Force – velocity components of critical power

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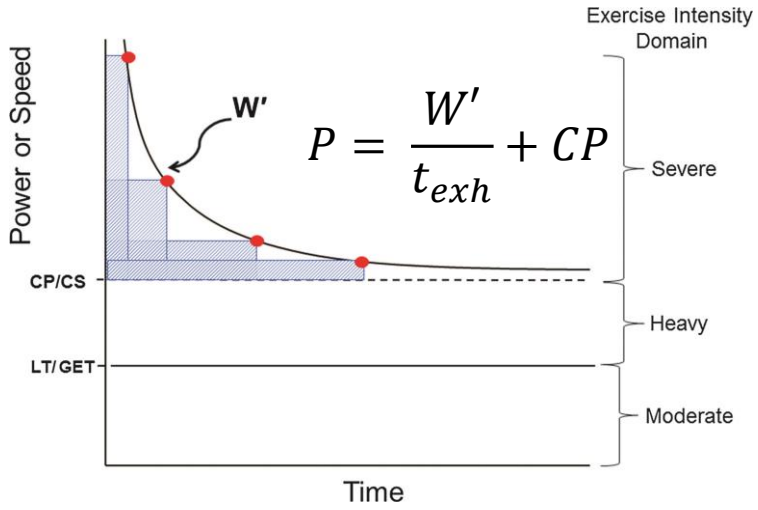
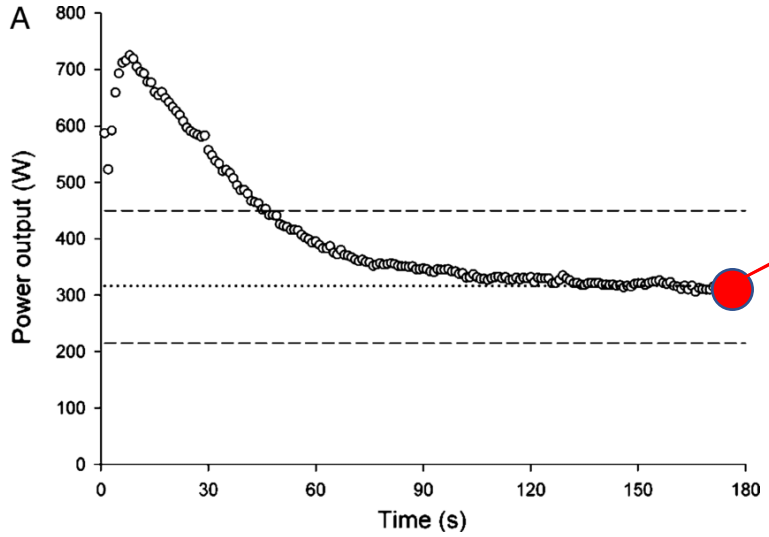
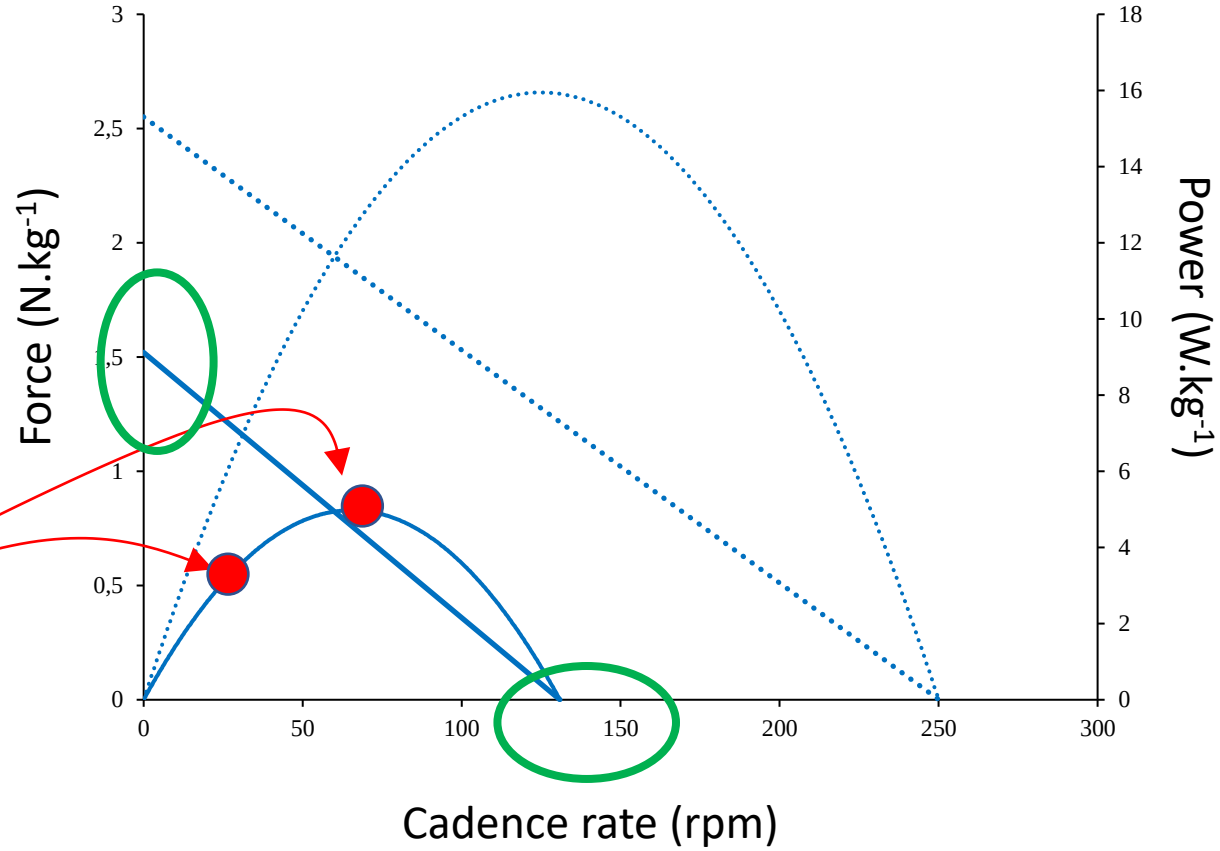
The power-time relationship



