

MUSCLE ACTIVITY TIMING IN ELITE HANDCYCLING

Kratzenstein, S., Brückner, J.-P., KIEL UNIVERSITY - GERMANY

Introduction



Photo © Oliver Kremer

Muscle activity timing of elite athletes is often the benchmark to assess the motor control of novices.

Especially elite hand cyclists are rarely accessible. Currently there are only two studies [1,2] that describe muscle activation during hand cycling, including datasets of one elite cyclist and 5 novices.

We asked, which muscle activation uses an elite cyclist during cycling at different loads? How does this activation fit into the current state of research?

Methods

Paralympic hand cyclist

- Paralympic Games London 2012
- National champion 2018 (10k time trialing)
- World cups 2009-11, '14, '15, '17 and '19
- Age 54, H4 classified

Novices (n=3)

- No experience in handcycling
- Age 22-24

RPE 19
3' cycling at 220W

RPE 7 | RPE 19
3' cycling at 100W

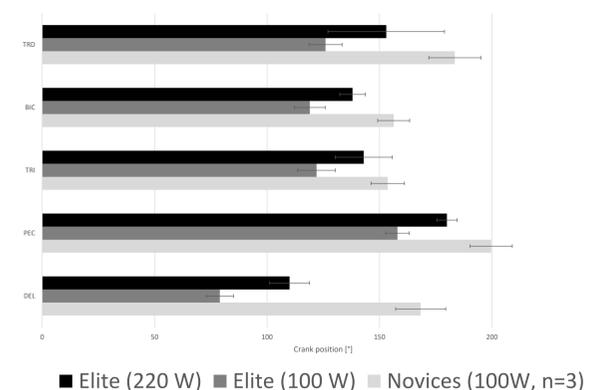
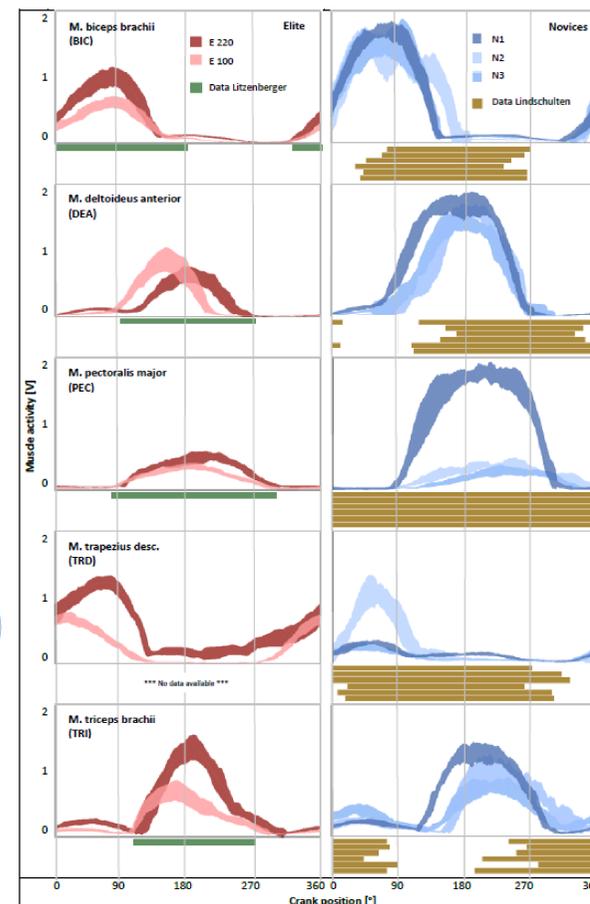
Analysis of muscle activity

- EMG application according to SENIAM guidelines [3]
- Neuromuscular on- and offset detection (single threshold 15% of max. activation [2])
- Biceps brachii, deltoideus ant., pectoralis major, trapezius desc. and triceps brachii

Take a look into the lab and watch how the study has been conducted



Results



Conclusions

- The muscle activity of the paralympic hand cyclist is characterized by
 - clear separation between active and passive phases (top figure).
 - stable activity periods even under high load.
 - shorter activity windows compared to novices' cycling (bottom figure).
 - similar activation pattern found by [2].
- The presumption of a stabilizing permanent function of the pectoralis majors [1] is not evident.

We should keep in mind

- Hand cycling includes a broad range of classifications that primarily effects the trunk stability.
- Bike geometries have an impact on neuromuscular activation levels.
- Datasets of 2 elite and 8 novices still provide only a limited insight into the entire mechanisms of motor control.

