Journal of Physical Education and Sport ® (JPES), 18(2), Art 99, pp. 677 - 685, 2018
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Monitoring stress, mood and recovery during successive basketball matches

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Published online: June 30, 2018
(Accepted for publication May 08, 2018)
DOI:10.7752/jpes.2018.02099

Abstract:
Objective: To explore the participation and attitude of institutionalised elderly towards Physical Activity. Method: This study is cross-sectional in time with a quantitative paradigm approach. The sample consists of 113 institutionalised elderly people (mean 82.96 ± 7.03 years of age). A questionnaire was used to collect data which was statistically analysed. This questionnaire was constructed by the researcher who used tests also validated by other authors. Results: The participation of the elderly was higher than inactivity. The general attitude towards physical activity was found to be positive. The frequency of participation influenced the attitude towards physical activity (Kruskal-Wallis; $p \geq 0.01$). Conclusion: The elderly people in this study were found sedentary lifestyle, however they had a generally positive attitude towards Physical Exercise. The frequency of participation seems to influence the attitude towards Physical Activity.
Key words: sport; physical education and training; athletes.

Introduction

Sports competitions are characterized when one or more individuals perform certain actions aimed at achieving a goal, and these actions require confrontation between individuals or groups of individuals of the same species motivated by the same purpose (Salvador, 2005). Thus, during sports competitions, it is expected that the individuals are subjected to a great psychophysiological demand that can directly influence the sporting results (Gonzalez-Bono, Salvador, Serrano, & Ricarte, 1999; Montgomery, Pyne, & Minahan, 2010; Moreira et al., 2012).

Some sport modalities such as basketball, which is characterized as an intermittent exercise modality with different high-intensity actions, require a significant physiological demand from the athlete, specifically anaerobic power, speed, agility, aerobic endurance and muscular strength (Abdelkrim, El Fazaa, & El Ati, 2007). These particularities are more evident in competitive matches since cardiorespiratory variables and the distance covered are higher during competitive matches compared to training matches (five on five) (Montgomery et al., 2010). This condition can be intensified in competitions where successive matches can happen in a short time and with short recovery period (Montgomery et al., 2008). Thus, in this scenario it is evident that there should be greater concern with the monitoring of competitive load in order to adjust the recovery process of the players, especially for those who are more susceptible to the stress generated by this condition. Thus, some instruments are being used to manage the competitive load which monitor how much this stressor is perceived by the players in an attempt to identify their fatigue level immediately after the matches and the readiness state for the next match. Among the instruments to monitor internal loads imposed by the matches (competitive load), the session rating of perceived exertion (session-RPE) (Foster et al., 2001) can be highlighted due to its sensitivity and validity in both of several individual and team (Haddad, Stylianides, Djaoui, Dellal, & Chamari, 2017) sports modalities, and for being a method of easy applicability, low cost and simple interpretation. In addition, other instruments such as stress questionnaires and questionnaires regarding the identification of mood fluctuations at different moments are used to contribute to determining the stress level and mood disturbances during training and competitions, as these indicators are an important instrument for monitoring fatigue progression towards overtraining (Saw, Main and Gastin, 2016).

Understanding the psychophysiological components is being evidenced in the literature from applied approaches in the training routines (Arruda et al., 2013) and in simulated and official matches (Moreira, McGuigan, Arruda, Freitas, & Aoki, 2012). Thus, with the aim of evaluating the stress generated by training and competition in athletes, some studies have been carried out using psychometric instruments (stress and mood questionnaires) in order to monitor the different training periods (load intensification, precompetitive and competitive periods) (Di Fronso, Nakamura, Bortoli, Robazza, & Bertollo, 2013; Moreira et al., 2012a).

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In addition to the need to monitor fatigue after training or competition, it is important to identify the state of readiness of the athlete for a new training session or competition (Jaspers, Brink, Probst, Frencken, & Helsen, 2017), since monitoring of the athlete's recovery is essential for organizing the next training load and to demonstrate the readiness to perform, risk of illness or injury and return to playing (Bourdon et al., 2017). Thus, several studies demonstrate the use of psychometric instruments and performance measures that can demonstrate the readiness of the players before the next stimulus (Jaspers et al., 2017; Kentta & Hassmen, 1998; Wallace, Slattery, & Coutts, 2014), as these aspects are strongly interrelated with load (Jaspers et al., 2017; Kentta & Hassmen, 1998).

