

# Influence of non-circular chainrings on muscular activity during stationary and outdoor cycling

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## **Research Question:**

Are there differences using a non-circular chainring compared to a circular chainring in muscle activation in terms of amplitude, timing and frequency content?

## **Hypotheses:**

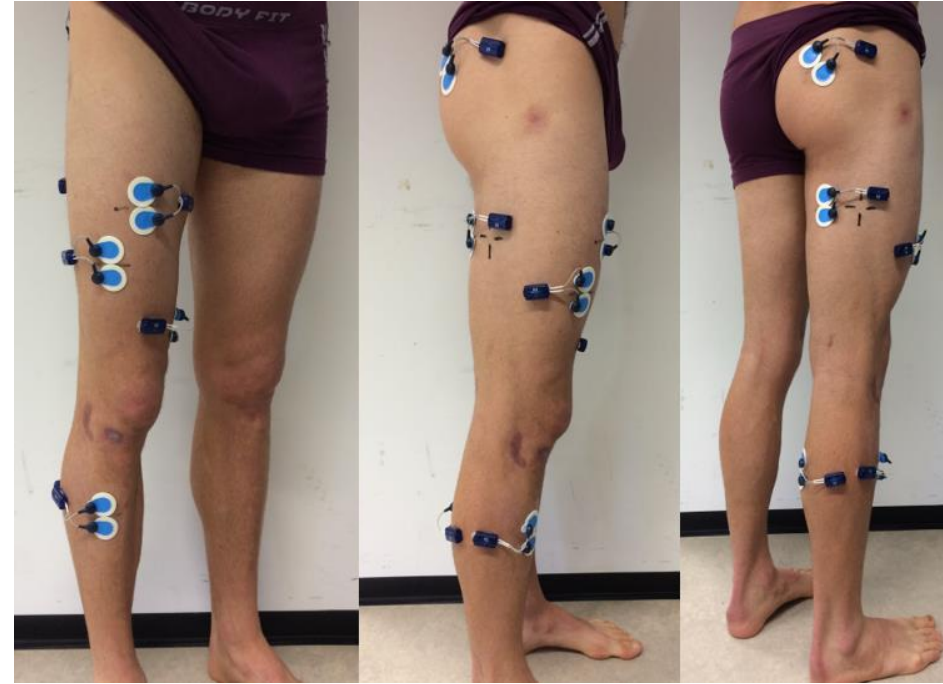
H1: The activation time of muscles used in the pushing phase is longer when using non-circular chainrings in comparison to circular ones

H2: The iEMG of muscles used in the pushing phase is longer when using non-circular chainrings in comparison to circular ones

# Methods

- sEMG of 7 muscles:

- m. gulteus max.
- m. biceps fem.
- m. rectus fem.
- m. vastus lat.
- m. vastus med.
- m. tibialis ant.
- m. gastrocnemius med.

