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The Business End of the Season: A Comparison Between Playoff and Regular-Season Workloads in Professional Basketball Players

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Purpose: To quantify and compare the internal workloads experienced during the playoffs and regular season in basketball. ***Methods:*** A total of 10 professional male basketball players competing in the Italian first division were monitored during the final 6 weeks of the regular season and the entire 6-week playoff phase. Internal workload was quantified using the session rating of perceived exertion (s-RPE) method for all training sessions and games. A 2-way repeated-measures analysis of variance (day type × period) was utilized to assess differences in daily s-RPE between game days, days within 24 hours of games, and days >24 hours from games during the playoffs and regular season. Comparisons in weekly training, game, and total workloads were made between the playoffs and regular season using paired *t* tests and effect sizes. ***Results:*** A significant interaction between day and competitive period for s-RPE was found ($P = .003$, *moderate*). Lower s-RPE was apparent during playoff and regular-season days within 24 hours of games than all other days ($P < .001$, *very large*). Furthermore, s-RPE across days >24 hours from playoff games was different than all other days ($P \le .01$, *moderate–very large*). Weekly training ($P = .009$, *very large*) and total ($P < .001$, *moderate*) s-RPE were greater during the regular season than playoffs, whereas weekly game s-RPE was greater during the playoffs than the regular season ($P < .001$, *very large*). ***Conclusions:*** This study presents an exploratory investigation of internal workload during the playoffs in professional basketball. Players experienced greater training and total weekly workloads during the regular season than during the playoffs with similar daily game workloads between periods.

Keywords: session RPE, monitoring, finals, postseason, congested schedule, training

A basketball season is typically organized into 3 distinct periods as follows: off-season, preseason, and competitive season (including both regular-season and playoff phases).[1] During the off-season, players aim to recover from the stress accumulated across the previous season and undergo maintenance training programs to avoid excessive detraining.[1] The preseason aims to prepare players for the upcoming competitive season, during which teams compete to attain the highest possible rank in competition standings.[1–3] The final team rank is typically used to determine the best-performing teams for progression to a playoff phase, during which basketball teams typically play several games against the same team in each series, aiming to win each sequential series and reach the finals to compete for the championship. Given the varied phases encountered across a basketball season, it is important to embed methods that permit quantification of player workloads to ensure that the underlying aims of each phase are being met.[2,4] In this regard, monitoring of the physical stimuli encountered by players during training and games (external workload) as well as the psychophysiological responses of players to these stimuli (internal workload) is recommended to elucidate the complete demands imposed on players across a season.[4,5]

Monitoring internal and external workloads can assist in optimizing physical performance in basketball players[2,6] while reducing the negative consequences of training[2,7] (ie, injury risk and nonfunctional overreaching) and the risk of undertraining.[4,6] Furthermore, monitoring player workloads provides insight into the precise demands imposed on players during training and games across different periods of the season. Given that basketball activity encompasses frequent multidirectional, high-intensity movements requiring extensive force and power development (eg, sprints, shuffling, changes of direction, jumps, accelerations),[8] erroneous management of prescribed workloads in players may impair neuromuscular mechanisms,[2] promote fatigue states,[9] and negatively affect game performance in players as the season progresses.[10] However, it should be considered that basketball practitioners may face difficulties in collecting data on external workloads as existing methodologies require time- and labor-intensive data analysis (eg, time-motion analysis)[11] and their use is not always permitted during official games (eg, microsensors).[12]

Previous studies have provided extensive insight into internal workload monitoring approaches and management in basketball.[2,4,6,13–16] The session-rating of perceived exertion (s-RPE) method has been widely used to quantify internal workload in basketball due to its user-friendliness and strong concurrent validity (ie, relationship with objective internal and external workload variables).[17] The s-RPE workloads administered to players are usually greater during the preparation period than other parts of the season as the absence of official competition permits coaching staff to plan greater training volumes and intensities.[2,15,18] In turn, during the competitive period, player s-RPE workloads are managed to optimize physical performance for upcoming games according to the team schedule. As such, player training workloads are usually adjusted in an inverse manner according to the number of games played per week.[14,15,19] Although existing basketball

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studies provide descriptive indications of the s-RPE workloads encountered during the preparation period[2,6] and regular season within the competitive period,[13–15,19] no studies have yet quantified workloads sustained during the playoffs in basketball. This lack of research attention is surprising considering the importance of the playoff phase in the competitive period wherein errors in workload management may be amplified, given that reductions in player performance may result in team elimination. Accordingly, during the playoffs, basketball players are required to compete in several games across a relatively short period in most leagues (eg, a game every 48 h), potentially augmenting fatigue responses, stress, and injury risk in players.[20] As such, understanding the workloads sustained by basketball players during the playoffs will provide basketball practitioners with useful insights to, potentially, inform the development of strategies that may enhance team success. The limited data available regarding playoff workloads are likely a consequence of the difficulties in recruiting teams during such an important period for research purposes combined with the limited number of teams that participate in an entire playoff phase.

