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POWER AND FORCE-VELOCITY DISTRIBUTION DURING INTERNATIONAL XCO-MTB RACES



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INSEP Terre de Champions
FÉDÉRATION FRANÇAISE DE CYCLISME

PREVIOUS FINDINGS

8 athletes from the French xco-mtb Team

Age: **22.4 ± 3 .4 yr** ***Height:*** **179 ± 3 cm** ***Body mass:*** **65.4 ± 3.5 kg**


Power Output and Pacing during International Cross-Country Mountain Bike Cycling

Granier et al. 2018. IJSPP

VO_{2max}

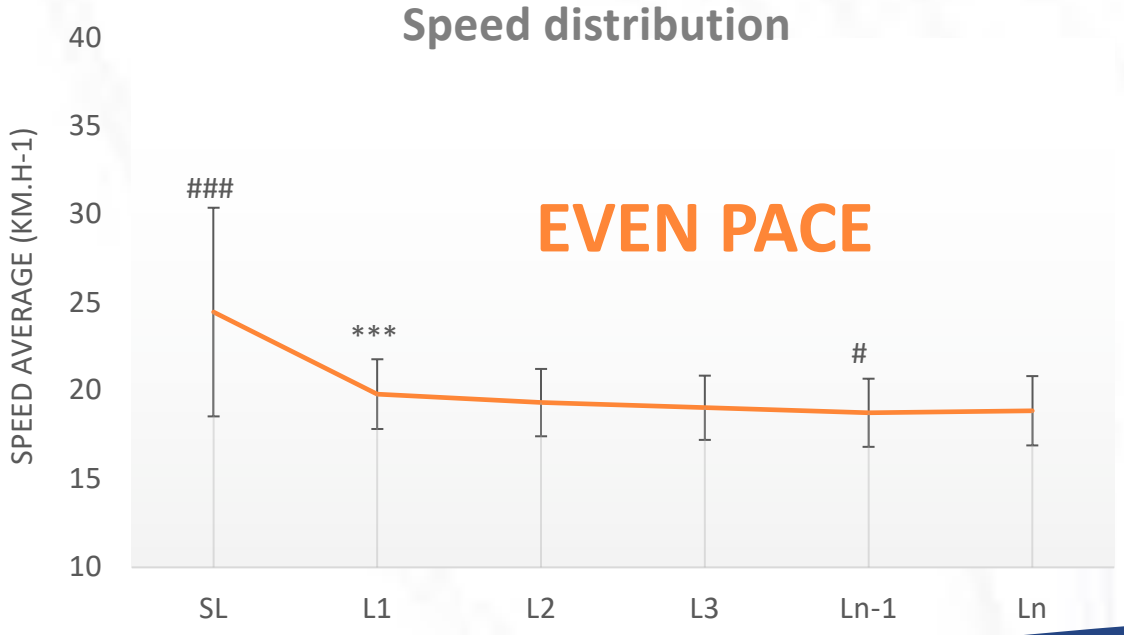
5.2 ± 0.3 $l.min^{-1}$

(79.9 ± 5.2 $ml.min^{-1}.kg^{-1}$)

PMA

6.3 ± 0.4 $w.kg^{-1}$

(411 ± 18 W)



13 international races analyzed

2014 HAFJELL LILLEHAMMER NORWAY UCI MOUNTAIN BIKE & TRIALS WORLD CHAMPIONSHIPS

ALPAGO 2015 Dolomiti Italy UEC Mountain Bike & Trials European Championships

Baku 2015 1ST EUROPEAN GAMES

UCI MOUNTAIN BIKE WORLD CUP PRESENTED BY SHIMANO

ANDORRA 2015 vallnord LA MASSANA UCI MOUNTAIN BIKE & TRIALS WORLD CHAMPIONSHIPS

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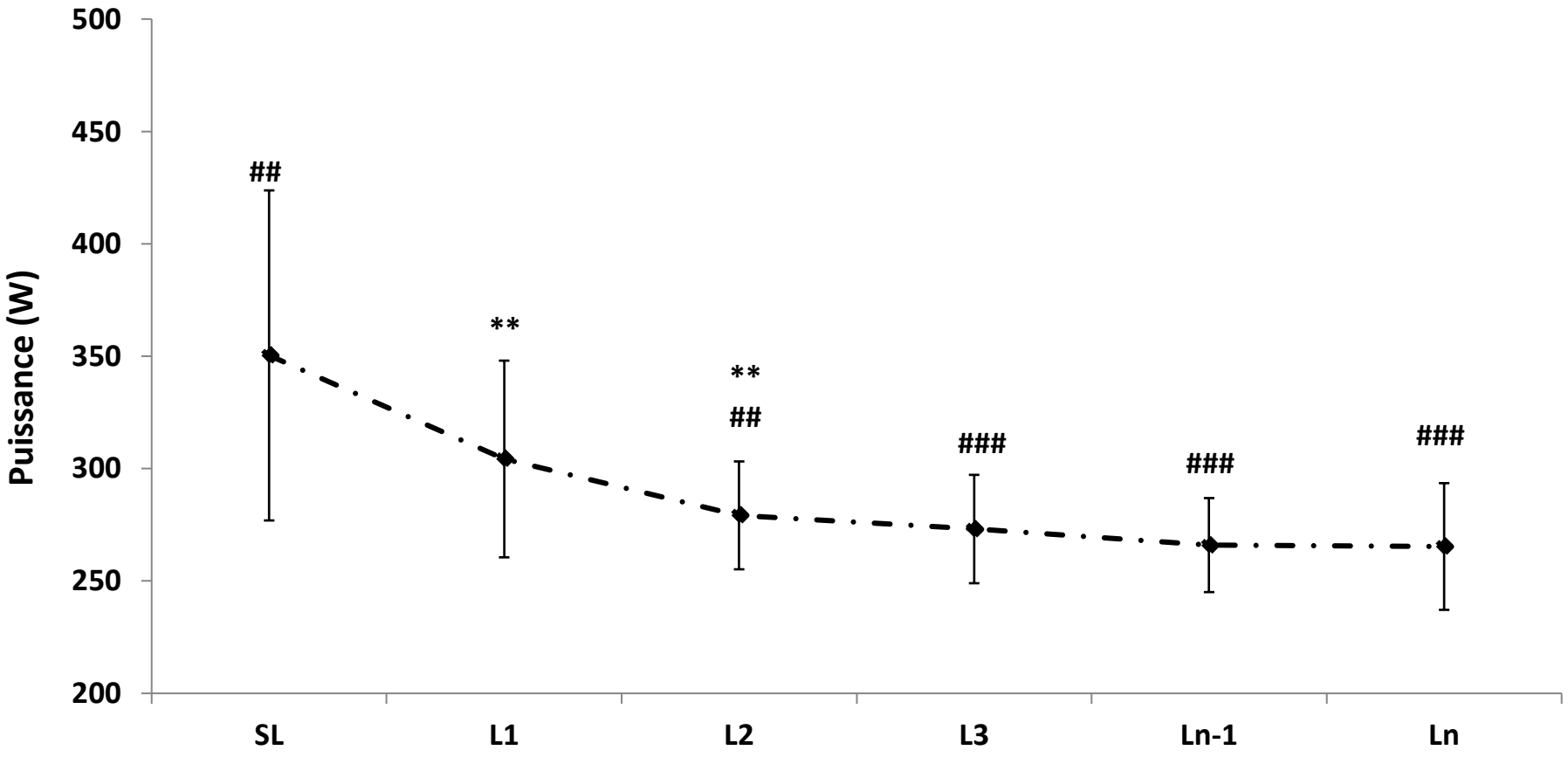
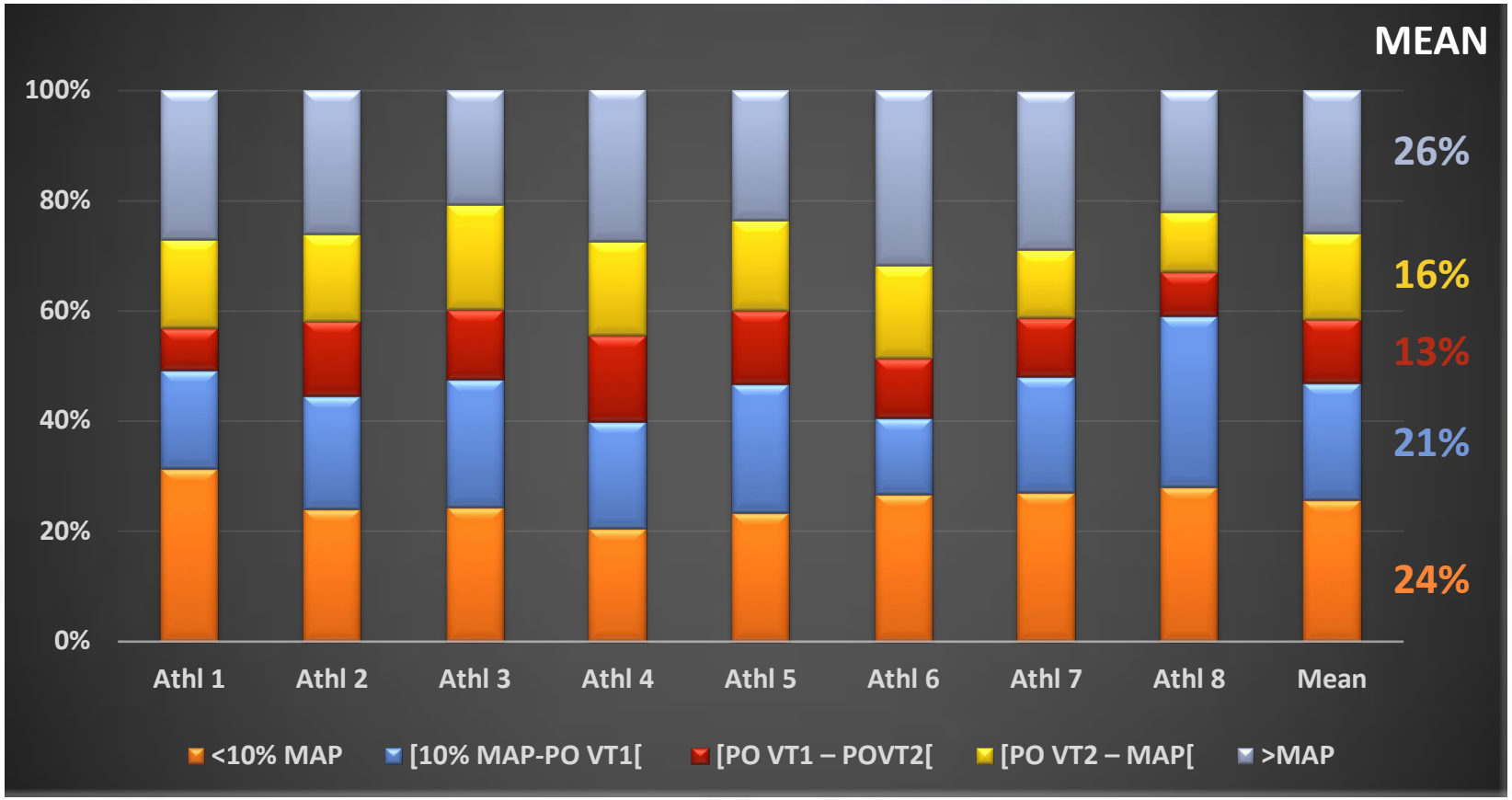
PO DISTRIBUTION IN ATHLETES DURING XCO-MTB RACES



