



Komplexe Leistungsdiagnostik im Handcycling:

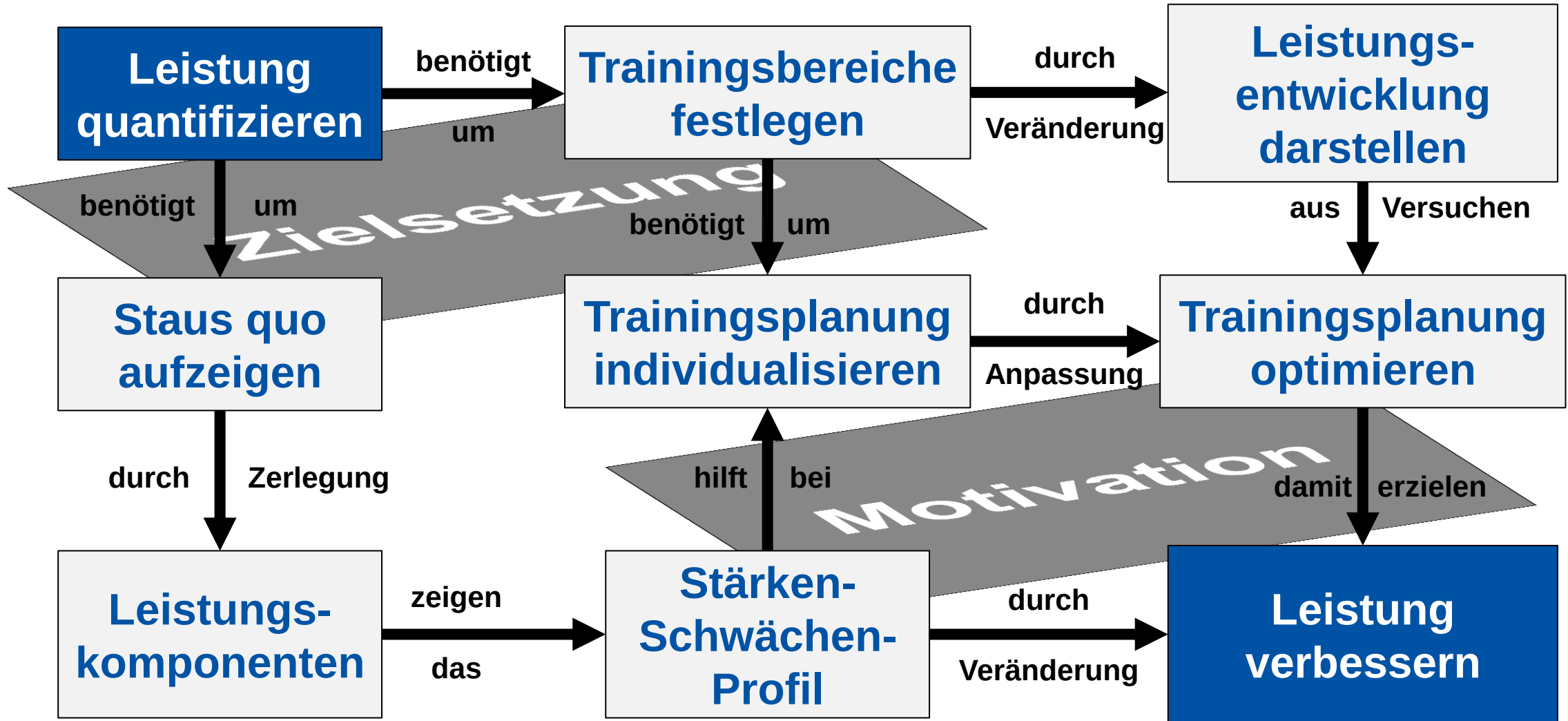
Kombination biomechanischer und leistungsphysiologischer Perspektiven

Oliver J. Quittmann

Institut für Bewegungs- und Neurowissenschaft



Deutsche
Sporthochschule Köln
German Sport University Cologne

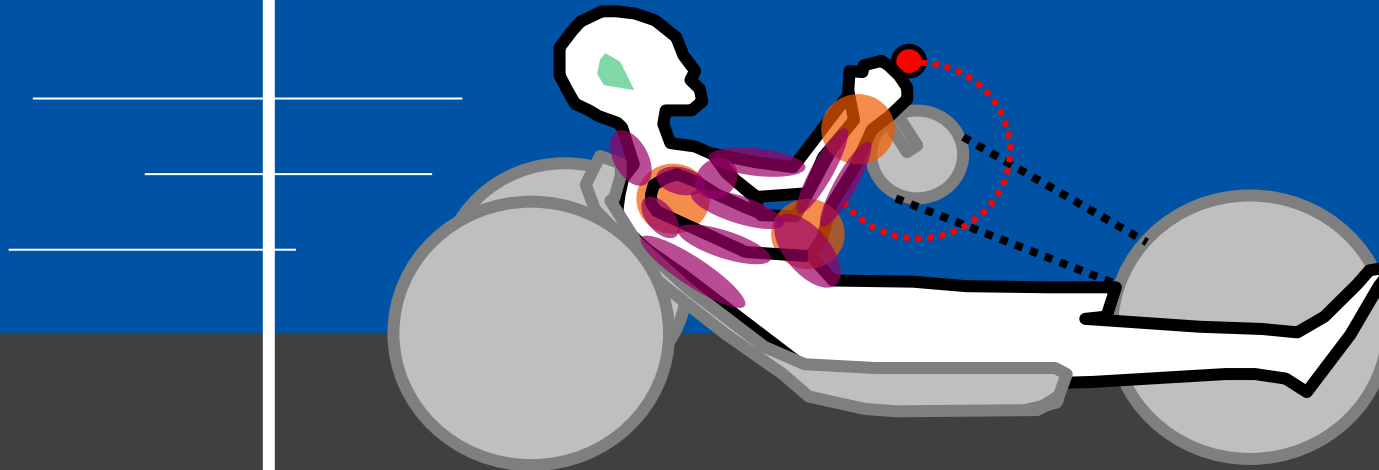




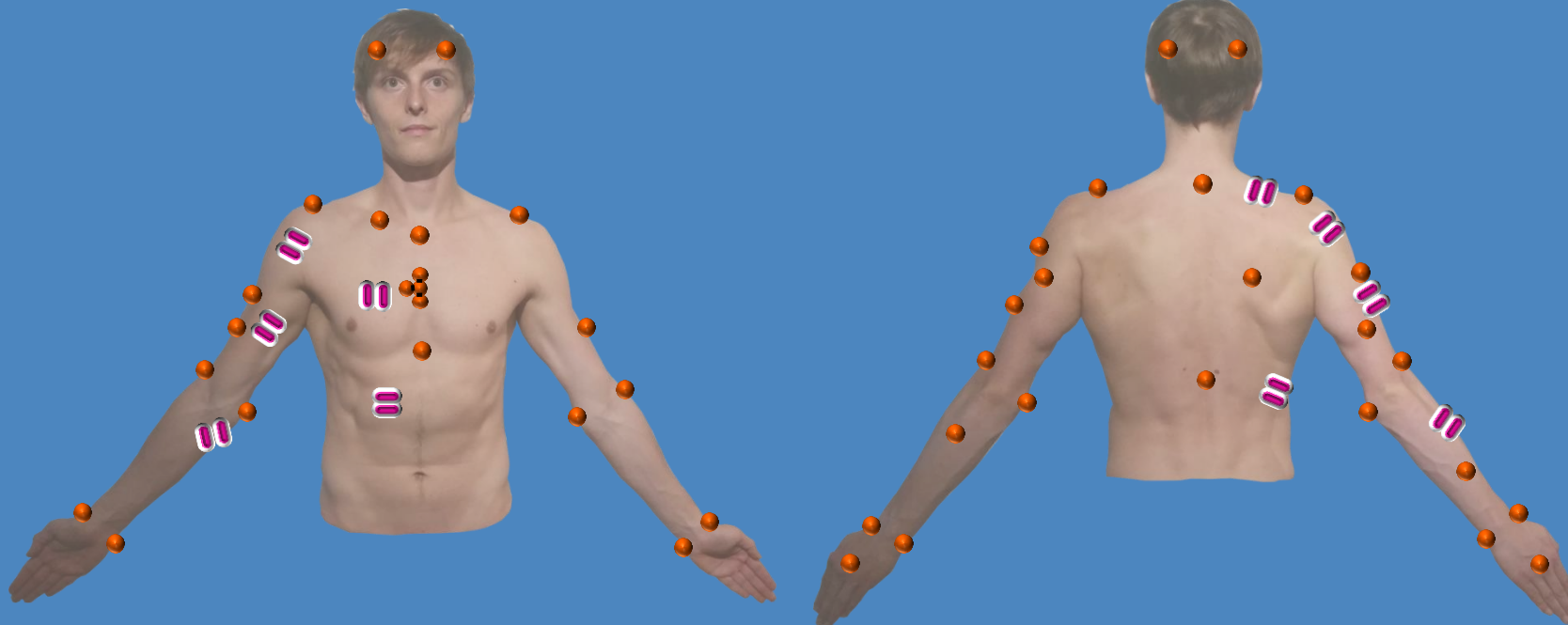
Walter Ablinger



Interne Faktoren

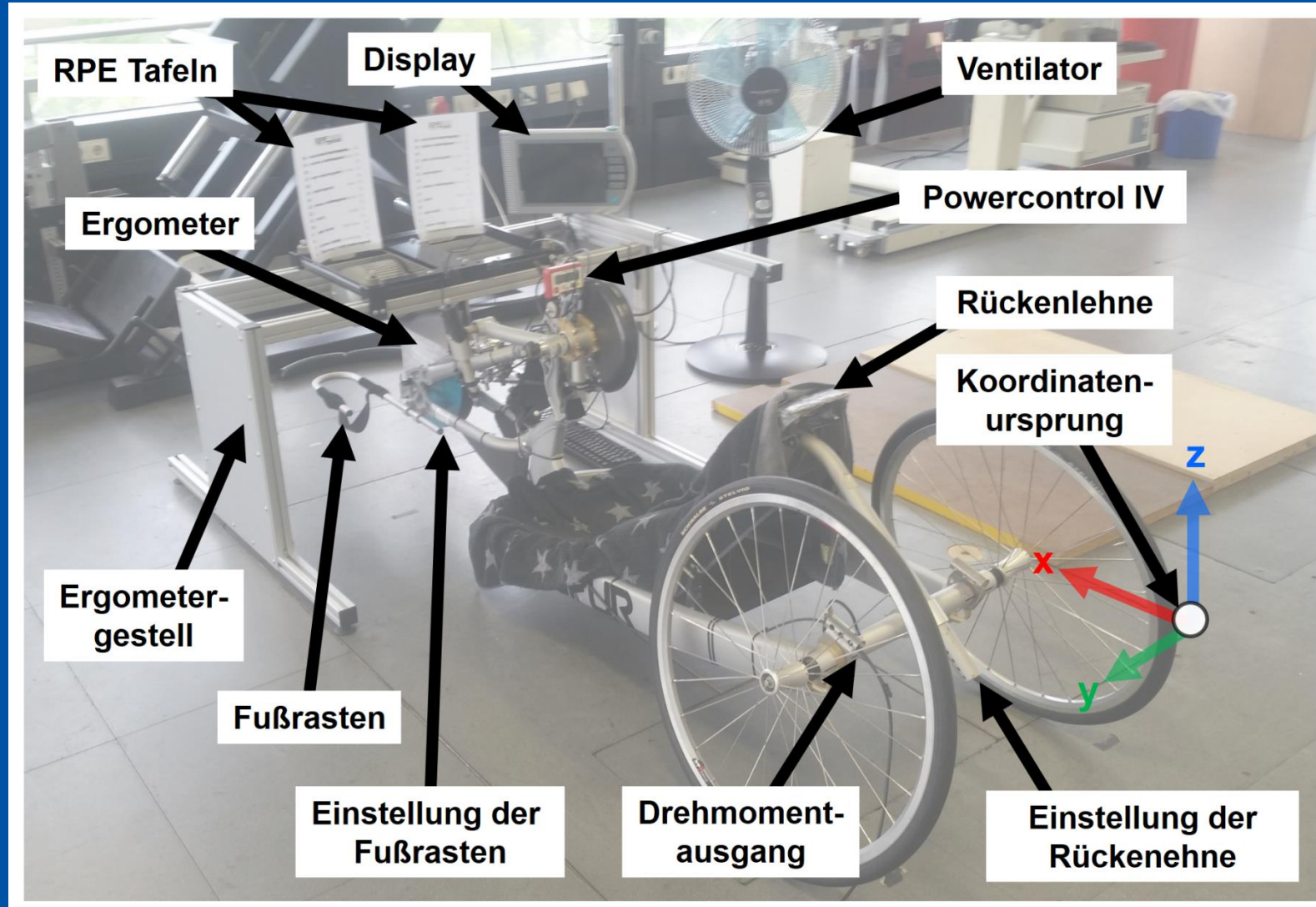


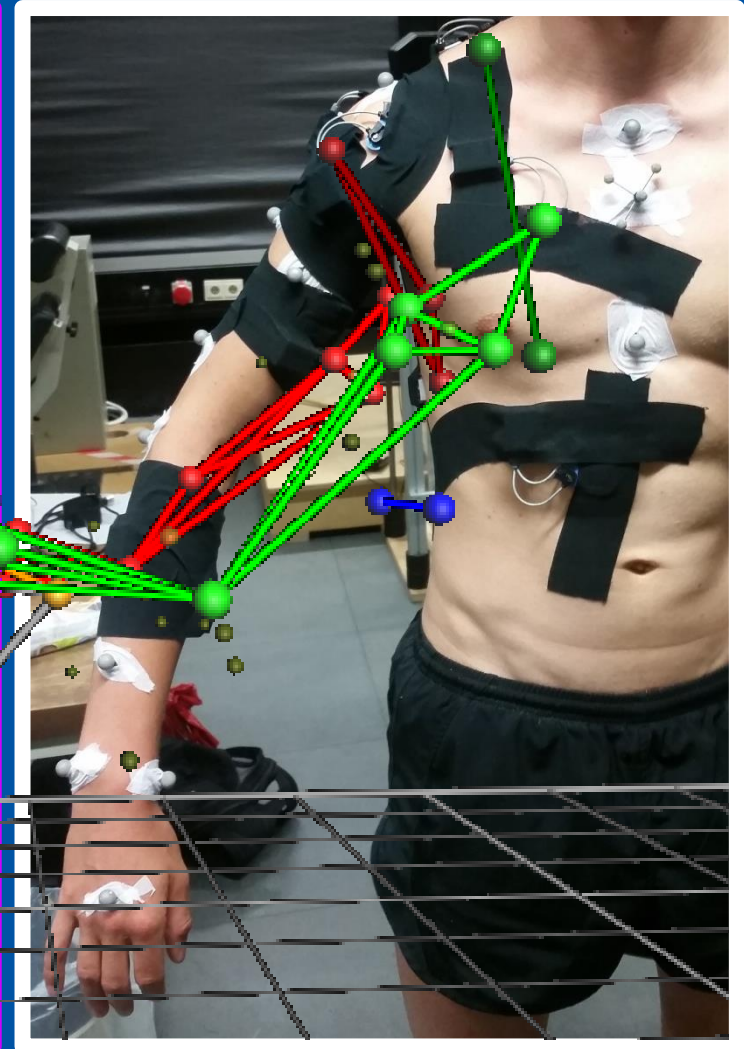
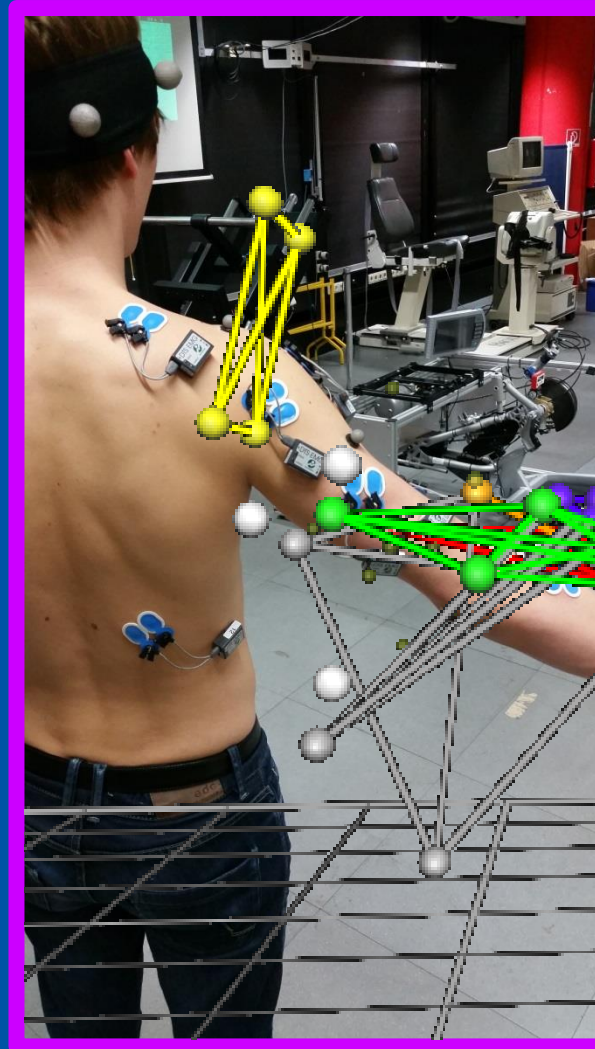
Externe Faktoren