Therefore, the aim of the present study was to quantify and compare the internal workloads experienced during the playoffs and regular season in professional, male basketball players.

Methods

Subjects

A total of 10 professional, male basketball players (age = 28.3 [5.7] y, stature = 199.3 [10.2] cm, body mass = 97.7 [12.2] kg, body fat = 11.2% [3.7%]) were recruited from the same basketball team competing in the Italian first division (ie, Serie A) to participate in this study. The inclusion criteria encompassed being part of the team during the entire investigated period, whereas the exclusion criteria included having played an average playing time ≤5 minutes during the monitored games. All players experienced an average playing time ≥15 minutes during the monitored games across the season. The study was approved by the independent institutional review board of the MAPEI Sport Research Center (IRBMMS122019001) in accordance with the Helsinki Declaration.

Design

A longitudinal, observational study design was followed to monitor the internal workloads experienced by players during the final 6 weeks of the regular season (ie, end of March to early May) and during the entire 6-week playoff phase (ie, early May to mid-June) of the 2015–2016 season. Regular season data were limited to the final 6 weeks to create an equivalent timeframe for comparisons across regular season and playoff phases. The daily training and game schedules followed by the players during the regular season are presented in Figure 1. At the end of the regular season, the team was ranked second (out of 16 teams), winning 29 games and losing 9 games. Specifically, during the last 6 weeks of the regular season, the team played 6 official games (ie, 1/wk), winning 3 of them. The playoff phase started 3 days after the end of the regular season and lasted 39 days, encompassing 16 official games. Team results in each series across the playoffs included 3 wins and 0 losses for the quarterfinals, 4 wins and 3 losses for the semifinals, and 2 wins and 4 losses for the finals. The daily training and game schedules performed by the players during the playoff phase are presented in Figure 2. Regular season and playoff days were classified as follows: game days, days ≤24 hours from a game, and days >24 hours from a game. Days wherein a player was unable to participate in a training session or game (ie, physical complaints, illness, personal reasons) were not included in the analysis. All players included in this study performed more than 80% of the team training sessions and games, which has been suggested as a suitable benchmark in basketball workload monitoring research.[3,21]

Methodology

Internal workload was quantified using the s-RPE method as previously described by Foster et al[22] and used widely in basketball research.[2,6,14,23] Specifically, individualized ratings of perceived exertion were multiplied by session duration (in minutes) to derive s-RPE workload in arbitrary units (AU). s-RPE was assessed using the Borg category-ratio (0–10) scale,[24] collected for each player 30 minutes after each training session and game without peer influence.[2,6,14] The duration of each training session was recorded individually for each player and included within-session recovery periods and warm-up activity.[2,6] Game duration was recorded from the warm-up to the end of the game, including all stoppages (ie, free-throws, out-of-bounds, fouls, injury pauses, time-outs, and between-quarter breaks).[2,6] All players were familiar with providing individualized ratings of perceived exertion as this monitoring approach had been utilized in the team prior to commencing the study.

Individual daily workloads according to day type (ie, game days, days ≤24 h from a game, and days >24 h from a game) were determined across the regular season and playoff phase. Weekly s-RPE workload was calculated separately for training sessions, games, and total (training and games combined) across the regular season and playoff phase. As the last game of the regular season was played 3 days before the commencement of the playoffs (ie, in the same week) and the last week of the regular season included no games, weekly s-RPE workloads were calculated during the first 5 weeks of the 6-week monitoring period in the regular season and during the last 5 weeks of the playoff monitoring period to avoid overlap of data. The s-RPE workload data were averaged for each player during each day type (game days, ≤24 h from a game, and >24 h from a game) and weekly workload data (training, game, and total workloads) were averaged within each competitive period (regular season and playoffs) for subsequent statistical analyses. When the player was unable to take part in a training or game session (eg, injury or missing game), average values were determined excluding the missing session.

Statistical Analysis

Data are reported as mean (SD). The assumption of normality was verified by the Kolmogorov–Smirnov test for each variable with log transformation applied when data were not normally distributed. A 2-way repeated measures analysis of variance was utilized to assess differences in daily s-RPE workload between conditions for 2 within-player factors as follows: (1) 3 conditions for day type (game days, days ≤24 h from a game, and days >24 h from a game) and (2) 2 conditions for competitive period (regular season and playoff phase). Partial eta-squared[25] (η_p^2 = [sums of squares effect]/[sums of squares effect + sums of squares error]) was used to indicate the size of the effect and classified as follows: $\eta_p^2 = .04$, *no effect*; $.04 \le \eta_p^2 < .25$, *minimum effect*; $.25 \le \eta_p^2 < .64$, *moderate*

effect; and $\eta_p^2 \geq .64$, *strong effect*.[26] When a significant main effect was found, Bonferroni post hoc correction was applied to locate significant pairwise differences. Pairwise comparisons in weekly training, game, and total s-RPE workloads between the regular season and playoff phase were performed using separate paired *t* tests. Cohen *d* with 95% confidence intervals were calculated[27] to indicate the size of the effect for all pairwise comparisons and interpreted as follows: <0.20, *trivial*; 0.20 to 0.59, *small*; 0.60 to 1.19, *moderate*; 1.20 to 1.99, *large;* and ≥2.00, *very large*.[28] Statistical significance was set at $P < .05$. SPSS (version 26.0; IBM SPSS Statistics, Chicago, IL) and JASP (version 0.11.1, jasp-stats.org) statistical software were utilized to perform data analyses.