Mean PO = 283 ± 22 W (4.3 ± 0.3 W.kg^{-1}) **Representing 68 ± 5 % MAP**

PO evolved from 0 to ~1200 W **CV PO of 74 % (61 to 87 %)**

PO DISTRIBUTION IN ATHLETES DURING XCO-MTB RACES



Mean PO = 283 ± 22 W (4.3 ± 0.3 W.kg^{-1}) **Representing 68 ± 5 % MAP**

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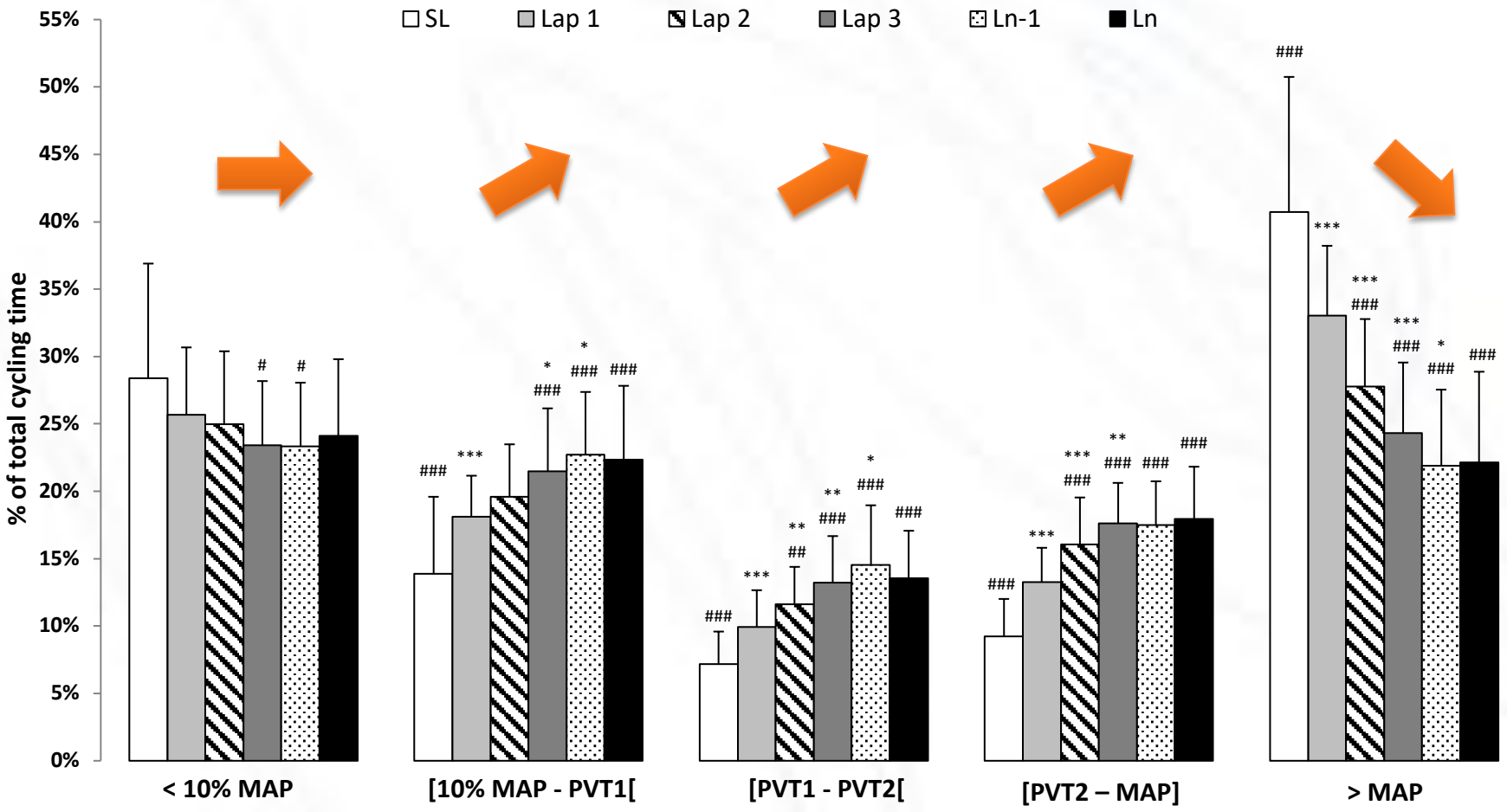
POWER DISTRIBUTION DURING MTB COMPETITIONS

