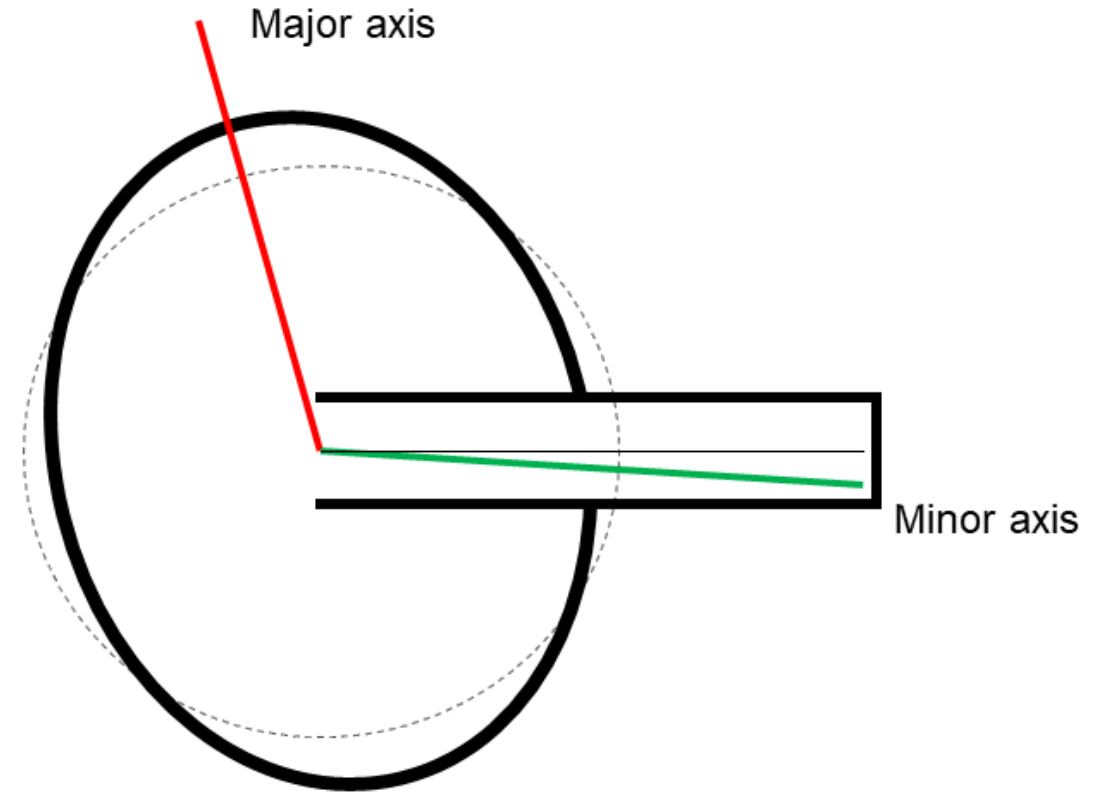
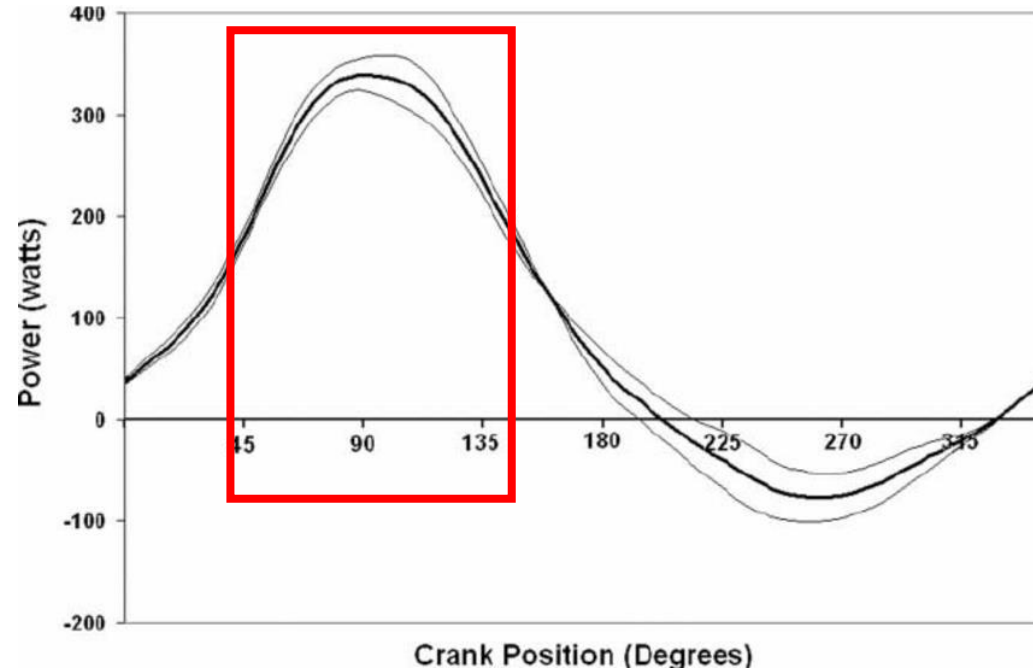