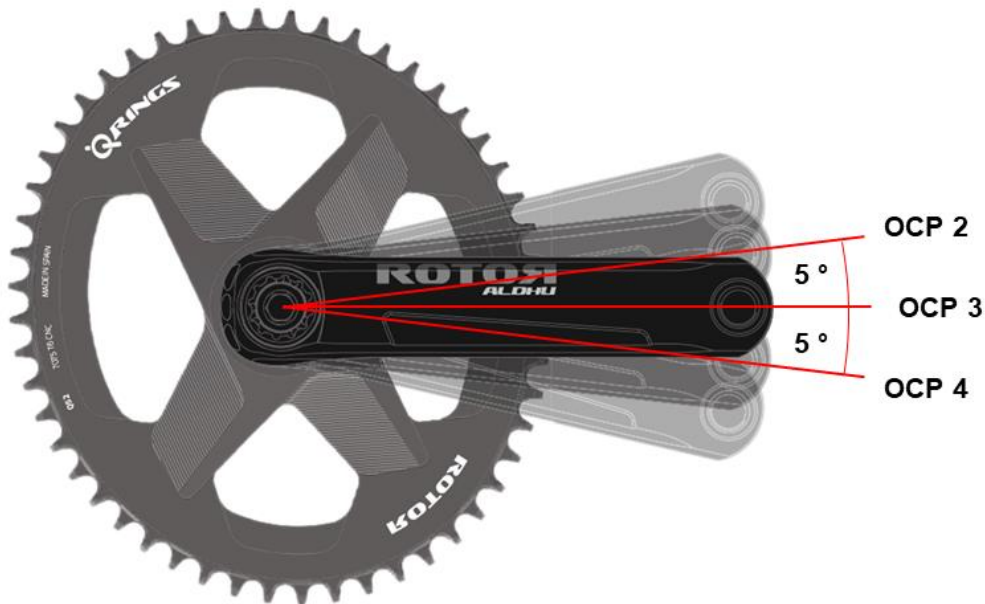


- Myon aktos (myon AG, Schwarzenberg, CH), 2000 Hz

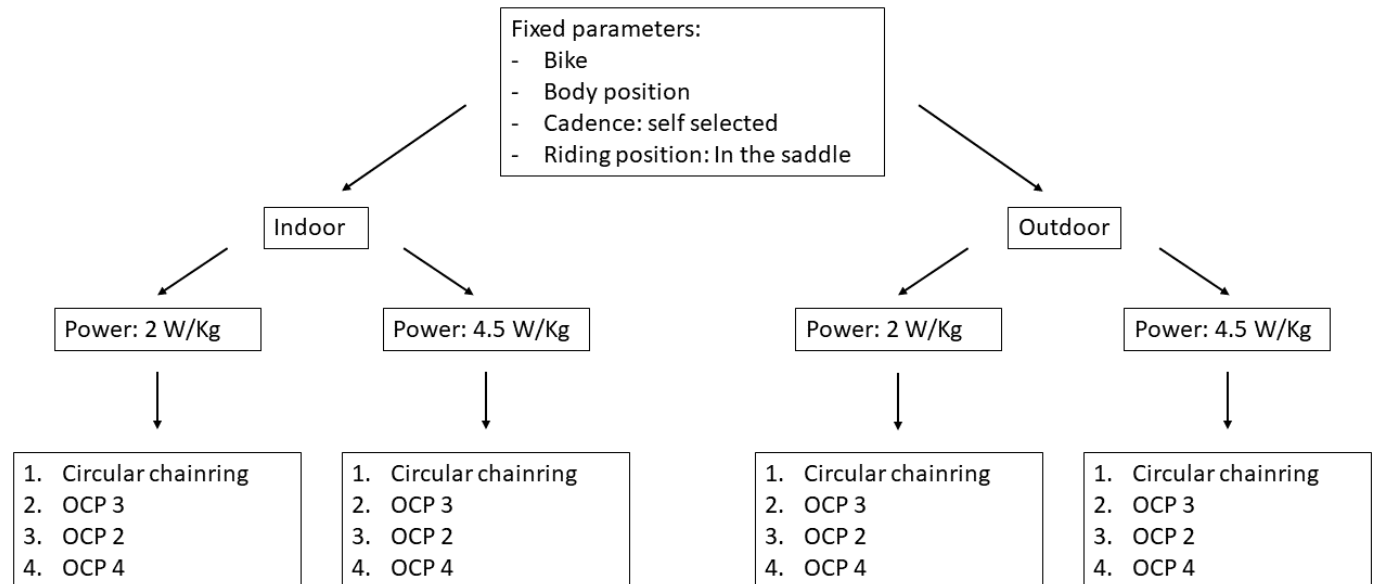
- Parameters: maximum activation, activation time, iEMG, wavelet transforms