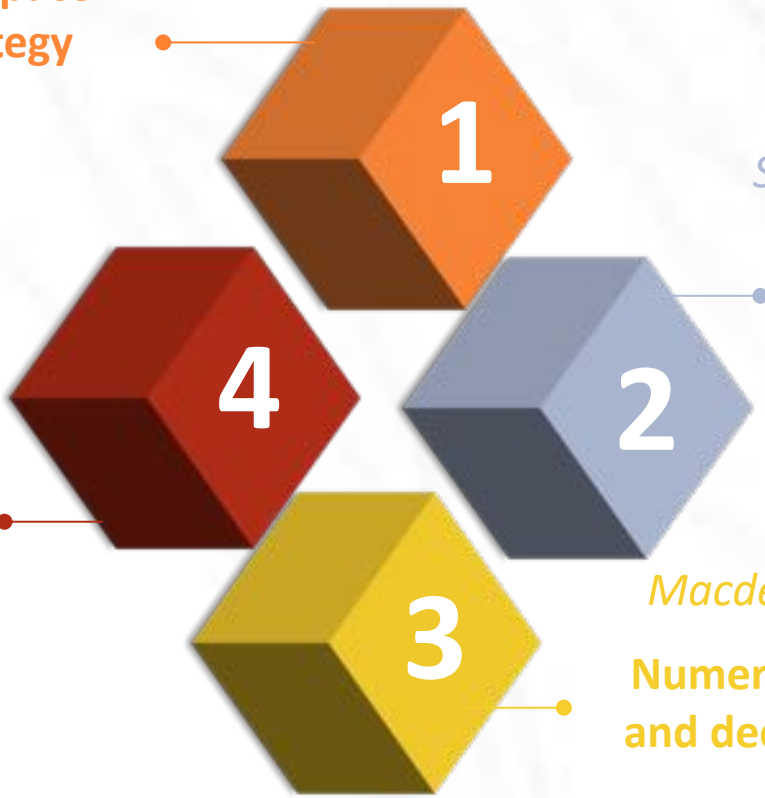


, Difference with the previous lap; #, Difference with the first Lap; (or # , likely; ** or ##, very likely; *** or ###, almost certain)

CONCLUSIONS AND INVESTIGATIONS

Abbiss et al. 2009

Even pace strategy



Stapelfeldt et al. 2004

26% of time spent above MAP
PO CV of 74%

Baron et al 2001
Inoue et al 2011

Anaerobic nature of work

Macdermid et al. 2012

Numerous accelerations and decelerations during races

CONCLUSIONS AND INVESTIGATIONS

01

Characterize the F/V profile of athletes in laboratory

02

Characterize cadence and force production during competitions

03

Characterize the intensity above MAP

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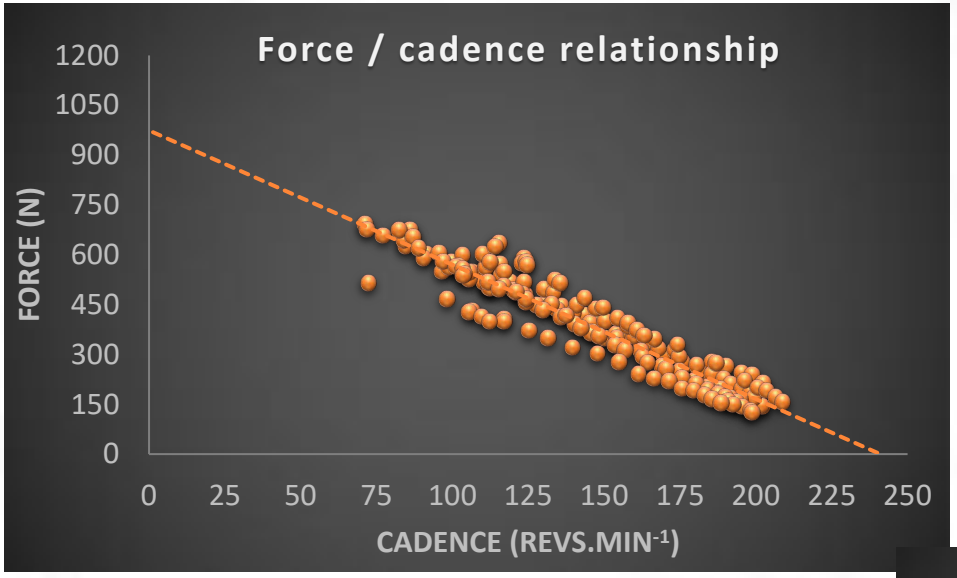
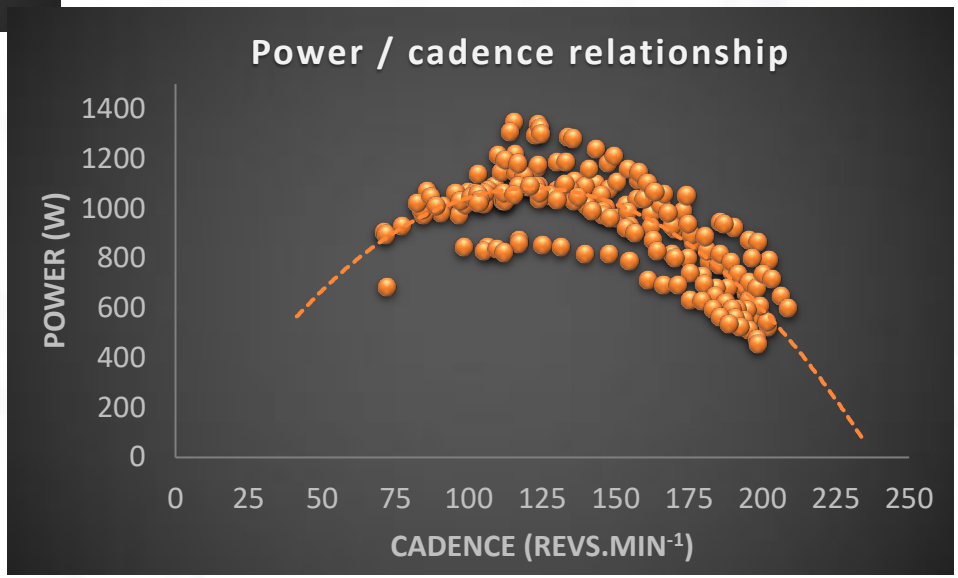
F/V TESTS IN SITTING POSITION

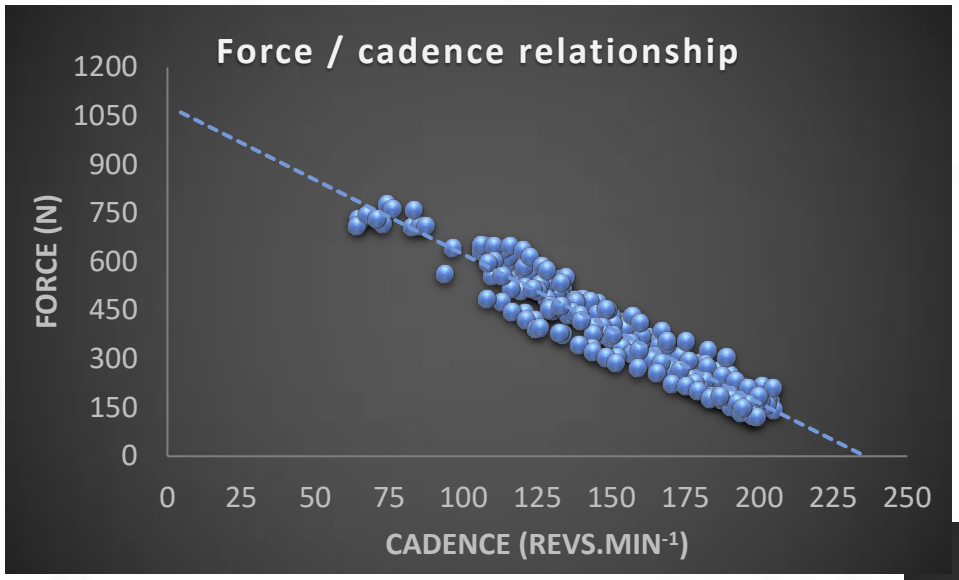


	Mean ± SD	Range
Vmax (revs.min^{-1})	237 ± 13	[226 ; 270]
Fmax (N)	1022 ± 123	[777 ; 1168]
Rel Fmax (N.kg^{-1})	15.5 ± 1.6	[12.3 ; 17.3]