Poole et al. 2016



The power-velocity relationship



Could correspond to different force-velocity components

Background: *what about the interaction of both power-time and power-velocity ?*

- Is there a difference between end-test power and a maximal end test power?

- How force and velocity parameters compose the maximal end-test power ?

Method

21
Active but non cyclist subjects

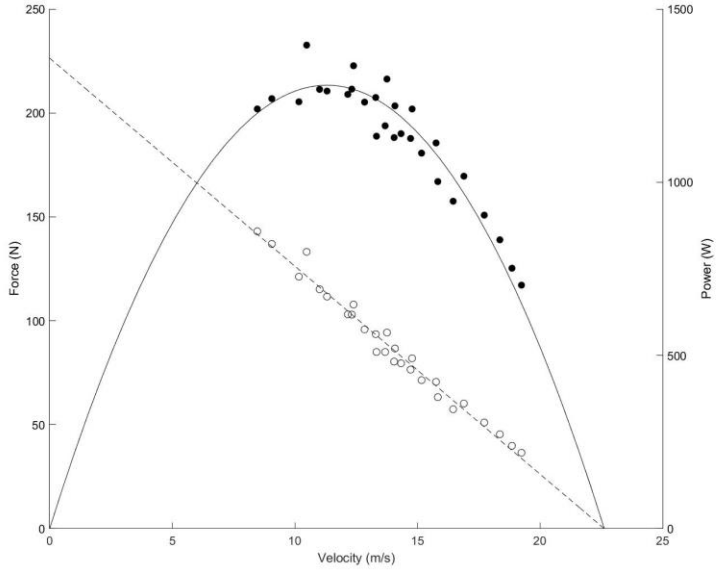
NC Group

19
Sub-elite cyclist subjects

SC Group

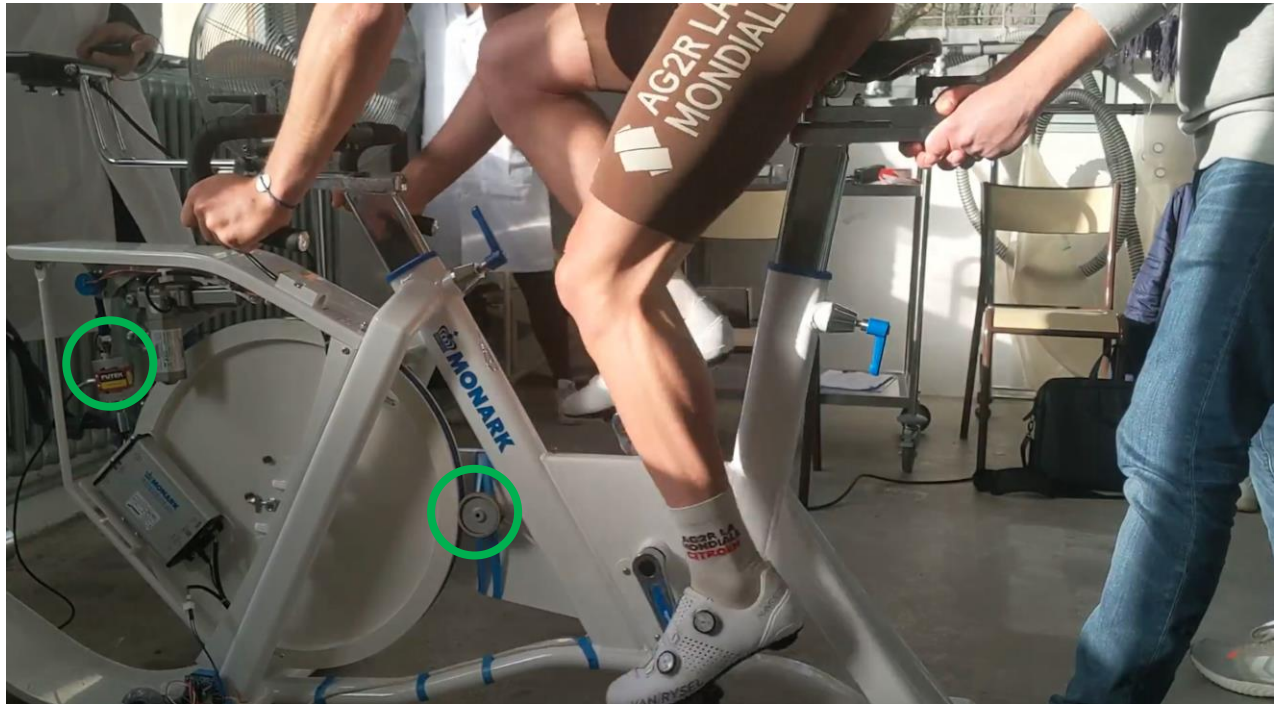
9
Elite cyclist subjects

EC Group



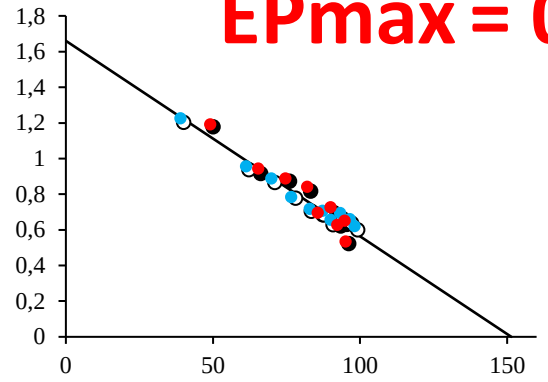
3 force-velocity tests in fresh conditions.

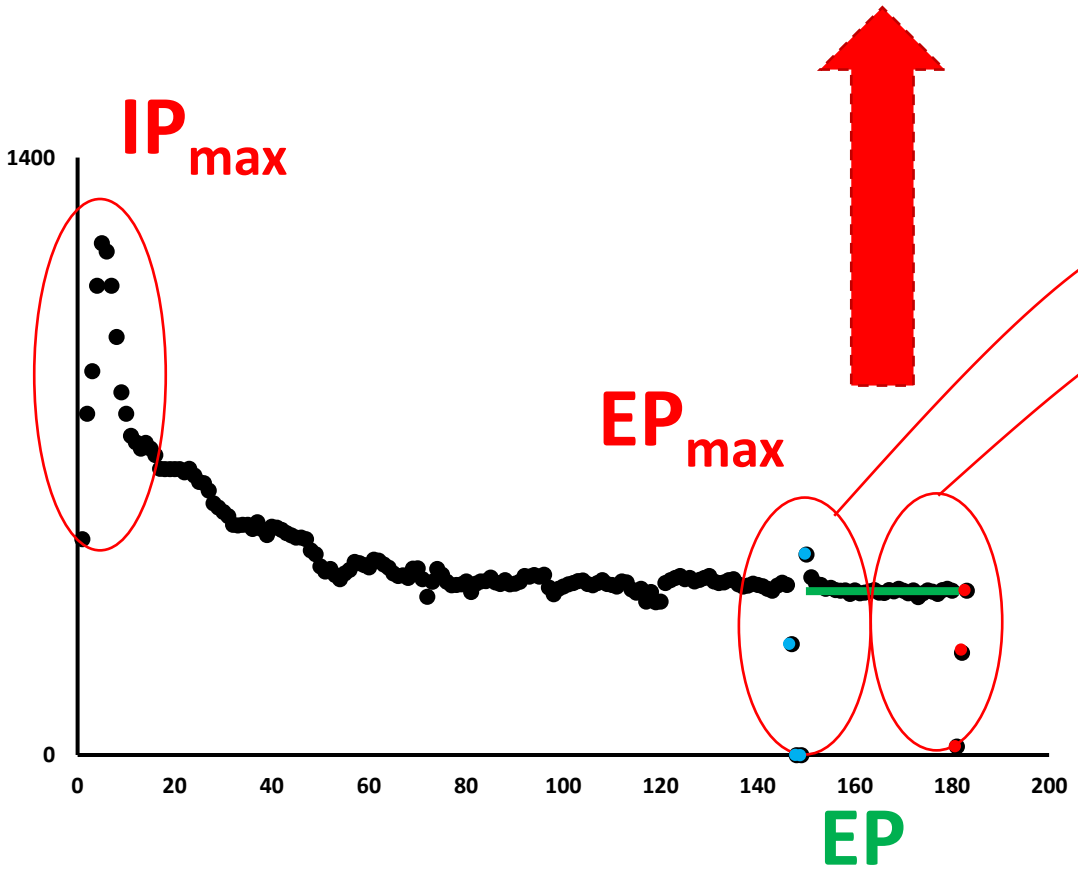
This permits to set the resistance for the all-out test, as $0.25*F_{0i}$