# Methods – Test design

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



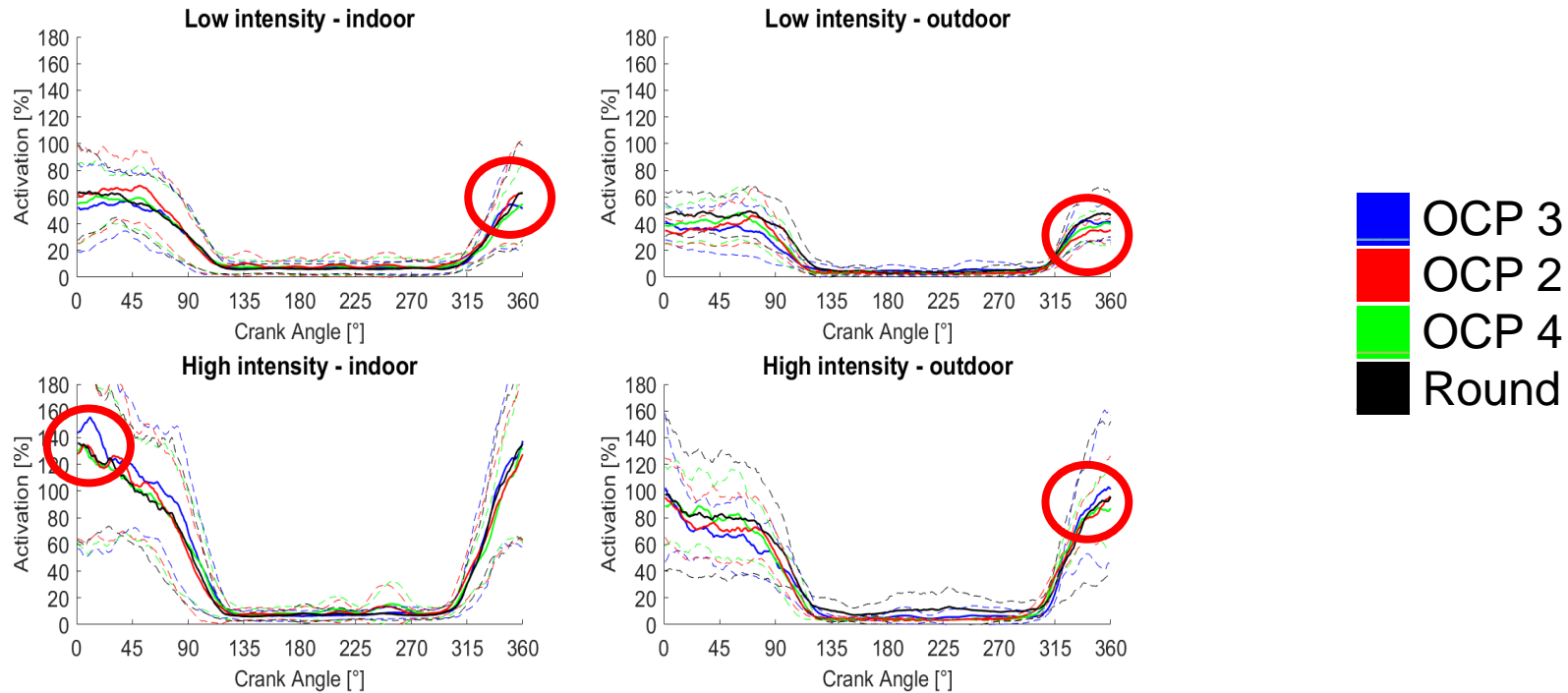
Source: <https://rotorbike.com/why-q/>