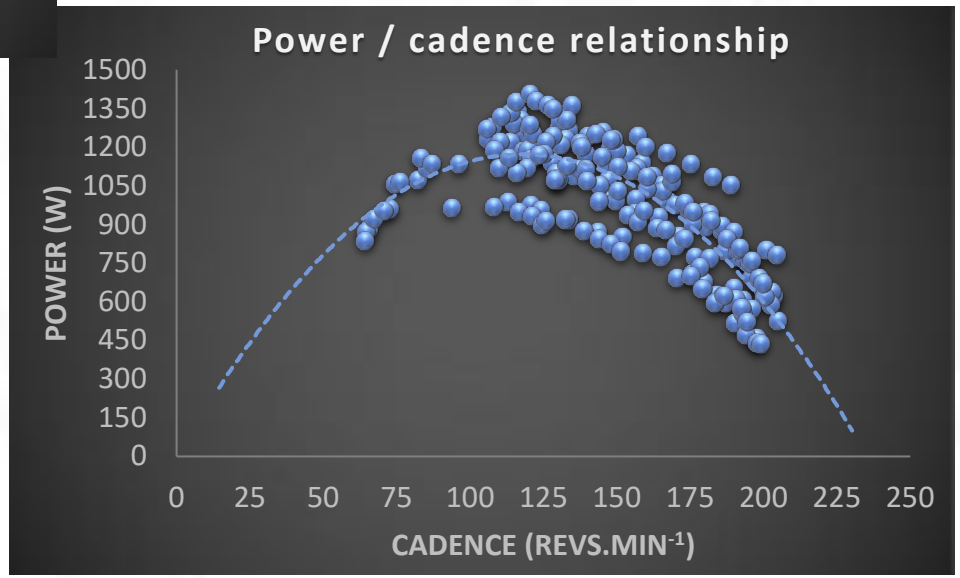


	Mean ± SD	Range
Vopt (revs.min^{-1})	119 ± 7	[113 ; 135]
ManP (W)	1109 ± 120	[843 ; 1276]
Rel. ManP (W.kg^{-1})	16.9 ± 1.5	[13.4 ; 18.1]

F/V TESTS IN STANDING POSITION



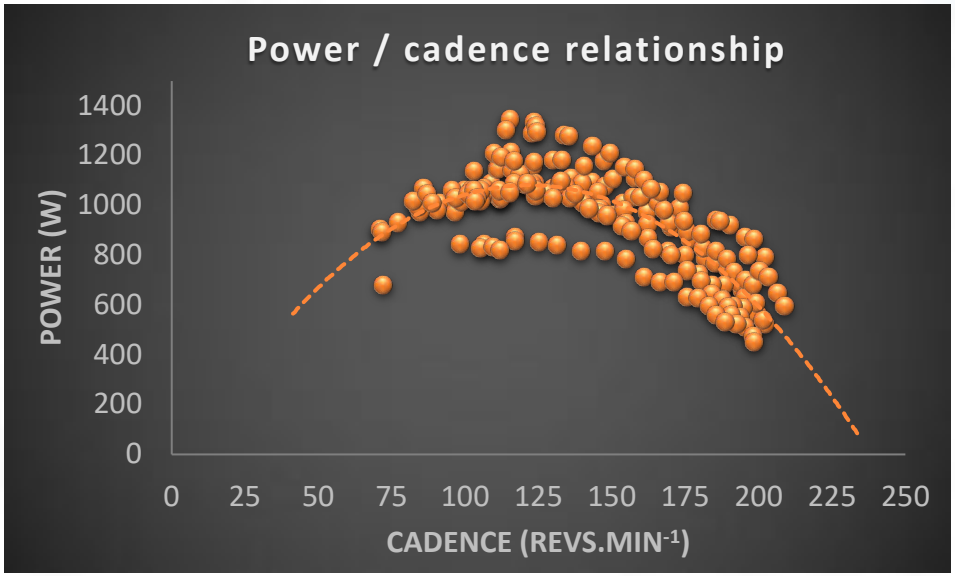
	Mean ± SD	Range
Vmax (revs.min^{-1})	232 ± 9	[220 ; 250]
Fmax (N)	1152 ± 101	[914 ; 1286]
Rel Fmax (N.kg^{-1})	17.5 ± 1.4	[14.5 ; 19.3]

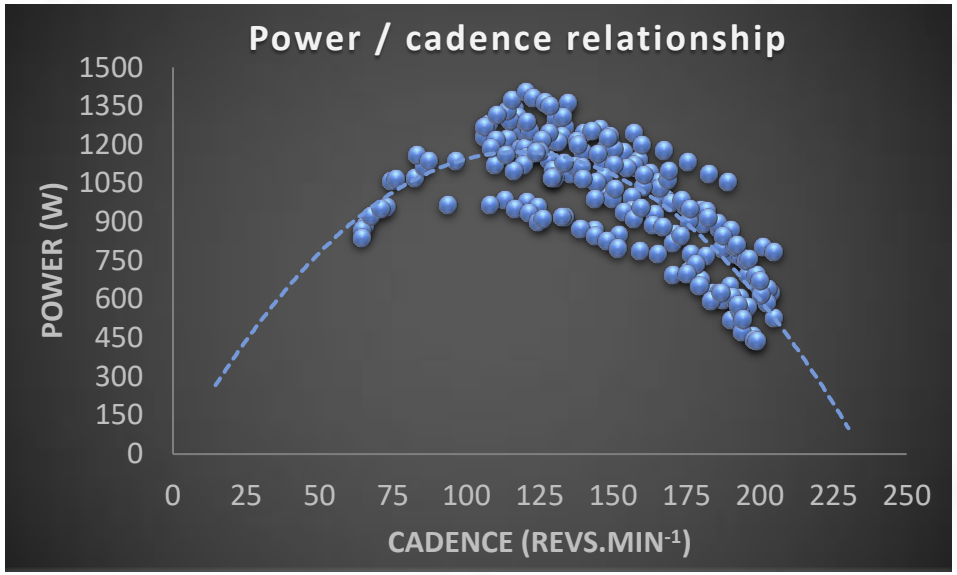


	Mean ± SD	Range
Vopt (revs.min^{-1})	116 ± 6	[110 ; 129]
ManP (W)	1213 ± 120	[939 ; 1347]
Rel. ManP (W.kg^{-1})	18.5 ± 1.6	[14.9 ; 20.5]

ATHLETES F/V PROFILES

*De Pauw, K. classification





Baron et al. 2001 and Inoue et al. 2012

*Pmax ~14.7 W.kg^{-1} and 1000 W with PL4 subjects**

Hurst et al. 2012

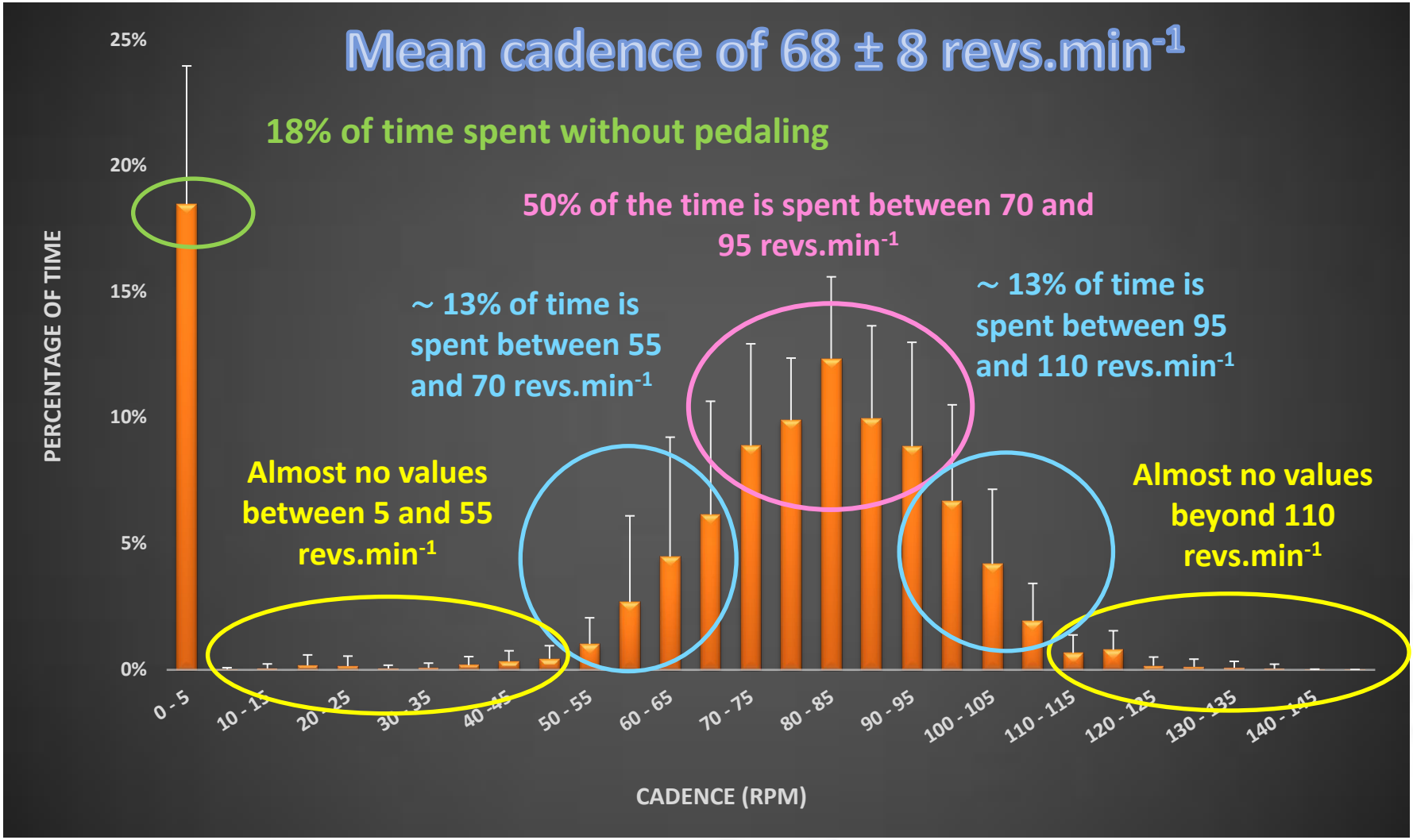
Pmax ~ 15.95 ± 0.75 W.kg^{-1} and 1113.86 ± 75.22 W with 6 elite xco riders
Vopt of 107.96 ± 4.63 revs.min^{-1}

