JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Early cortical proprioceptive processing is not affected by muscle fatigue: an MEG study

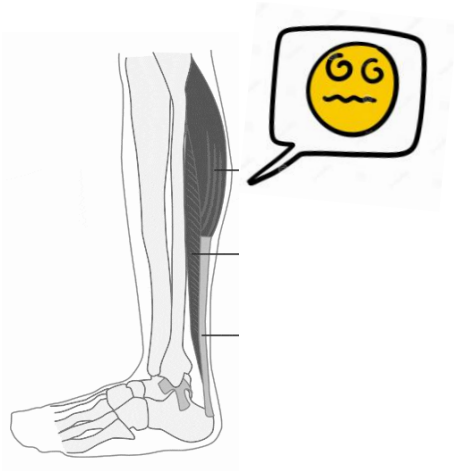
Junru Chen, Toni Mujunen, Feiyue Li, Harri Piitulainen

Liikuntatieteen päivät tutkimusesittelyitä

3. 9. 2025

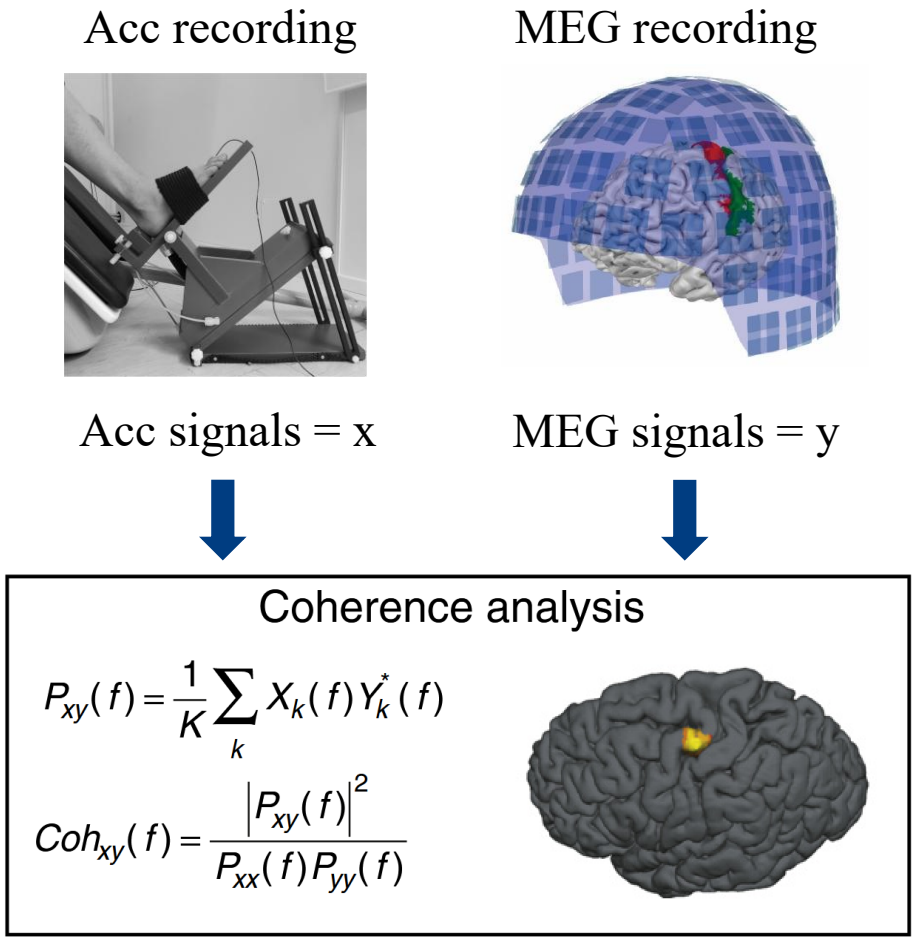
Muscle fatigue can alter or impair proprioception

- A number of central changes occur during muscle fatigue and affect, for example, proprioception, tremor, and postural control (Gandevia, 2001).
- Muscle fatigue is not just a matter of peripheral mechanisms accompanying depletion of muscle energy supplies, but includes activation processes at spinal and cortical levels (Proske & Gandevia, 2012).
- Our aim is to investigate whether muscle fatigue affect the 'pure' cortical proprioception during passive movement.