Method

$$EPmax = 0.25 \times F_{0E} \times V_{0E}$$

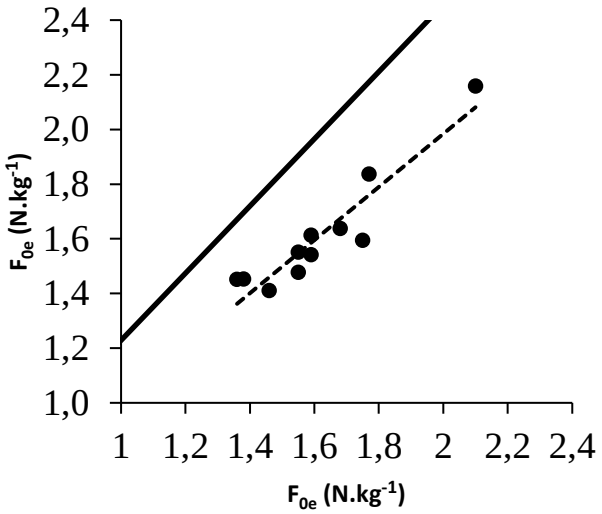




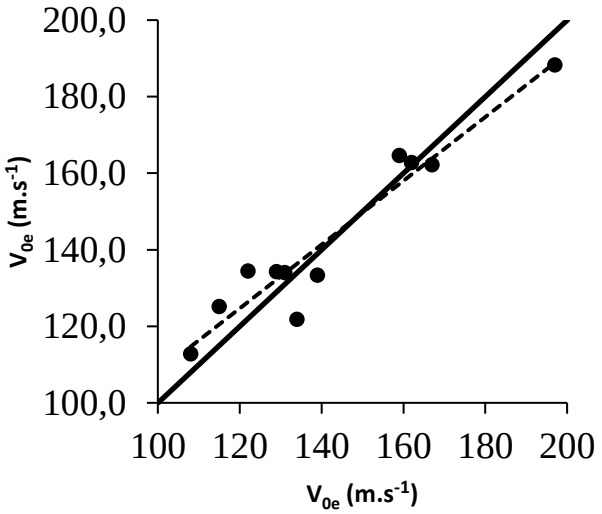
The test have been performed twice by 11 subjects

Results: *reliability*

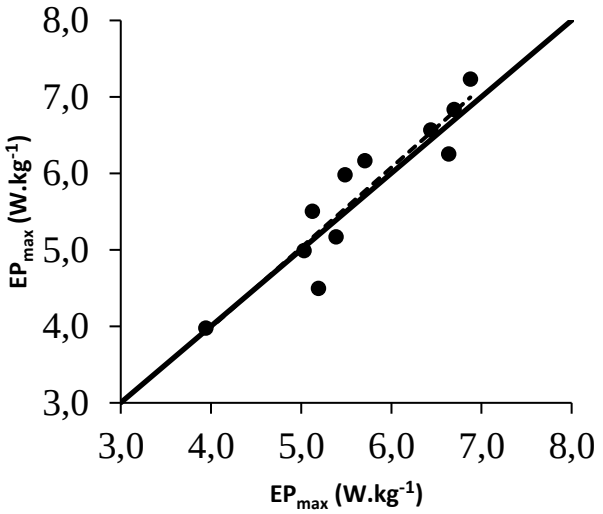
Indicators	ICC	%SEM
F_{0e}	0.94	3.3
V_{0E}	0.95	3.9
EP_{max}	0.93	4.2



F_{0e} (N.kg^{-1})



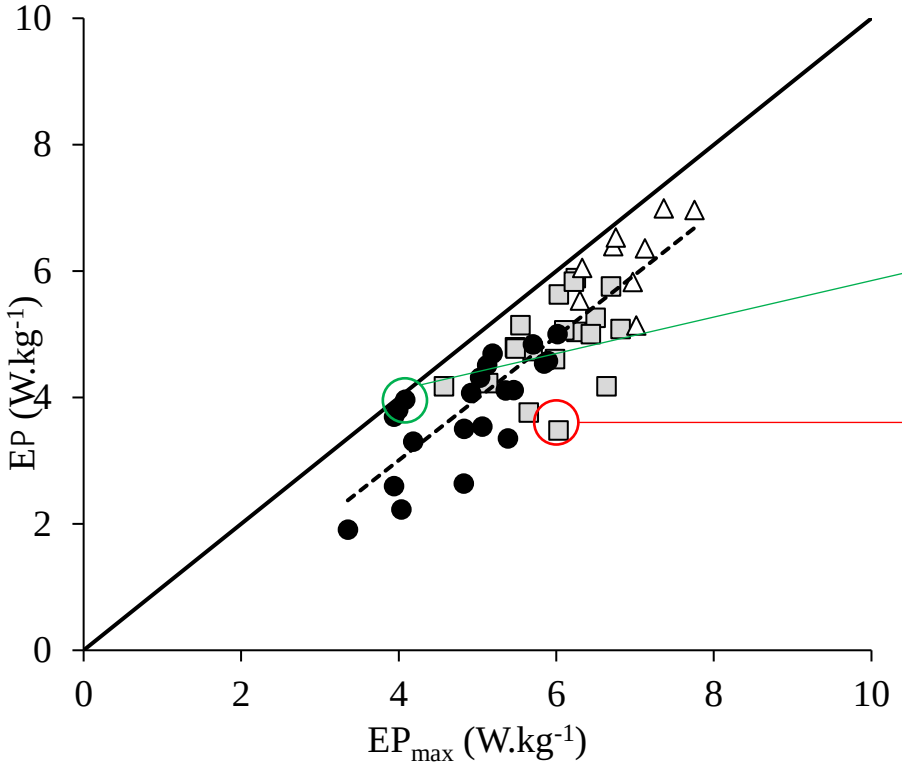
V_{0e} (m.s^{-1})