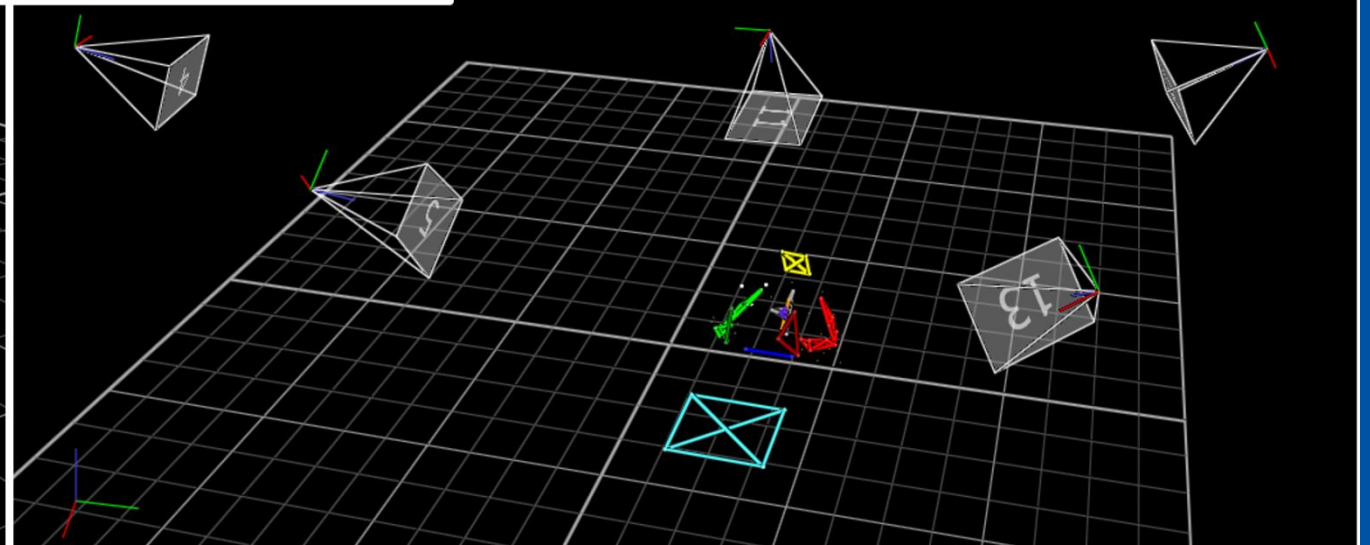
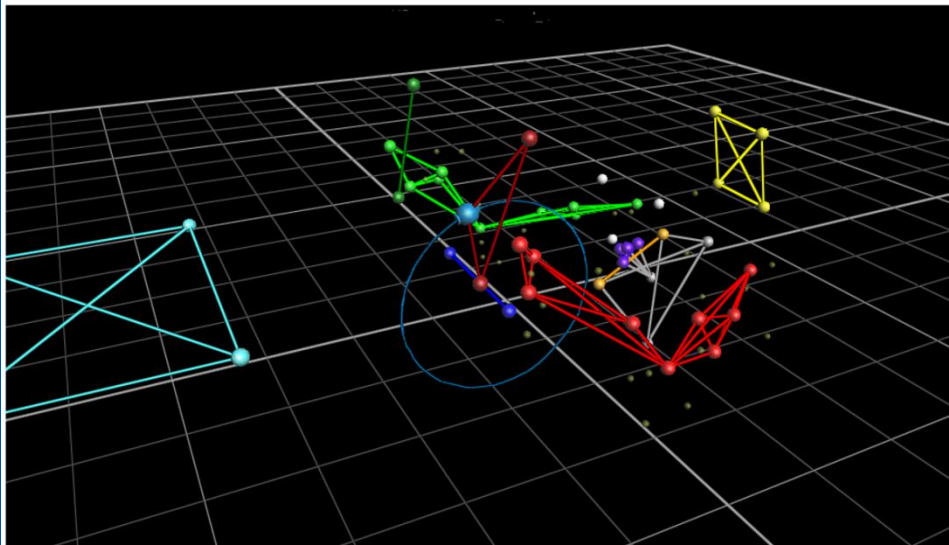
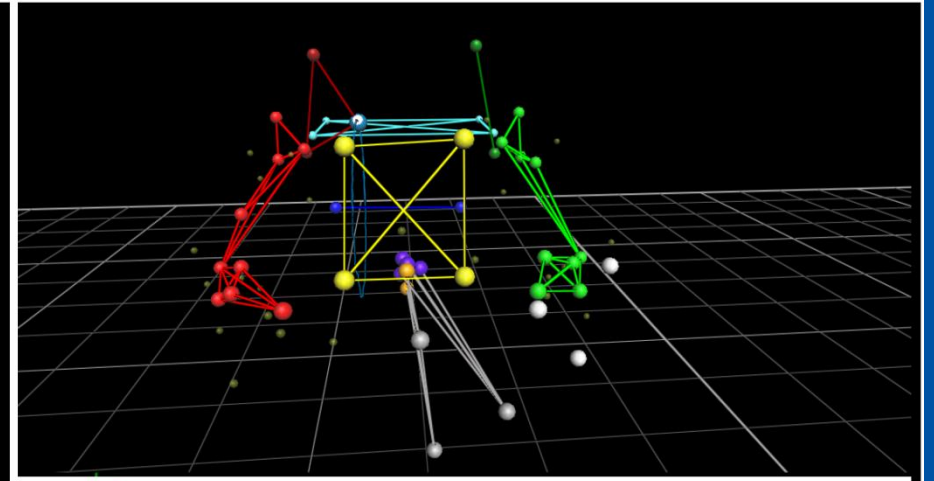
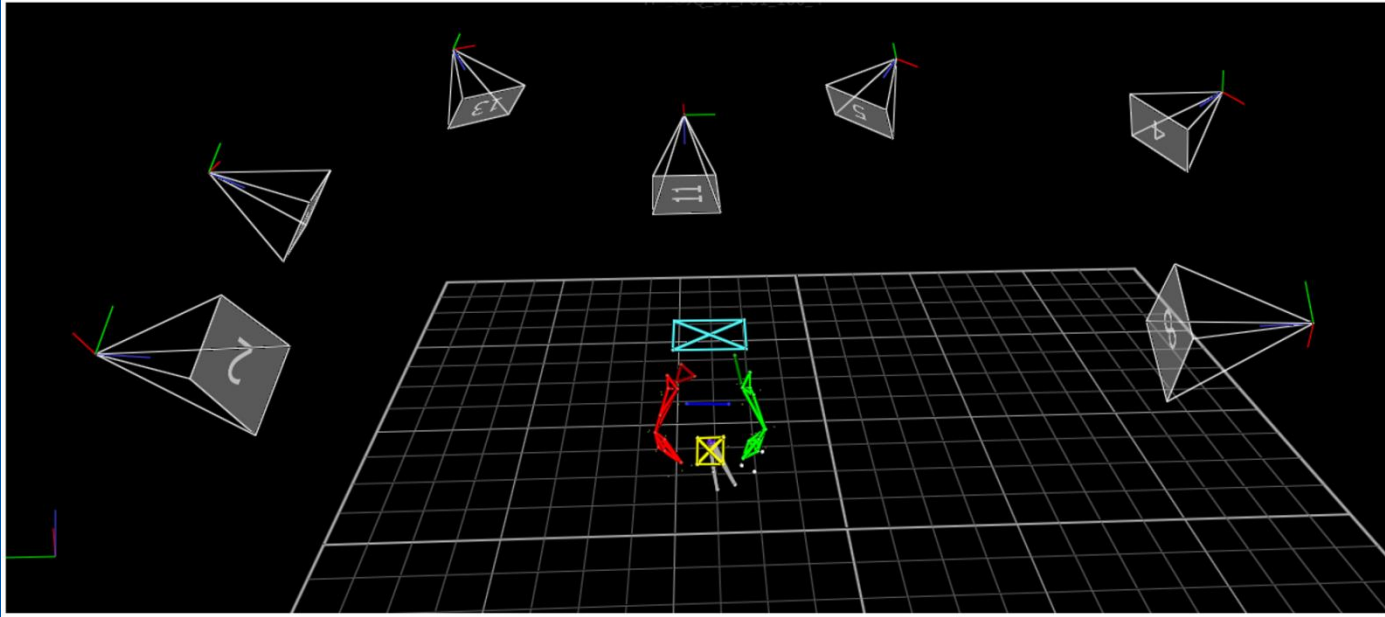


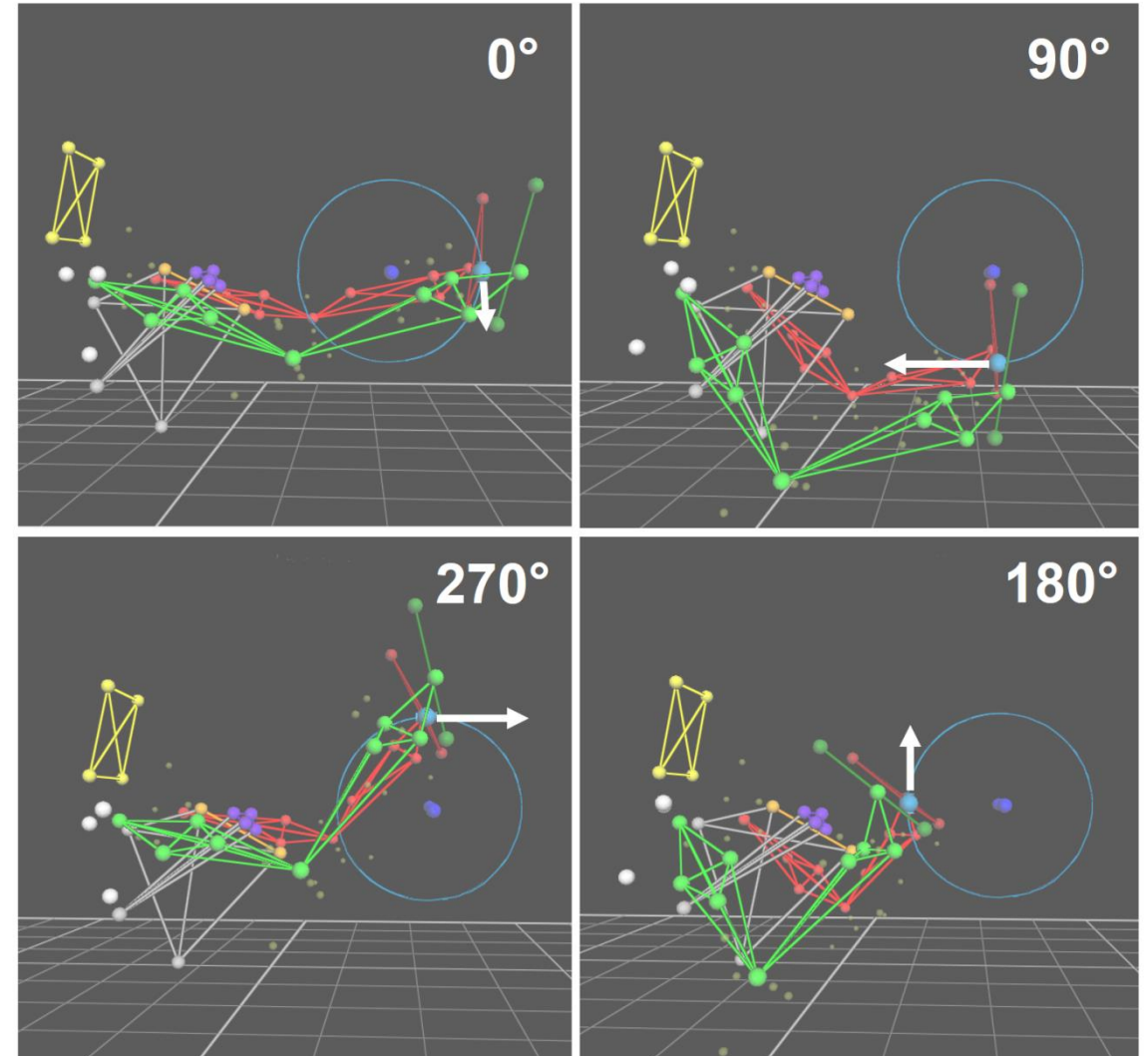
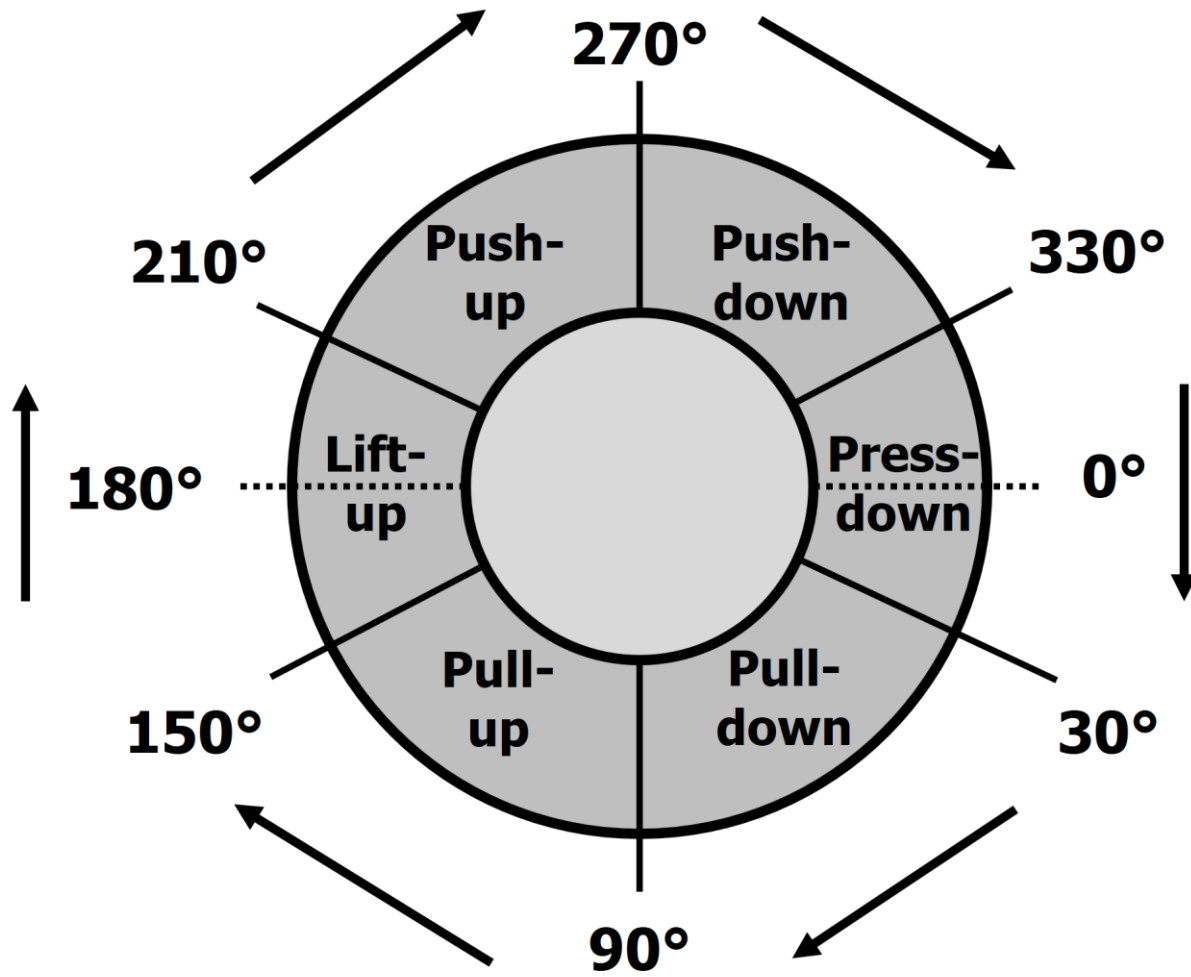
• reflektierende Marker

