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Pre-season and in-season internal training load quantification of one-week schedules in under-17 European soccer team

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ABSTRACT

The aim of this study was to compare internal training load (ITL) of starters versus non-starters from the same under-17 soccer team. Rated of perceived exertion was collected and then multiplied by training or match duration (s-RPE) from twenty-three soccer players. The study analysed a total of 2 matches and 8 training sessions during the in-season with ANOVA with repeated measures. The main results showed higher values in pre-season for training duration (103.3 vs 90.0 min, p=0.000) in MD-5 and (103.7 vs 96.7 min, p>0.05) in MD-3 than in-season, but lower values for training duration (103.2 vs 112.0 min, p=0.013) in MD-4 and (84.0 vs 97.2 min, p=0.000) in MD-2 than in-season. s-RPE was higher in pre-season than in-season (725.5 vs 481.3 a.u., p=0.000) in MD-5 and (755.8 vs 655.2 a.u., p=0.031) in MD-3 but lower (705.2 vs 821.3 a.u., p=0.002) in MD-4 and (476.0 vs 559.0 a.u., p=0.020) in MD-2 than in-season. This study present relevant additional ITL data for pre-season and in-season that could be used to adjust periodization in under-17 soccer players.

Key words: soccer training; internal load; training load, periodization, RPE, monitoring.

INTRODUCTION

As an index of perception of exertion of internal training load (ITL), rated of perceived exertion (RPE) is an integration of afferent neural signals from various physiological systems to the brain (Abbiss et al., 2015). Gaudino et al. (2015) used the training duration multiplied by the RPE to generate the session-RPE (s-RPE) and reported that s-RPE was significantly correlated with the highspeed running distance, number of impacts, and accelerations in elite soccer players. In addition, Impellizzeri et al. (2018) recommended to use ITL as primary measure when monitoring athletes because it determines the training outcome experienced from a specific external load applied. This is an easier and low-cost tool that could be used

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during an entire season. According to Bompa and Haff (2009), pre-season phase consists in the period before the beginning of competitions and its goal is to promote physical, technical and psychological base. Generally, this phase is associated by an increase in training volume during approximately 6 weeks. Then, competition phase, known as in-season phase, consists in high-intensity period of training and matches during approximately 40 weeks. The emphasis of this phase is to allow soccer players to give the best performance in soccer matches by keeping sport-specific fitness, developing technical and tactical soccer actions, and reducing fatigue (Bompa & Haff, 2009). Therefore, the aim of this study was to analyse ITL between pre-season versus in-season and between player positions from the same team during the in-season 2017-2018.

MATERIAL AND METHODS

Participants

Twenty-one male under-17 soccer players belonging to a Portuguese team with a mean ± SD age, height and mass of 16.0 ± 0.2years, 173.9 ± 0.1cm and 65.3 ± 4.2kg, respectively, participated in this study. They consisted in four central defenders (CD), three wide defenders (WD), six central midfielders (CM), three wide midfielders (WM) and three strikers (ST). Inclusion criteria were regular participation in most of the training sessions (100% of weekly training sessions).

Measures

Each individual RPE value was multiplied by the session duration to generate a session-RPE (s-RPE) value. All explanations of this measure were reported in previous study (Oliveira et al., 2019a, 2019b).

Procedures

The weeks from pre-season and in-season phases were analysed in relation to the number of days away from the competitive one-match week (i.e., match day minus) where the team trained four days a week (match day [MD] minus [-]; MD-5; MD-4; MD-3; MD-2) with one match-day (MD) (Oliveira et al. 2019a). Data from rehabilitation or additional training sessions of recuperation were excluded. This study did not influence or alter the training sessions in any way. Total minutes of training sessions included warm-up, main phase and slow down phase plus stretching. All participants were familiarized with the training protocols prior to investigation. This study was conducted according to the requirements of the Declaration of Helsinki and was approved by the institution's research ethics committee.

Analysis

Data were analysed using SPSS version 22.0 (SPSS Inc., Chicago, IL) for Windows statistical software package. Initially, descriptive statistics were used to describe and characterize the sample. Shapiro-Wilk and the Levene tests were used to assumption normality and homoscedasticity, respectively. ANOVA with repeated measures was used with Bonferroni post hoc, once variables obtained normal distribution (Shapiro-Wilk>0.05) to compare days away from the competitive match fixture and player positions. Also, it was used ANOVA Friedman and Mann-Whitney tests were used for the variables that not obtained normal distribution to compare different scenarios. Results were significant with $p \leq 0.05$.

RESULTS

In training duration from pre-season, there were significant differences between all player positions for MD-5 and MD-4 ($p<0.000$). Also, there were significant differences between CD vs ST (61.3 vs 36.7min, $p=0.034$), WD vs ST (71.3 vs 36.7 min, $p=0.004$), CM vs ST (62.2 vs 36.7 min, $p=0.015$), WM vs ST (80.0 vs 36.7 min, $p=0.000$). Regarding s-RPE, there were significant differences between CM vs WM (914.7 vs 784.0 a.u., $p=0.038$) and CM vs ST (914.7 vs 746.7 a.u., $p=0.005$) in MD-4. Also, there were significant

differences between CD vs WD (428.8 vs 521.7 a.u., p= 0.07), WD vs ST (521.7 vs 273.3 a.u., p=0.03), CM vs WM (452.7 vs 640.0 a.u., p=0.010) and CM vs ST (452.7 vs 273.3 a.u., p=0.014) in MD.
In training duration from in-season, there were significant differences between all player positions for MD-5 (p<0.000). No differences were found for any other training or match duration. No differences were found regarding s-RPE between any training session or match.
Training duration was higher in pre-season than in-season (103.3 vs 90.0 min, p=0.000) in MD-5, (103.7 vs 96.7 min, p>0.05) in MD-3. When comparing pre-season with in-season, training duration was lower in pre-season than in-season (103.2 vs 112.0 min, p=0.013) in MD-4 and (84.0 vs 97.2 min, p=0.000) in MD-2. No differences were found for training duration when comparing pre-season with in-season in MD. s-RPE was higher in pre-season than in-season (725.5 vs 481.3 a.u., p=0.000) in MD-5, (755.8 vs 655.2 a.u., p=0.031) in MD-3. When comparing pre-season with in-season, s-RPE was lower in pre-season than in-season (705.2 vs 821.3 a.u., p=0.002) in MD-4 and (476.0 vs 559.0 a.u., p=0.020) in MD-2. No differences were found for s-RPE when comparing pre-season with in-season in MD.

DISCUSSION

The main finding of this study highlights that pre-season presented higher values of ITL than in-season in MD-5 and MD-3, however in-season presented higher values of ITL than pre-season in MD-4 and MD-2. These finding are not in line with periodization proposed by Bompa and Haff (2009) where pre-season phase should have higher values in all training sessions. Another finding is related to the player positions comparisons. Pre-season revealed that ST performed training session with lower durations than other positions. Also, CM and WM presented higher values when compared to other positions. However in in-season phase there were no differences between player positions for training duration or s-RPE which is in line with Oliveira et al. (2019b). Possible explanations could be associated to the volatile construct of s-RPE that can be dissociated from the physiological process as reported in Oliveira et al. (2019b).

CONCLUSIONS

The most relevant conclusion indicates that is still not well characterized pre-season and in-season phases. Our data provides additional information regarding ITL that could be used to adjust periodization to under-17 soccer players.

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