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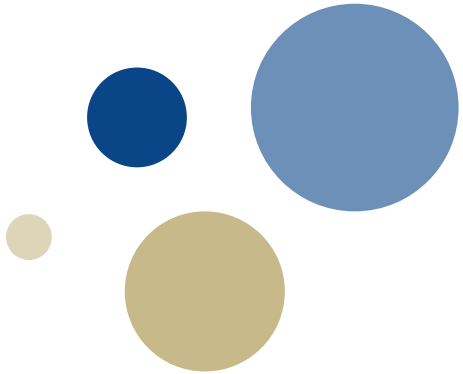

Joint specific power production in cycling: the effect of cadence and athlete level

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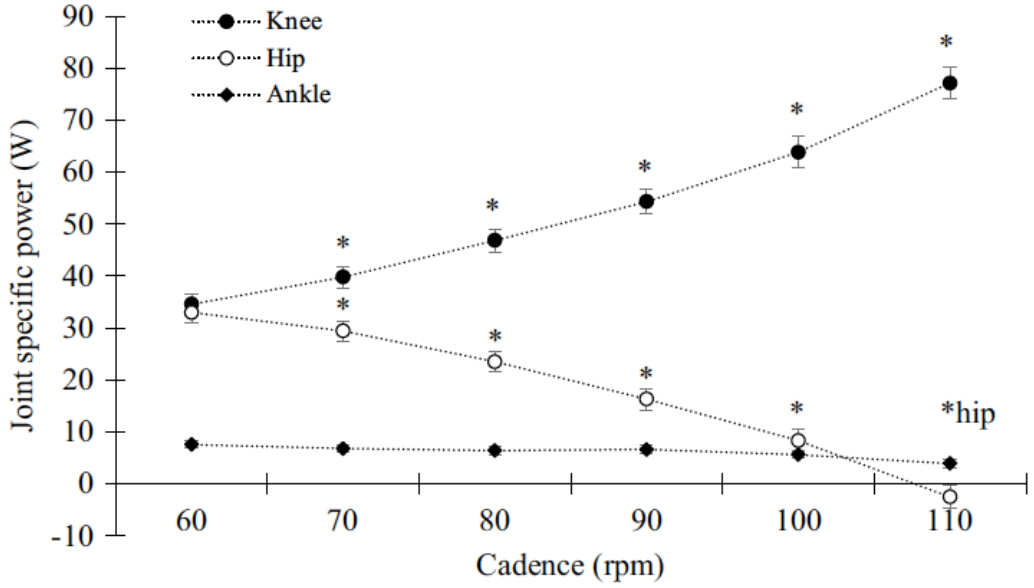
Introduction

- Low cadence interval training.
- Changing cadence leads to numerous technical responses.
- Joint specific power contribution
- Lack of studies including cadences below 60 rpm.
- Lack of studies including high-level athletes.



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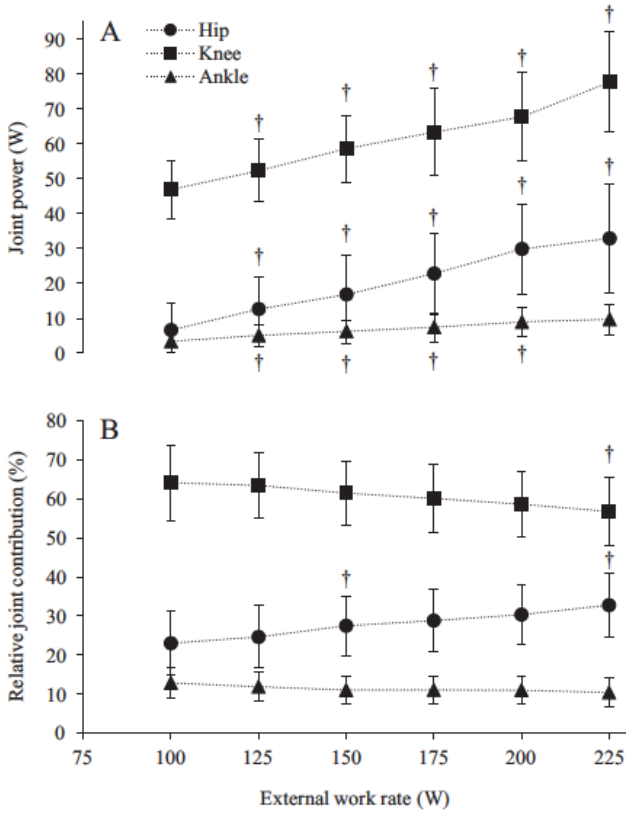

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Study aim

To investigate joint specific power production in recreational- and elite cyclists during low- and moderate intensity cycling at a range of different cadences.