V_{opt} between 116 and 119 revs.min^{-1}

P_{max} between 1109 and 1213 W

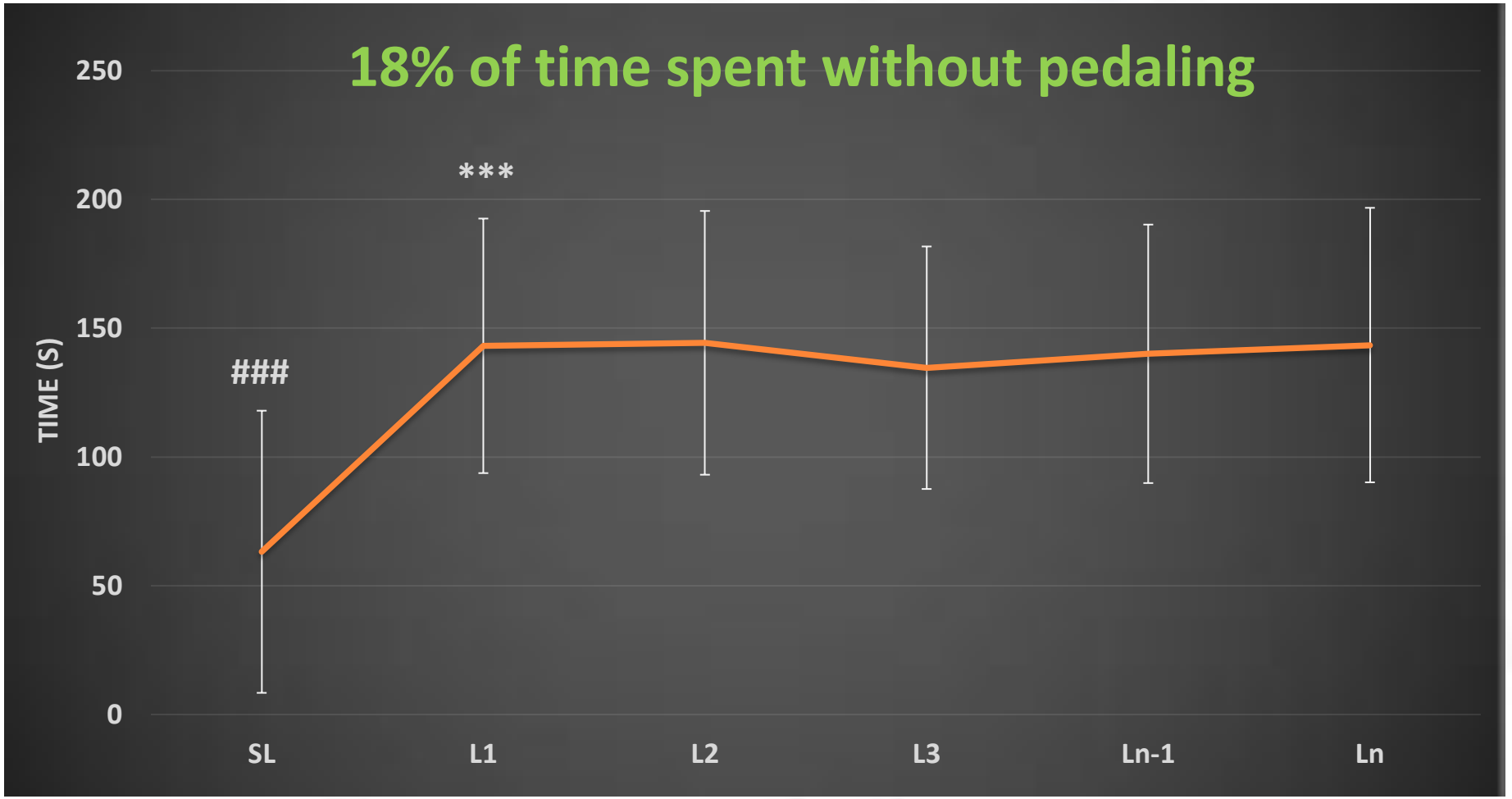
Rel P_{max} between 16.9 and 18.5W.kg^{-1}