Influence of non-circular chainrings on kinematics during stationary and outdoor cycling

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Philipp Neumeister, Stefan Litzenberger

Non-circular chainrings



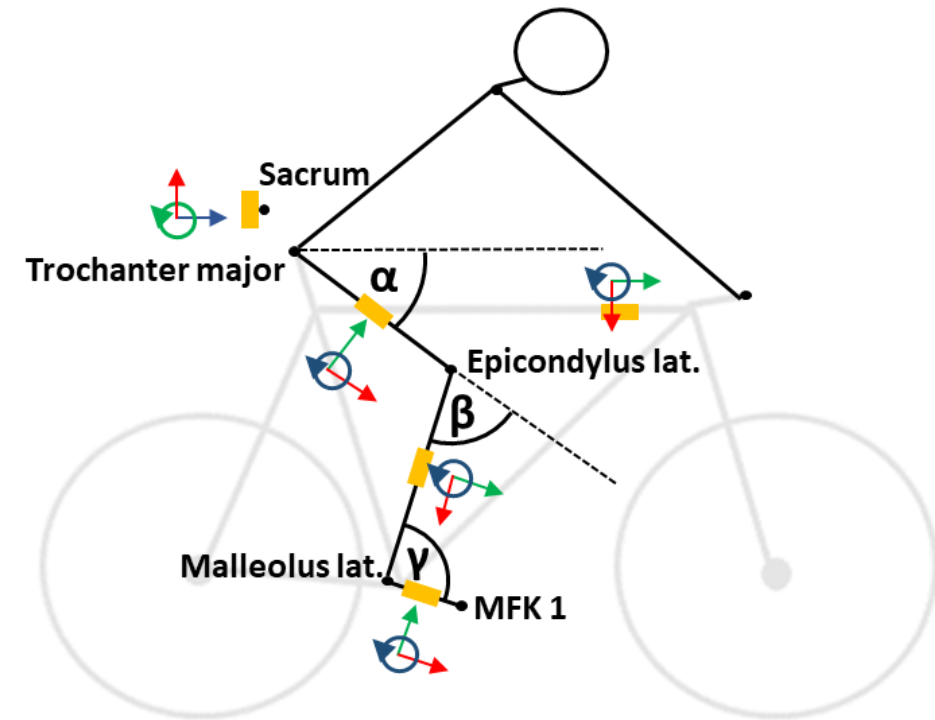
Research Questions

Are there differences using a non-circular chainring compared to a circular chainring