sEMG Elektroden

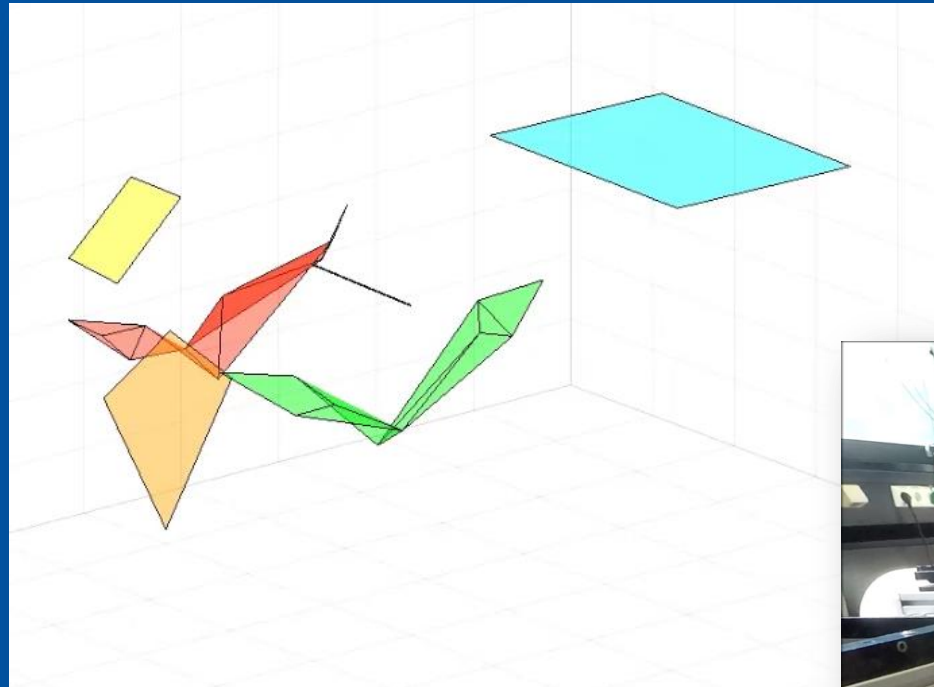








Quittmann et al. (Under Review). *Sports Biomech*

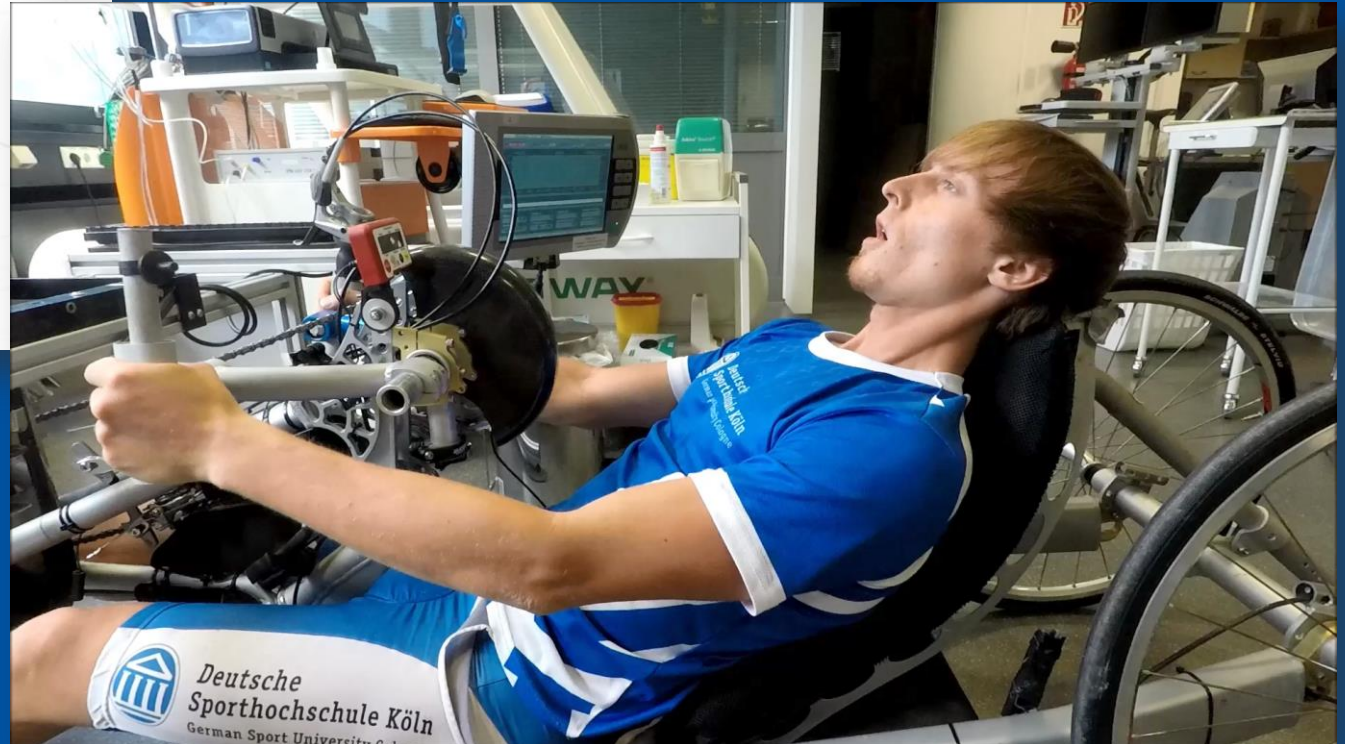


↑
Polygon

(basierend auf den Markern)