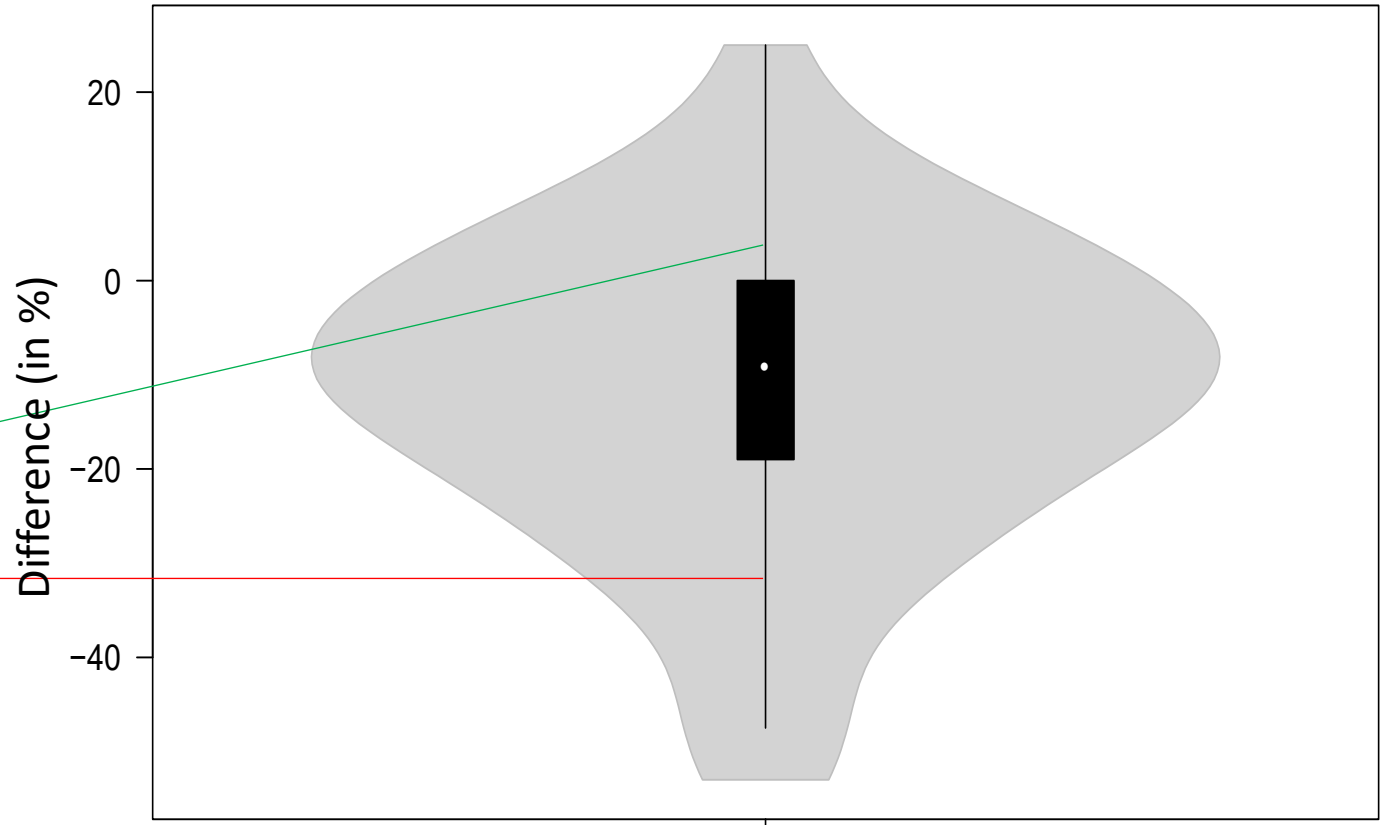
EP_{max} (W.kg^{-1})