Participants

	Elite	Recreational
n	9	10
Age (years) *	22.0 (0.5, 19.0-24.0)	39.8 (3.0, 25-51)
Weight (kg) *	73.4 (2.8, 62.4-90.1)	90.5 (5.5, 73.4-132.5)
Height (cm)	182.6 (1.9, 173-190)	184.1 (1.8, 174.5-193)
HR_{max} self-reported (bpm) *	201 (1.6, 190-205)	193 (1.8, 180-200)
WR_{LT} (W) *	314.8 (8.0, 278.0-345.2)	237.4 (13.8, 125.0-286.2)
WR_{LT} (W/kg) *	4.3 (0.2, 3.7-4.9)	2.7 (0.2, 0.9-3.5)
20-min all-out (W) *	364.1 (8.7, 331-404)	263.1 (12.6, 184-329)
20-min all-out (W/kg) *	5.0 (0.2, 4.4-5.6)	3.0 (0.2, 1.4-4.0)

Mean (SE, range) for subject characteristics. WR_{LT} = work rate in watt at lactate threshold (4 mMol bLa). *Asterisk* indicate a significant ($p < 0.05$) difference between groups.

Protocol

- Two days of testing.
- Physiological tests (day 1)
- Technique tests (day 2)

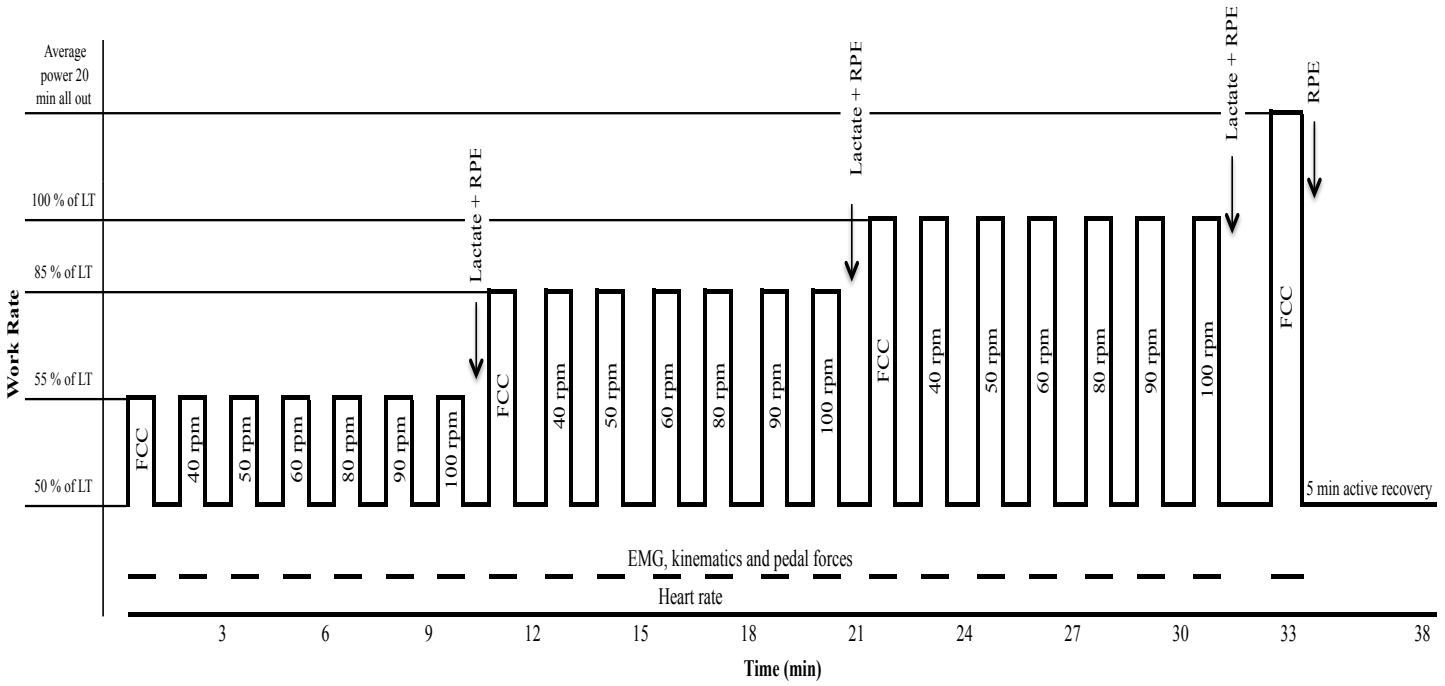
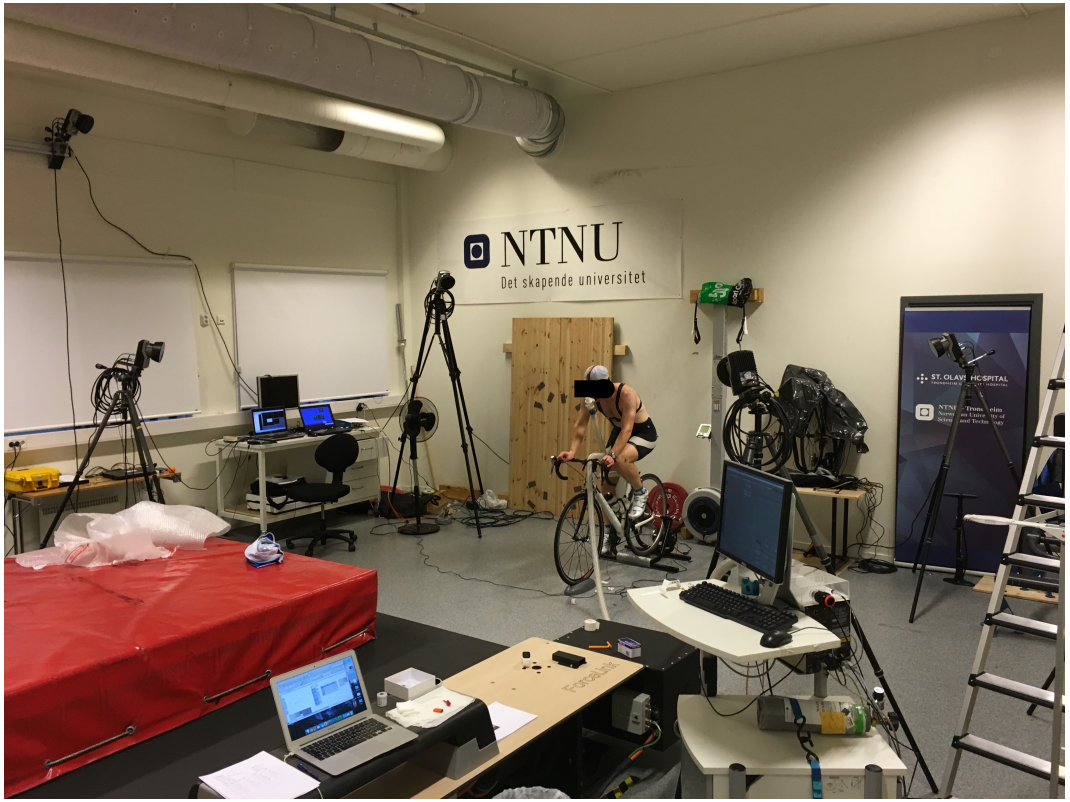