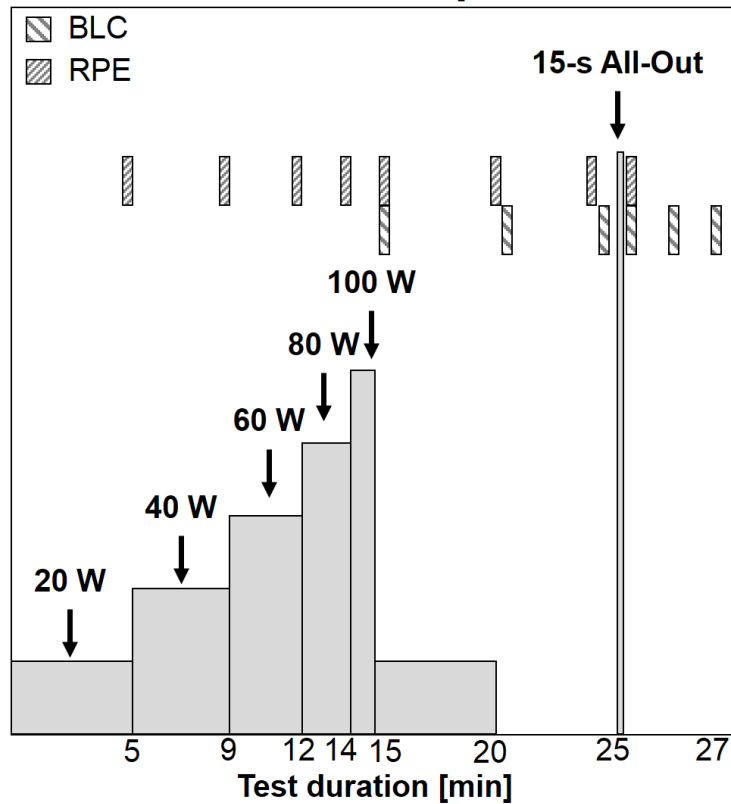
Proband

0.5 x Speed

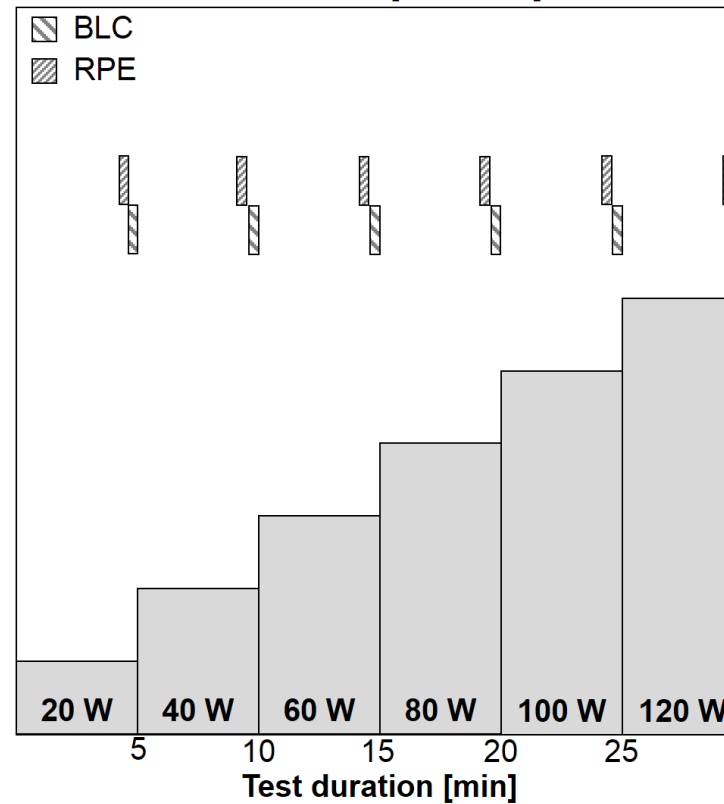


Belastungsprotokolle

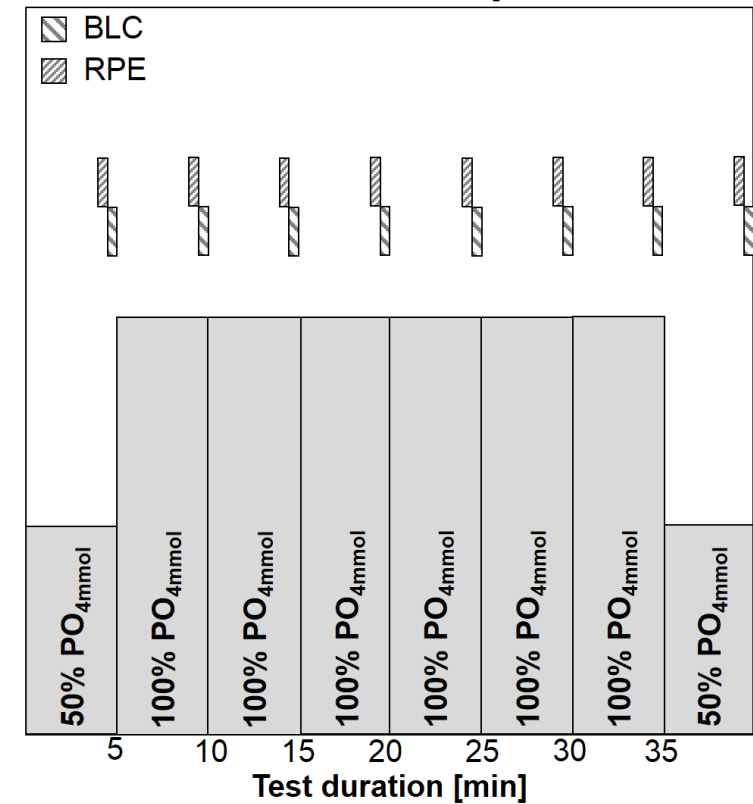
(a) Familiarisation protocol



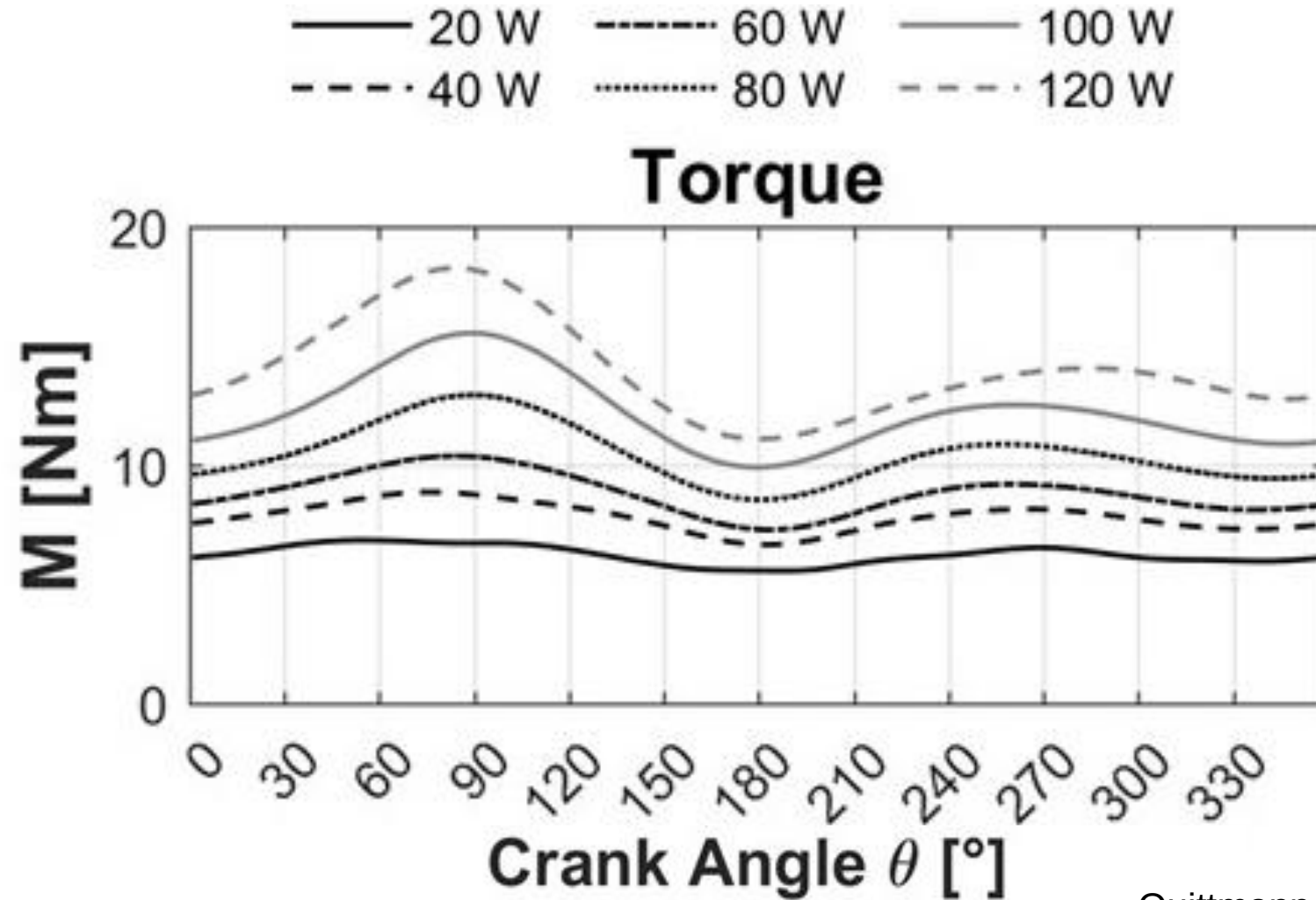
(b) Incremental step test protocol



(c) Continuous load protocol



Quittmann et al. (2018). *Eur J Appl Physiol*



Quittmann et al. (2018). *Sports Eng*

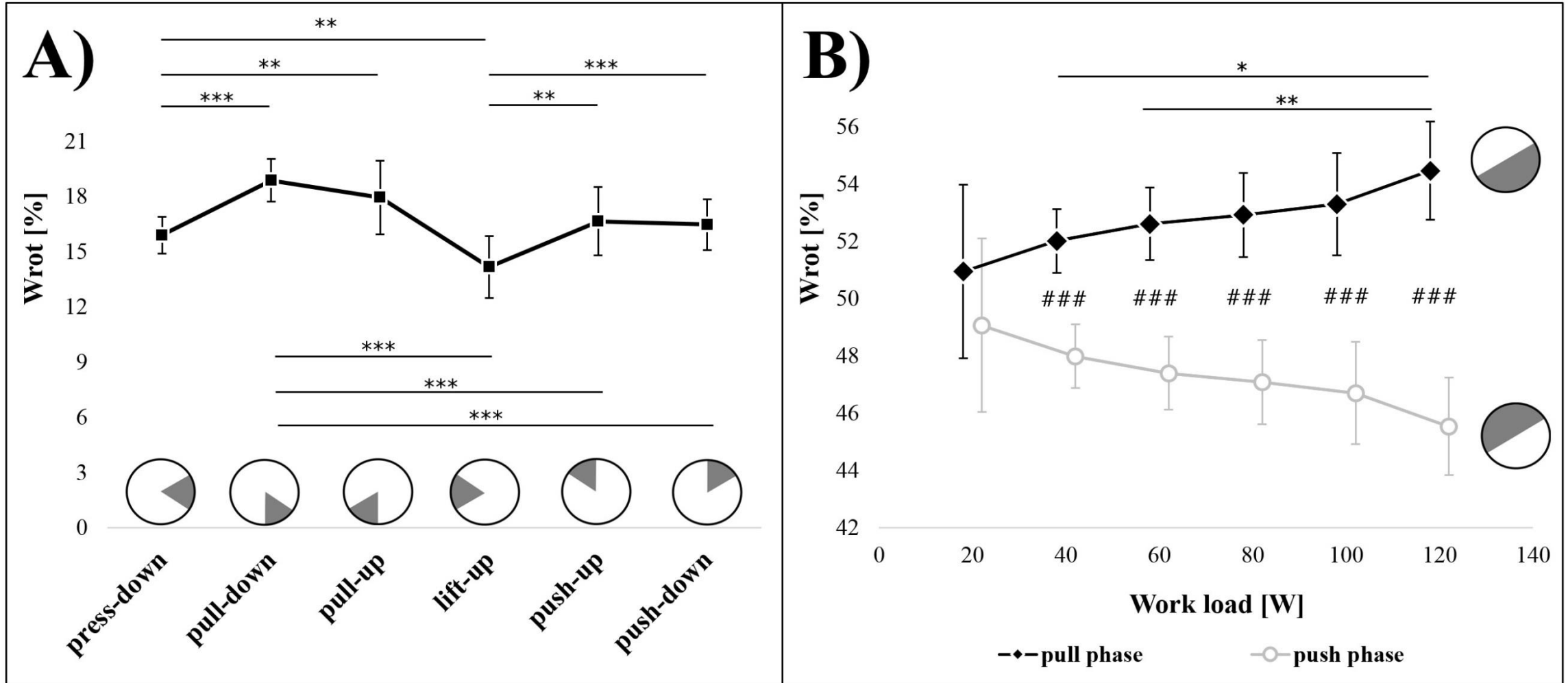
Zusammenfassung

Laktatkinetik

Muskelaktivität

Gelenkinematik

Kurbelkinetik



Quittmann et al. (2018). *Sports Eng*

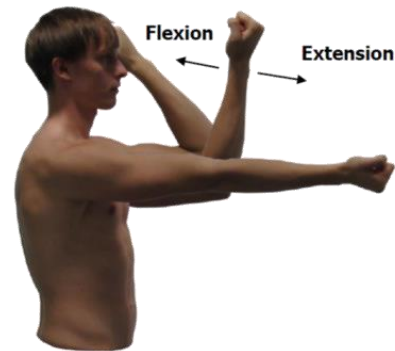
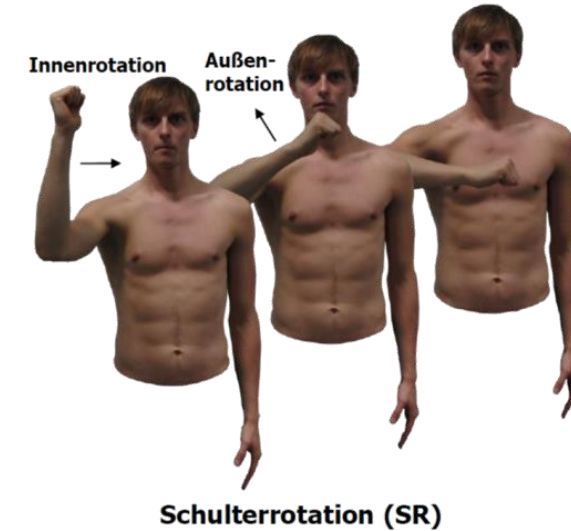
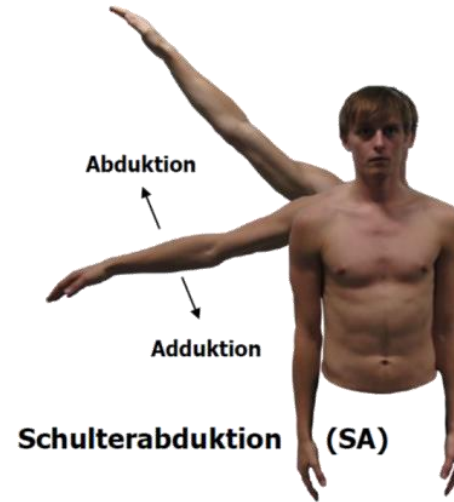
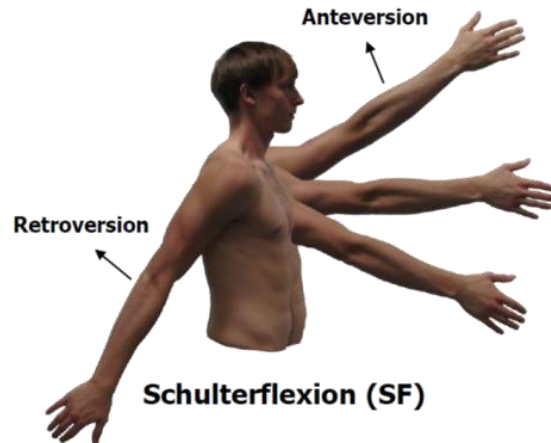
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Laktatkinetik

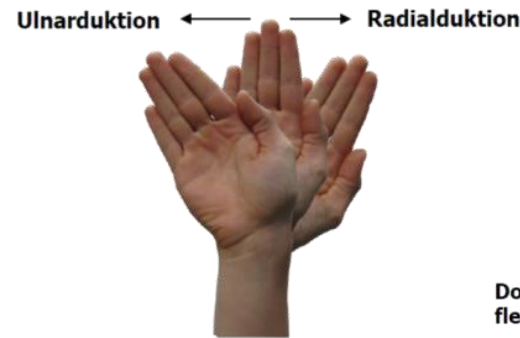
Muskelaktivität

Gelenkkinematik

Kurbelkinetik



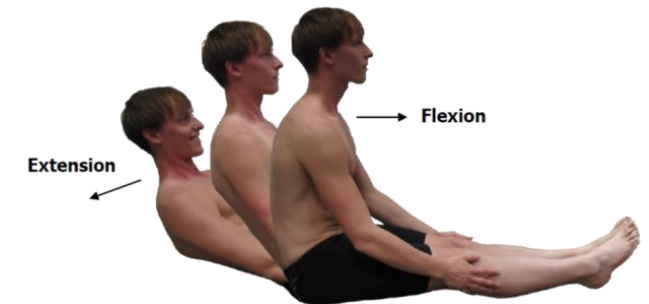
Ellenbogenflexion (EF)



Radialduktion (RD)



Palmarflexion (PF)



Rumpfflexion (RF)

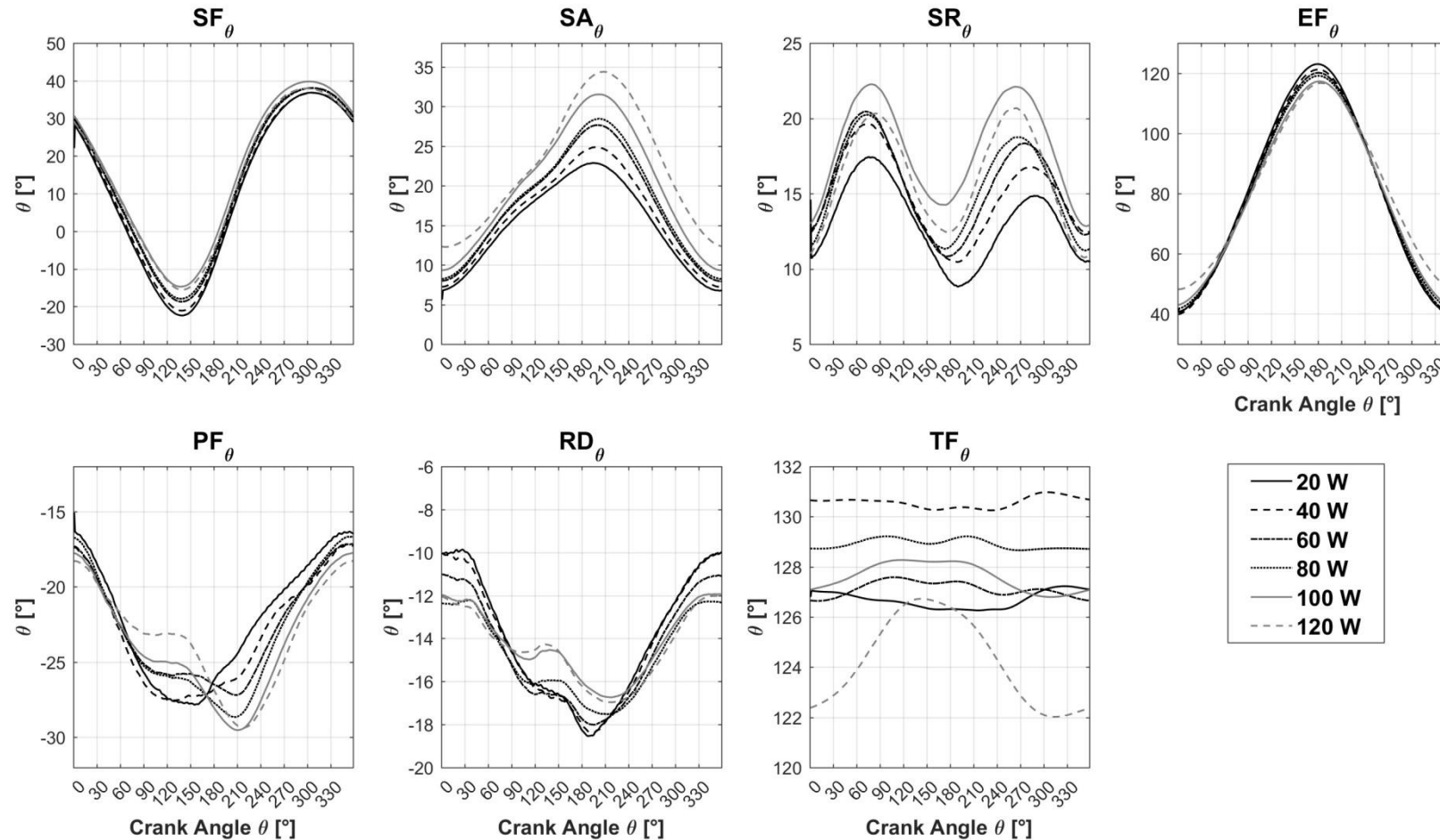
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Laktatkinetik

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SF = shoulder flexion, SA = shoulder abduction, SR = shoulder (internal) rotation, EF = elbow flexion,
PF = palmar flexion, RD = radial (ab-)duction, TF = trunk flexion