Among these tools, the total quality recovery (TQR) scale (Kentta & Hassmen, 1998) and the vertical jump height (VJH) are used alone or in combination in an attempt to monitor the player's recovery, and may offer better subsidies for training or competitive load control when associated with fatigue monitoring instruments during the season. In addition, as a result of this monitoring some studies are consistent in demonstrating that official matches result in significant physiological stress for a period of 24 hours or more after match (Montgomery et al., 2010; A. Moreira et al., 2012). Consequently, the need to analyze how athletes respond to competitions composed of successive matches performed in short recovery periods, and especially with a rest period of less than 24 hours is evident.

Therefore, the psychological behavior regarding perceived exertion, mood, and stress tolerance, as well as readiness and recovery status in basketball athletes who perform several consecutive competitive matches with a short recovery period has been little explored in the literature. This knowledge could be useful for sports scientists and practitioners working with basketball teams who are often faced with this situation in a practical setting, in an attempt to understand the possible effect of successive competitive stress on the recovery process and on the psychological and physical responses of players.

Thus, the objective of the present study was to analyze the competitive internal load (session-RPE), stress tolerance (Daily Analysis of Life Demands in Athletes, DALDA), mood states (using the Brunel Mood Scale, BRUMS), and competitive recovery (Total Quality Recovery - TQR and vertical jump height - VJH) during four successive basketball matches within a three day-period. It was hypothesized that successive matches being performed in a very short recovery period (less than 24-h) would increase the internal load while decreasing stress tolerance and total quality recovery. In addition, fluctuations in the mood state as well as a decrease in vertical jump performance are expected as a consequence of possible accumulated stress.

Material & methods

Experimental Approach

The present study was characterized as being quantitative with a non-experimental and descriptive cross-sectional design. It was developed during a university sports competition. The participants (university basketball players) were assessed throughout the competition for three successive days in order to recognize the effect of successive matches on their psychological and physical responses. On the first day (Day 1) two matches were played in the evening (8:00 pm and 10:00 pm), one match on day 2 (Day 2) in the afternoon (4:00 pm), and finally one match on the 3rd day (Day 3) also in the afternoon (noon), totaling four matches. The players were required to complete a daily log with questionnaires (DALDA and BRUMS) and scales (TQR and Borg CR-10) during the competition days before and after the matches and always in the same sequence (Figure 1). All players were familiarized with the all tools used by at least 6 months.

The matches consisted of four quarters of 10 consecutive minutes each (each quarter runs continuously), with a 1-minute break between first and second quarters and the third and fourth quarters, while the break at half-time was 3-minutes, thus the total time of each match was 65-min. A standard 20-min warm-up was performed before each match comprising aerobic exercise, static and dynamic stretching and basketball drills. The official competition was preparatory to the main university competition of Brazil. Each assessed official match was played against a different team. The three opponent teams have had different difficulty levels according to the University Sports Ranking of Brazilian Confederation of University Sports (efficiency awards of year before).

Opponent level

The opponent level was established according to Kelly and Coutts (2007) and Robertson and Joyce (2015), and was considered the teams' classification in the university ranking of the previous year, and the match location. A 3, 2 and 1 point from ranking scale from best to worst position was implemented, with 2 and 1 point for the location (home and away, respectively). The day between the matches was not utilized since all teams had the same recovery time. Thus, the host team was classified as the most difficult (Team 1 – 5 points), followed by the team assessed in this study (Team 2 – 3 points) and finally the third team with less difficulty (Team 3 – 2 points). Regarding the result of the competition, in the first two matches played by the assessed team there was a win and a defeat (Team 2 - 64 vs. Team 3 - 33 points, and Team 2 - 40 vs. Team 1 - 43 points, matches 1 and 2, respectively), and in the third match there was another win (Team 2 - 45 vs. Team 1 - 22 points). In the final match, they needed to win by at least four points advantage to be champions. Although they had won the match, the score was Team 2 56 vs. Team 1 54 points, ranking 2nd in the competition.