# Results – Amplitudes

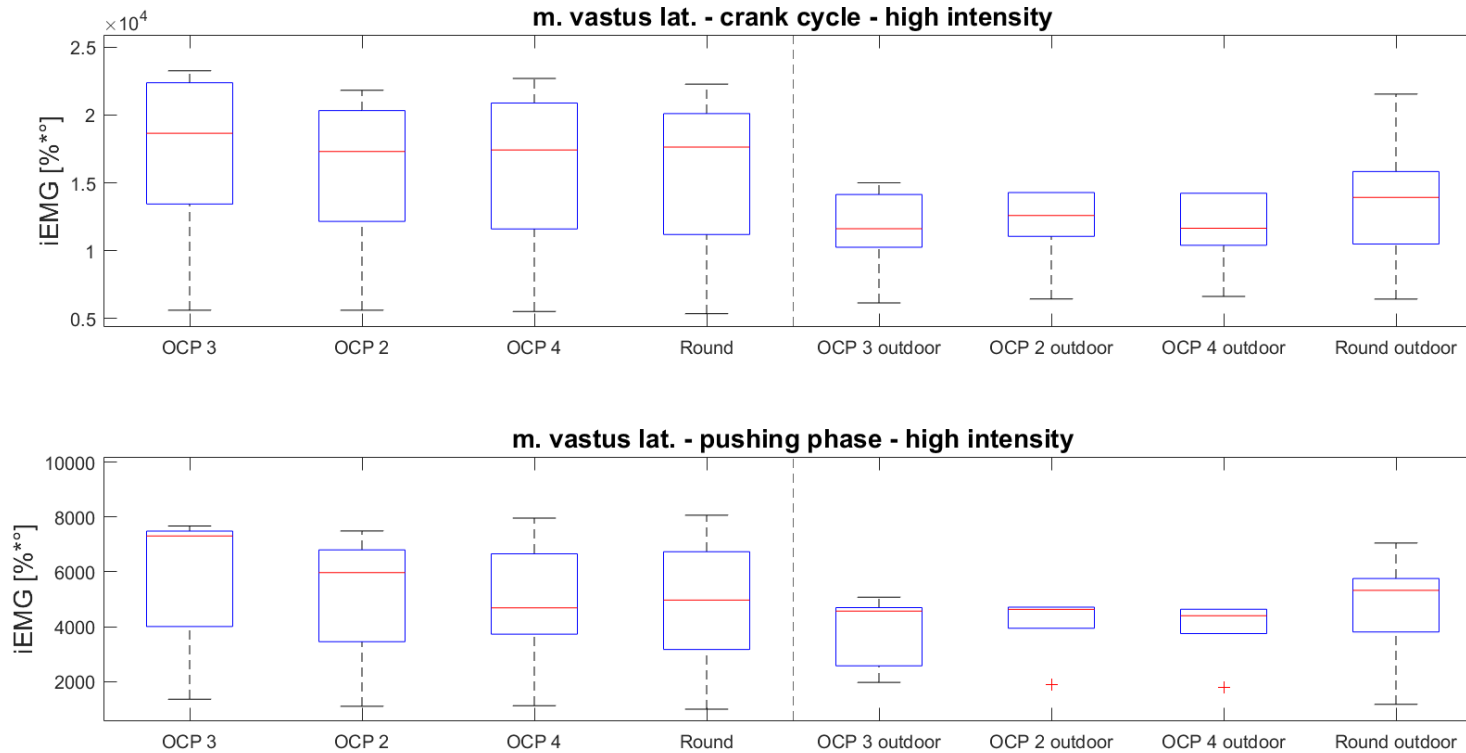
- Amplitude: No differences in all muscles

m. vastus lat.