Quittmann et al. (2018). *Sports Eng*

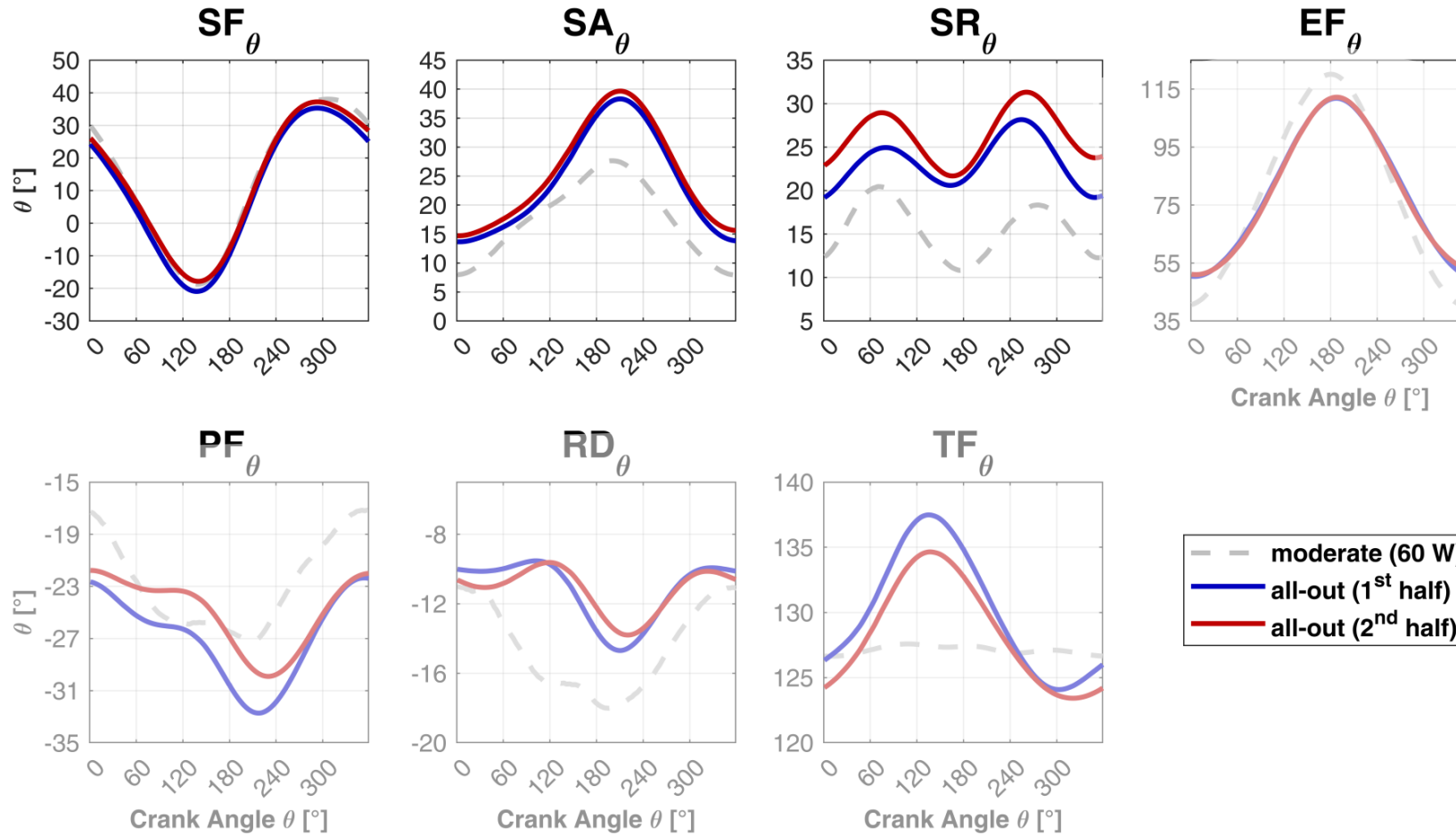
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Quittmann et al. (Under Review). *Sports Biomech*

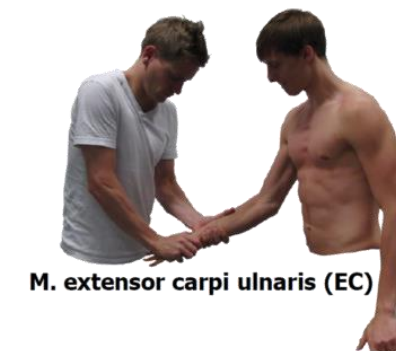
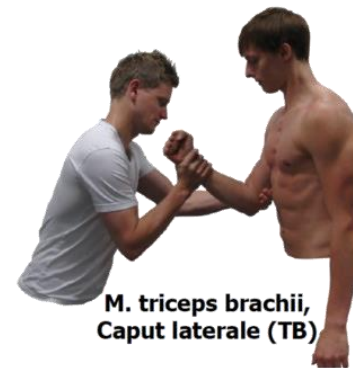
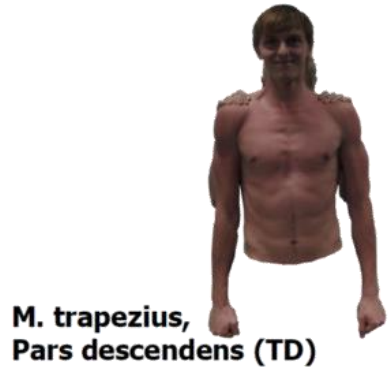
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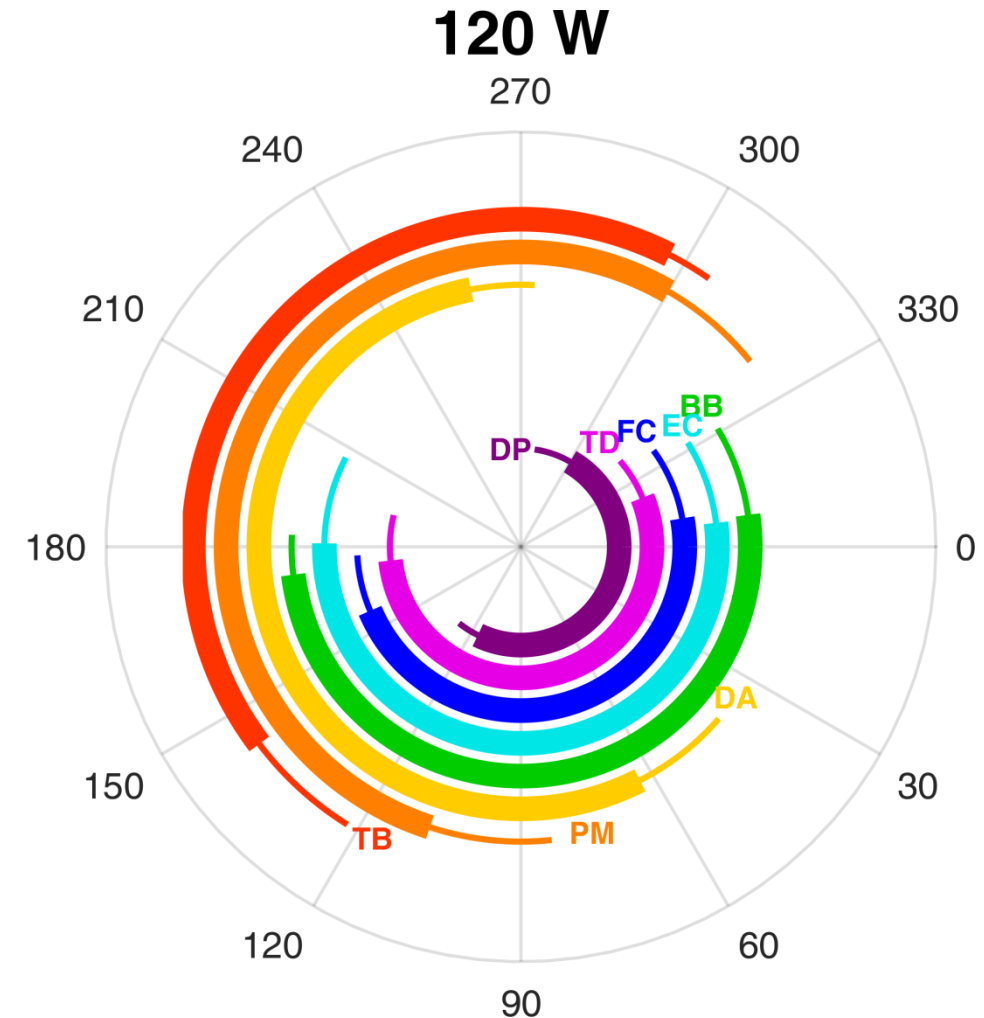
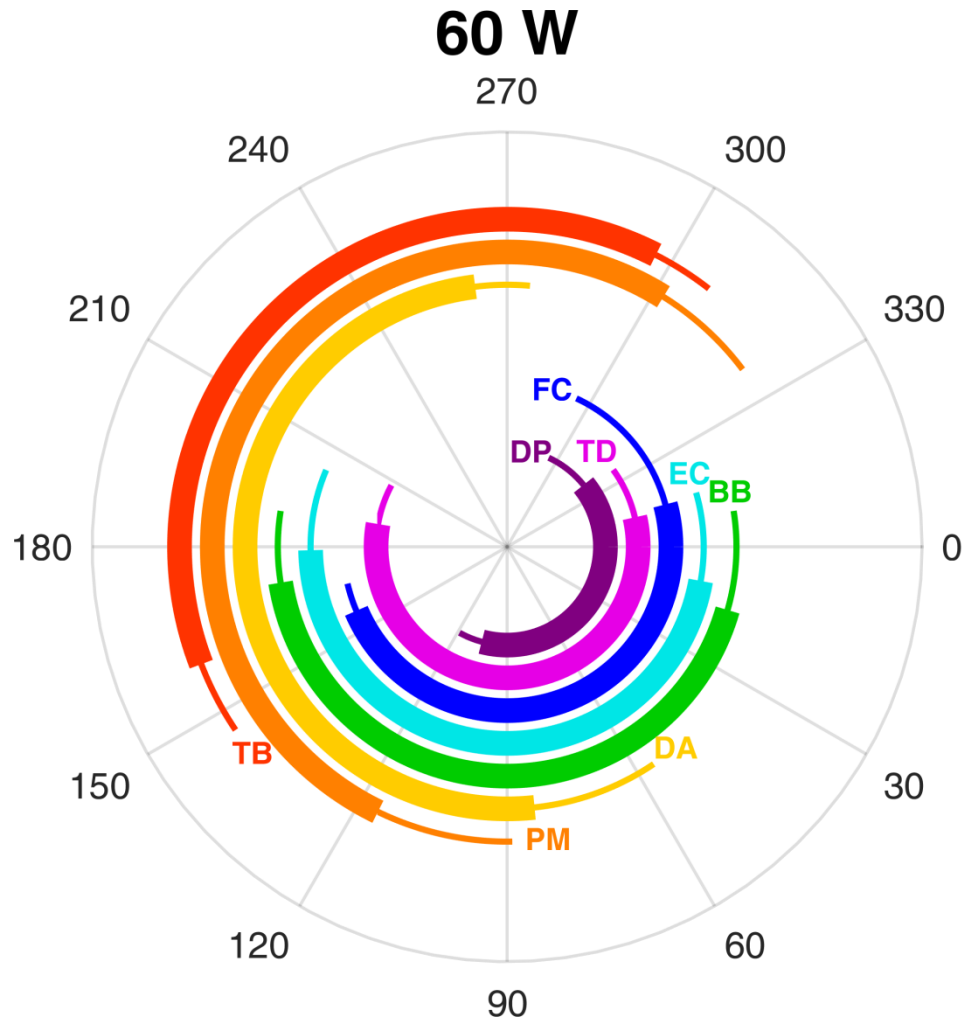
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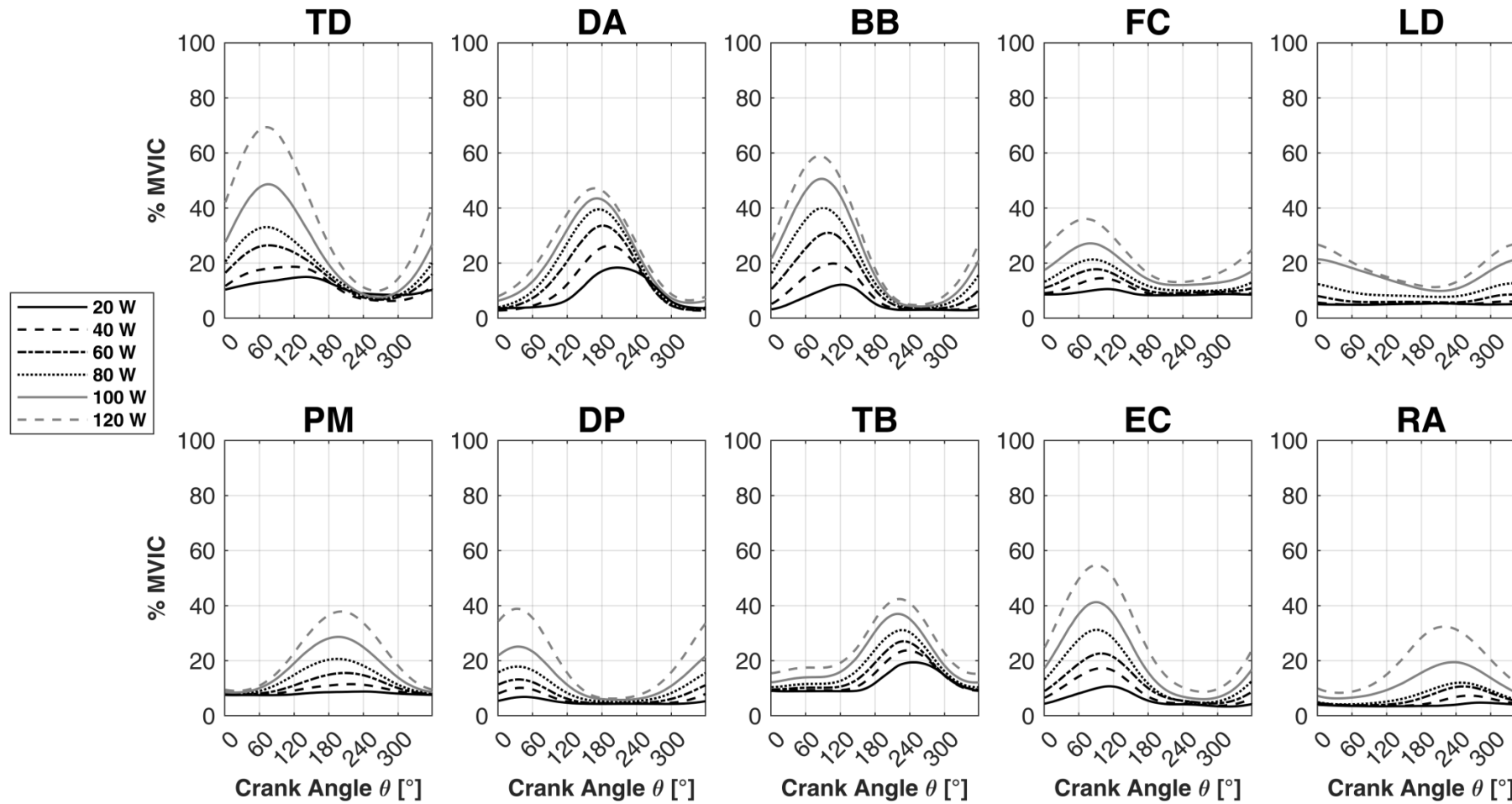
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TD = M. trapezius, PM = M. pectoralis major, DP = M. deltoideus, Pars spinalis, DA = M. deltoideus, Pars clavicularis, BB = M. biceps brachii, TB = M. triceps brachii, FC = elbow flexors, EC = elbow extensors, LD = M. latissimus dorsi, RA = M. rectus abdominis, MVIC = maximal voluntary isometric contraction