Participants

Twelve volunteers (mean ± SD: age, 20.8 ± 2.1 years; height, 1.84 ± 0.1m; body mass, 83.2 ± 12.4 kg) were recruited for this study and their data were retained for analysis based on the participation of the players in four assessed official matches according to previous studies (Arruda et al., 2014; Arruda, Aoki, Paludo, & Moreira, 2017; Moreira et al., 2013; Moreira et al., 2012a). Participants were all university players selected by the university sports committee to participate in the competition.

All players were duly informed of the research procedures and agreed to participate voluntarily, signing the informed consent form. The players presented a training background in the modality since the school period, with experience in university sport competitions of regional and national character. The players were used to participating in four training sessions a week (120–150 minutes per session), and were in the pre-competitive period of sports preparation. The training involved physical and technical training on two days of the week (Monday and Wednesday) and technical and tactical training on other two days (Friday and Saturday). No recovery strategy was adopted during the competitive period evaluated such as supplements, sports drinks, or cold-water immersions, compression or massage. Moreover, there were no reports of injuries during the competition. The study was approved by the ethics committee of the Federal University of Ceará (n ° 84097/2012).

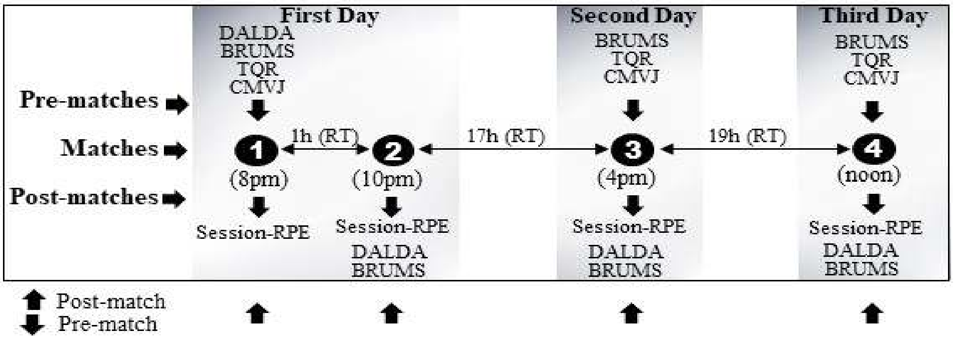

Fig. 1 The experimental flowchart. DALDA, Daily Analysis of Life Demands in Athletes; BRUMS, Brunel Mood Scale; TQR, Total Quality Recovery; CMVJ, Countermovement Vertical Jump and session-RPE of each match. Pre-matches, measurements before the match; Post-matches, measurements immediately after the match; RT indicates recovery time between the matches.

Match internal load

The match internal load (MIL) was quantified at the end of each match using the session-RPE method as proposed by Foster et al. (2001). The values were obtained from the product of the perceived exertion value on the CR-10 scale by the match duration in minutes, and the total time of the match from the start to the end of the matches including all stops was considered for all evaluated subjects, in accordance with previous studies (Haddad et al., 2017; Moreira et al., 2012a). The perceived exertion values were obtained approximately 30 minutes after the matches through the following question: "How was the effort in the match?". The result, time x RPE, is presented in arbitrary units (UA) and represents the internal load response to the physiological stress of the matches.

Stress tolerance

Daily Analysis of Life Demands in Athletes – DALDA (Rushall, 1990) was used before the first match (baseline) and at the end of each of the three days of competition to assess stress tolerance, according to Rushall, (1990). This instrument was validated for Portuguese by Moreira and Cavazzoni (2009). The questionnaire consists of two parts; the first refers to sources of stress (part A - nine questions) and the second part concerns stress symptoms (part B - 25 questions). Each item is evaluated according to the athlete's perception, being classified as "worse than normal", "normal" or "better than normal". In order to evaluate the stress tolerance (ST) throughout the competition, values were assigned to the items of the questionnaire ("worse than normal" = 1, "normal" = 2 and "better than normal" = 3), and lastly the sum of the values was obtained in each part (parts A and B) of the questionnaire. Thus, a high score indicates that the athlete was more tolerant to stress and vice-versa (Freitas et al., 2014).