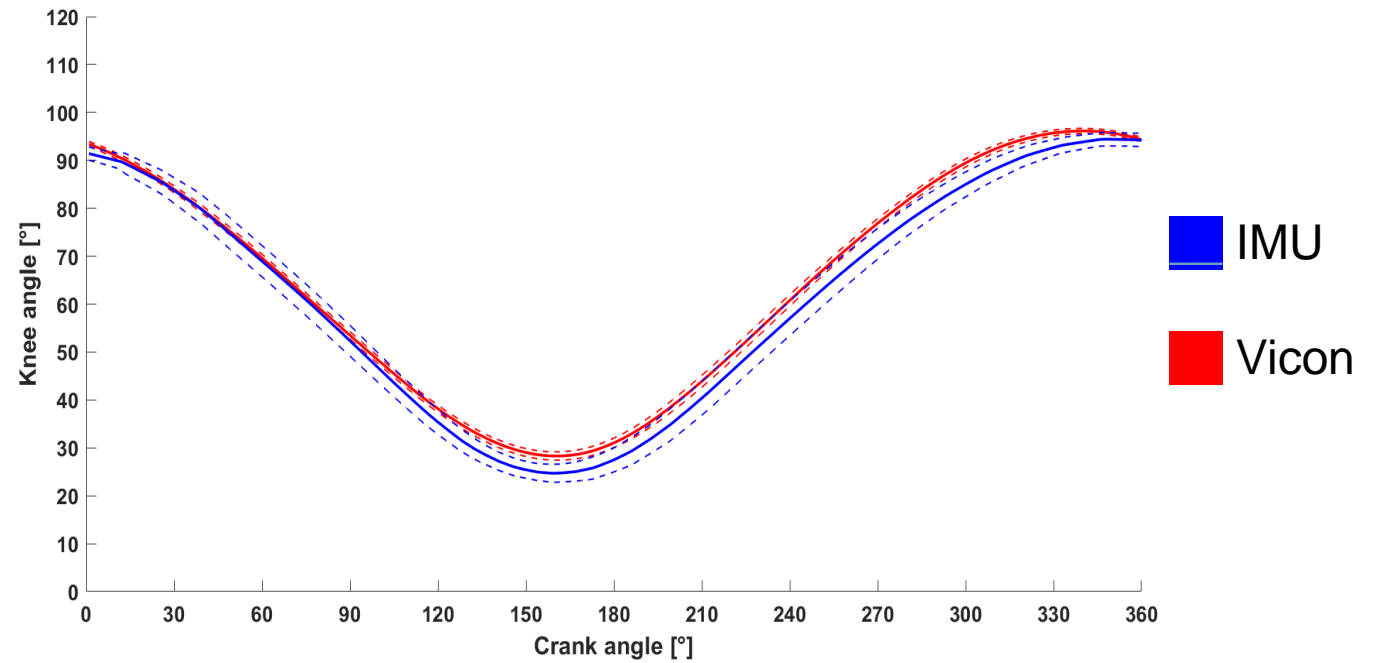
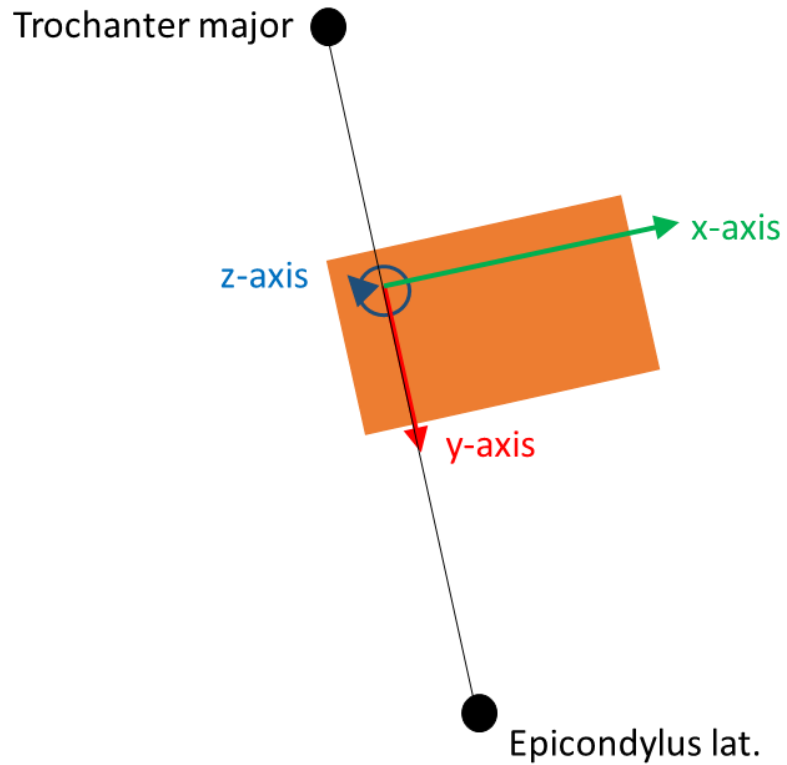
1. in joint kinematics?
2. comparing the data measured while riding indoors on a stationary trainer with the data measured while riding outdoors?

Methods

- 6 IMUs from Xsens (MTw Awinda, Xsens Technologies, Enschede, NL)
- Sampling rate 100 Hz
- Joints:
 - Hip (α)
 - Knee (β)
 - Ankle (γ)
 - Sacrum
- Parameters:
 - Joint angles
 - Joint angular acceleration

