

# Neuromuscular adjustments after sprint interval exercise in hypoxia versus normoxia

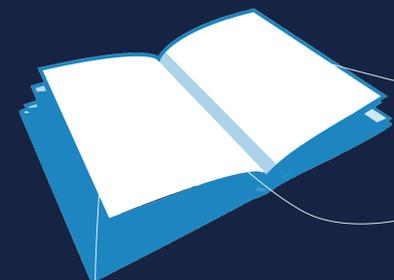


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LABORATORY  
**KAYSER-PLACE**

@c\_dons



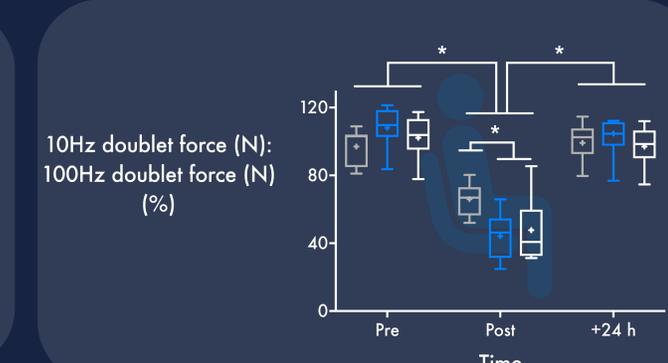
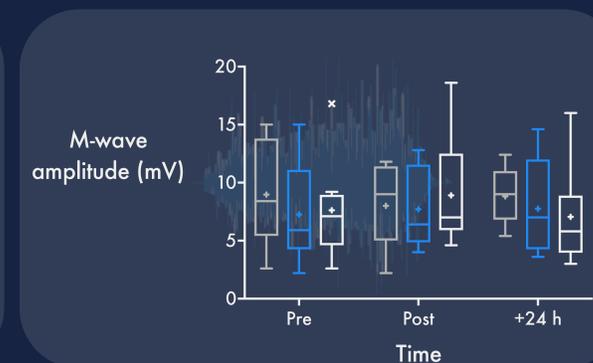
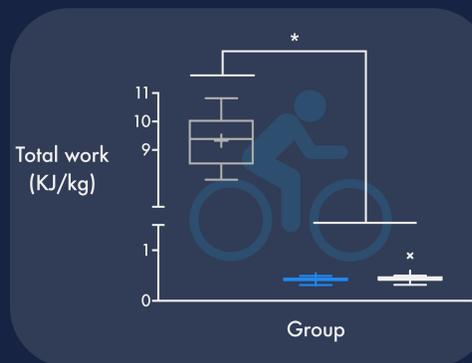
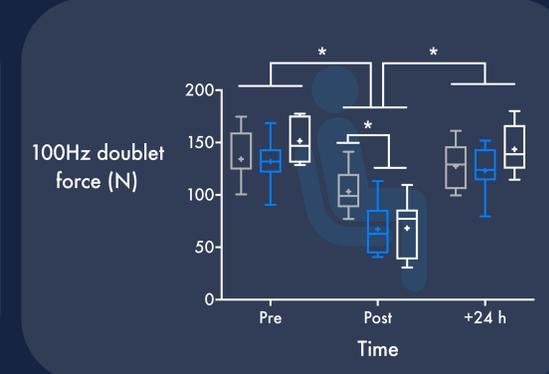
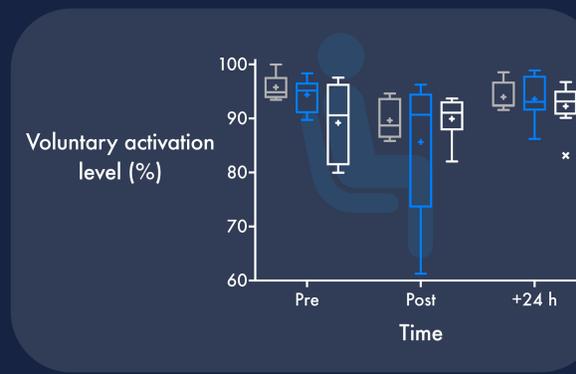
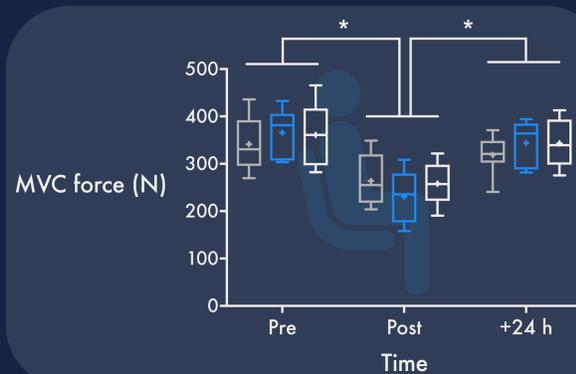
Exercise intensity and duration have important implications for the contributions to fatigue in the central nervous system (central fatigue) and at the level of the muscle (peripheral fatigue)<sup>1,2</sup>.