Mood state

Mood state (MS) was measured using Brunel Mood Scale (BRUMS), validated to be used in the Brazilian population by Rohlfs et al. (2008). The instrument contains 24 simple mood descriptors such as angry, energetic, nervous, and unhappy, and was applied before warm-ups (20 minutes) and at the end of each day of competition (20 minutes after matches). The participants were asked to rate "How do you feel now"? and they had to indicate whether they have experienced such feelings on a 5-point scale (0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely) (Rohlfs et al., 2008). After that, we verified the variation of scores of tension, depression, anger, vigor, fatigue and confusion pre and post-match. Furthermore, Total Mood Disturbance (TMD) was verified subtracting the values of the five negative sub-scales (anger, tension, confusion, depression, fatigue) from the vigor value, adding a constant of 100. Thus, higher scores indicate worse state of mood (Rouveix, Duclos, Gouarne, Beauvieux, & Filaire, 2006).

Total Quality Recovery

Players' recovery status was determined prior to the competition and before each match day using the Total Quality Recovery scale – TQR (6-20 scale) (Kentta & Hassmen, 1998). Participants answered the question: "What is your condition now?". The players were clarified about the scale extremes, with "6" being the value in which the athlete is considered as "nothing recovered" going to "20" which refers to "fully recovered". This tool has been used in several studies with a similar approach (Crowcroft, McCleave, Slattery, & Coutts, 2017; Freitas, Nakamura, Miloski, Samulski, & Bara-Filho, 2014).

Vertical Jump Height

The Countermovement Vertical Jump test (CMVJ) was performed to evaluate the vertical jump height (VJH). The players were evaluated in rest condition before each match. The CMVJ was performed according to the procedures of Bosco, Luhtanen, & Komi (1983). The best jump was chosen after three maximum attempts with 30-second intervals. A contact mat and the Jump System Pro software (*Cefise*®, Brazil) were used for the VJH measurement. The intraclass correlation coefficient between jump measurements was 0.96, 0.95 and 0.98 on the three days of competition, respectively.

Statistical Analyses

Data normality was assessed by the Shapiro–Wilk's test. The Friedman's test was used to examine differences between matches for IL in each match, and the ST, MS and TMD throughout the days of competition. Post hoc Wilcoxon test was utilized when a significant value was found. The Wilcoxon test also compared the mood subscales and TMD values before and after each match. An analysis of variance (ANOVA) with repeated measures was used to examine the differences between QTR and VJH values on competition days, followed by post hoc Bonferroni when found in significant F values. The level of significance was set at $\rho < 0.05$. The effect size (ES) was calculated considering as trivial (≤ 0.2) small (> 0.2-0.6), moderate (> 0.6-1.2), large (> 1.2-2.0), very large (> 2.0-4.0) and extremely large (> 4.0) (Hopkins, Marshall, Batterham, & Hanin, 2009). The internal consistency of mood scale and stress questionnaire were verified by Cronbach´s α (DALDA, Part A = 0.73, Part B = 0.72, BRUMS, pre = 0.71, post = 0.73), considering values of 0.7 or greater as reliable (Crowcroft et al., 2017; Freitas et al., 2014a).

Results

The values of competitive internal load obtained by the session-RPE method demonstrated a significant main effect ($\chi 2$ (3) = 13.71; $\rho = 0.003$). As seen in Figure 2, post hoc testing revealed a significant difference between matches 1 and 4 (240.0 ± 122.4 vs 405.3 ± 212.0 UA, $\rho = 0.04$; ES = -1.0 moderate), 2 and 3 (218.7 ± 92.38 vs 431.7 ± 219.0 UA, $\rho = 0.003$; ES = 1.1 moderate) and between matches 3 and 4 ($\rho = 0.02$; ES = -1.2 moderate).

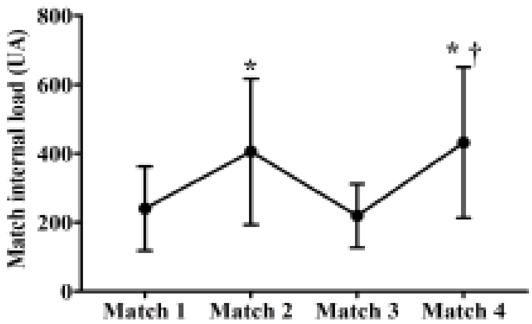

Fig. 2 Variation of the internal load for each basketball match. *Significant difference from match 3; †Significant difference from match 1.