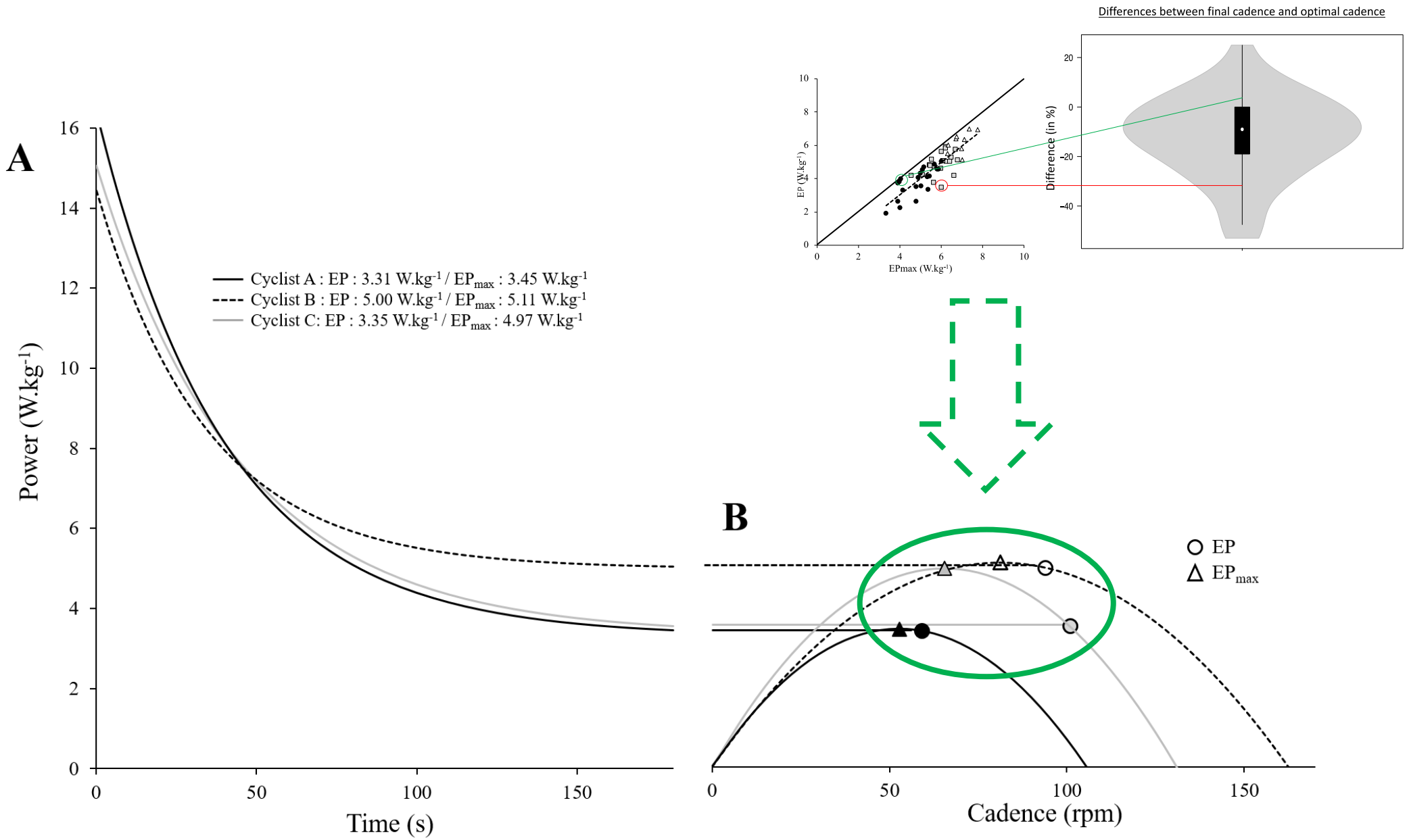
Results: *end-test power and end-test maximal power parameters*

- EP and EP_{max} are significantly different ($p<0.001$).
- EP : 4.64 ± 1.01 $W \cdot kg^{-1}$
- EP_{max}: 5.67 ± 1.01 $W \cdot kg^{-1}$