# Results - iEMG

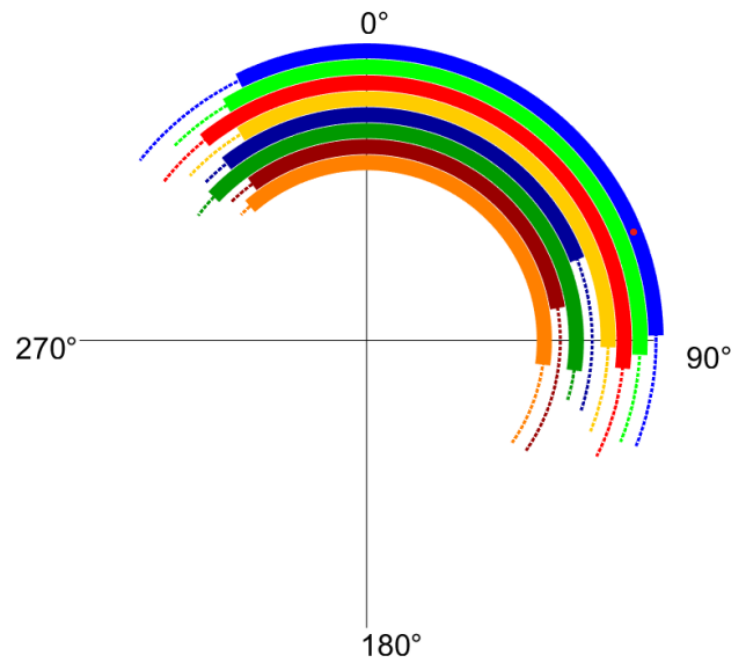
- iEMG: No differences in all muscles



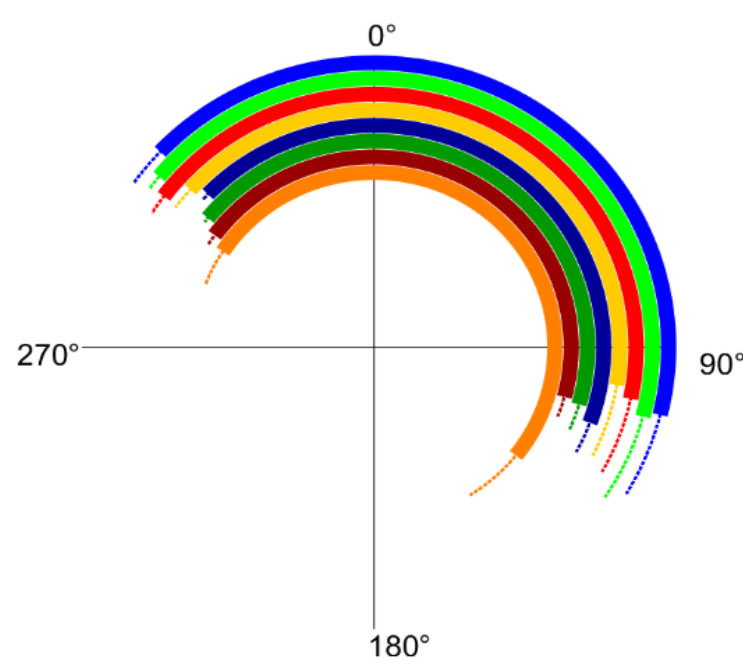
# Results – Activation time

- No differences in m. gluteus max., m. biceps fem., m. rectus fem., m. tibialis ant., m. vastus lat. & med.