CADENCE DISTRIBUTION DURING XCO-MTB

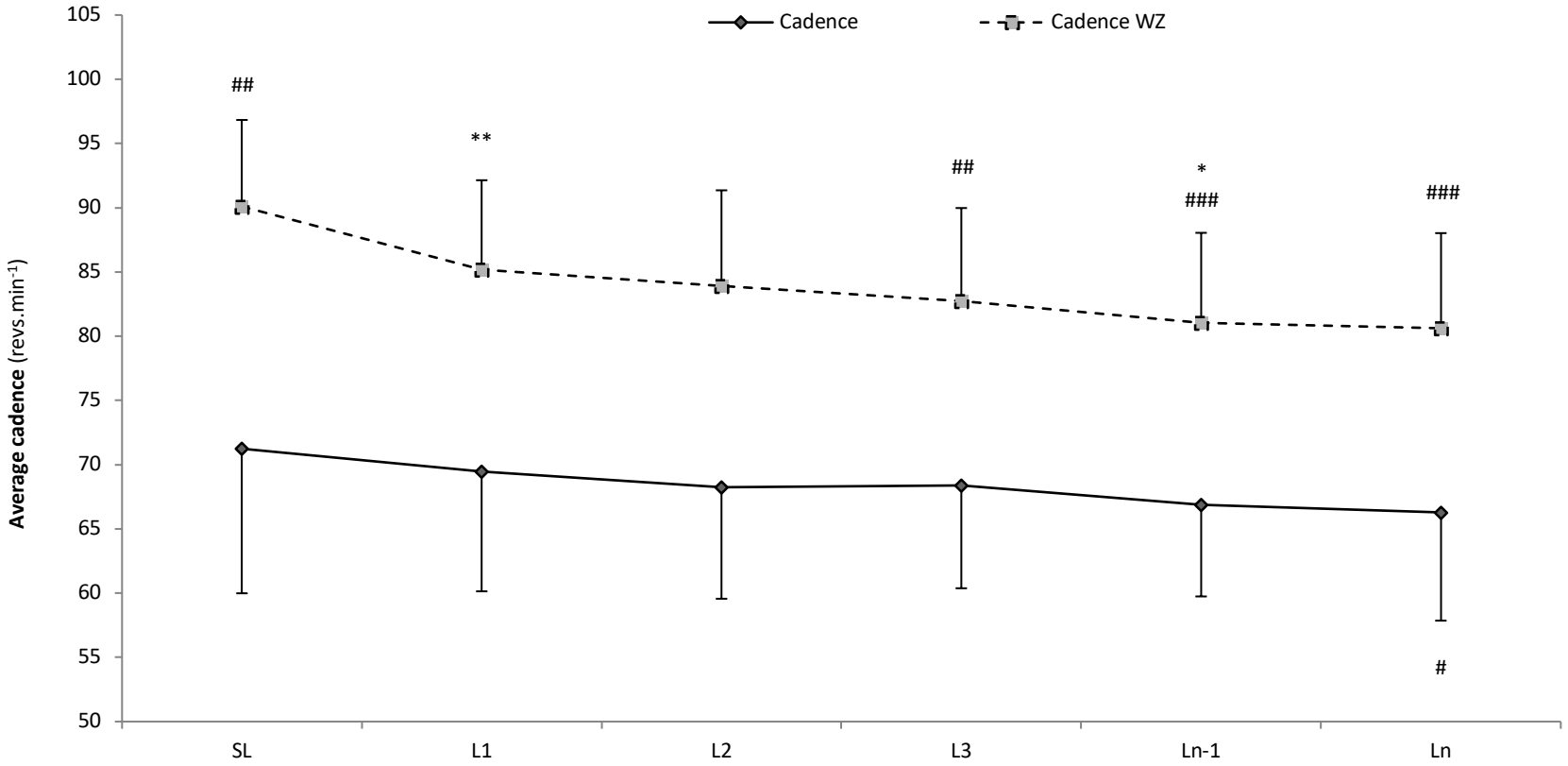


EVOLUIONT OF TIME SPENT WITHOUT PEDALING

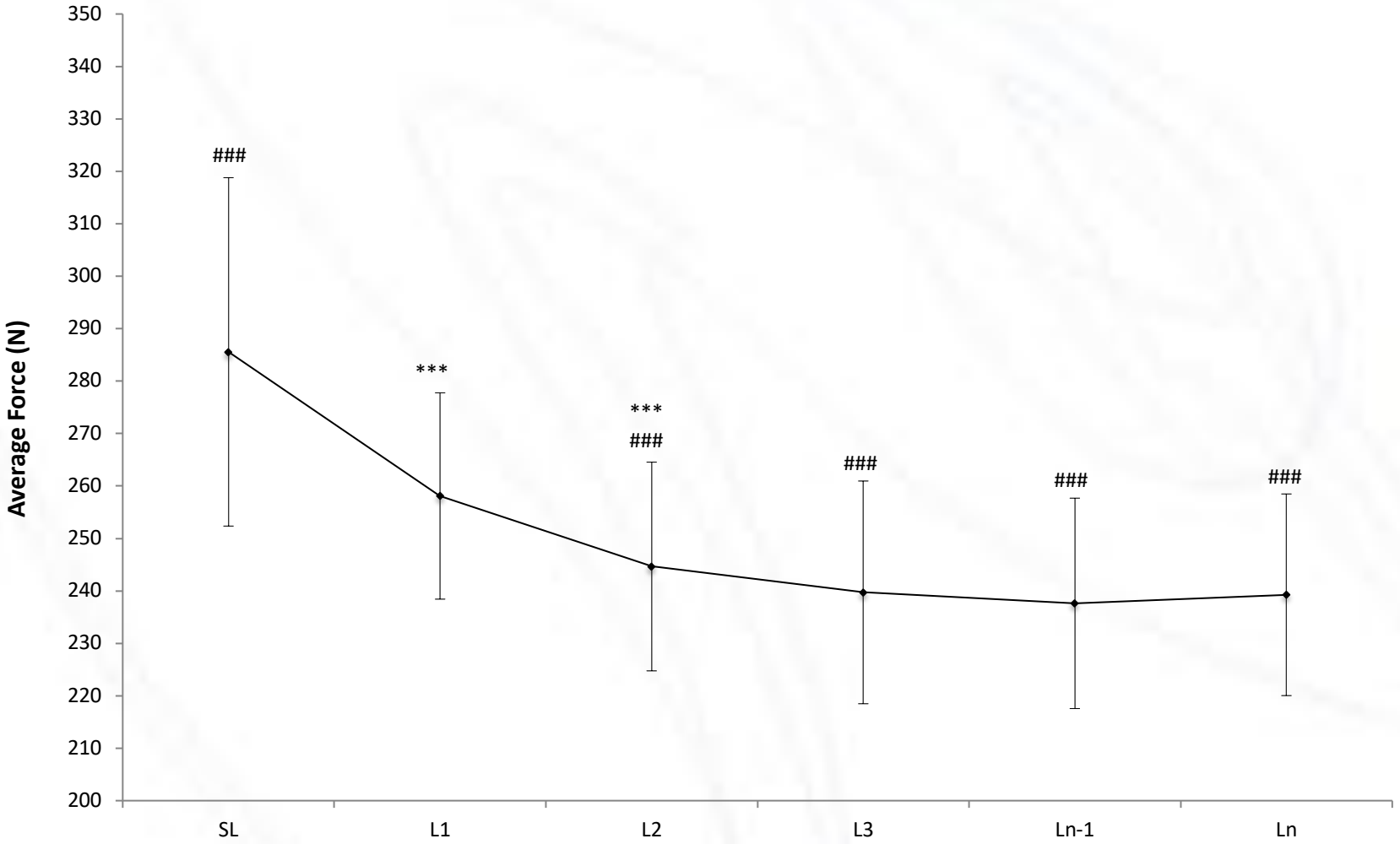
Mean cadence of 87 ± 7 revs.min^{-1}



CADENCE EVOLUTION LAP BY LAP DURING XCO MTB

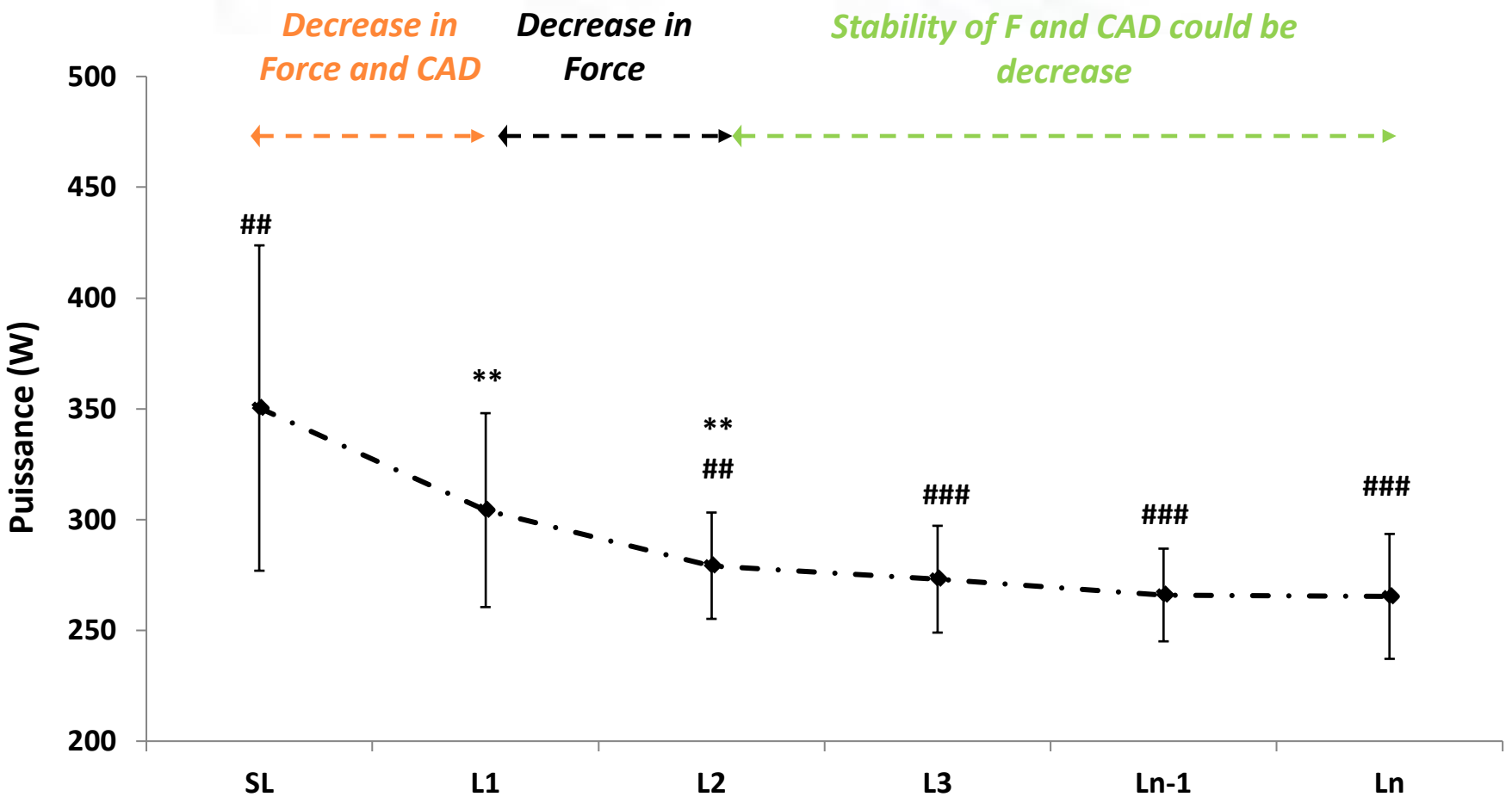


Force distribution during xco mtb



, Difference with the previous lap; #, Difference with the first Lap; (* or # , likely; ** or ##, very likely; * or ###, almost certain)*

Power production during xco mtb



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WHAT HAPPENS ABOVE MAP?