Quittmann et al. (Under Review). *Sports Biomech*

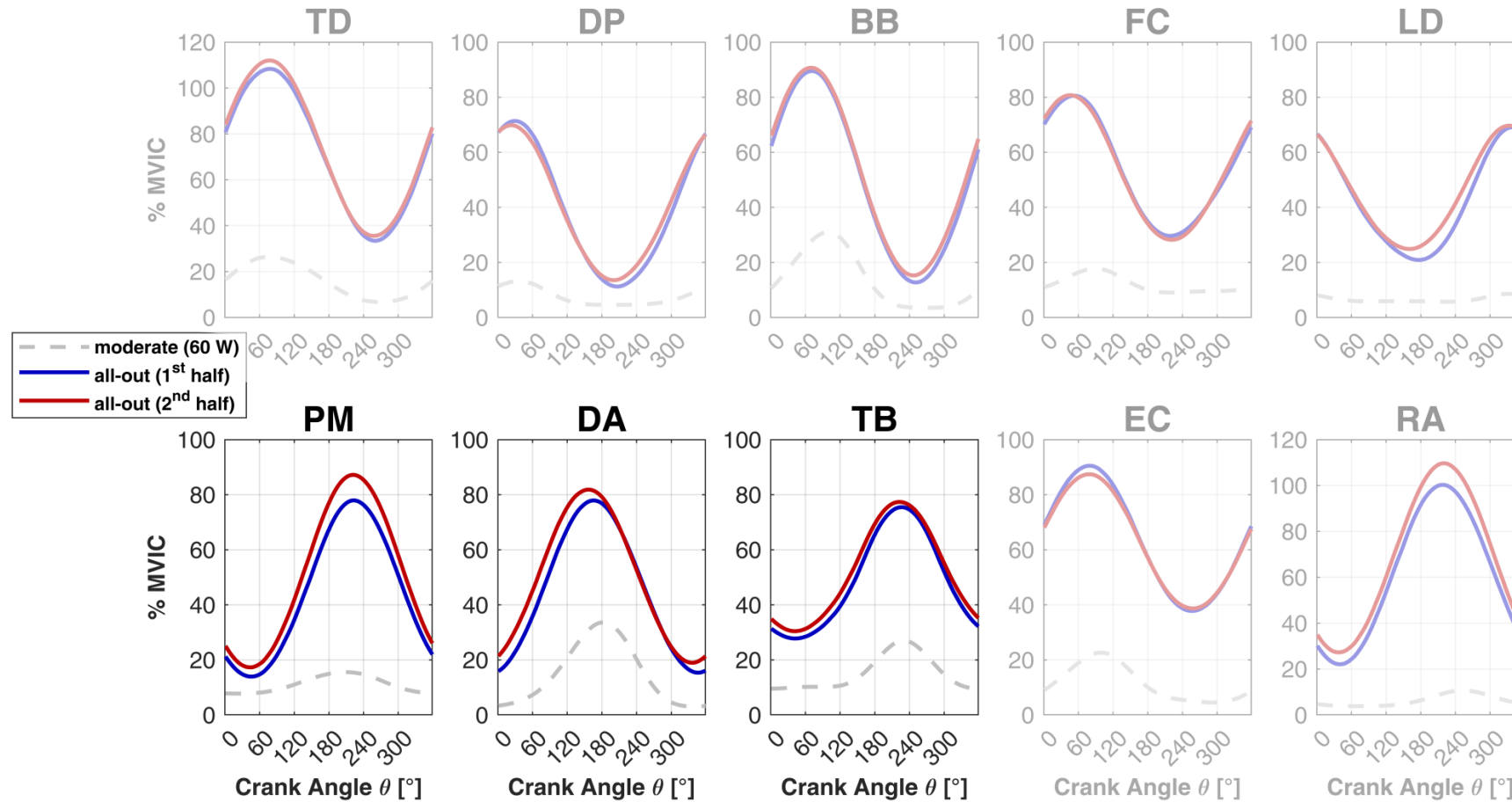
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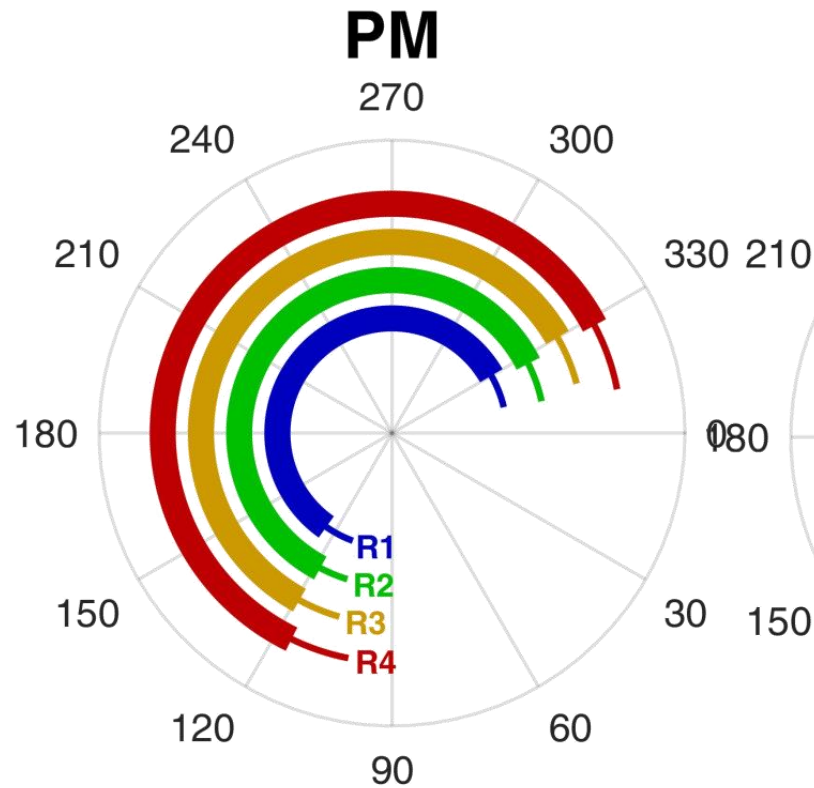
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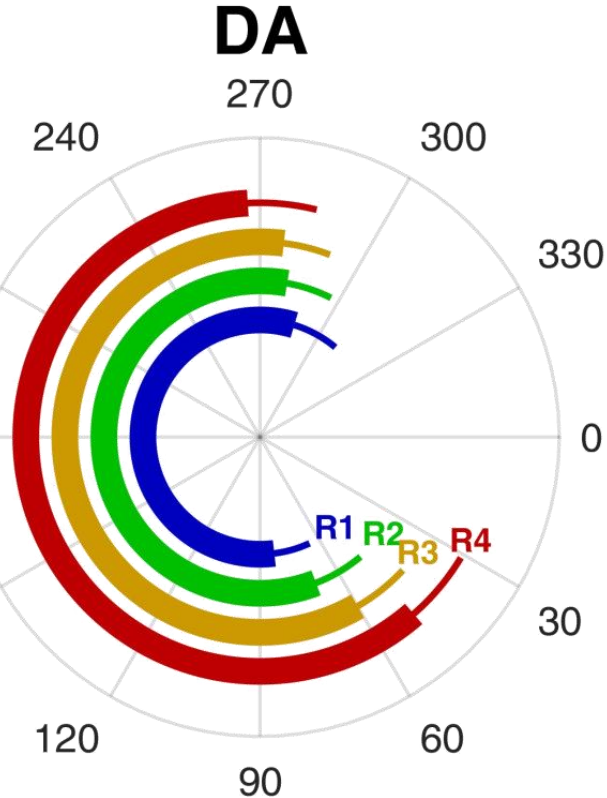
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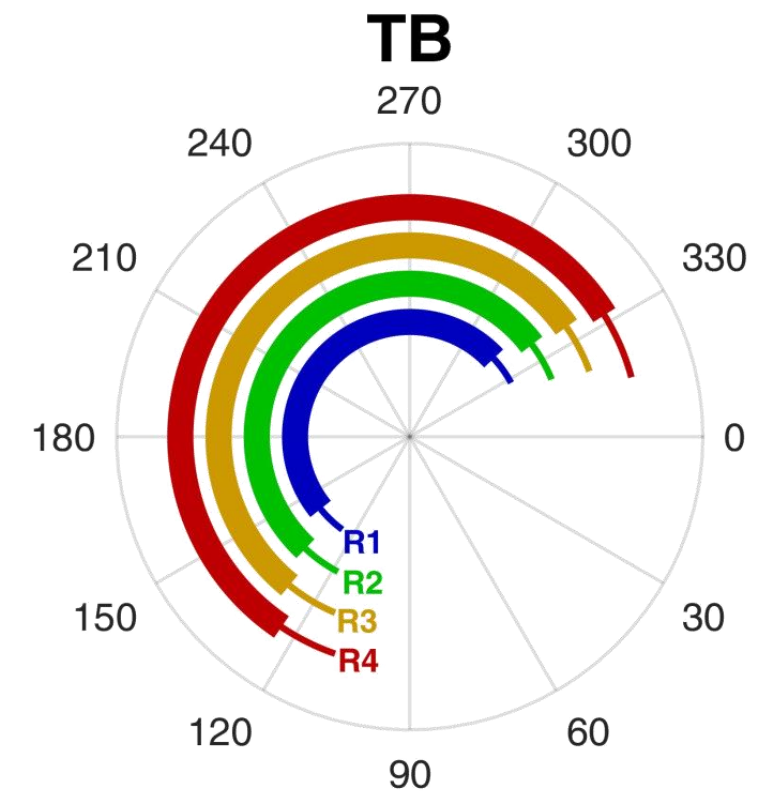
Kurbelkinetik