Previous research has attributed fatigue after endurance exercise to central and peripheral mechanisms<sup>3</sup>, whereas peripheral mechanisms due to reactive oxygen species dependent impaired calcium handling<sup>4</sup> seem to predominate after sprint interval exercise.

Exercise in hypoxia (altitude of 3000m) may induce a greater oxidative stress than exercise in normoxia (sea level)<sup>5</sup> and thus may further impair calcium handling and increase peripheral fatigue following sprint interval exercise.

**We tested the hypothesis that a bout of exercise which induces a greater oxidative stress causes greater peripheral fatigue**

Endurance Normoxia Wingate Normoxia Wingate Hypoxia



PARTICIPANTS (±SD)

	Endurance Normoxia	Wingate Normoxia	Wingate Hypoxia
Age (yrs)	23 (±2)	24 (±3)	23 (±2)
Mass (kg)	73.1 (±4.7)	78.0 (±7)	73.5 (±6.4)
Height (cm)	180.8 (±7.3)	177.6 (±4.8)	177.1 (±5.3)
VO <sub>2</sub> max (ml · kg <sup>-1</sup> · min <sup>-1</sup> )	53.7 (±5.2)	53.6 (±5.1)	53.2 (±8.9)
Power at VO <sub>2</sub> max (W/kg)	4.4 (±0.8)	4.5 (±0.5)	4.7 (±0.6)
Number of participants (n)	8	8	8

EXERCISE

**Endurance Normoxia**  
- 1hr at power at 65% VO<sub>2</sub>max  
- 21% FiO<sub>2</sub> (sea level)

**Wingate Normoxia**  
- 6 Wingates (30-s "all out" sprint) with 4 min recovery  
- 21% FiO<sub>2</sub> (sea level)

**Wingate Hypoxia**  
- 6 Wingates (30-s "all out" sprint) with 4 min recovery  
- 14% FiO<sub>2</sub> (3000m)

TRIAL

Exercise

Time

Biopsy

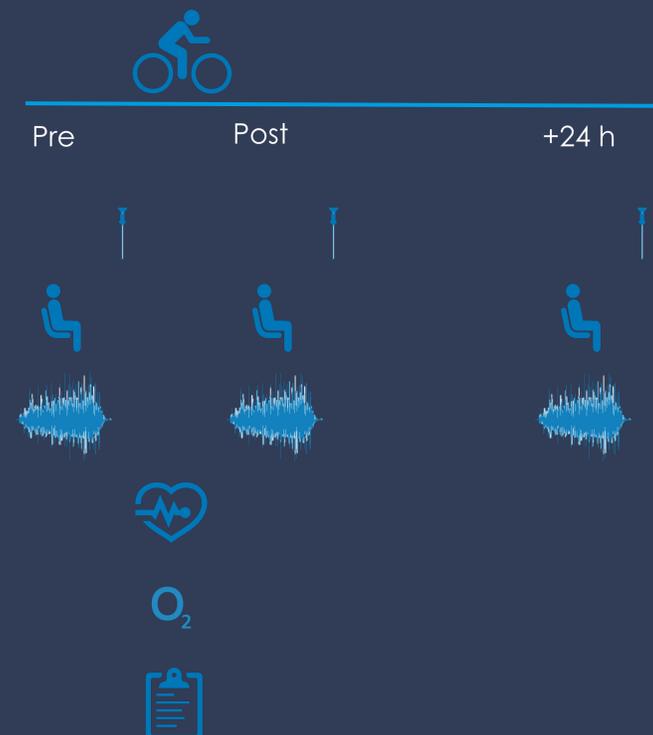
Force

EMG

HR

O<sub>2</sub> Sat.

RPE



## SUMMARY



Despite the 10 times greater work load in endurance exercise compared with wingate groups there was a **similar loss of MVC force in all groups**.



**Less peripheral fatigue after endurance exercise compared with after sprint interval exercise.** Complete recovery of voluntary and evoked forces after 24 h.



**Hypoxia did not exacerbate the extent of peripheral fatigue induced by sprint interval exercise.** Muscle biopsy analysis still needed to determine the level of oxidative stress in all conditions.

### References

<sup>1</sup>Gandevia 2001; *Physiol Rev*, 81: 1725-1789. <sup>2</sup>Allen et al 2008; *Physiol Rev*, 88: 287-332. <sup>3</sup>Millet & Lepers 2004; *Sport Med*, 34: 105-116. <sup>4</sup>Place et al 2015; *Proc Natl Acad Sci USA*, 115: 15492-15497. <sup>5</sup>Pialoux et al 2006; *Eur J Clin Nutr*, 60: 1345-1354