m. vastus lat – Low intensity

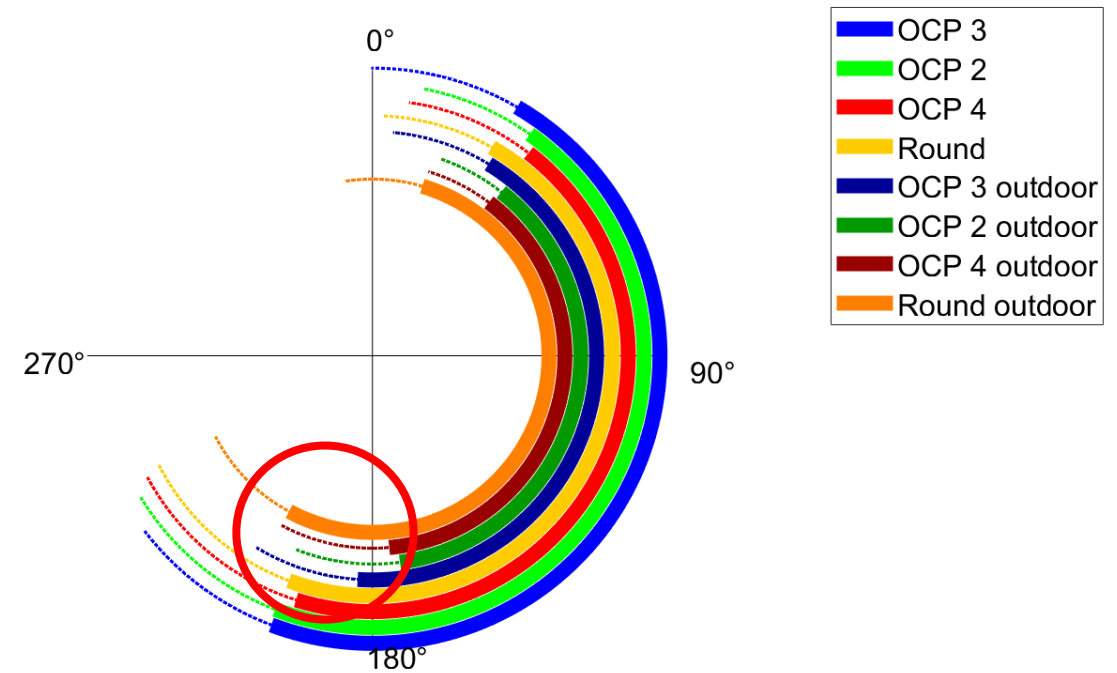
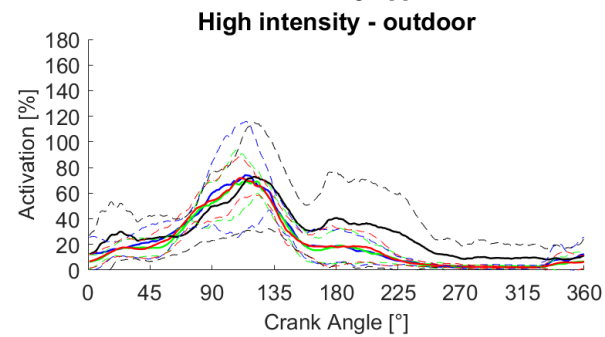
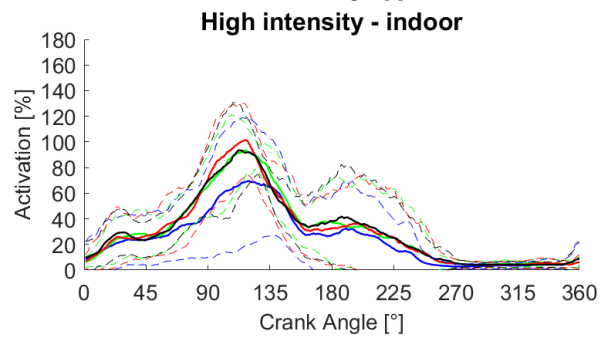
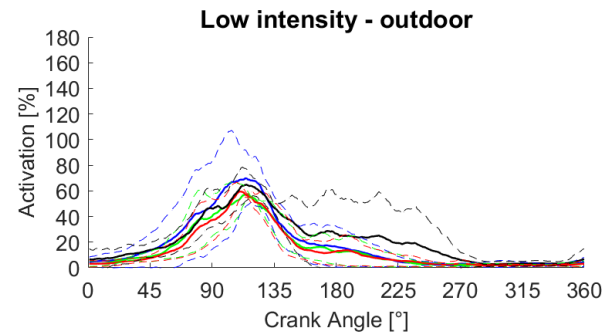
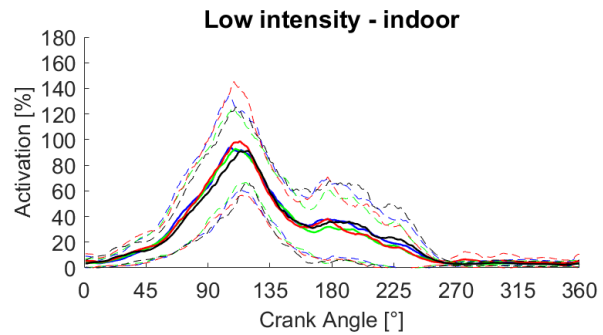


