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Sweet Performance: Associations of Maximum Physiological Performance and Diabetes in a Group of World Class Road Cyclists with Type 1 Diabetes

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Introduction

• It is unknown how parameters of maximum performance are associated with markers of type 1 diabetes (T1D) in world class road cyclists

Aim

• This study investigated whether markers related to T1D influence cardio-pulmonary exercise (CPX) test performance in a group of world class road cyclists with T1D

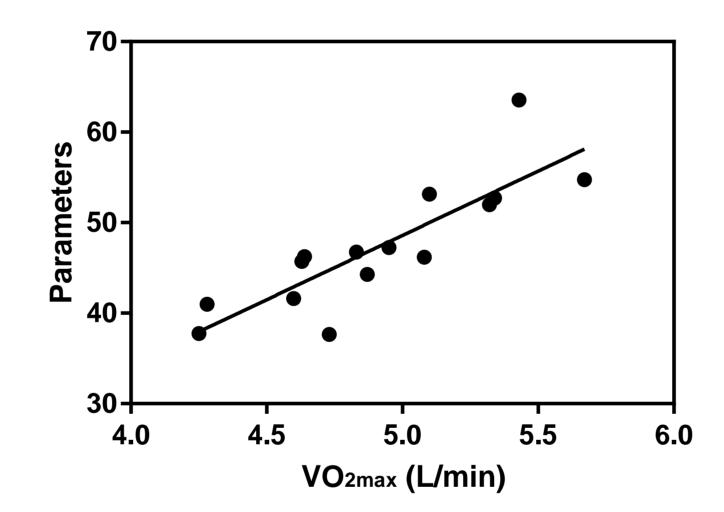
Methods

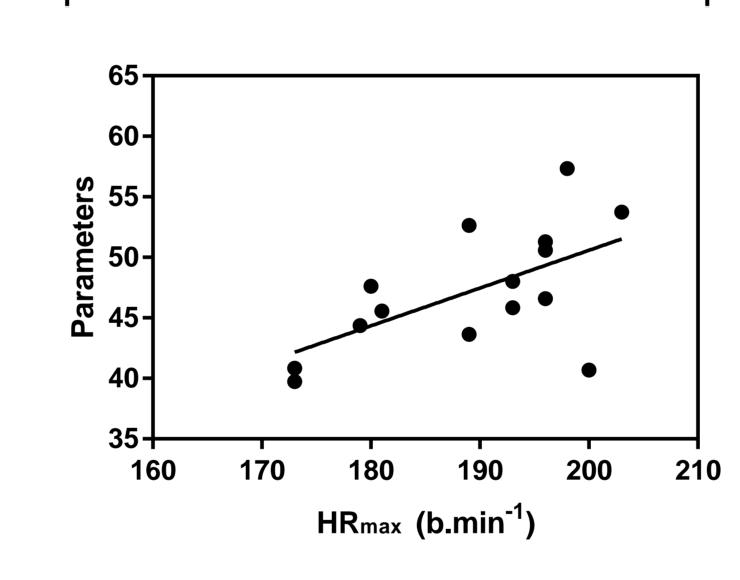
- All participants performed CPX tests on a cycle ergometer
- Both lactate turn points (LTP₁/LTP₂) were identified by a computer-aided linear regression break point analysis from the power output (P) and lactate concentration relationship ^{1,2}
- Adjusted stepwise linear regression analysis was performed to investigate relationships between markers of T1D control and absolute maximum markers of performance:
 - maximum power output (P_{max})
 - maximum oxygen consumption $(\dot{V}O_{2max})$
 - maximum heart rate (HR_{max}).
- Associations between submaximal CPX parameters and $\dot{V}O_{2max}$, HR_{max} and P_{max} were also investigated

Results

Fifteen male world class road cyclists were included in this analysis

	World Class Cyclists
BMI (kg/m ²)	21.6 ± 1.5
Age (years)	27 ± 4
HbA _{1c} (%)	7.2 ± 0.7
Diabetes Duration (years)	11 ± 5





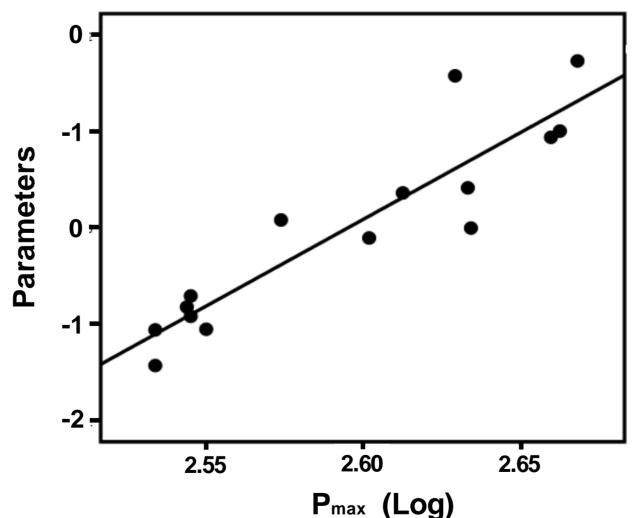


Fig. 1: Results following CPX-testing in world class cyclists with type 1 diabetes

- Starting CPX blood glucose (BG), post-CPX BG, Δ BG, T1D duration, HbA_{1c} and BMI were not associated with $\dot{V}O_{2max}$ (r^2 = 0.51, p = 0.32) and P_{max} (r^2 = 0.48, p = 0.37) during CPX testing
- HR_{max} was associated with T1D duration ($r^2 = 0.31$, p = 0.03)
- \dot{V} O_{2max} was associated with power at the heart rate turn point $(P_{HRTP})^{3,4}$ and CO_2 expiration at the lactate turn point 2 $(\dot{V}CO_{2LTP2})$ with $(r^2 = 0.87, p < 0.0001)$. These results were also associated when adjusted for T1D parameters $(r^2 = 0.95, p = 0.002)$
- HR_{max} was associated with ventilation at the LTP₂ (VE_{LTP2}), Lactate_{LTP1}, VCO_{2LTP2} and P_{LTP2} ($r^2 = 0.91$, p = 0.002). When this result was adjusted for T1D parameters the association was significant ($r^2 = 0.93$, p = 0.05)
- P_{max} was solely associated with $\dot{V}O_{2HRTP}$ (r^2 = 0.71, p < 0.0001). This association remained significant when adjusted for T1D parameters

Conclusion

This is the first dataset presenting CPX data from a world class cycle team with T1D. The study shows that not all markers of maximum physiological performance are influenced by T1D, solely HR_{max} by T1D duration. Yet, maximum performance is dependent on several submaximal cardio-pulmonary markers of performance.

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