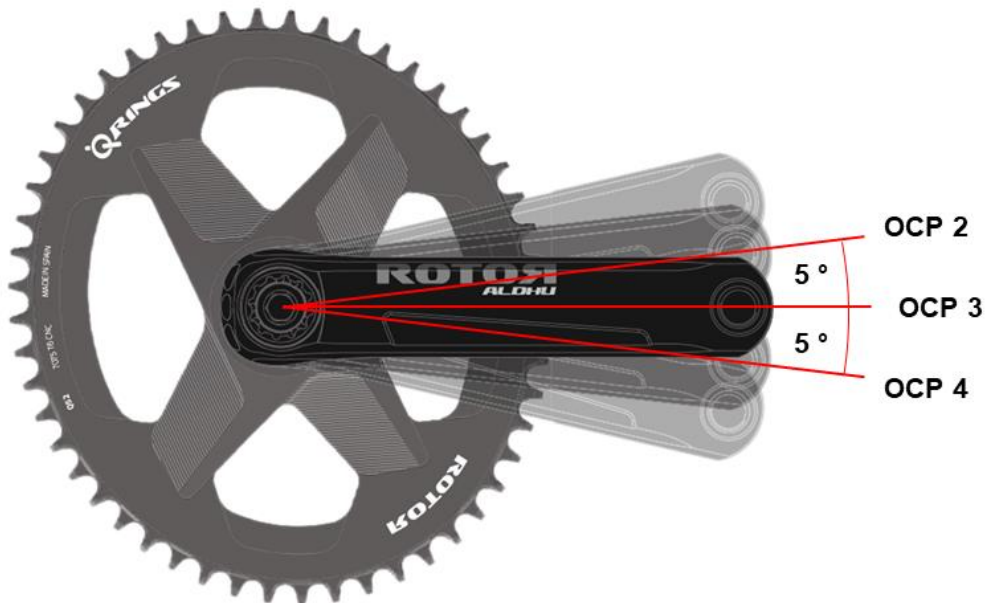


Methods – IMUs

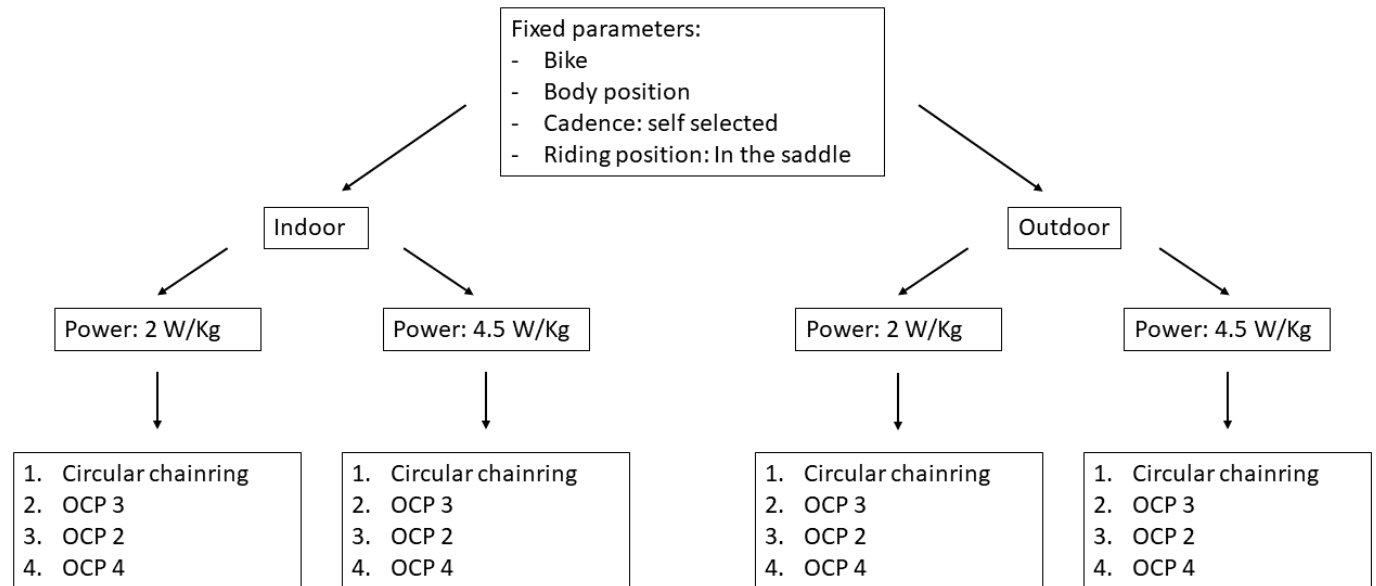


Methods – Test design

- 5 male subjects (experienced road cyclists)
- Roadbike (Merida, Yuanlin, China)
- Q-Ring (Rotor, Madrid, Spain), ovality 12.5%

