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Short term parasympathetic reactivation after the LSCT: a practical tool to predict and monitor cycling performance

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Abstract

Introduction: The measurement of heart rate recovery (HRR) and parasympathetic reactivation after exercise to predict and monitor changes in training status has gained popularity over the last few years (Daanen et al, 2012, Bellenger et al., 2016). More recently, short term parasympathetic reactivation (LnRMSSD) has gained popularity as a marker of training status. However it has not yet been established over which time frame short term LnRMSSD should be measured and if gender effects LnRMSSD measurement. Therefore the aim of this study was to determine the LnRMSSD time interval with the highest reliability, determine the relationship between LnRMSSD and cycling performance and, determine if LnRMSSD is similar in male cyclists

Methods: Fifty male (5.1±0.6 W/kg) and twenty female (4.8±0.3 W/kg) cyclists participated om the study. Both HRR and LnRMSSD were captured as part of the LSCT (Lamberts et al., 2014), which was used as a warm-up before a Peak Power Output (PPO) test (including VO2max determination), and two days later before aa 40km time trial (40km TT) test. The reliability of the measurement was determined over 6 LSCT's, while 30, 60 and 90 second LnRMSSD data intervals were captured. Relationships were analysed between the most reliable LnRMSSD measurement and PPO, VO2max and 40km TT performance

Results: The reliability and associated typical error of the measurement (TEM) of the parasympathetic measurements were the lowest over the 60 second period (LnRMSSD60s) (ICC: 0.99; TEM: 7.7%). The relationship between HRR and training status was weaker than the relationship LnRMSSD60s and training status. Strong relationships were found between PPO & LnRMSSD60s in male ($r = 0.93$; $p < 0.0001$) and female ($r = 0.85$; $p < 0.0001$) cyclists. Slightly weaker relationships were found between VO2max & LnRMSSD60s in male ($r = 0.71$; $p < 0.0001$) and female ($r = 0.63$; $p < 0.0001$) cyclists and 40km TT time & LnRMSSD60s in male ($r = -0.83$; $p < 0.0001$) and female ($r = -0.63$; $p = 0.003$) cyclists. Although similar slopes were found in male and female cyclists, the y-axis intercept was significant different in all three performance parameters relationships with LnRMSSD60s ($p < 0.0001$).

Discussion: Short term parasympathetic reactivation after the LSCT is a promising new parameter that will assist in more accurately predict and monitor training status in cyclists. The most reliable LnRMSSD measurement was found over a 60s period (LnRMSSD60s). Good relationship between LnRMSSD60s and PPO, VO2max and 40km TT were found both in male and female cyclists. Although similar relationships were found in male and female cyclists, different y-axis intercept were found. This finding indicates that LnRMSSD60s values in female cyclists relate differently to training status than in male cyclists. Although this study used the relationship between LnRMSSD60S and cycling performance parameters (PPO, VO2max and 40km TT time), the author would like to emphasize that the actual LnRMSSD60s measurement should be used for monitoring purposes and not the predicted cycling performance values. In addition, the author would like to emphasize that a multi-factorial approach (e.g. power, cadence and RPE from the LSCT) should be used to predict, monitor, and fine tune training prescription in cycling.

Keywords: Cycling, LSCT, Monitoring, HRR, RMSSD

References

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