

MONITORING CHANGES IN PHYSICAL PERFORMANCE IN YOUNG HIGHLY-TRAINED FOOTBALL PLAYERS USING HEART RATE MEASURES

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Introduction

Exercise heart rate (HR_{ex}), HR recovery (HRR) and post-exercise HR variability (HRV) during and after a submaximal running test (i.e., 5'-5' test¹) have been proposed as non-invasive markers of players' fatigue and/or fitness level¹. A decrease in HR_{ex} and an increase in HRR are generally indicative of improved fitness levels. Conversely, an increase in HR_{ex} has been used as a marker of non-functional overreaching. Cardiac autonomic activity as inferred from HRV measures can also play a role in the training response. The aim of the present study was to verify the validity of these HR measures to track possible changes in physical performance over an entire competitive season in young highly-trained football players.

Methods

Data from 65 players (age 15.1±1.5 y; 0.6±1.4 y from peak height velocity, height 164.3±10.3 cm; body mass 53.7±11.1 kg) presenting complete data over two consecutive testing sessions (October to January, or January to May) were analyzed. Tests consisted in the 5'-5' test (5-min 9 km/h-run followed by a seated 5-min recovery), a counter movement jump (CMJ), acceleration (Acc) and maximal sprinting speed (MSS) obtained during a 40-m sprint with 10-m splits, repeated sprints (10 x 30-m sprints, RS) and an incremental running test to estimate maximal aerobic speed (MAS). Possible changes in physical performance were examined for the players presenting either a substantial decrease or an increase in HR measures over two consecutive testing sessions (greater than 3, 13 and 10% for HR_{ex}, HRR and HRV, respectively¹).

Results & Discussion

A within-player decrease in HR_{ex} (Figure 1) or an increase in HRV were associated with likely improvements in MAS, while opposite changes lead to unclear changes in MAS. There was 99% more chance to observe an improvement in MAS for players showing a decrease than an increase in HR_{ex}. None of the other performance variable changes could be predicted by the HR measures.

Conclusions

Monitoring HR_{ex} and HRV is effective to track changes in MAS only. Present data question however the use of an increase in HR_{ex} as a systematic marker of non-functional overreaching.

References

1. Buchheit, M. et al. (2010). *Eur J Appl Physiol*, 109(5):869–878.

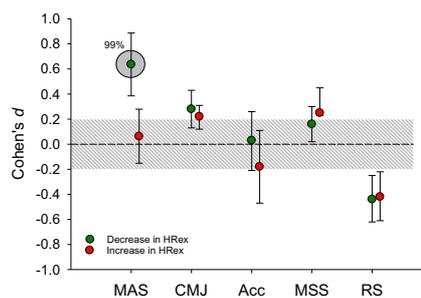


Figure 1. Changes (Cohen's d or effect size) in the performance variable for players showing a substantial decrease (green) or increase (red) in submaximal exercise HR (HR_{ex})