Regarding stress tolerance throughout the competition, it was observed that the sources (part A from DALDA) and symptoms (part B from DALDA) did not change significantly (Sources $\chi^2_{(3)} = 5.483$, $\rho = 0.139$, Pre matches (mean ± standard deviation) 18.5 ± 3.0; Day 1: 19.4 ± 3.0; Day 2: 17.6 ± 3.0; Day 3: 19.4 ± 3.0 and symptoms $\chi^2_{(3)} = 5.44$; $\rho = 0.141$, Pre matches: 50.5 ± 7.0; Day 1: 47.3 ± 12.0; Day 2: 46.3 ± 6.0; Day 3: 44.6 ± 5.0). The effect size for stress tolerance for part A (sources) remained "small" values on all days of competition. (Day 1 ES = 0.3 small, Day 2 ES = 0.4 small and Day 3 ES = 0.07 trivial), while part B (symptoms) increased as a function of the match days compared to the pre-match moment was from "small" to "moderate" on the third day of competition (symptoms: Day 1 ES = 0.31 small, Day 2 ES = 0.63 moderate and Day 3 ES = 0.94 moderate).

The MS score for all sub-scales of BRUMS is shown in Figure 3. The sub-scales anger, depression, fatigue and vigor were more sensitive to stress triggered by matches, presenting higher scores (anger, depression, fatigue) and minor (vigor) at the end of the competition days (ρ < 0.05). In addition, the TMD increased at the end of each match during the competition (Day 1: before: 100.3 ± 6.4, after: 124.0 ± 14.1, ρ < 0.001, ES: - 1.9 large; Day 2: before: 100.8 ± 5.3, after 113.3 ± 14.8, ρ = 0.01, ES: -1.0 moderate; Day 3: before: 104.7 ± 11.48, after: 123.7 ± 17.30 ρ = 0.002, ES: -1.4 large). We also did not observe any cumulative effect of the TMD throughout matches (ρ > 0.05).

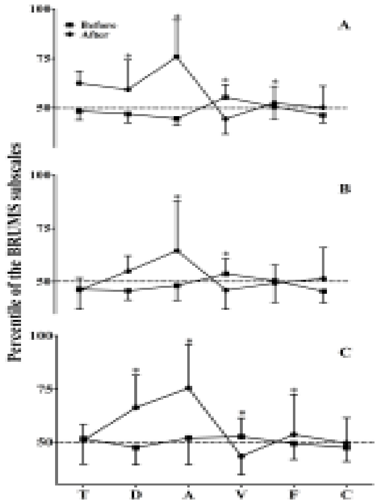

Fig. 3. Variation of mood state in each day of competition. T: Tension; D: Depression; A: Anger; V: Vigor; F: Fatigue; C: Confusion. *Significant difference from before (p < 0.05). (A) Day 1 (two matches); (B) Day 2 (one match); (C) Day 3 (one match).

Figure 4 shows values of TQR and vertical jump height throughout the days of competition. The recovery scale showed a decrease over the days (F (2.11) = 4.408, ρ = 0.02). Thus, the players felt less recovered on the last match day compared to Day 1, (ρ = 0.017, ES = 0.9 moderate). The values of the vertical jump height in the resting condition also differed over the days (F (2.11) = 3.990, ρ = 0.03), presenting significantly lower heel height at Day 2 than Day 1 (Δ = - 4.1%) (ρ > 0.05, ES = 0.9 moderate).

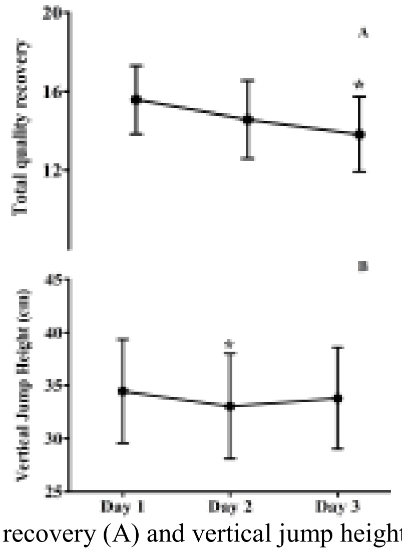

Fig. 4 Variation of total quality of recovery (A) and vertical jump height (B) in each day of competition. * Significant difference from the Day 1.