- früherer Onset
- längere Aktivierung



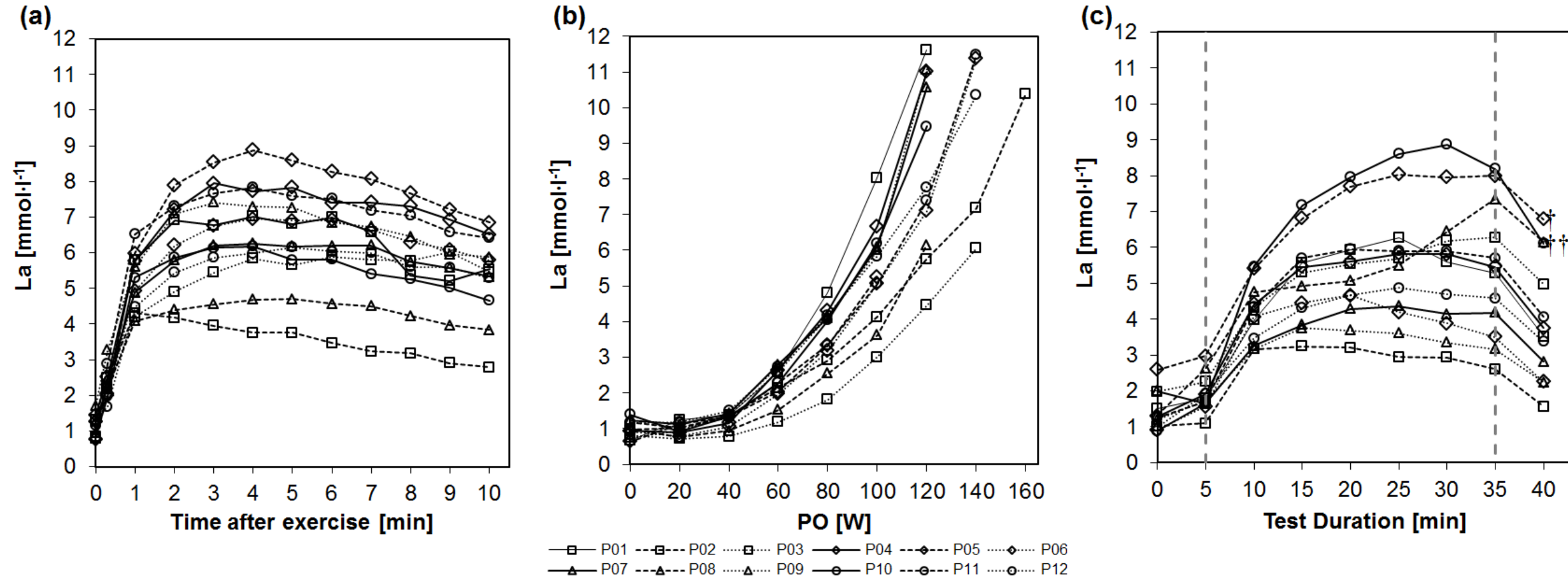
- früherer Onset
- Früherer Offset



- früherer Onset
- späterer Offset
- längere Aktivierung

Quittmann et al. (Under Review). *Sports Biomech*





Quittmann et al. (2018). *Eur J Appl Physiol*



Sprinttest im Handbike



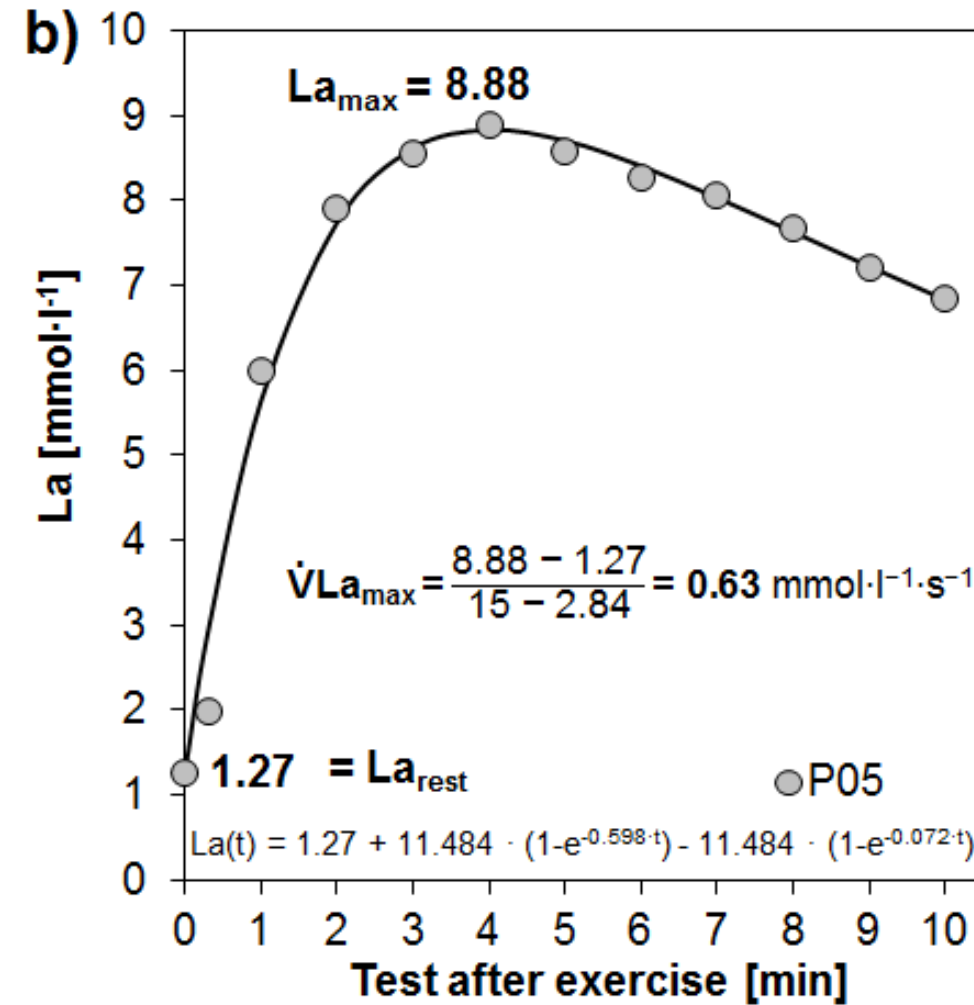
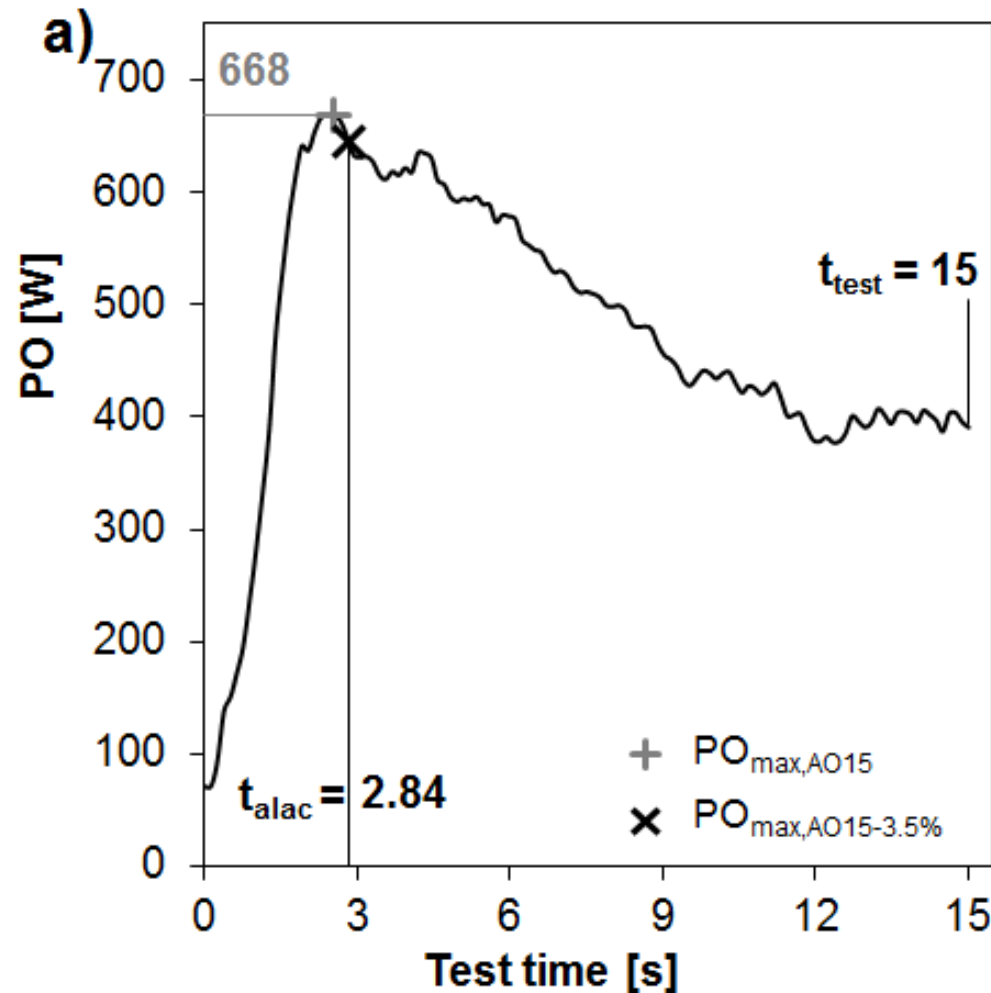
Zusammenfassung

Laktatkinetik

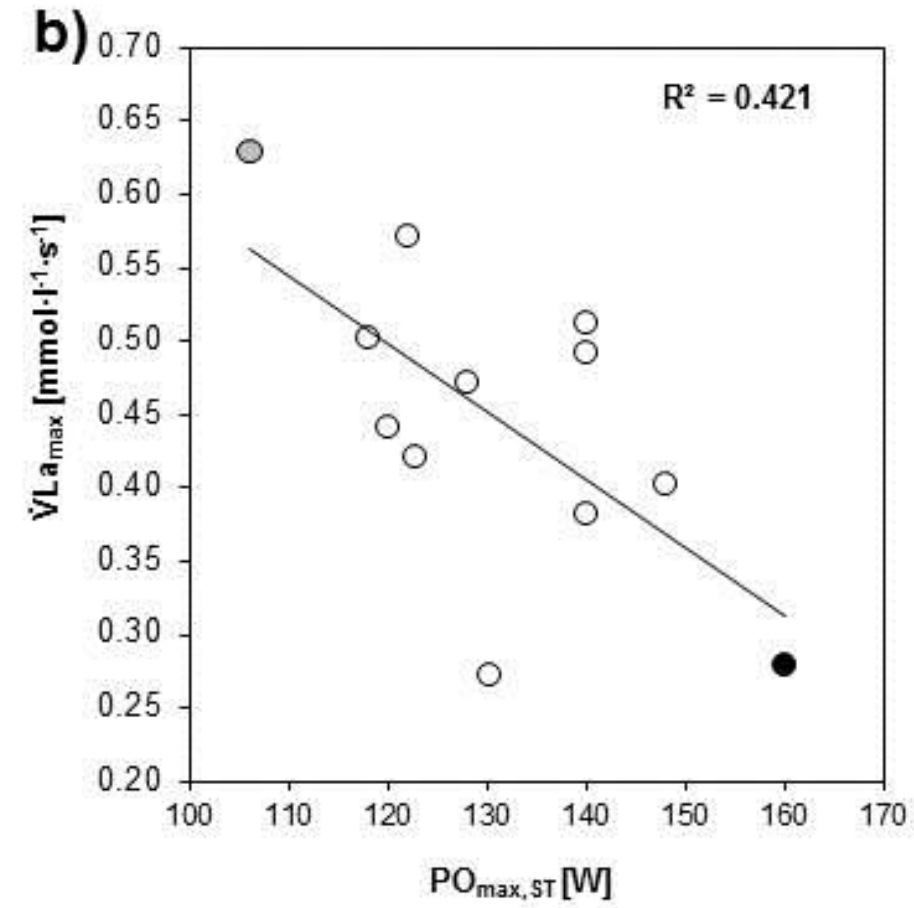
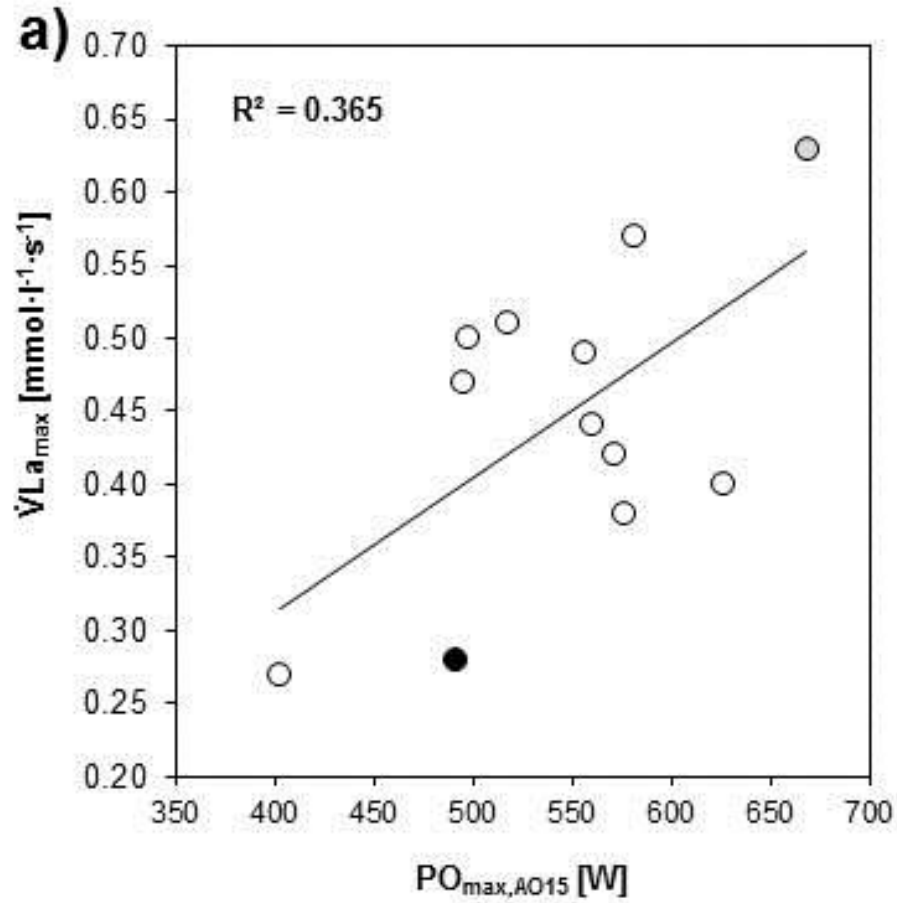
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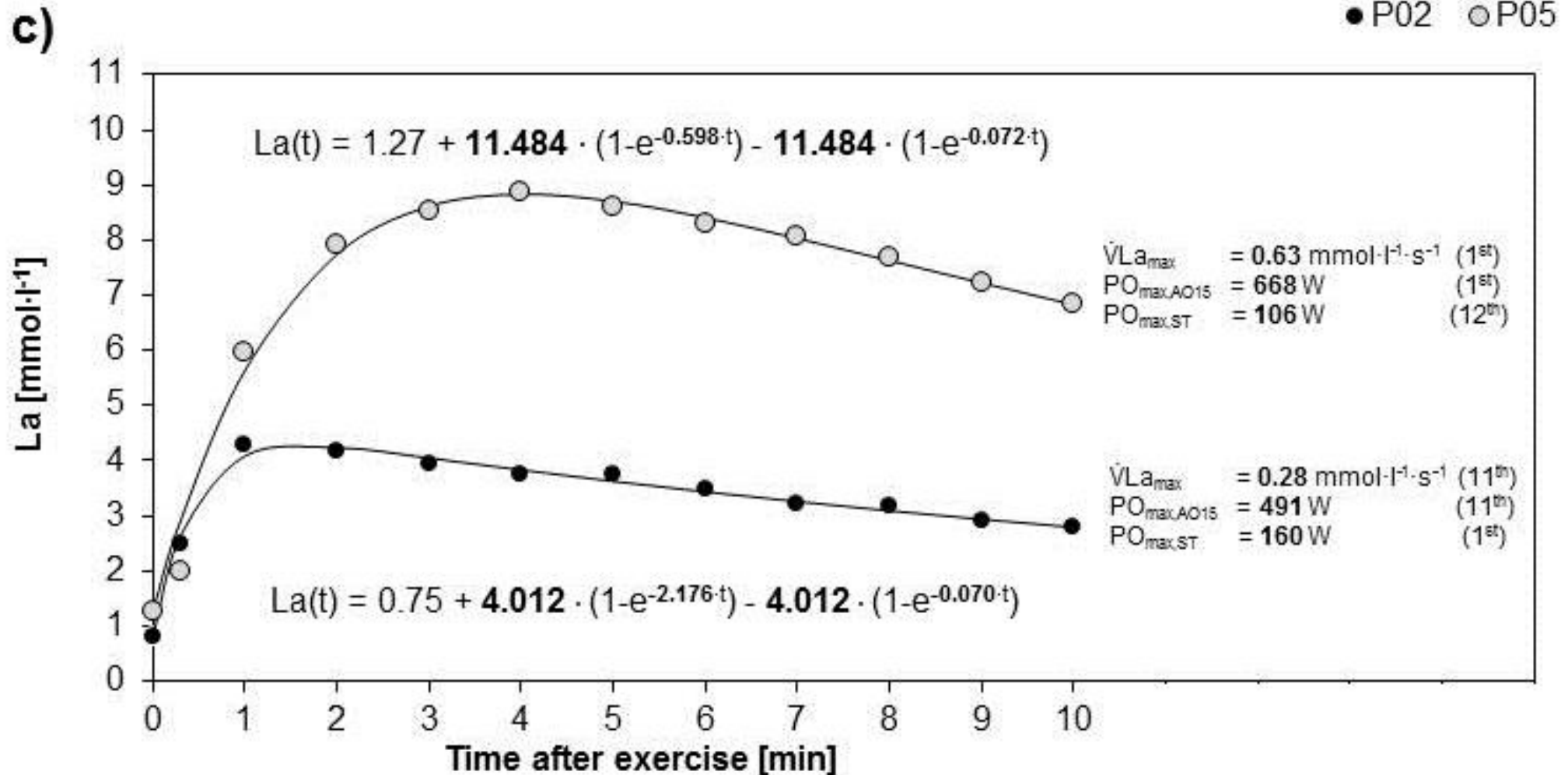