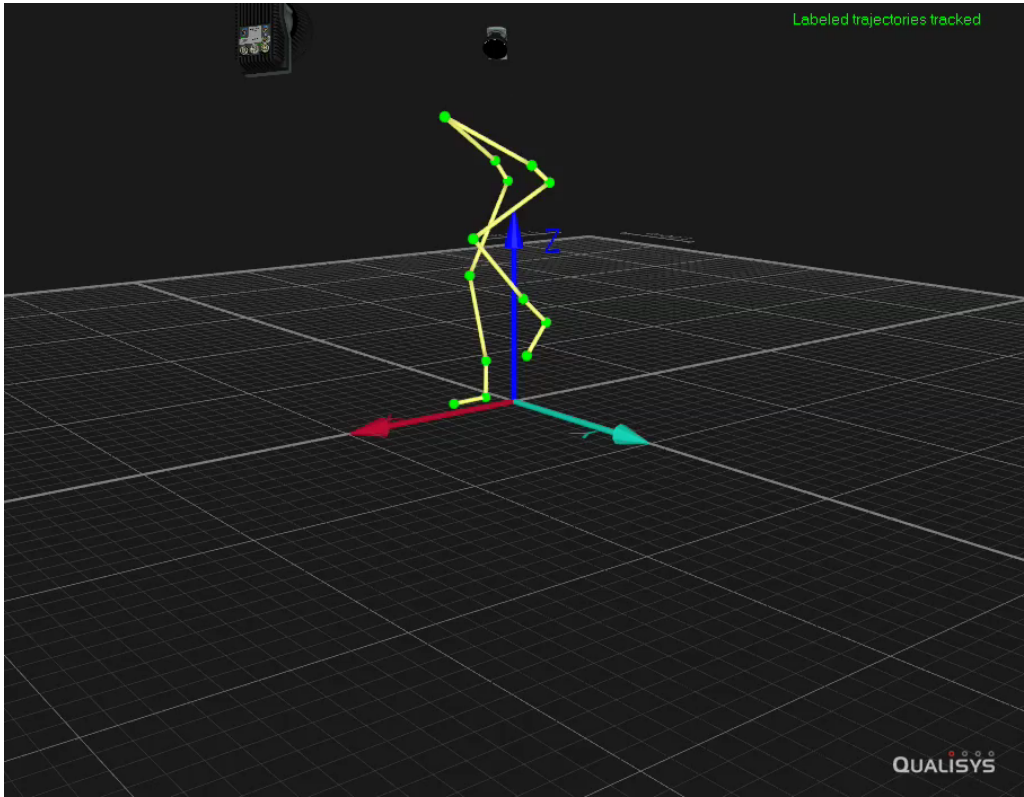
Fig. Schematic presentation of the main test on test day 2

Measurements and analysis

- Kinematic data (Oqus)
- EMG (Noraxon)
- Pedal force (custom made pedals)
- Lactate (Biosen)
- HR (Polar)
- Stationary trainer (Computrainer)