Discussion

The goal of the current study was to analyze the competitive internal load, stress tolerance, mood state, and competitive recovery in a three day-period in university basketball players. The main findings of this study were that the match internal load and the mood state (MS) did not suffer a cumulative effect of the matches, while the total quality of recovery and vertical jump performance were influenced by short period of time recovery among the matches. On the other hand, successive matches did not significantly influence players' stress tolerance (ST).

The accumulation of matches in a short period potentially results in residual fatigue, probably due to insufficient time for physical recovery, which in turn could increase the propensity to injury (Carling et al., 2015;

Montgomery et al., 2008). However, this fact was not confirmed in our study since a cumulative stress effect during the competition on the implemented indicators was not identified. However, significant differences were observed in the competitive internal load between the matches. These differences are possibly according to the level of difficulty of the match, considering the opponent's level and the match results, as the team obtained wins in matches 1 and 3 with greater advantage in the final score than in matches 2 and 4 (see session "Opponent level" in Experimental Approach). This hypothesis is supported by literature that demonstrates changes in the work rate of players can be influenced by the profile of opponents (Lago, 2009; Marqués-Jiménez, Calleja-González, Arratibel, Delextrat, & Terrados, 2017) (although this should be seen with some caveat since monitoring of the external load of the matches was not performed).

Regarding the intensity of the internal load triggered by the matches during the competitive week, we found values that varied from low to moderate intensity (Moreira et al., 2015). Nevertheless, these results showed agreement with other studies on basketball players (Haddad et al., 2017; Nunes, Costa, Viveiros, Moreira, & Aoki, 2011). Although Moreira et al. (2012) affirmed that a competition presents superior physical stress than a training session, this fact must be considered together with the competitive level of the opponent when interpreting such internal load values (Kelly & Coutts, 2007). These results demonstrate the match internal load usefulness in order to adjust the training loads during competitive phases of the sports season, as well as to guide the athlete's involvement in the subsequent matches according to the physiological stress generated in the previous match. Associated with this, some factors such as the level of the opponent, the number of training sessions between the matches and the transfer to competition should be well determined because these factors also influence the organization of training loads (Kelly & Coutts, 2007).

During competition matches, it is well known that athletes are exposed to situations of great cognitive stress and this demand can lead to a decrease in performance and satisfaction during competition, and may interfere with the ability to cope with acute stress (Anshel & Wells, 2000). In addition, successive matches played in a short period of time result in accumulation of physiological stress (changes in heart rate, lactate, ammonia, cortisol, IgA) (Chatzinikolaou et al., 2014; Moreira et al., 2012). Thus, the exposure to competitive load may interfere with the athletes' perception of stress. In our results, it was found that four matches in three days were not enough to modify the stress tolerance of university basketball players. Such findings are probably associated with previous experience of players at different training load during training routines, which could minimize the potential stressor of the competition. Similar results were found by Freitas et al. (2014), where weeks of loading intensification and weeks of tapering were also not sufficient to alter the stress tolerance of players.

However, the existence of a positive and significant association between sources and symptoms of stress with increased levels of cortisol when analyzed weekly is worth emphasizing, and highlights the use of direct and indirect means in monitoring sports stress (Moreira, Arsati, Lima-Arsati, Simões, & Araújo, 2011). Although no modulation of stress tolerance was found in our results, previous studies (Freitas, Aoki, Arruda, Nakamura, & Moreira, 2013; Moreira & Cavazzoni, 2009) emphasize the utility and sensitivity of DALDA during moments of training intensification and/or preparation load for competitions. In this way, the need for regular monitoring of the training process is reinforced in order to reduce the occurrence of negative adaptations. This fact points to subjective instruments, since according to Saw et al. (2016), subjective instruments can alone or with the help of direct means monitor the athlete's well-being in response to training.