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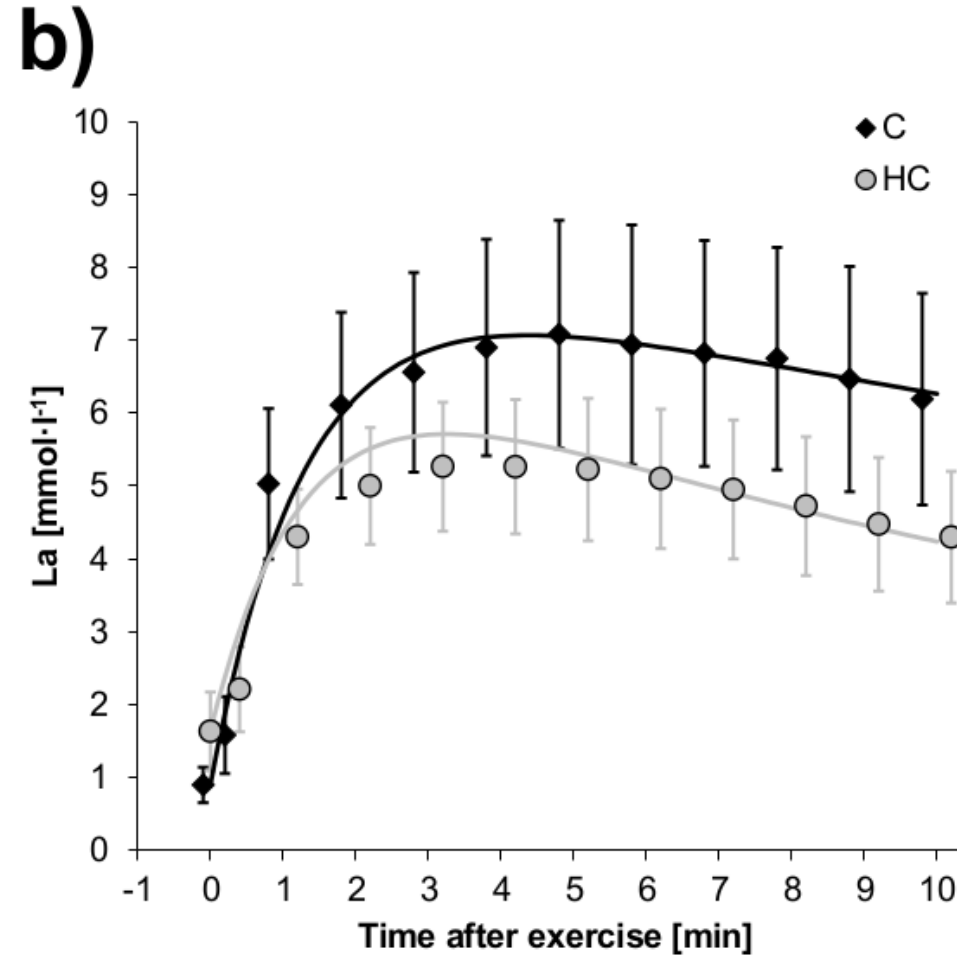
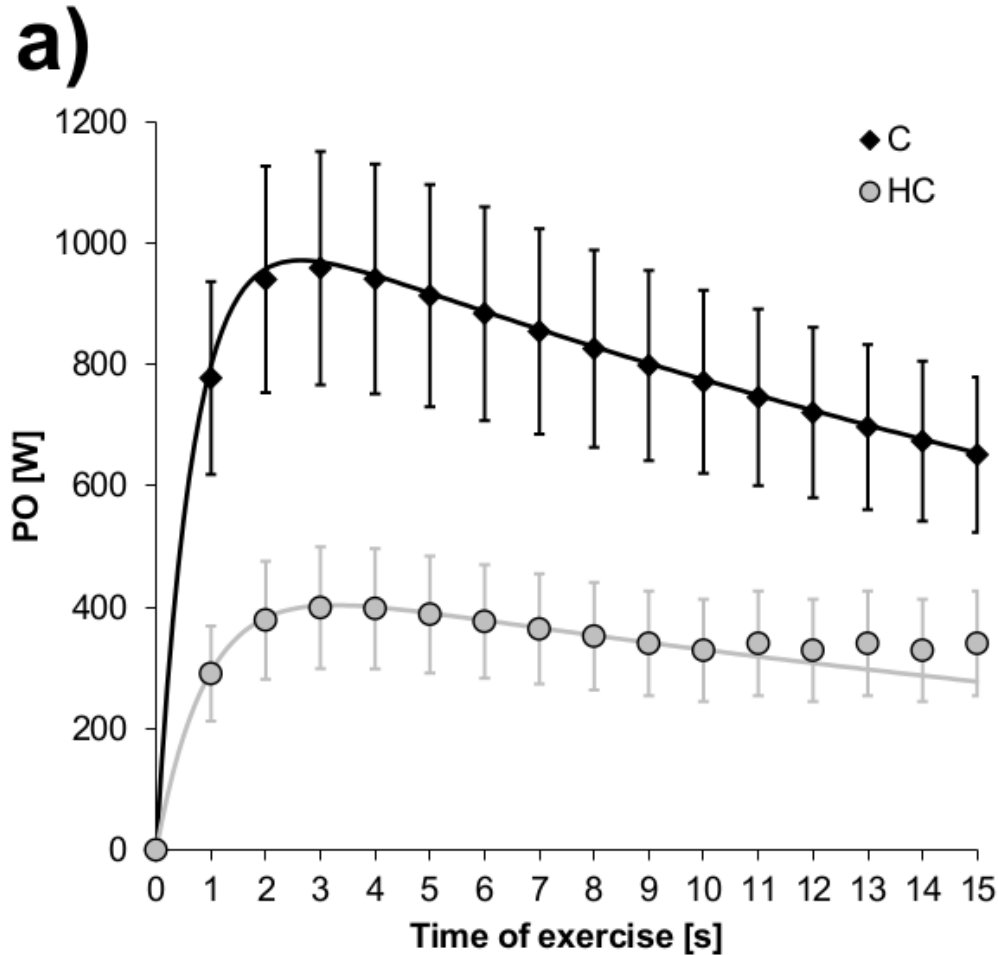


● P02 ○ P05

Quittmann et al. (2017). *ECSS*



Quittmann et al. (2018). *Eur J Appl Physiol*



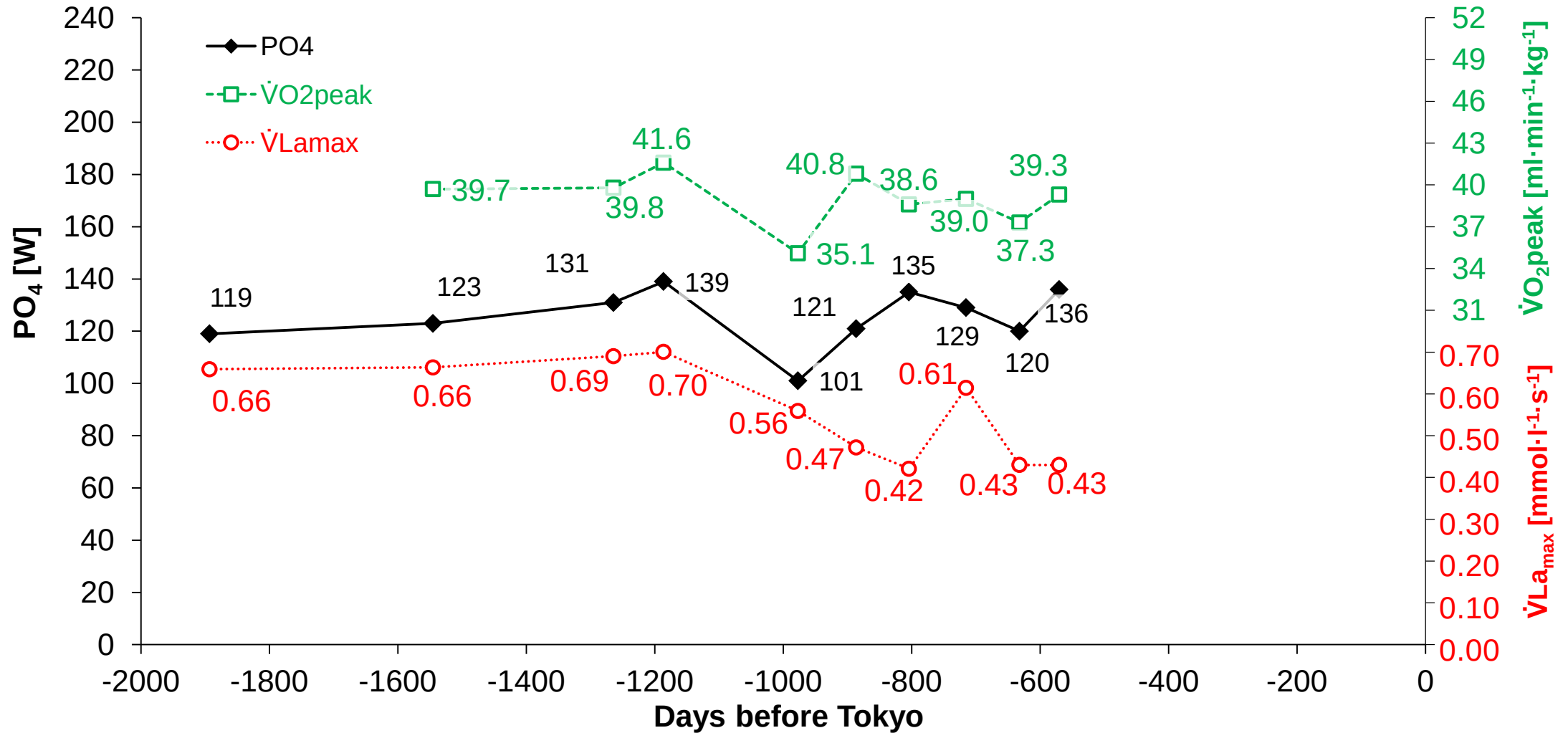
Zusammenfassung

Laktatkinetik

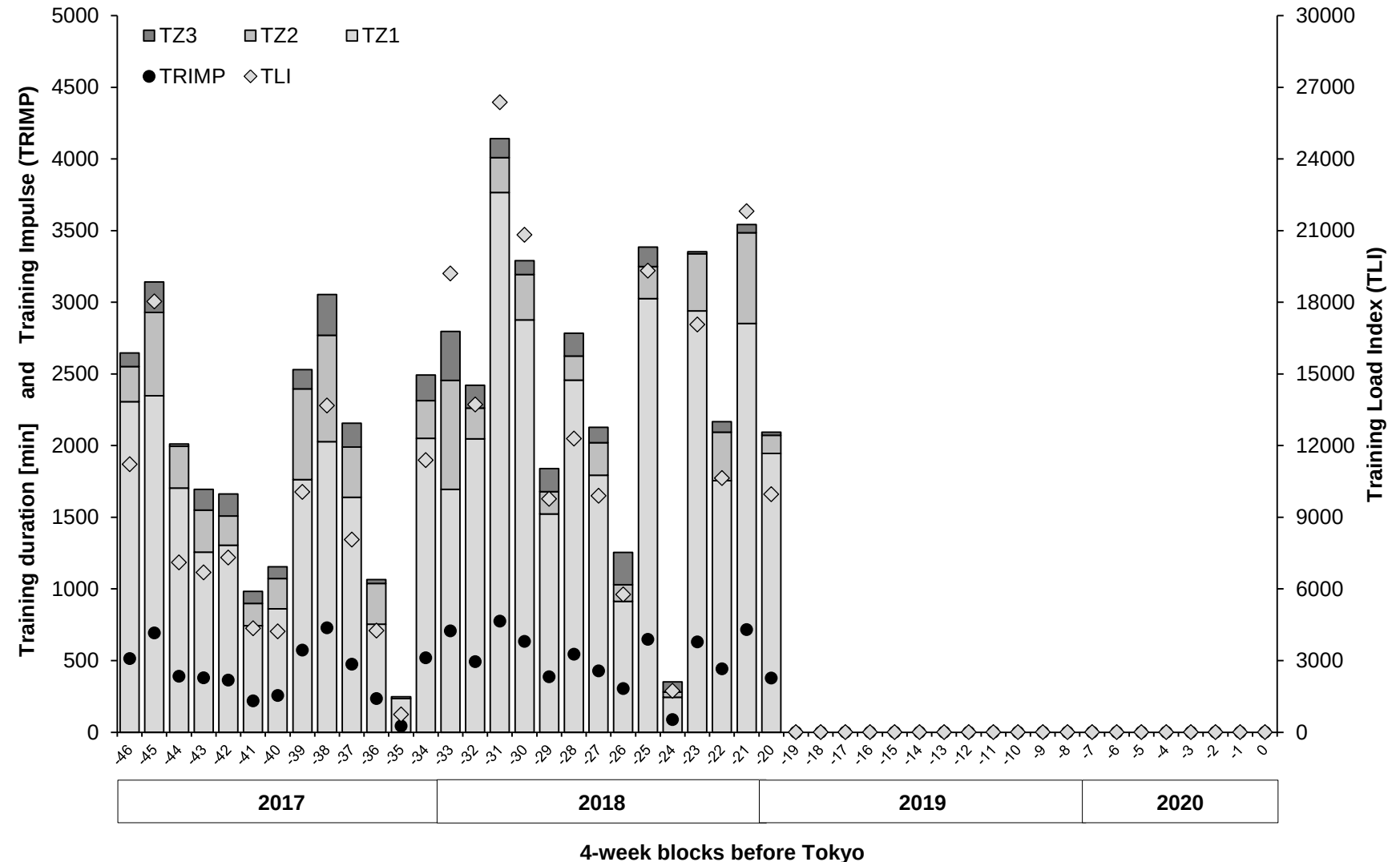
Muskelaktivität

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- Steuerung des Trainings nach:
- **Herzfrequenzbereichen und subjektivem Belastungsempfinden**
- Training als Wechselspiel *umfangs-* und *intensitätsorientierter* Belastung



Zusammenfassung

Laktatkinetik

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- Die **komplexe Leistungsdiagnostik im Handcycling** umfasst die *Kombination biomechanischer und leistungsphysiologischer Perspektiven*.
- Während **biomechanische Analysen** die *Bewegung und muskuläre Koordination* darstellen, kann die **Laktatkinetik** zur Beurteilung der *physiologischen Reaktion bzw. metabolischen Leistungsfähigkeit* herangezogen werden.
- Diese Erkenntnisse führen zu einem verbesserten **Verständnis der Antriebsstruktur im Handcycling** und tragen damit zur *Optimierung der Leistungsentwicklung* bei.
- Obwohl diese differenzierte, *wissenschaftliche Betrachtung* zu hilfreichen Erkenntnissen führt, steht das **Training des Athleten** im Vordergrund.



Komplexe Leistungsdiagnostik im Handcycling:

Kombination biomechanischer und leistungsphysiologischer Perspektiven

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Literatur

- Quittmann OJ, Abel T, Strüder HK (2017). Relationship between physiology and performance of handcycling in able-bodied subjects. In: A. Ferrauti, P. Platen, E. Grimmering-Seidensticker, T. Jaitner, U. Bartmus, L. Becher et al. (Hg.): *22nd Annual Congress of the European College of Sport Science*. 5th - 8th July 2017, MetropolisRuhr - Germany : book of abstracts, Bd. 22. Bochum: Bochumer Universitätsverlag Westdeutscher Universitätsverlag, 30-31.
- Quittmann OJ, Meskemper J, Abel T, Albracht K, Foitschik T, Rojas-Vega S, Strüder HK (2018). Kinematics and kinetics of handcycling propulsion at increasing workloads in able-bodied subjects. *Sports Eng* 21 (4), 283-294.
- Quittmann OJ, Abel T, Zeller S, Foitschik T, Strüder HK (2018). Lactate kinetics in handcycling under various exercise modalities and their relationship to performance measures in able-bodied participants. *Eur J Appl Physiol* 118 (7), 1493-1505.
- Quittmann OJ, Abel T, Albracht K, Strüder HK (Under Review). Reliability of muscular activation patterns and their alterations during incremental handcycling in able-bodied participants. *Sports Biomech*.
- Quittmann OJ, Abel T, Albracht K, Strüder HK (Under Review). Biomechanics of a 15-s all-out handcycling exercise test in able-bodied participants. *Sports Biomech*.
- Quittmann OJ, Abel T, Vafa R, Mester J, Schwarz Y, Strüder HK (Under Review). Maximal lactate accumulation rate is highly reliable in, correlates among and differs between handcycling and cycling. *The Phys Sports Med*.

Es bestehen keine Interessenskonflikte von Seiten des Vortragenden sowie unmittelbarer und mittelbarer Angehörigen.

Für die Durchführung der zugrundeliegenden Untersuchungen wurden keine Forschungsfördermittel bezogen.