m. vastus lat – High intensity



# Results – m. gastrocnemius med.

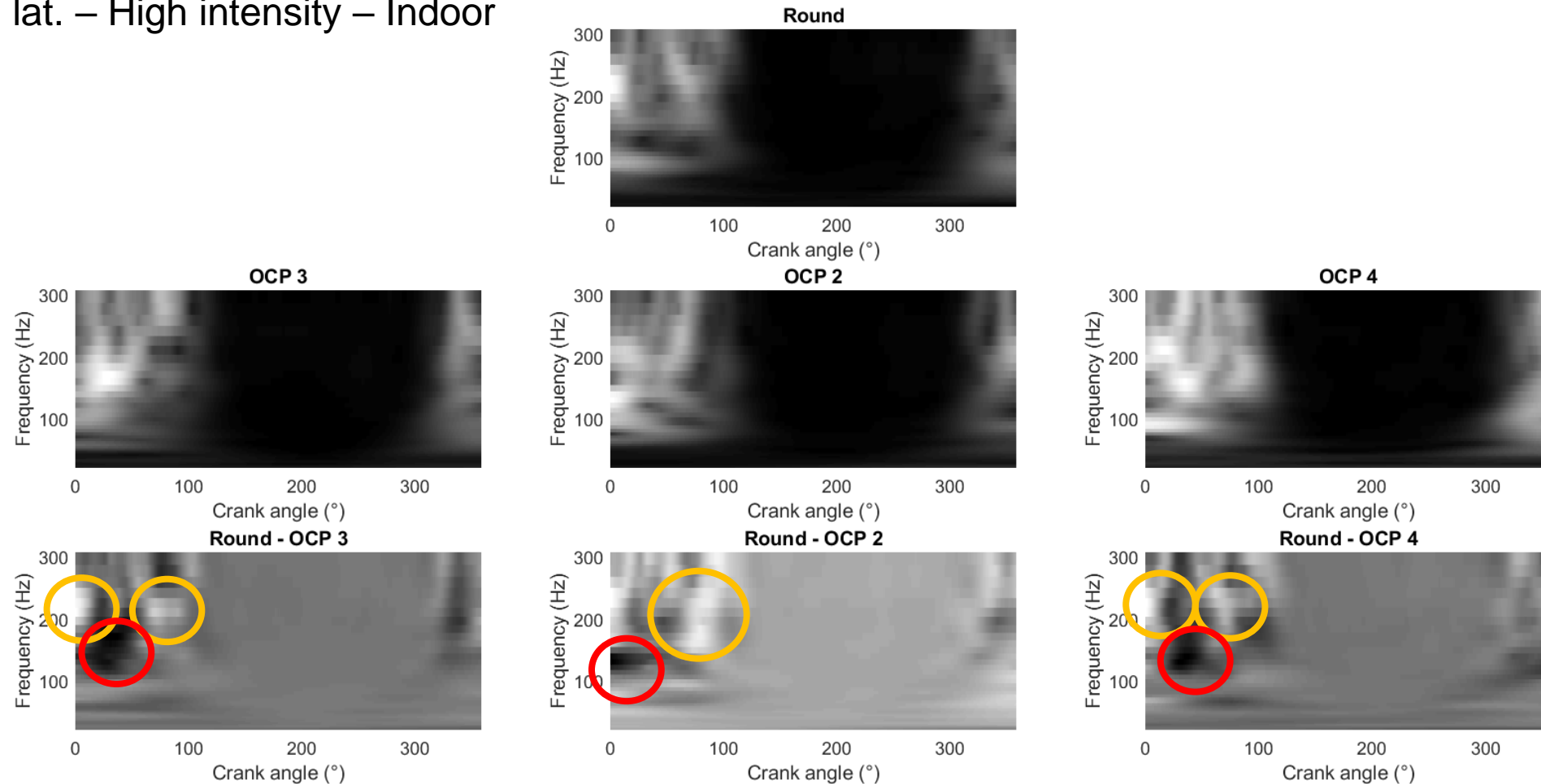
## Activation pattern – high intensity





# Results – Wavelet transforms

m. vastus lat. – High intensity – Indoor



→ Lower frequencies using the non-circular chaining

# Discussion

Are there differences in muscle activation in terms of amplitudes, timing and frequency content using a non-circular chainring compared to a circular chainring?

- No difference in the amplitudes and iEMG
- Only m. gastrocnemius med. with a longer activation when cycling with the circular chainrings
- Wavelets indicate lower frequencies using the non-circular chainring

# Conclusion

- Alterations for m. gastrocnemius med. → Compensation by ankle motion
- Less influence due to minor ovality
  
- Further investigation about frequency content
- Considering fatigue



**FH**

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Questions? |  
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