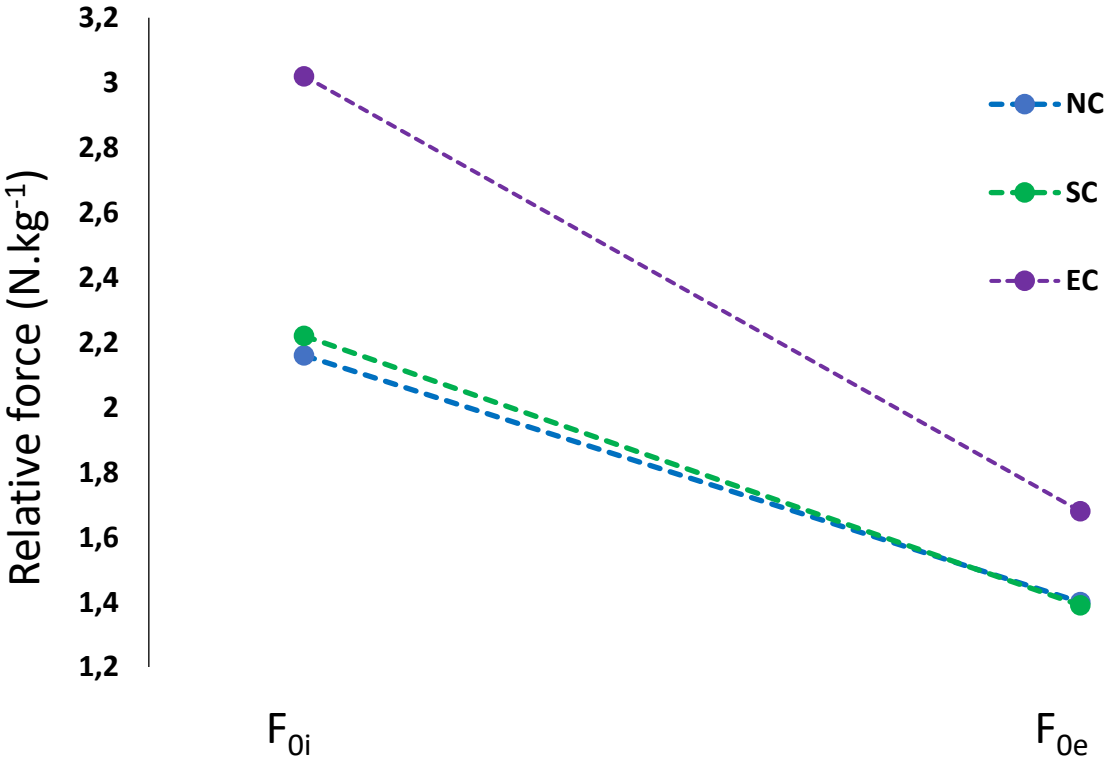


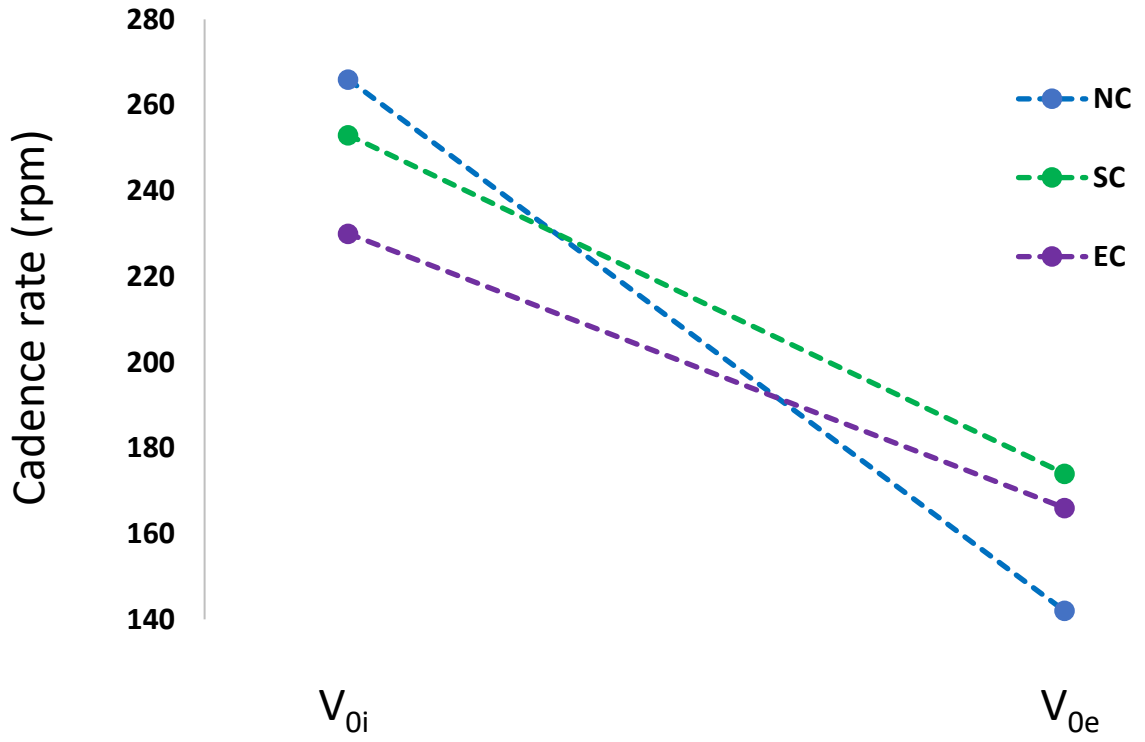
Differences between final cadence and optimal cadence