Regarding MS, the "iceberg profile" (Morgan, Brown, Raglin, O'Connor & Ellickson, 1987) was observed before the matches in the first two days of competition. However, after the matches the negative sub scales of anger, depression, fatigue increased regardless of the outcome of the matches, as well as the positive sub scale of vigor presented a decrease at the end of the match, thereby deconstructing the previously observed "iceberg profile" (Morgan et al., 1987). In addition, there was an increase in TMD only as a result of the match, not achieving a cumulative effect throughout the competition. According to Rouveix et al. (2006), these findings may confirm the existence of psychological stress during successive matches in university players. It may be related to hormonal changes (cortisol/cortisone ratio) due to competitive periods. Additionally, previous studies affirm that high physical and psychological stress has the potential to imbalance the MS (Arruda et al., 2013; Abele & Brehm, 1993). However, this fact is not consistent in the literature, as it is dependent or not on the result of the competition (Gonzalez-Bono et al., 1999; Abele & Brehm, 1993). Although players' levels of satisfaction were not assessed, such changes found in our results may be associated with athlete satisfaction with their performance in the match (Gonzalez-Bono et al., 1999). Nevertheless, it was observed that the MS did not suffer interference of the match outcome because the anger and vigor sub scales suffered increase and decrease in both winning and losing, respectively. These results were different from the study by Gonzalez-Bono et al. (1999), which showed a smaller increase in the negative mood of the winning athletes in relation to the losers, but both groups had negatively altered MS scores. Consequently, the authors believe that such behavior can be related to the satisfaction of the players with their performance during the match (errors and correctness), as well as tension derived from the uncertainty of the results during the match (Gonzalez-Bono et al., 1999).

The effect of successive matches in the state of readiness was identified through the TQR scale and VJH throughout this competition, which were both negative and significant over the days. Before the first day, the players reported that they were "well recovered" by the TQR scale. In contrast, values were close to "poorly recovered" on the last day of competition. In this way, it can be seen that successive matches did not allow efficient recovery for the players. In addition, it is worth mentioning that two matches were performed on the first day with intervals of approximately 60 minutes between them. Furthermore, it is known that in team sports that require intermittent exercise such as basketball, the requirement of different types of muscle contractions, sprints and decelerations may explain such results of accumulated fatigue (Abdelkrim et al., 2007). It is important to highlight that monitoring the recovery during the competitive period allows the coaching staff to adjust training loads and recovery processes, as well as to modify the list of players who would participate in subsequent matches in an attempt to minimize potential risks of overtraining, injuries and diseases (Di Fronso et al., 2013).

Previous studies have shown that basketball athletes may present a decrease in neuromuscular performance as a result of sports competitions or in situations of training load intensification, and this decrease occurs in the ability to perform jumps and sprints (Chatzinikolaou et al., 2014; Moreira et al., 2013). Our results showed decreases in vertical jump height throughout the competition, more specifically after the first day (two matches with reduced recovery time) of competition. Our results are consistent with the literature based on the fact that post-match basketball athletes may present decreased muscle strength and increased muscle damage markers (Chatzinikolaou et al., 2014) within 48 hours, as well as increased delayed-onset muscle soreness, inflammatory markers and oxidative stress (Moreira et al., 2013). In this perspective, short recovery time between successive matches seems to affect the neuromuscular performance of basketball players; thus, the use of any type of muscle recovery strategy may be necessary in competitions with these characteristics.

Even in face of these findings, this study presents some limitations that should be highlighted such as the failure to use physiological measures for stress monitoring (cortisol, testosterone/cortisol ratio) which could be more directly related to the stress triggered by successive matches. It is also possible to emphasize the non-control of the match performance, number of hits, errors, rebounds and others (involvement), which could be more enlightening regarding the intensity played in each match, as well as the analysis of the external load of the players during the competition. Additionally, more studies with this population including a larger number of successive matches should be developed to confirm the findings presented herein. However, it is important to note the usefulness of instruments for monitoring the stress and recovery of university players who, in addition to participating in competitions with similar format, are also affected by academic requirements for professional qualification.

Conclusions

The findings of the present study indicate that the short period of recovery between the successive matches did not generate a cumulative effect in the match internal load, mood state or stress tolerance; however, the match internal load and mood state were modulated by the specific condition of each match. Furthermore, the successive matches led to a decrease in total recovery quality and vertical jump height in university players. Thus, the results suggest that successive matches performed in a short period of time had a partial influence on the psychological state and state of readiness of university players. The results demonstrate the need to take an approach that associates fatigue and recovery monitoring in order to know the actual readiness state of the players during a competition performed in congested schedules.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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