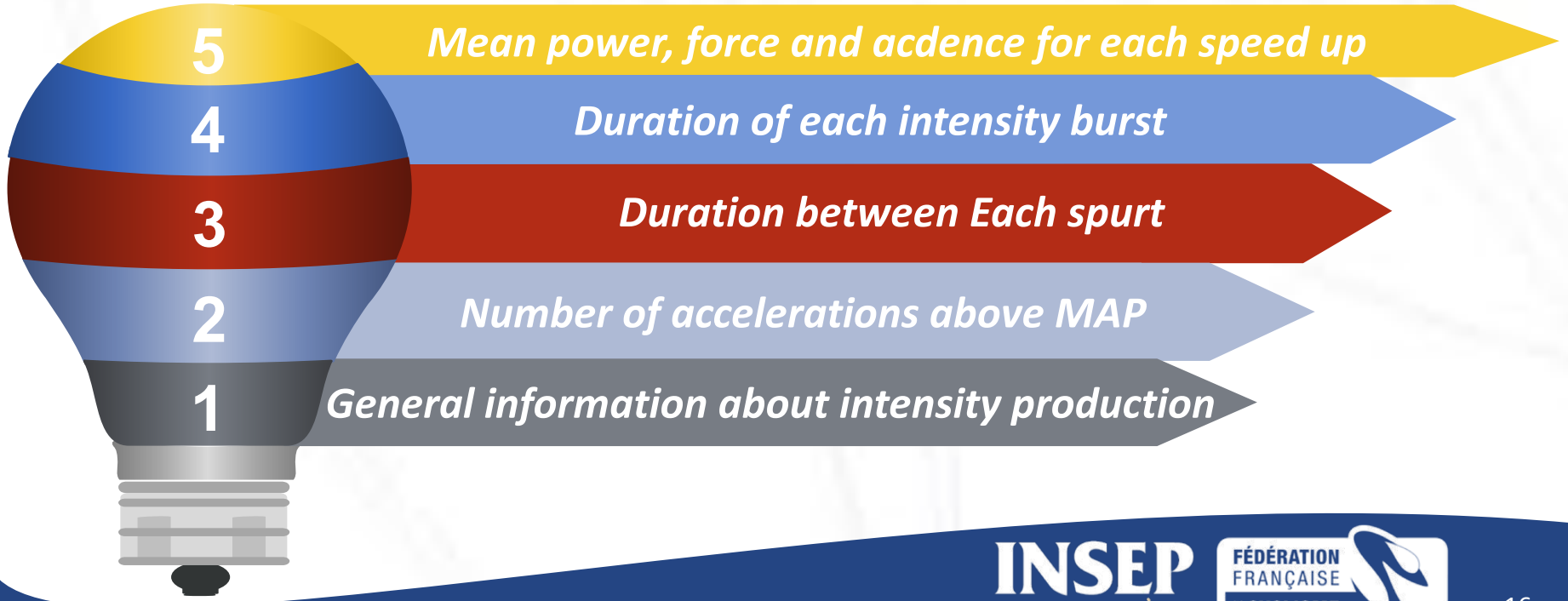
26% of time is spent above MAP

Granier et al. 2018

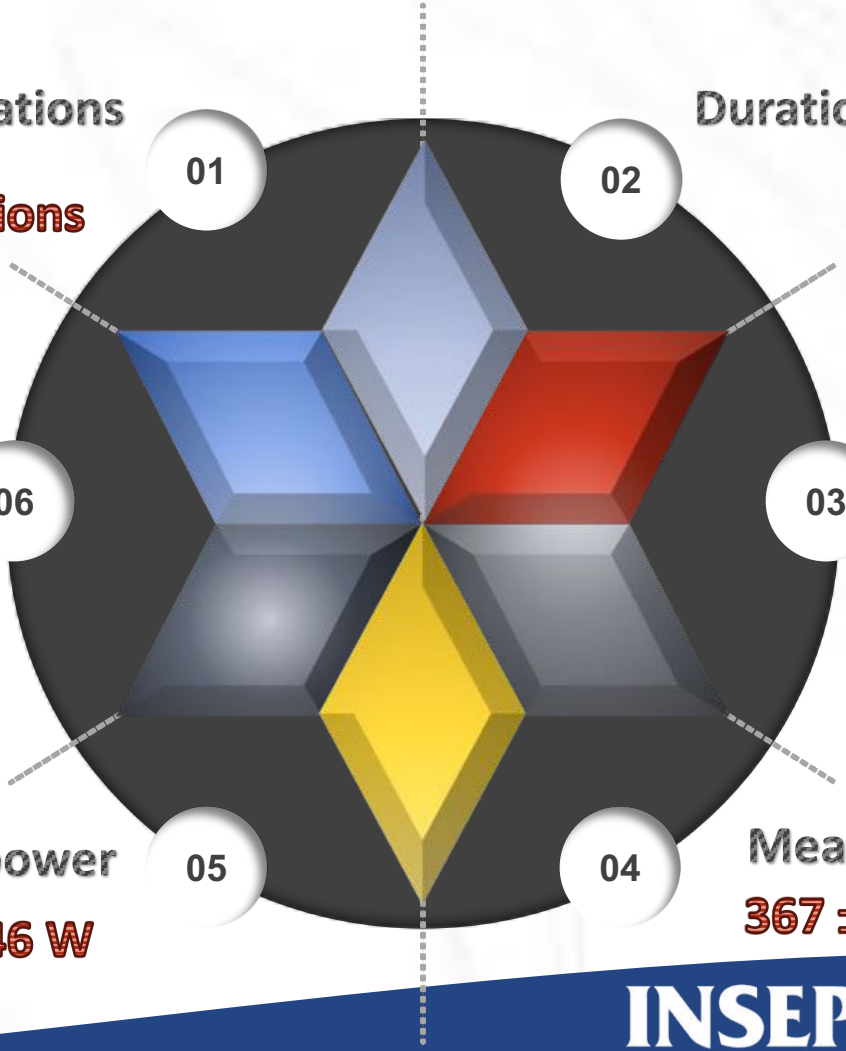
In xco mtb races, the difficulty and technicity of terrains require to the athlete to speed up, exceeding MAP values, or slow down frequently.

Macdermid et al. 2012

How characterize the effort above MAP?



