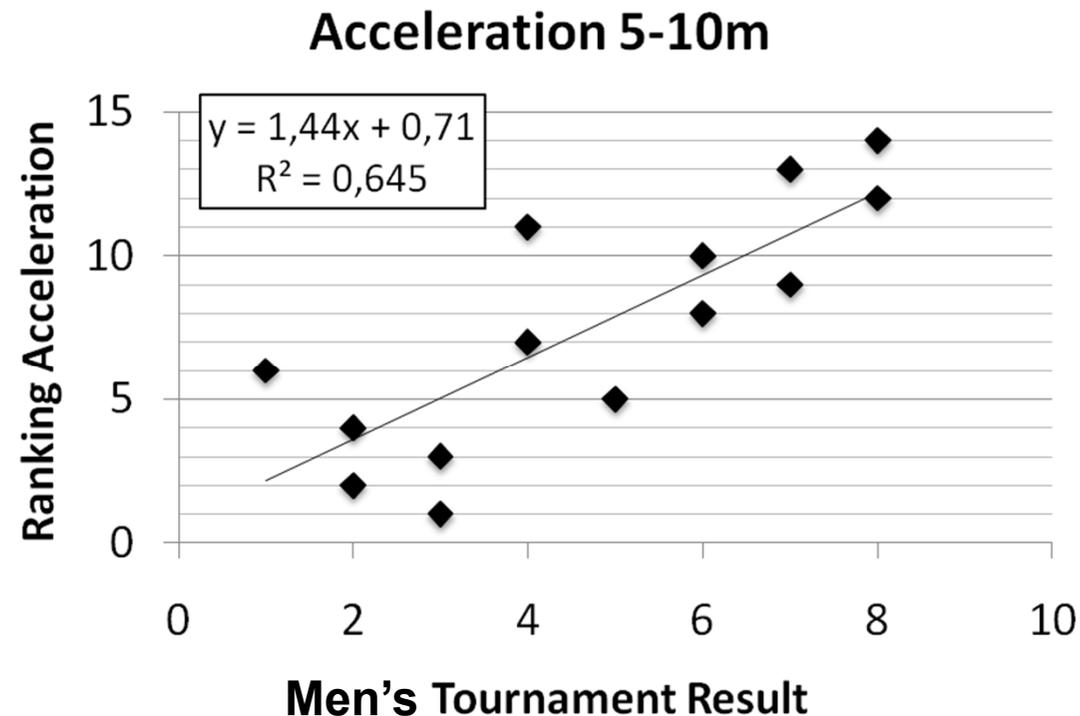
Results: Relation w Ranking

- **Men:**
 - doubles ranking - accel. 5-10m ($r = -0.47$; $p = 0.088$); 10-20m ($r = -0.74$; $p = 0.003$)
- **Women:**
 - doubles ranking - accel. 0-2.5m ($r = -0.78$; $p = 0.003$); 5-10m ($r = -0.47$; $p = 0.042$)
- **Quads:** no significant relations or tendencies found



Results: Relation w Tourny Results

- **Men:**
 - Tourny result - acceleration 5-10m ($r = -0.81$); 20-m time ($r = 0.65$)
- **Women:** no sig. relations
- **Quads:**
 - Tourny result - acceleration 0-2.5m ($r = -0.79$)



Discussion/Conclusions

- M accelerated faster than W and Q, and were faster at all distances during the 20-m sprint
- W had a faster 20-m time than Q, predominantly due to a faster initial acceleration
- Maximal acceleration was considerably higher in M than in W and Q, while there was no difference between W and Q
- Player's doubles ranking in M appears related to the acceleration during the latter part of the 20m, while in W the ranking is stronger related to the acceleration during the first part
- Tournament results were significantly related to some acceleration parameters in M and Q, suggesting that acceleration capability is an important determinant of wheelchair tennis success
- NB. Acceleration dependent on several factors: muscle function, propulsion technique, wheelchair drag