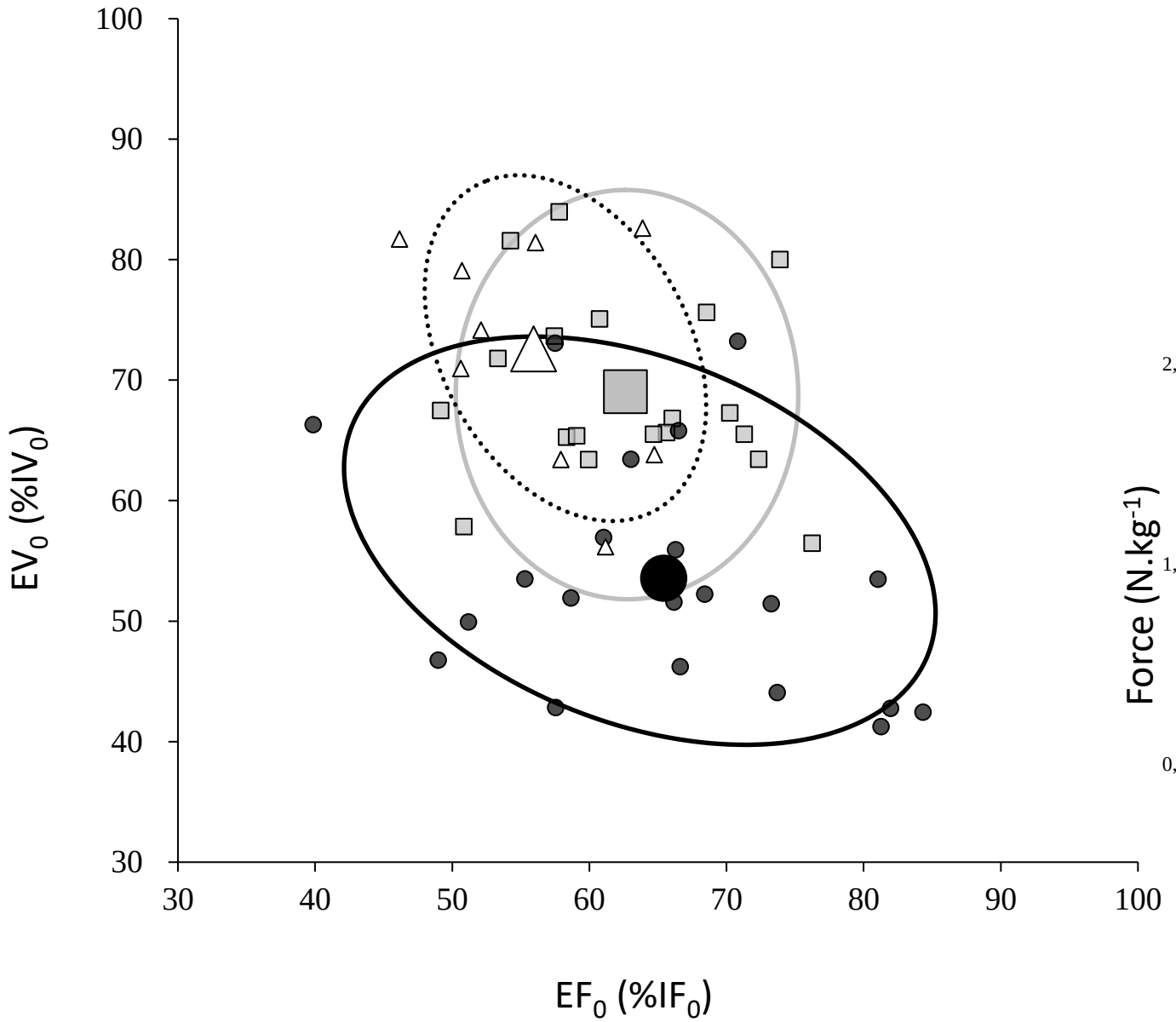

A
Power (W.kg-1)
Time (s)
Cyclist A : EP : 3.31 W.kg-1 / EPmax : 3.45 W.kg-1
Cyclist B : EP : 5.00 W.kg-1 / EPmax : 5.11 W.kg-1
Cyclist C: EP : 3.35 W.kg-1 / EPmax : 4.97 W.kg-1
Differences between final cadence and optimal cadence
EP (W.kg-1)
EPmax (W.kg-1)
Difference (in %)
B
EP
EPmax
Cadence (rpm)

Results: *initial and end-test parameters*

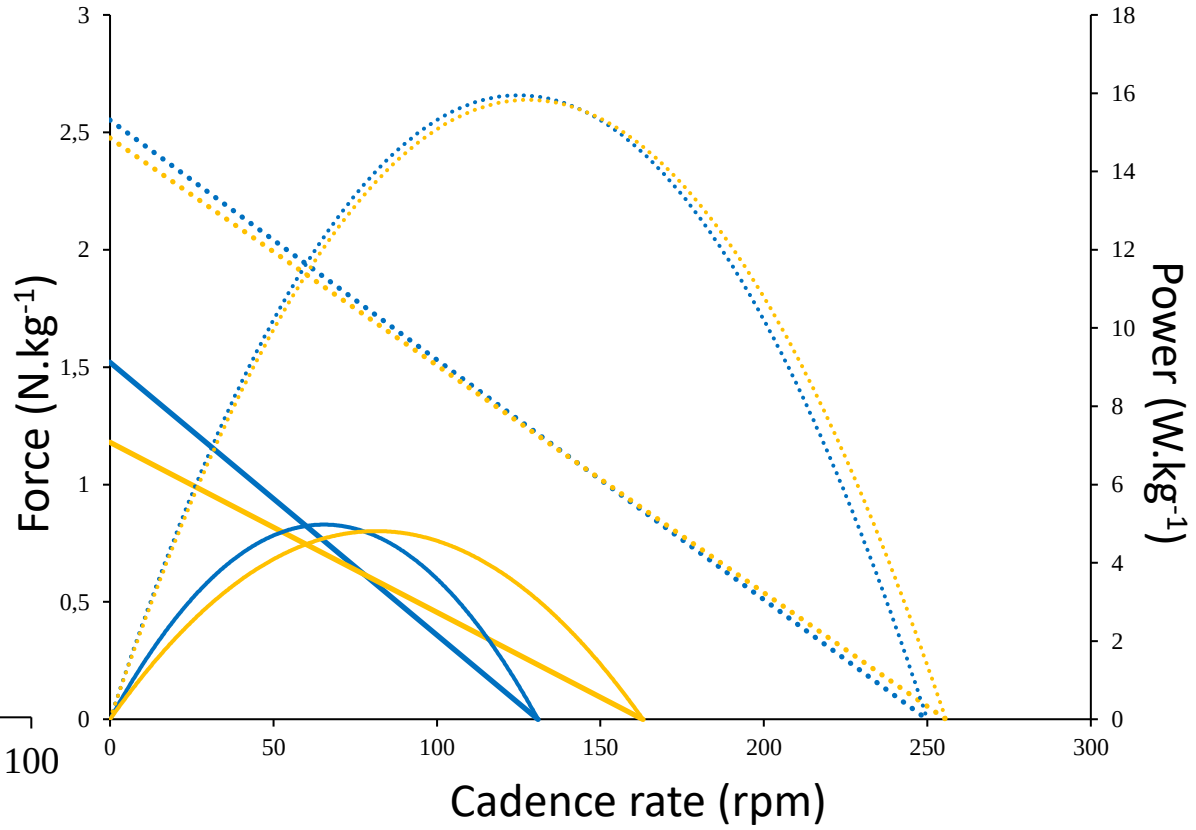




V_{0e} and F_{0e} are not correlated.



EPmax may be composed by different Force-velocity parameters.



Conclusion

- EP may underestimate the maximal end-test power.
- It is important to assess the force-velocity components of the end-test power in order to give training prescriptions or to compare athletes.

Further researches

- Comparing EP_{max} with training data.

- Finding training protocols to enhance force or velocity components of critical power.

Force – velocity components of critical power

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