- Inverse dynamics
- RMS analysis of EMG data
- Normalization of EMG data



Joint specific power

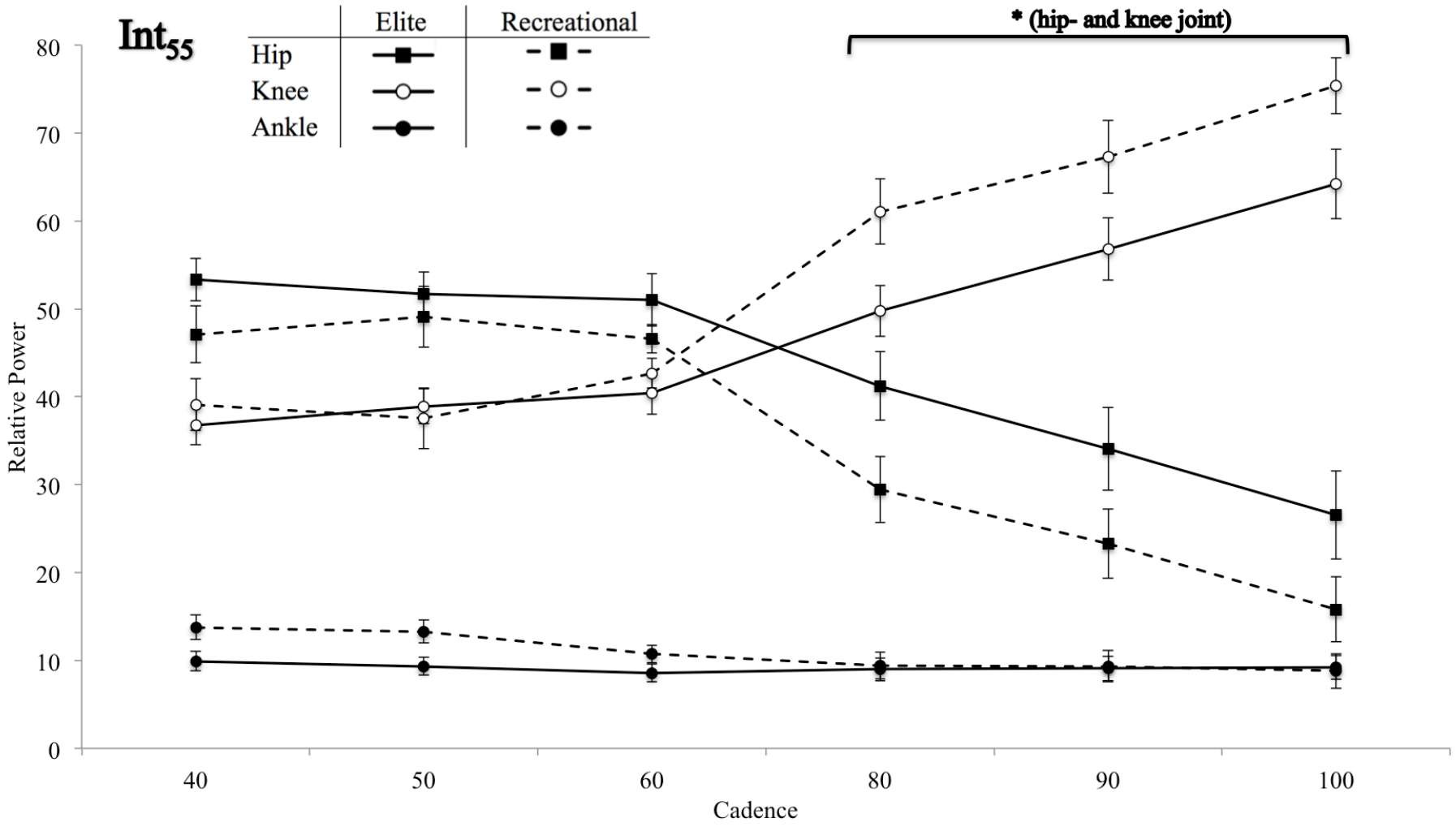


Fig. *Group mean and standard error for relative joint power in hip (square), knee (open circle) and ankle joint (filled circle) at Int_{55} for Elite n=9 (line) and Recreational n=10 (dashed line) cyclists. Asterisk indicate a significant ($p < 0.05$) difference to 40 rpm.*