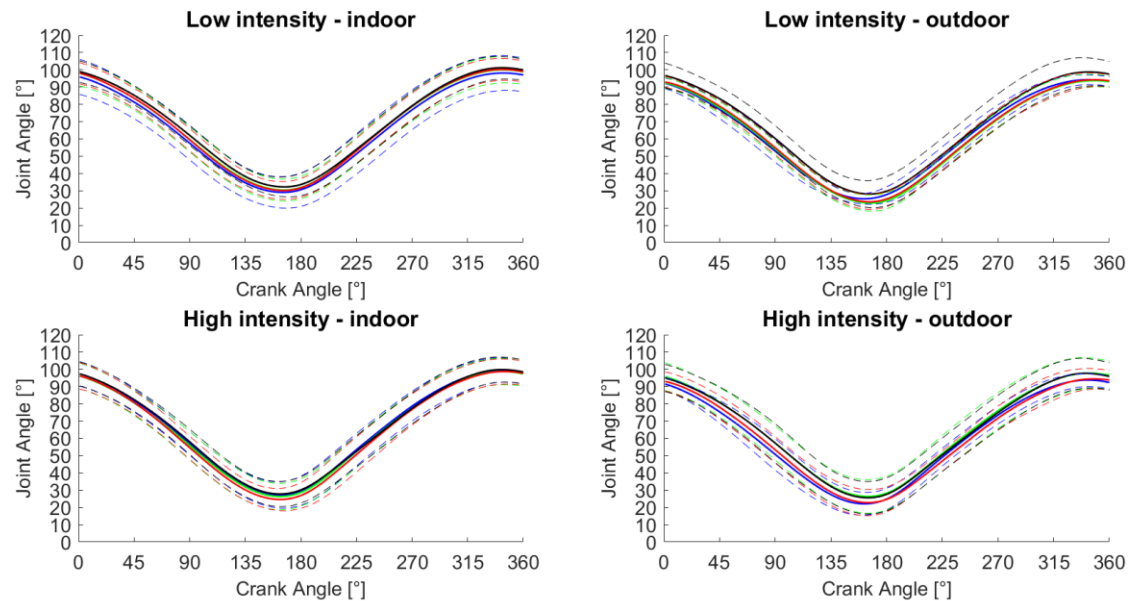


Source: <https://rotorbike.com/why-q/>

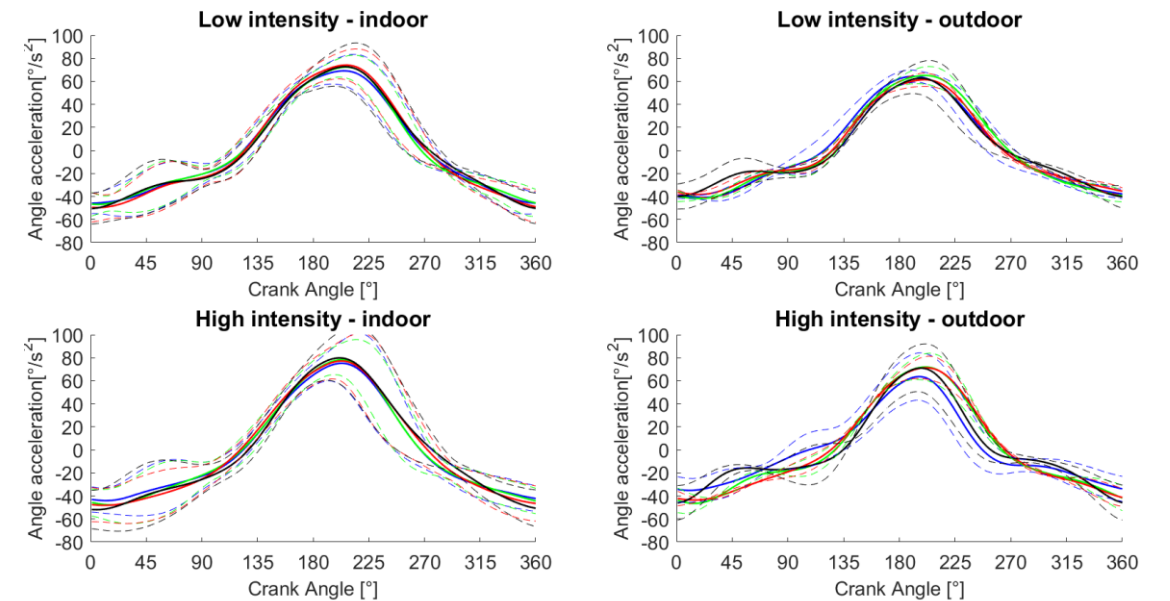


Results – Knee kinematics

Joint angles



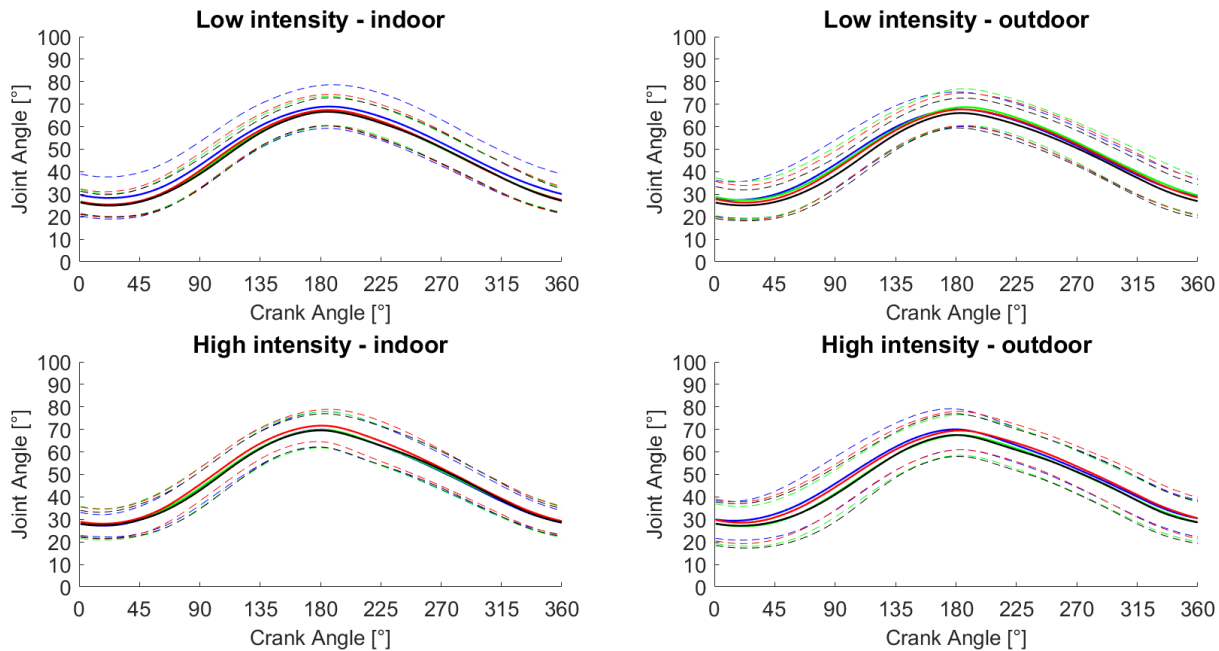
Joint angular acceleration



■ OCP 3 ■ OCP 2 ■ OCP 4 ■ Round

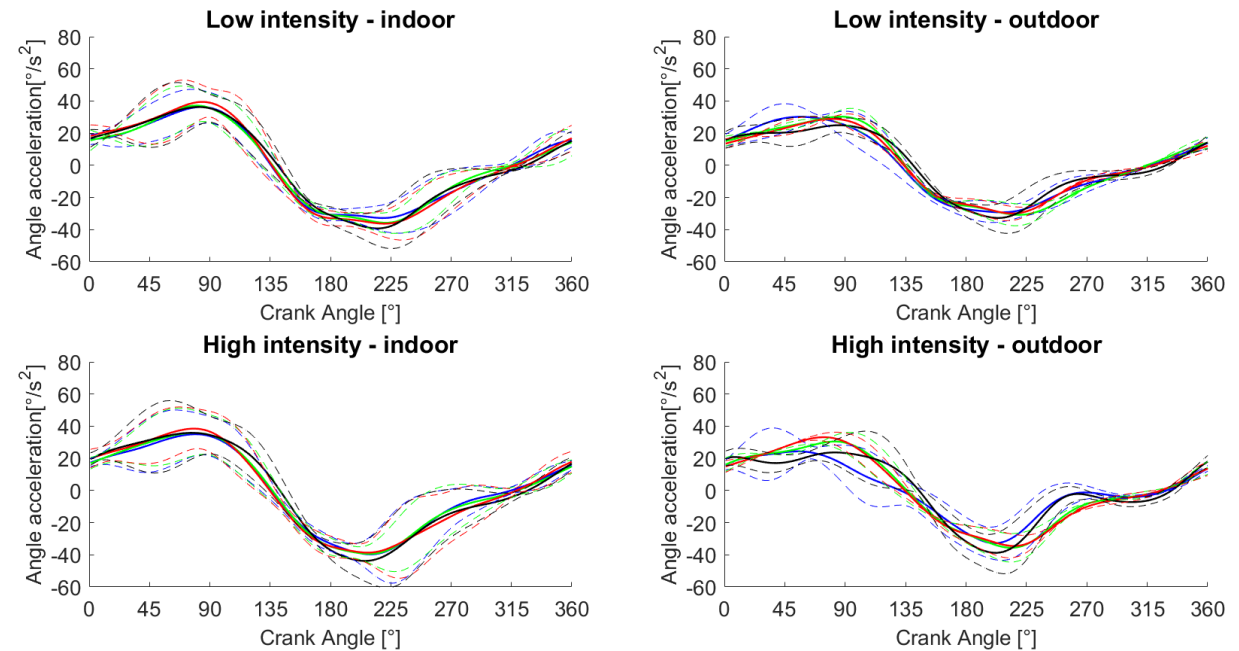
Results – Hip kinematics

Joint angles



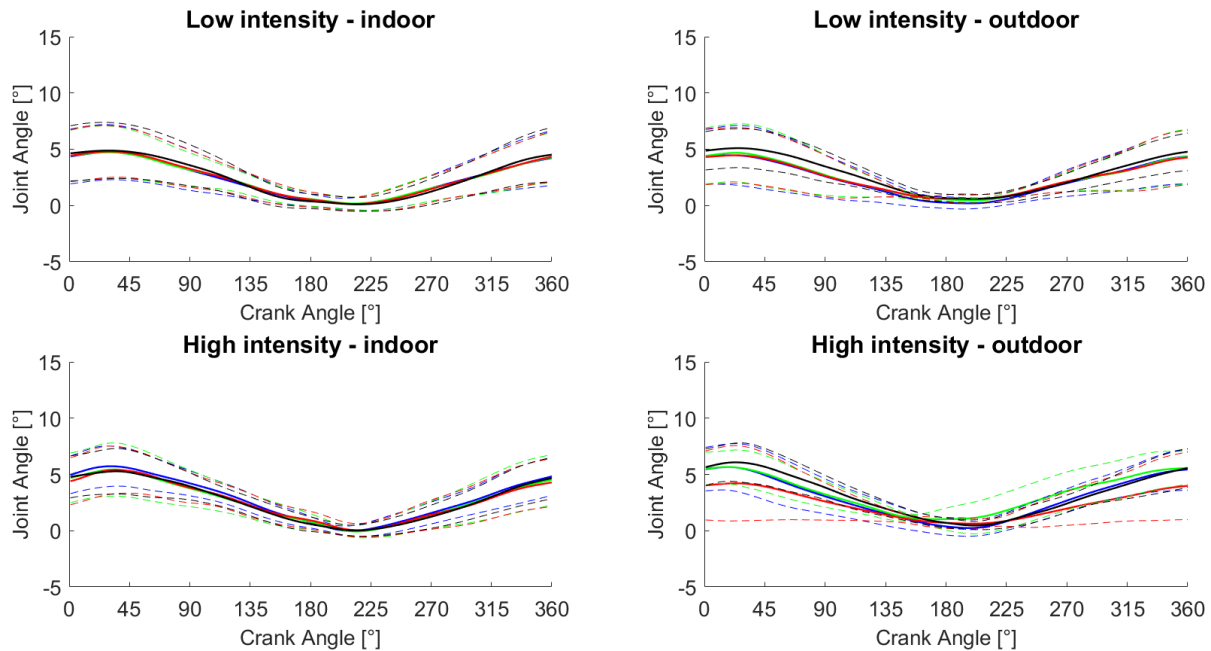
