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A novel formula using energy contributions to calculate pure maximum rate of lactate production (PvLa.max) during an all-out anaerobic cycling test

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INTRODUCTION:
The aim of this study was to compare previous calculating formulas of maximal lactate produced rate (La.max) and a novel formula of pure La.max (P La.max) during a 15-s maximal sprint cycling test (MSCT) and to analyse their correlations.
METHODS:
Thirty male national-level track cyclists participated in this study (n = 30). They performed a 15-s MSCT in which anaerobic power output (peak watt; Wpeak and mean watt; Wmean), peak and mean oxygen uptakes ($V\dot{O}2peak$ and $V\dot{O}2mean$), and maximal blood lactate concentrations (Lamax) were measured. These variables were utilised for different calculations of La.max and three energy contributions (phosphagen contribution; WPCr, glycolytic contribution; WGly, and oxidative contribution; WOxi). P La.max calculation considered ΔLa−, timespan until Wpeak (tPCr−peak), and contributed timespan of the oxidative system (tOxi). Other La.max values without tOxi were calculated using decreased time by 3.5% from Wpeak (tPCr −3.5%) and tPCr−peak.
RESULTS:
Absolute (kJ) and relative (%) WPCr indicated higher levels compared to WGly and WOxi. Values of WGly in kJ and % were significantly higher than WOxi ($p < 0.0001$, respectively). The value of La.max (tPCr −3.5%) was significantly higher than P La.max and La.max (tPCr−peak) (0.97 ± 0.18, 0.88 ± 0.13, and 0.85 ± 0.12, respectively; $p < 0.0001$) while La.max (tPCr−peak) was lower than P La.max ($p < 0.0001$, respectively). A very high association between P La.max and La.max (tPCr−peak) was observed ($r = 0.99$; $R2 = 0.98$). This was higher than the relationship between P La.max and La.max (tPCr −3.5%) ($r = 0.87$; $R2 = 0.77$). La.max (tPCr−peak), P La.max, and La.max (tPCr −3.5%) correlated with absolute Wmean and WGly (vs. Wmean: $r = 0.48$, 0.45, and 0.43; vs. WGly: $r = 0.73$, 0.70, and 0.61, respectively).
CONCLUSION:
P La.max as a novel calculation of La.max provides more detailed insights into interindividual differences in energy and glycolytic demands than La.max (tPCr−peak) and La.max (tPCr −3.5%). In particular, because WOxi and WPCr can differ remarkably between elite cyclists, implementing those values in P La.max can therefore establish more optimized individual responses for elite track cyclists.

Topic: Training and Testing

Presentation E-poster