During a xco-mtb race 130 ± 28 accelerations are produced above MAP



01 — Number of accelerations

18 ± 4.2 accélérations

02 — Durations of accelerations

7.3 ± 1.5s

03 — Delay between accelerations

40.4 ± 14.1s

04 — Mean force

367 ± 10 N

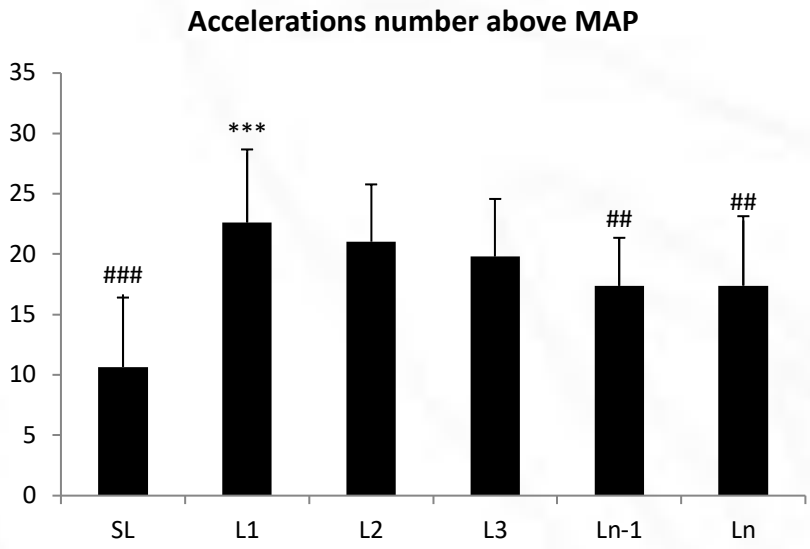
05 — Mean power

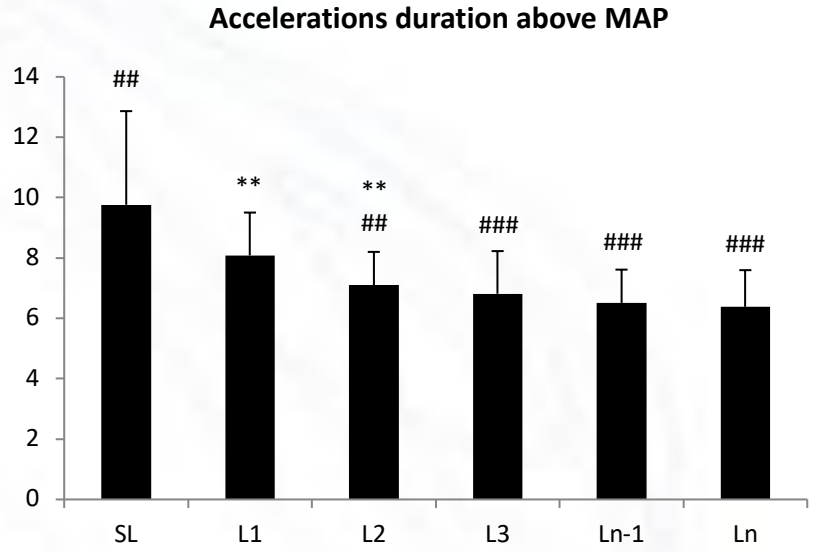
559 ± 46 W

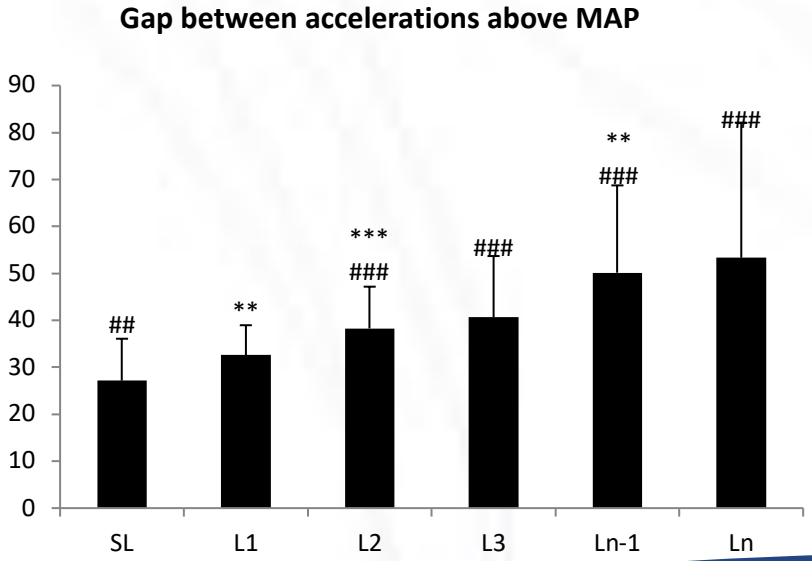
06 — Mean cadence

85 ± 5 revs.min^{-1}

SUPRAMAXIMAL EFFORTS EVOLUTION LAP BY LAP







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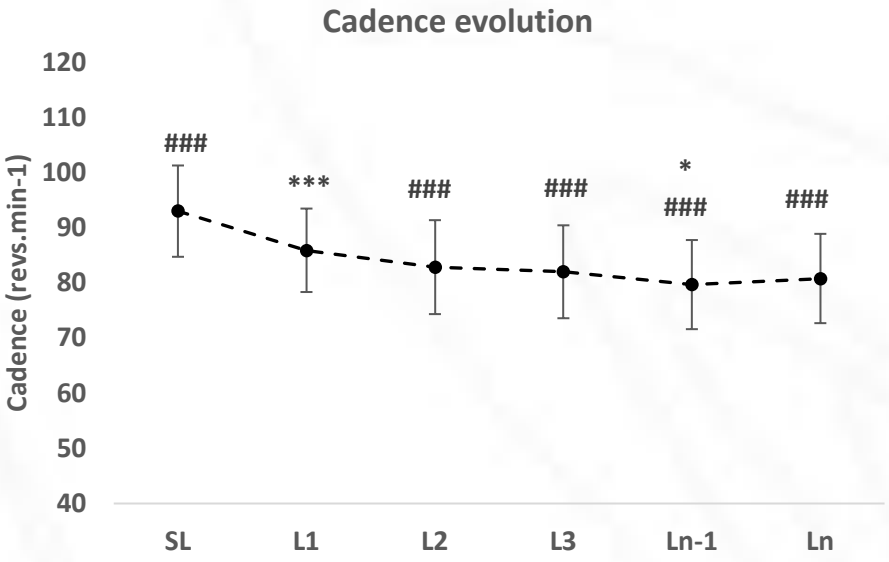

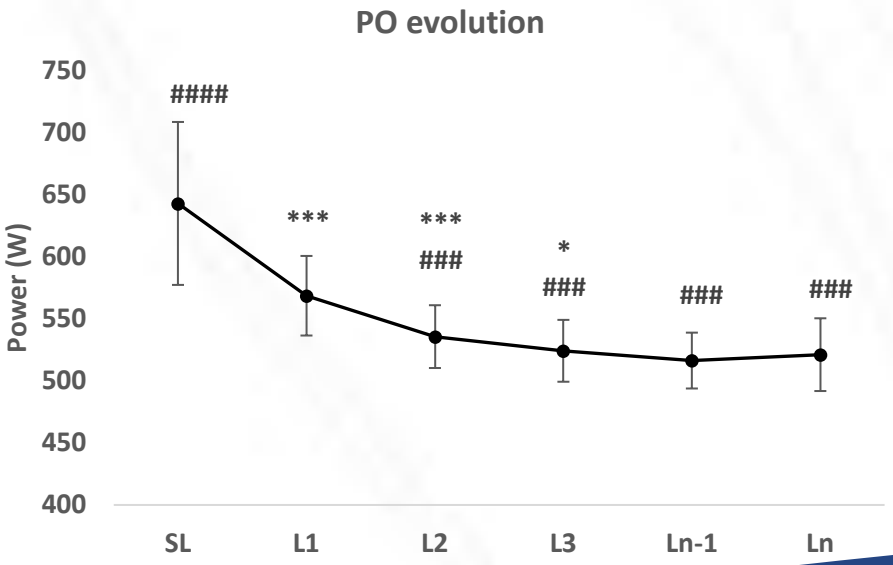

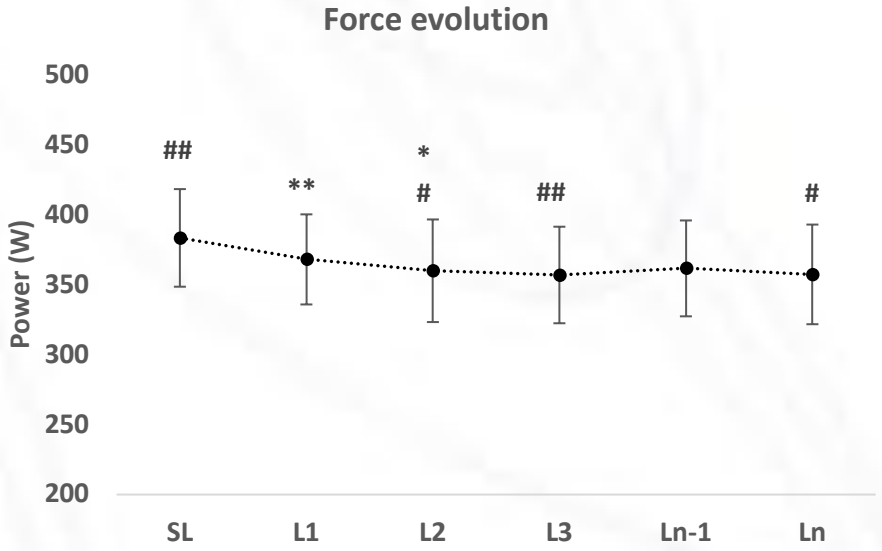

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Mean values lap by lap

F ↘ and Cad → in result PO ↘

Mean values for accelerations above MAP

Cad ↘ and F → in result PO ↘

CONCLUSION

The ability of F production in acceleration phases seems to play an important role in performance

The cadence produced is not as low as usually thought and is a reason why the PO decrease during races

This study indicates that the stochastic nature of XCO-MTB promotes a higher anaerobic contribution than previously reported and that XCO-MTB athletes must be able to recover very rapidly from short anaerobic effort throughout races

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Picture credits: Keno photography