■ OCP 3 ■ OCP 2 ■ OCP 4 ■ Round

Joint angular acceleration

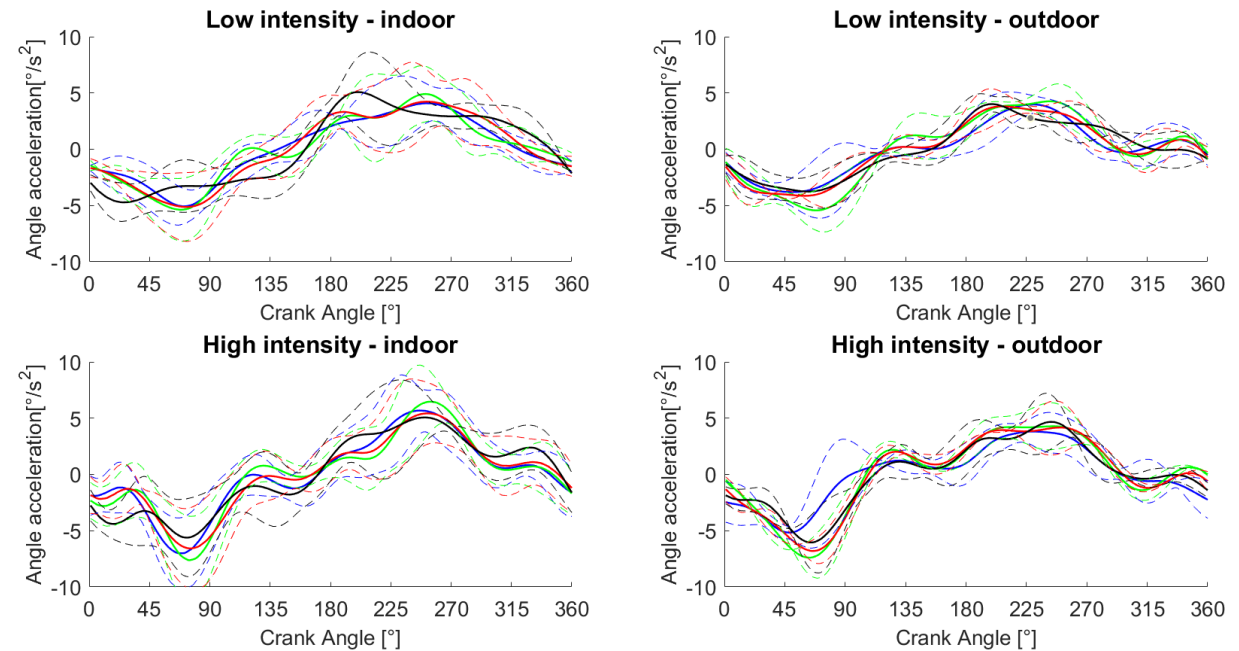


Results – Sacrum kinematics

Joint angles



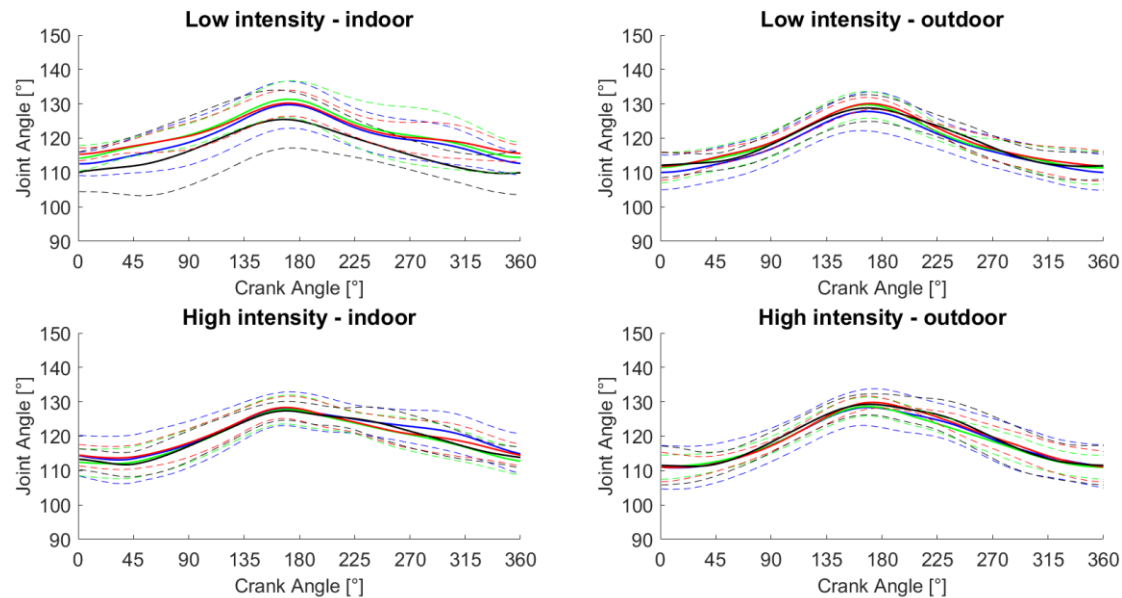
Joint angular acceleration



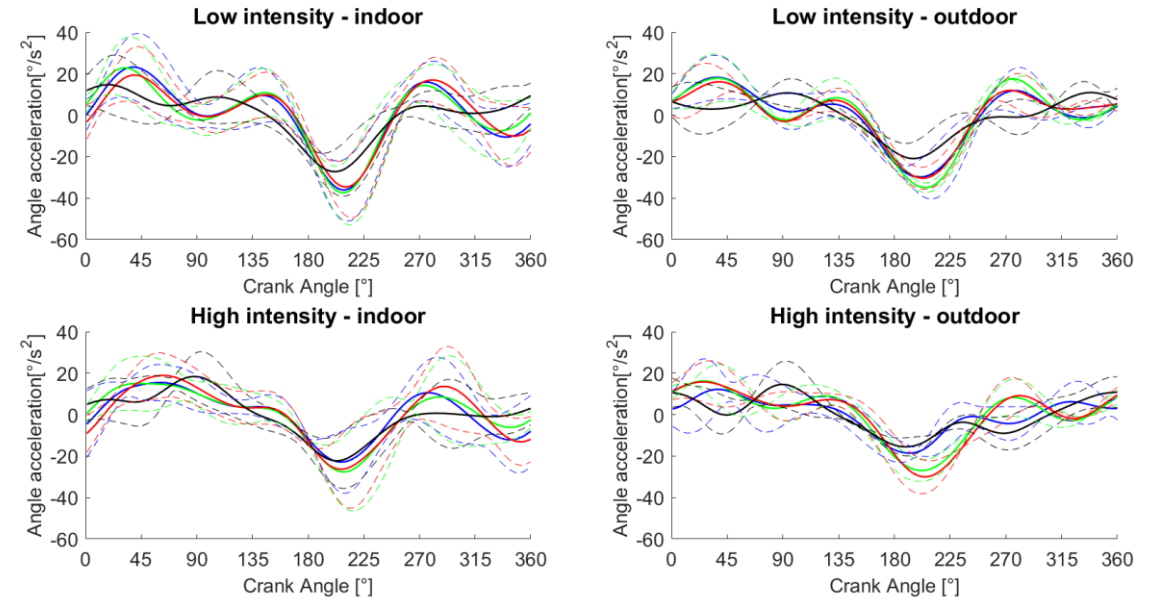
■ OCP 3 ■ OCP 2 ■ OCP 4 ■ Round

Results – Ankle kinematics

Joint angles



Joint angular acceleration



■ OCP 3 ■ OCP 2 ■ OCP 4 ■ Round

Discussion

Are there differences in joint kinematics using a non-circular chainring compared to a circular chainring?

- No differences at the hip, knee and sacrum
- Significant differences in joint angular acceleration at the ankle

Discussion

Are there differences comparing the data measured while riding indoors on a stationary trainer with the data measured while riding outdoors?

No significant differences regarding the kinematics of the lower limbs

Conclusion & Take Aways

- Compensation by ankle motion
- Less influence due to minor ovality
- No individual analysis
- IMUs enable outdoor measurements



FH

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Questions? |
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