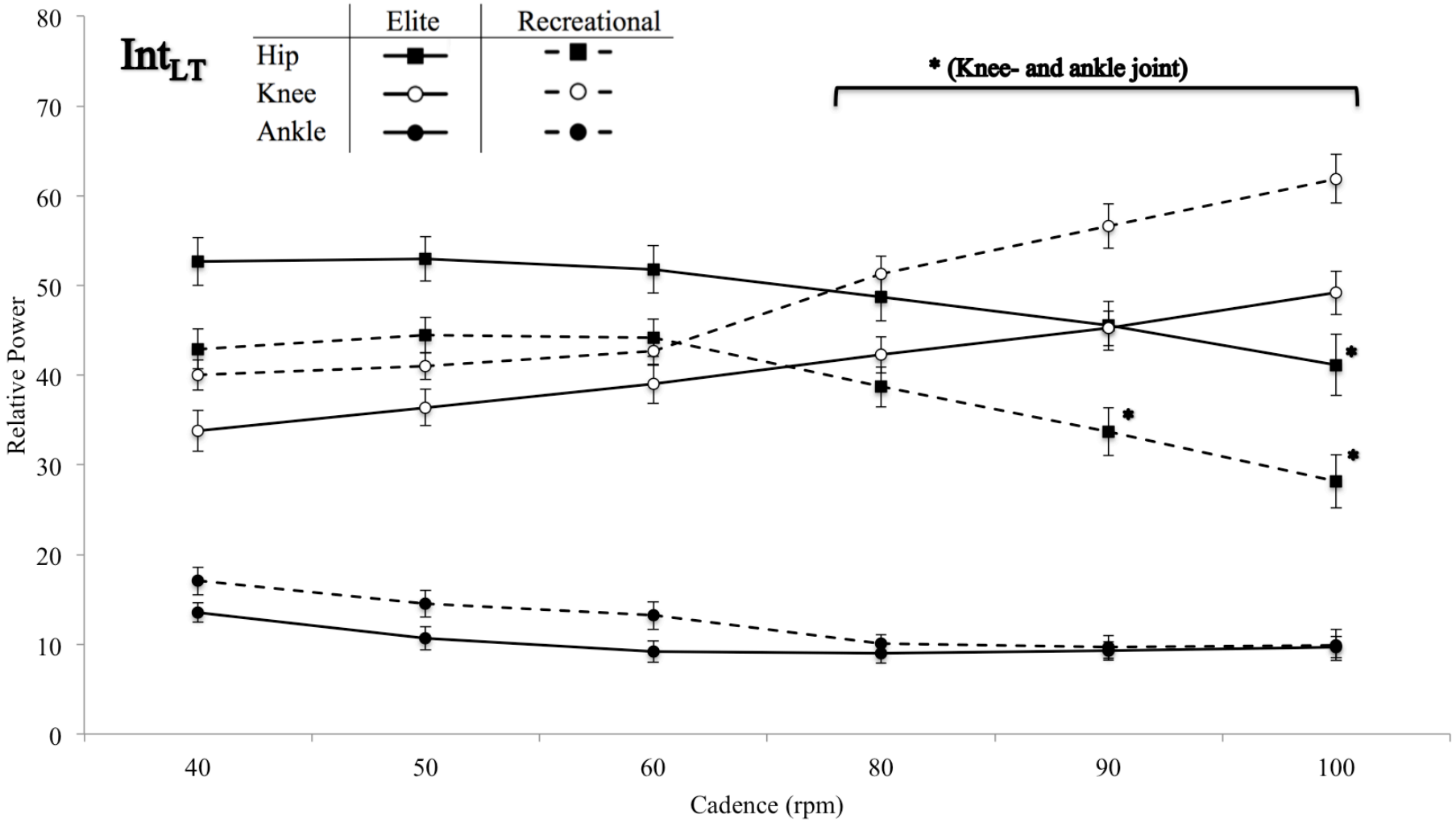


Fig. *Group mean and standard error for relative joint power in hip (square), knee (open circle) and ankle joint (filled circle) at Int$_{LT}$ for Elite n=9 (line) and Recreational n=10 (dashed line) cyclists. Asterisk indicate a significant (p <0.05) difference to 40 rpm.*