Measure of cortical proprioceptive processing

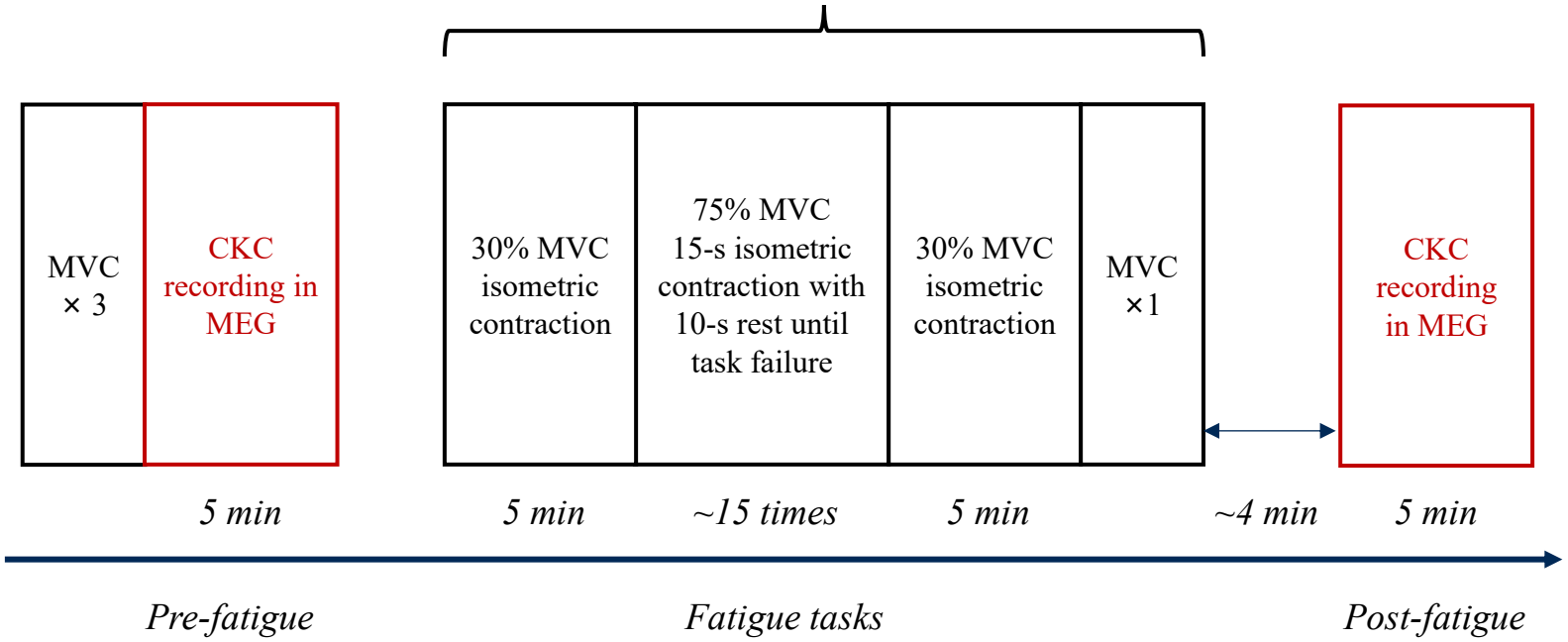
- Corticokinematic coherence (CKC) between limb kinematics and MEG signals reflects cortical processing of proprioceptive afference.
- Proprioceptive afference from the proprioceptors, such as muscle spindles, Golgi tendon organs and joint receptors is elicited by continuous passive movement stimulation.
- Primary proprioceptive input travels to the SM1 cortex contralateral to the stimulation, but also widely to other cortices.



Methods:

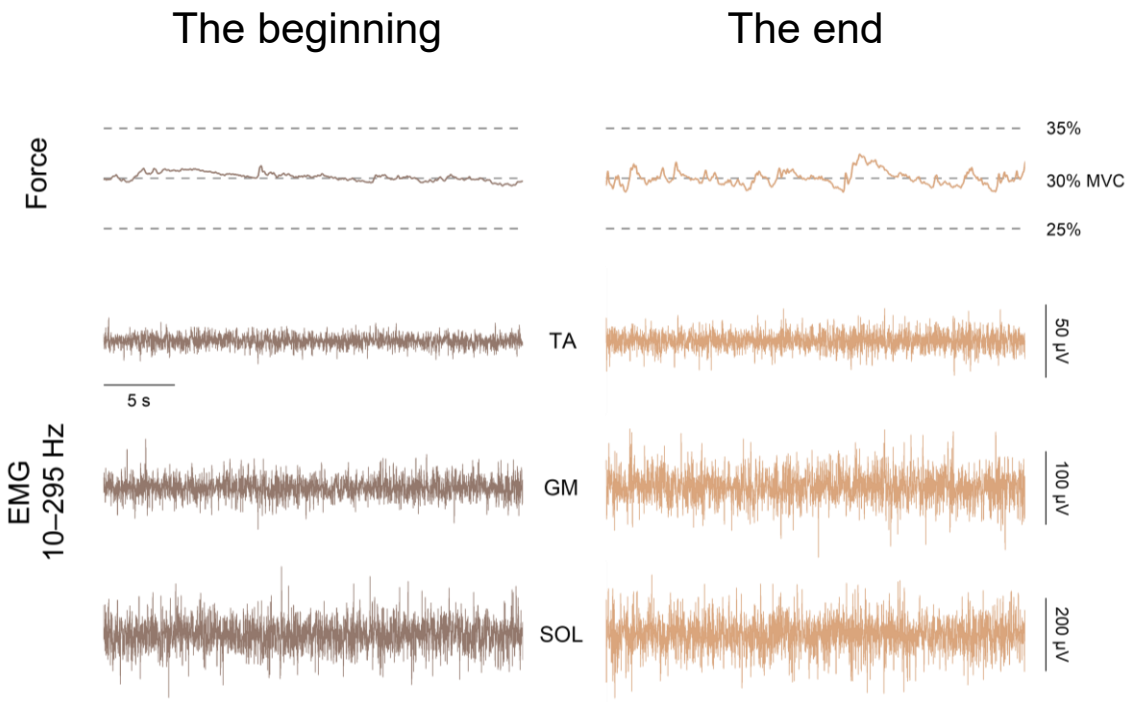
Experimental procedure

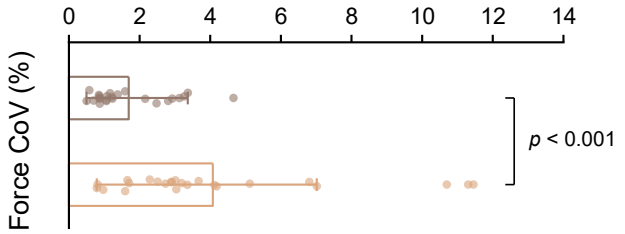
- 24 healthy participants, 30.7 ± 6.5 yr, 11 males; 21 right-footed, 3 mixed-footed.
- All the measurements were performed in seated position inside the MEG room.
- The duration between the CKC recording and fatigue tasks was 278 ± 54 s.

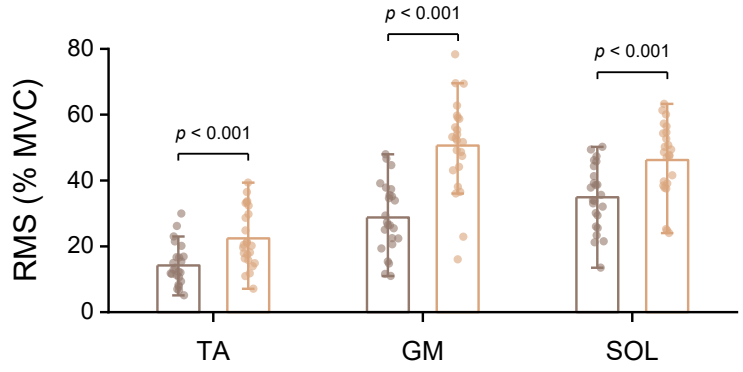


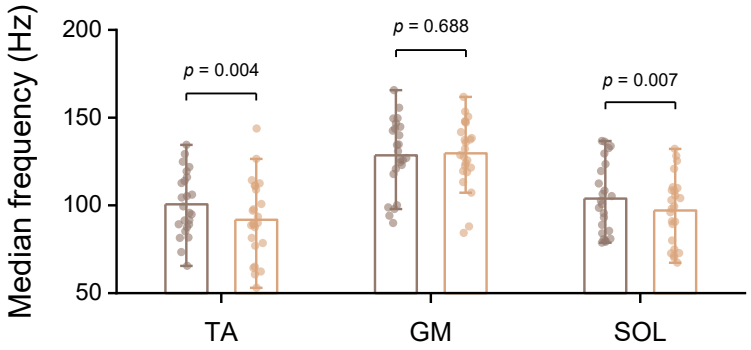
Results:

Muscle fatigue-related indicators



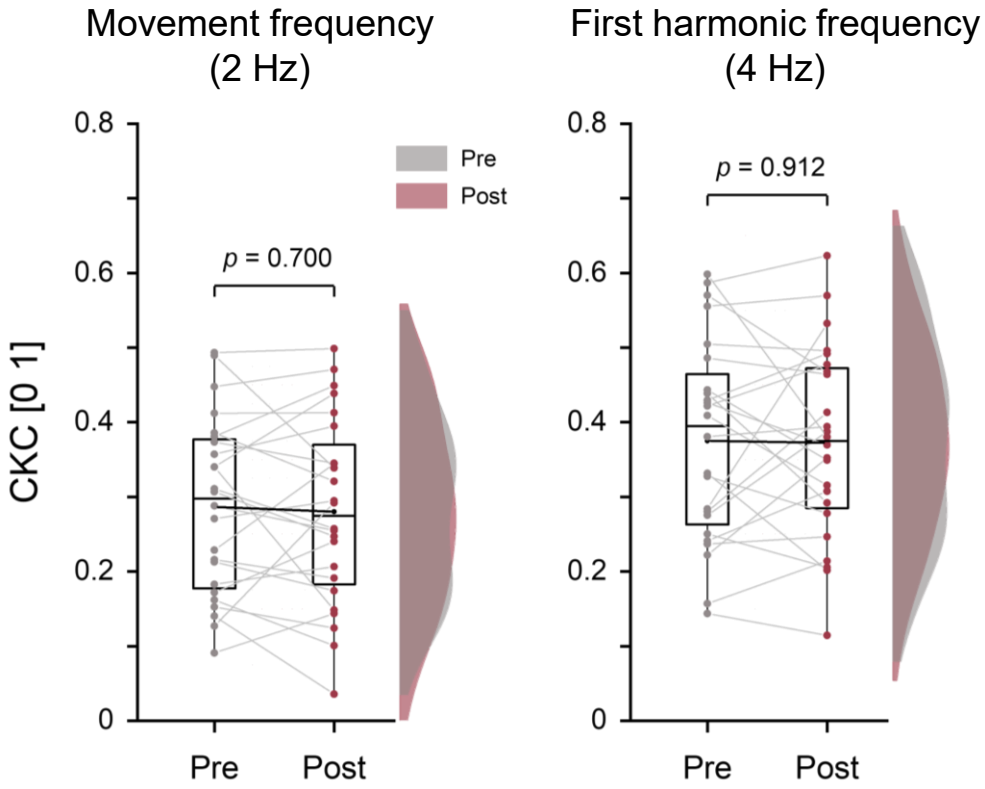


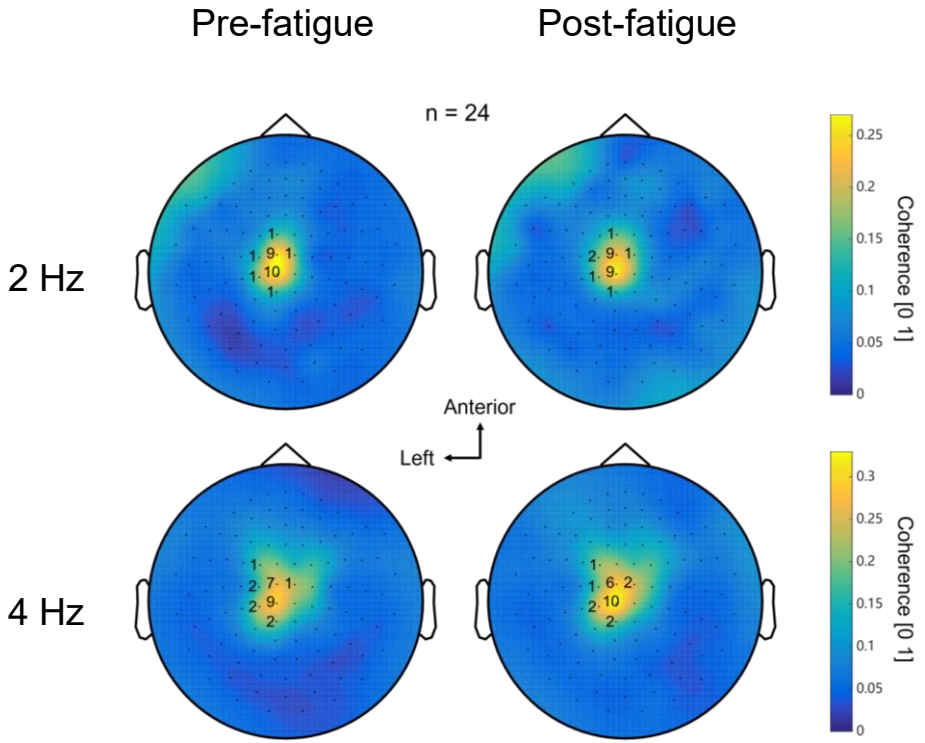




Results:

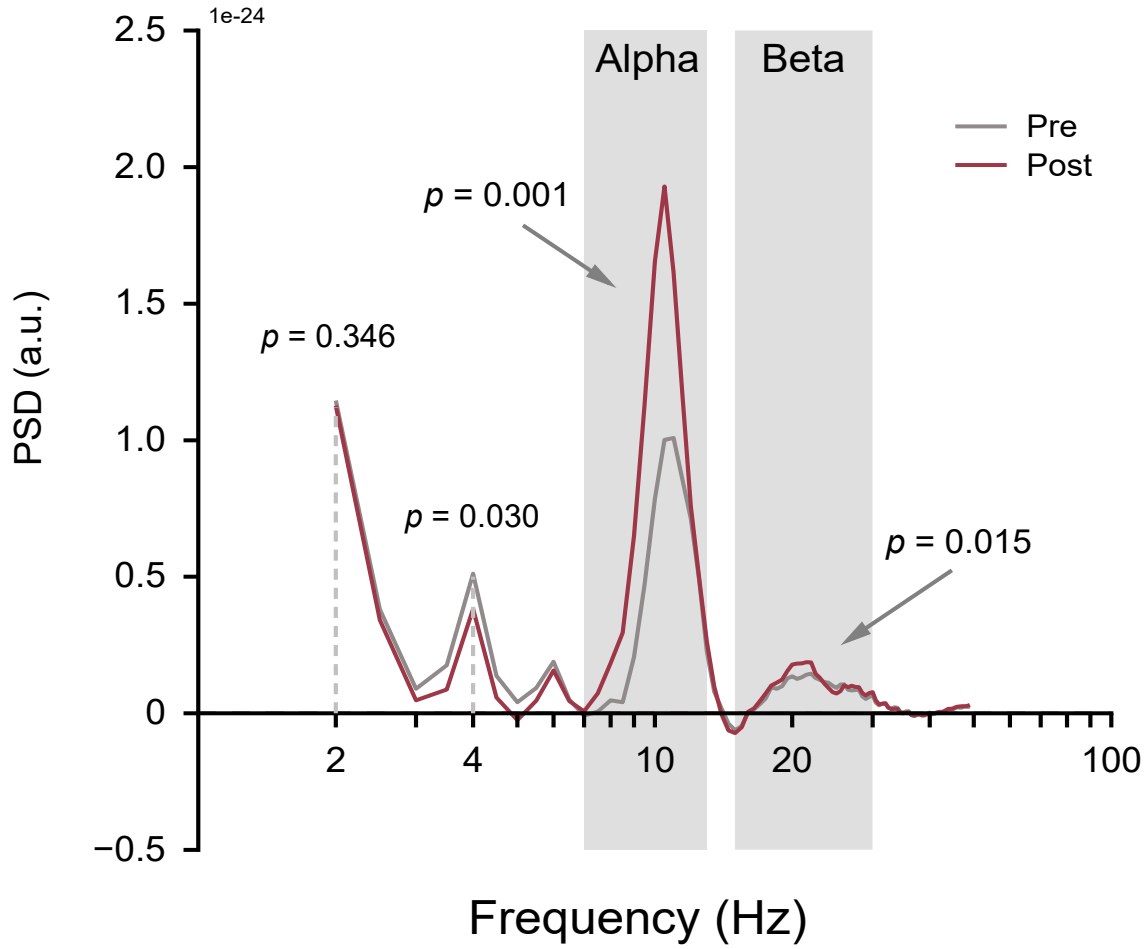
No fatigue-related effect on CKC





Results:

Fatigue-induced changes in neural oscillations



Conclusion

- Plantar-flexor muscle fatigue has no significant effect on the early cortical processing of proprioceptive afference, suggesting that CKC is resistant to fatigue or recover rapidly (5-10 min) after exercise.
- The increase of α and β power following muscle fatigue reflected fatigue-induced modulation of neuronal proprioceptive processing.
- Our following studies will track cortical proprioceptive processing during the fatigue task to identify possible acute fatigue effects on cortical proprioception.

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Thank you!

Junru Chen

Liikuntatieteen päivät tutkimusesittelyitä

3. 9. 2025