

# 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 (LTP<sub>1</sub>/LTP<sub>2</sub>) were identified by a computer-aided linear regression break point analysis from the power output (P) and lactate concentration relationship<sup>1,2</sup>
- 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<sub>max</sub>)
  - maximum oxygen consumption ( $\dot{V}O_{2max}$ )
  - maximum heart rate (HR<sub>max</sub>).
- Associations between submaximal CPX parameters and  $\dot{V}O_{2max}$ , HR<sub>max</sub> and P<sub>max</sub> were also investigated

## Results

- Fifteen male world class road cyclists were included in this analysis

|                           | World Class Cyclists |
|---------------------------|----------------------|
| BMI (kg/m <sup>2</sup> )  | 21.6 ± 1.5           |
| Age (years)               | 27 ± 4               |
| HbA <sub>1c</sub> (%)     | 7.2 ± 0.7            |
| Diabetes Duration (years) | 11 ± 5               |

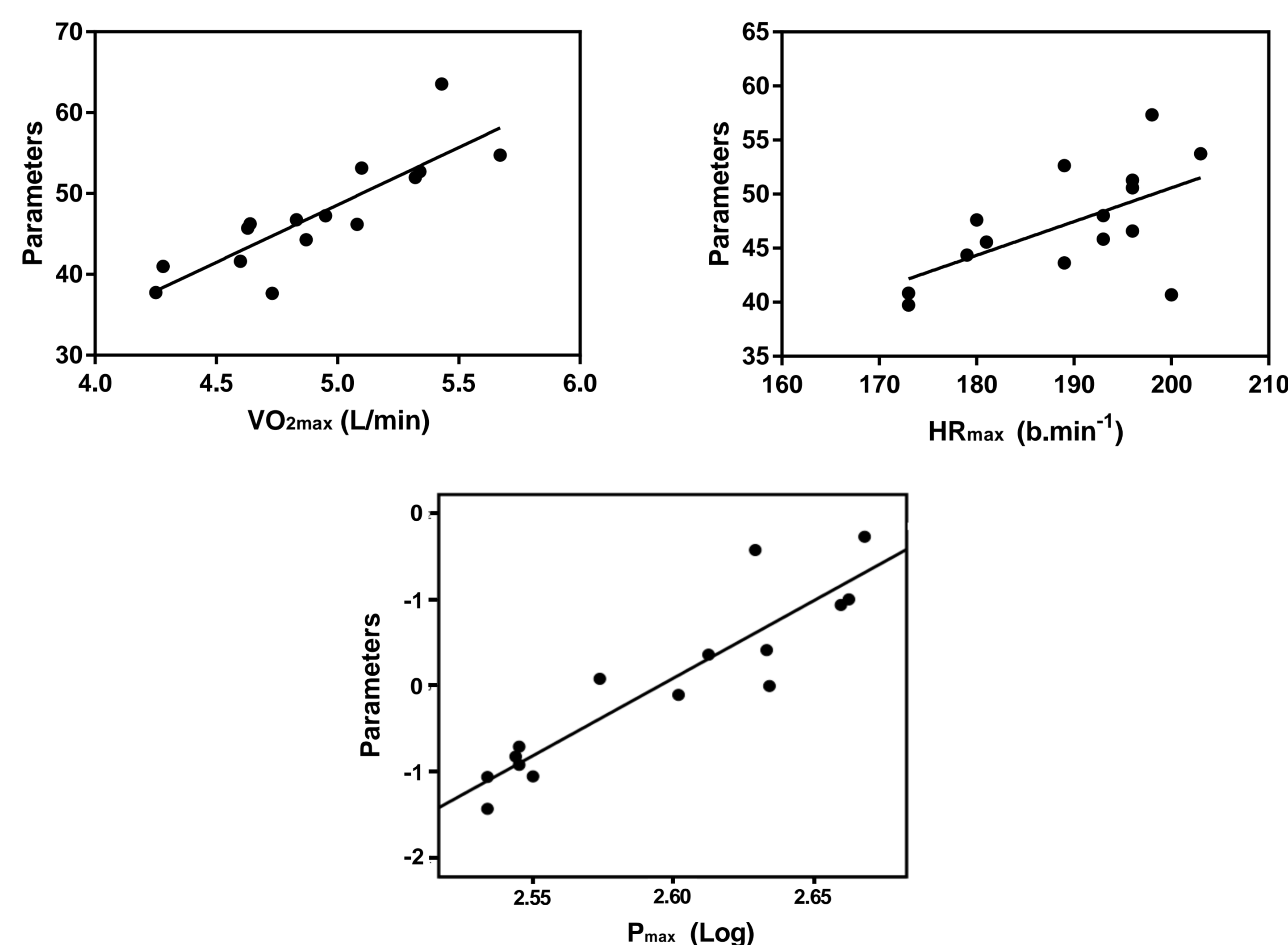


Fig. 1: Results following CPX-testing in world class cyclists with type 1 diabetes

- Starting CPX blood glucose (BG), post-CPX BG, ΔBG, T1D duration, HbA<sub>1c</sub> and BMI were not associated with  $\dot{V}O_{2max}$  ( $r^2 = 0.51$ ,  $p = 0.32$ ) and P<sub>max</sub> ( $r^2 = 0.48$ ,  $p = 0.37$ ) during CPX testing
- HR<sub>max</sub> 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<sub>HRTp</sub>)<sup>3,4</sup> and CO<sub>2</sub> 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<sub>max</sub> was associated with ventilation at the LTP<sub>2</sub> (VE<sub>LTP2</sub>), Lactate<sub>LTP1</sub>, VCO<sub>2LTP2</sub> and P<sub>LTP2</sub> ( $r^2 = 0.91$ ,  $p = 0.002$ ). When this result was adjusted for T1D parameters the association was significant ( $r^2 = 0.93$ ,  $p = 0.05$ )
- P<sub>max</sub> 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<sub>max</sub> by T1D duration. Yet, maximum performance is dependent on several submaximal cardio-pulmonary markers of performance.