Vastus Lateralis

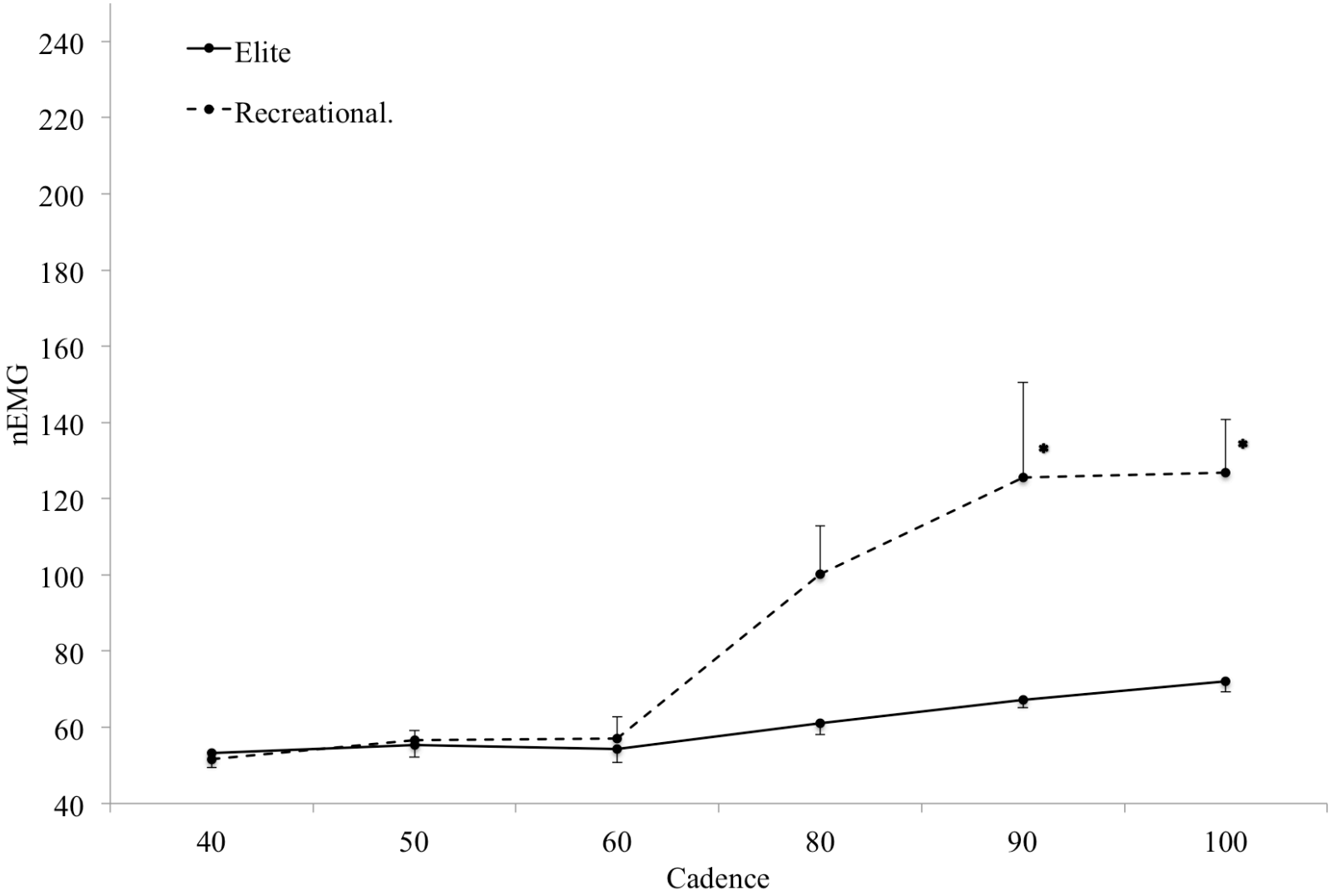
