

Load ratios during a cycling Grand Tour: detecting fatigue?

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Introduction

Previous research has suggested the integration of subjective and objective variables when monitoring the fatigue state of athletes (Halson, 2014: Sports Medicine, 44(2), 139-147). However, there is limited information on the integration of different subjective and objective measures of load based on rating of perceived exertion (RPE), heart rate (HR) and power output (PO) to detect the fatigue state of cyclists. This study evaluated the changes in integrated ratios of different load measures (session-RPE; sRPE, individualized TRIMP; iTRIMP, Training Stress ScoreTM; TSS) of professional cyclists during baseline training and during a Grand Tour.

Methods

RPE, PO and HR data was collected from twelve professional cyclists (VO_{2max} : 75 ± 6 ml·min·kg⁻¹) during the 2016 Giro d'Italia and Vuelta a España and in the 2 weeks before the start of the Grand Tours to provide baseline training data. Subjective:objective load (sRPE:iTRIMP, sRPE:TSS) and external:internal load (TSS:iTRIMP) ratios were calculated for every training session or stage in the Grand Tour. The ratios were compared to each other using a multilevel random intercept model using Tukey's method for pairwise comparisons.

Results

When compared to baseline training data, *small to moderate* increases ($d = 0.21 - 1.17$) in the sRPE:TSS and sRPE:iTRIMP ratios were observed during a Grand Tour whilst differences in the TSS:iTRIMP ratio were *trivial to small* ($d = 0.03 - 0.27$). There were no clear decreasing or increasing trends observed in load quantified using sRPE, TSS and iTRIMP over the course of the Grand Tour with load being highest in the second week for all three measures. However, the slope of linear relationship between sRPE and TSS and sRPE and iTRIMP increased with every week of the Grand Tour. Thereby, we observed a continuous increase in the sRPE:TSS and sRPE:iTRIMP ratios during the three weeks of the Grand Tour (Figure 1). A *small* increase in the sRPE:TSS ratio was observed when comparing week 3 with week 1 ($d = 0.49$) and week 2 ($d = 0.34$) of the Grand Tours. A *small* increase in the sRPE:iTRIMP was observed when comparing the third to second week ($d = 0.28$). *Small* increases in the TSS:iTRIMP ratio were observed comparing the third week to first week ($d = 0.25$) and second week ($d = 0.39$) of the Grand Tours.

Conclusions

These results show the continuous increases in subjective:objective load ratios during the course of a Grand Tour. Accumulated fatigue caused by the demanding nature of Grand Tours most likely contributes to these results. The changes were not reflected in solitary load measures suggesting that ratios can provide valuable additional information when monitoring athletes. The gradual increase in subjective:objective load ratios could indicate increasing fatigue that is not necessarily reflected by changes in solitary load measures. Future research should evaluate the use of integrated load ratios during the daily training process to monitor the fatigue state.



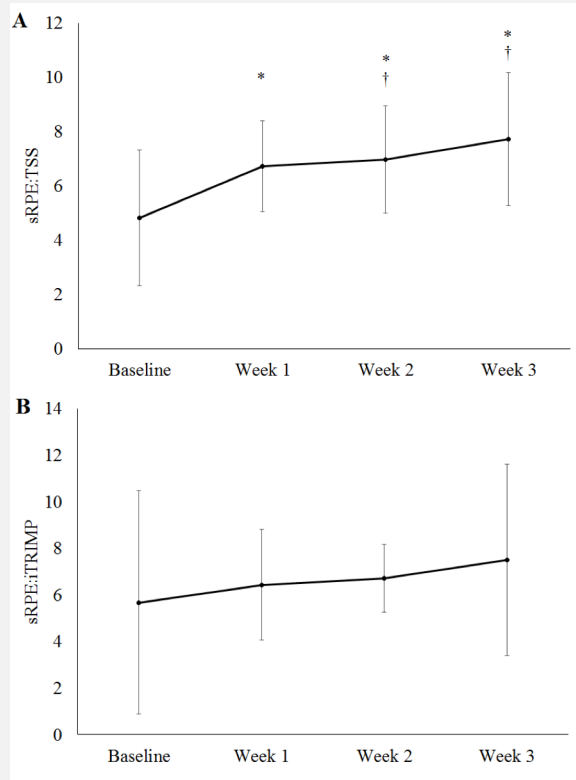


Figure 1. sRPE:TSS ratio (A) and sRPE:iTRIMP ratio (B) during baseline training and grand tour data. * Significantly different from baseline training data ($P < 0.05$). † Significantly different from week 1 ($P < 0.05$). sRPE = session rating of perceived exertion training load; TSS = Training Stress Score™; iTRIMP = individualized TRIMP.

Key words: cycling, training load, fatigue

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