

The influence of prior accumulated fatigue (“work”) on power output in professional cyclists



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“Durability” or “Fatigue Resistance”

*The ability to produce high power outputs in a fatigued state or after prior accumulated work
(Spragg & Leo 2021)*

Research Background

- understanding the physiological and performance attributes of endurance ‘durability’
- race demands in professional road cycling: more than 4 hours of total race duration, >160 km in length and >2.000 m of elevation gain (Mujika and Padilla 2001; Padilla et al. 2000, 2008)
- recent research on “fatigue resistance”, “durability” or “acute performance decrement” (van Erp et al. 2021; Leo et al. 2021; Maunder et al. 2021, Kesisoglou et al. 2021)
- fatigue mechanisms on the power-duration relationship across exercise intensity domains (Clark et al. 2019)

Power Profiling, Workload Characteristics, and Race Performance of U23 and Professional Cyclists During the Multistage Race Tour of the Alps

Peter Leo, James Spragg, Iñigo Mujika, Andrea Giorgi, Dan Lorang, Dieter Simon, Justin S Lawley

PMID: 33789246 DOI: 10.1123/ijsp.2020-0381

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> [Med Sci Sports Exerc.](#) 2021 Sep 1;53(9):1903-1910. doi: 10.1249/MSS.0000000000002656.

Maintaining Power Output with Accumulating Levels of Work Done Is a Key Determinant for Success in Professional Cycling

Teun VAN Erp ¹, Dajo Sanders ², Robert P Lamberts ¹

Affiliations + expand

PMID: 33731651 DOI: [10.1249/MSS.0000000000002656](#)

- prior work done affects the performance of climbers and sprinters negatively
- MMP values decline differently depending on rider's specialization (sprinter vs. climber)
- maintaining high power outputs after high amounts of accumulated work

Can we assess (monitor) the riders' performance capacity after prior accumulated work in the field?

Training Camp 1

- 12 min test (fresh)
- 12 min test (fatigued) after continuous effort (CON)



9 professional road cyclists

Training Camp 2

- 12 min (fresh)
- 12 min test (fatigued) after intermittent efforts (INT)



DAY 1

12 min test (fresh): 30' of warm up at low intensities ($2.0-3.0 \text{ W.kg}^{-1}$)

DAY 2

12 min test (fatigued) after CON:
-30' warm up @ low intensities ($<3.0 \text{ W.kg}^{-1}$),
-150 min CON @ $2.5-3.0 \text{ W.kg}^{-1}$ before 12 min test

12 min test (fatigued) after INT:
30' warm up @ low intensities ($2.5-3.0 \text{ W.kg}^{-1}$),
150 min @ $>3.0 \text{ W.kg}^{-1}$ INT (stochastic high intensity efforts) before 12 min test



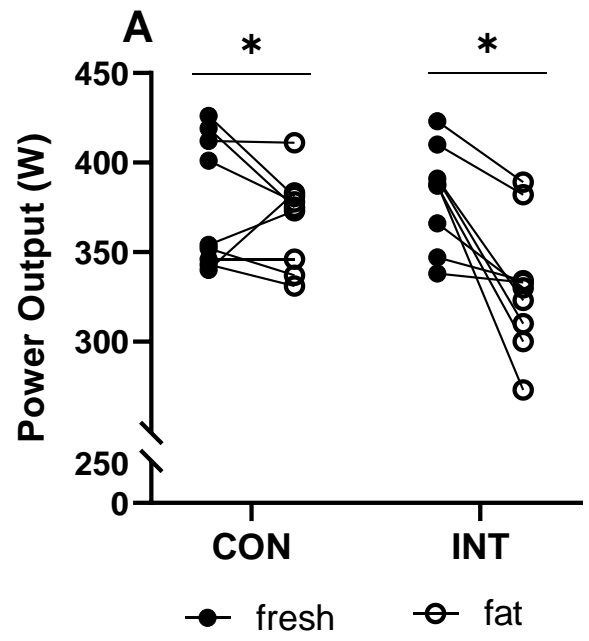
The Protocol – ~~DON~~



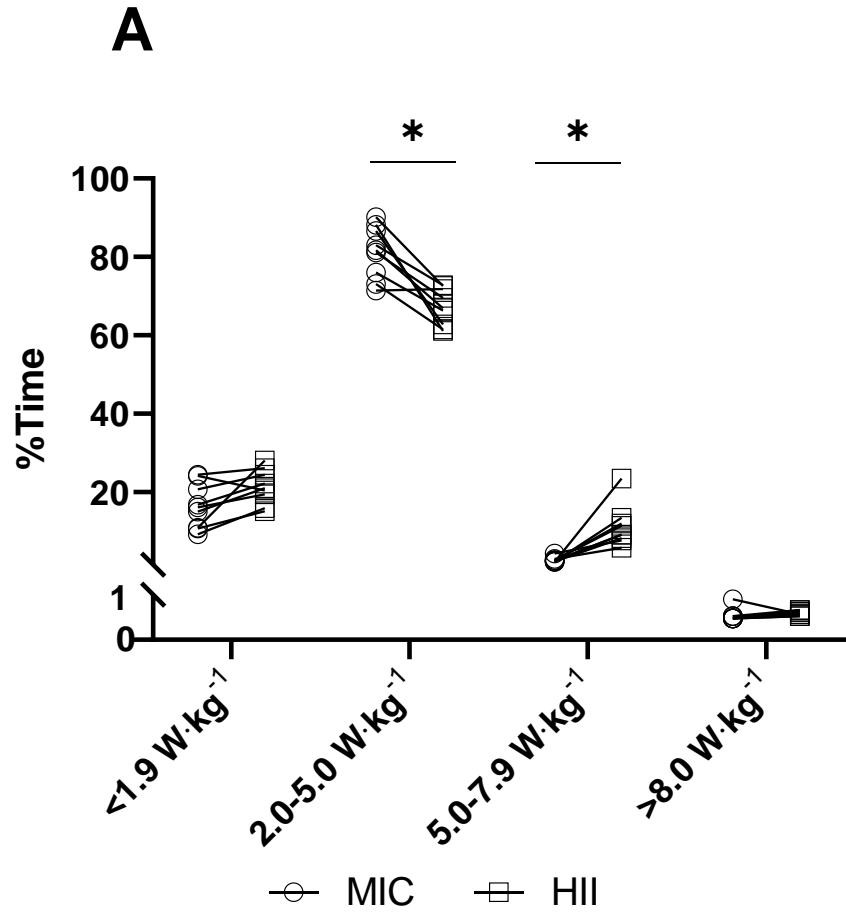
Body mass (kg)

CON	66.3 ± 5.8
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INT	66.6 ± 5.5
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Results



Conclusions

- ✓ first attempt to evaluate acute performance decrement in professional cyclists with a field test
- ✓ high intensity work needs to be quantified in order to properly interpret the decline in power output
- ✓ more accumulated time in high intensity exercise domains (at 5.0-7.9 W.kg⁻¹) contributes to a more rapid decline in power output
- ✓ accumulation of total work in combination with intensity does more detrimentally affect power output
- x no recordings of rating of perceived exertion
- x no reflection on training between camps

Questions?!