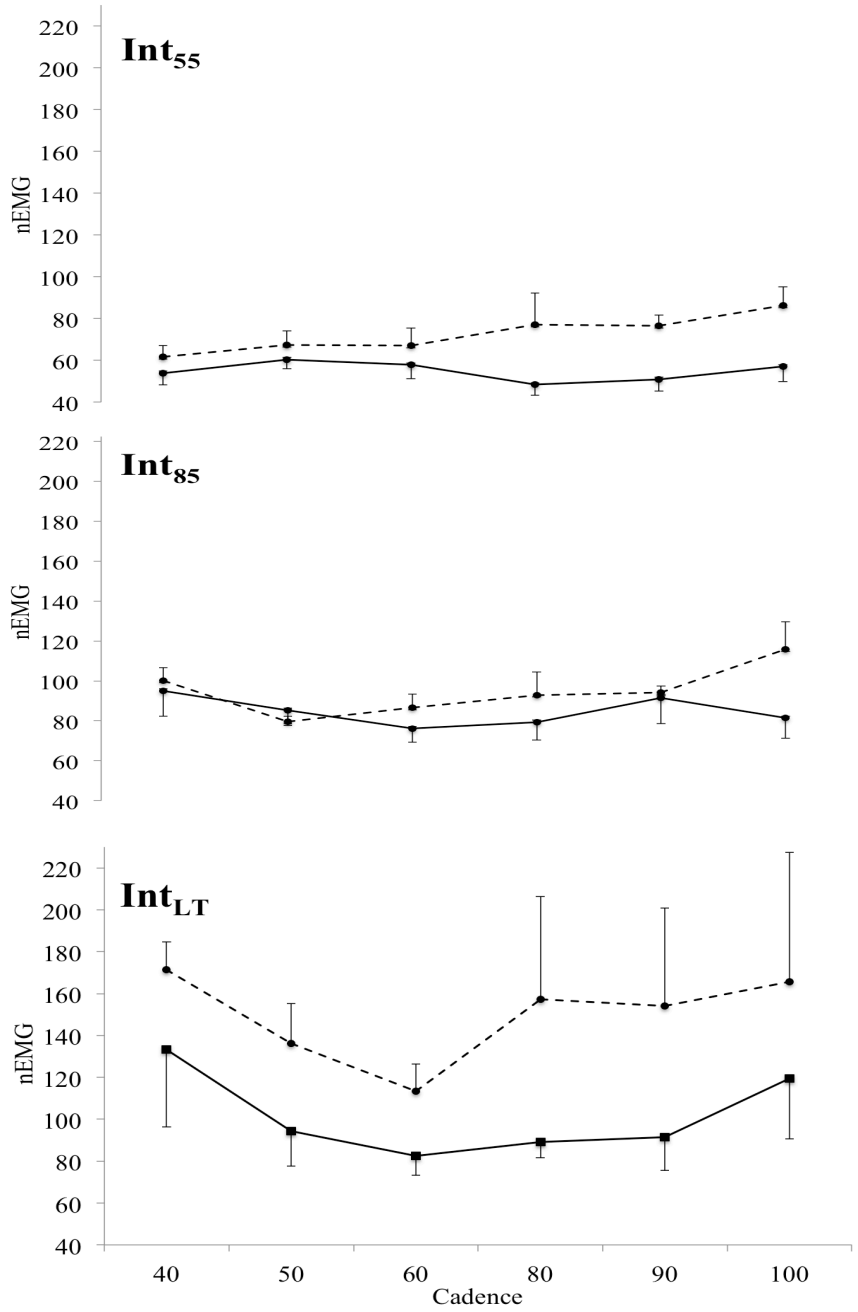


Fig. Group mean and standard error for nEMG in VL at all intensities combined for elite n=8 (solid line) and recreational n=8 (dashed line) cyclists. Asterisk indicate a significant (p <0.05) difference to 40 rpm.

Gluteus Maximus



- A main effect of intensity was found.
- No significant effect of cadence.
- Trend of increased GM activity at 40- and 50 rpm at $Int_{LT.}$

Fig. Group mean and standard error for nEMG in GM at Int_{55}, Int_{85} and Int_{LT} for elite n=6 (solid line) and recreational n=6 (dashed line) cyclists.

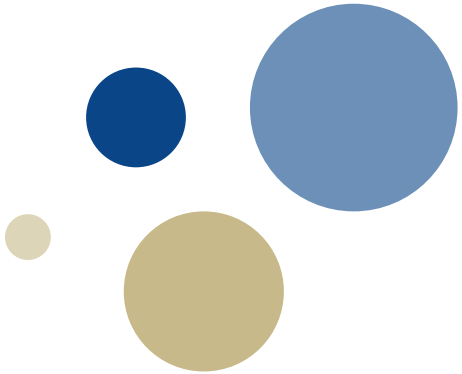
Conclusion

- The present study demonstrates that:
  - There is an effect of cadence and athlete level on the relative joint contribution in cycling.
  - There is an effect of cadence on the VL activity, however, the effect is only present in the recreational group.

Practical implications

- No effect of lowering the cadence below 60 rpm when only considering the hip- and knee joint contribution.
- Trend of increased GM activity at Int_{LT} with 40 rpm compared to 60 rpm.

The lack of an effect of lowering the cadence below 60 rpm may have implications for how low cadence training is performed.



Thank you

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