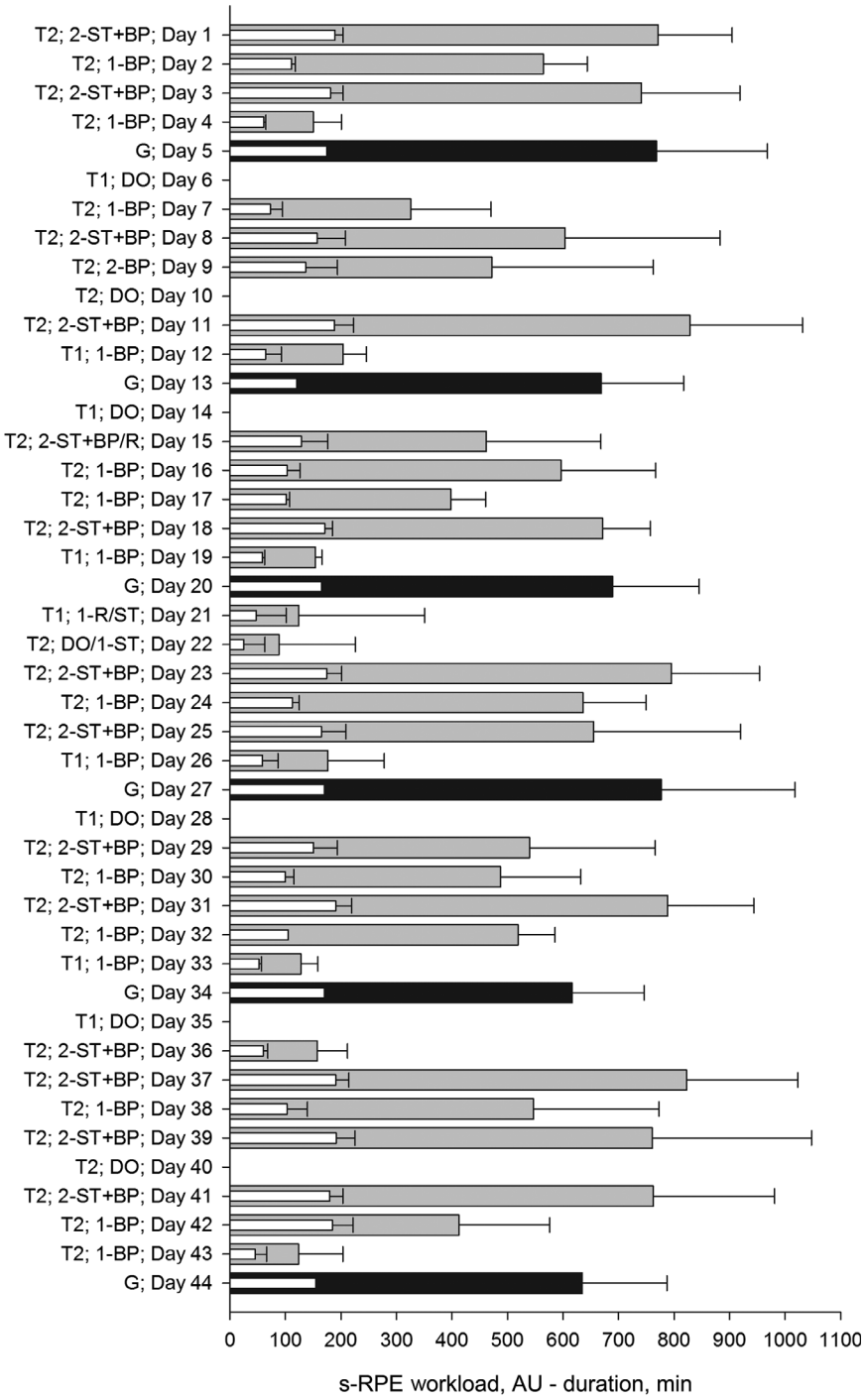

Figure 1 — The daily schedule and s-RPE workloads experienced during the last 6 weeks of the regular season in professional male basketball players. Note: The white columns represent the duration of training/game sessions, the gray columns represent workloads experienced during training days, and the black columns represent workloads experienced during game days. 1- indicates 1 daily training session; 2-, 2 daily training sessions; AU, arbitrary units; BP, basketball practice; DO, day off; G, game day; R, recovery intervention; s-RPE, session rating of perceived exertion; ST, strength training; T1, day ≤24 hours from a game; T2, day >24 hours from a game.

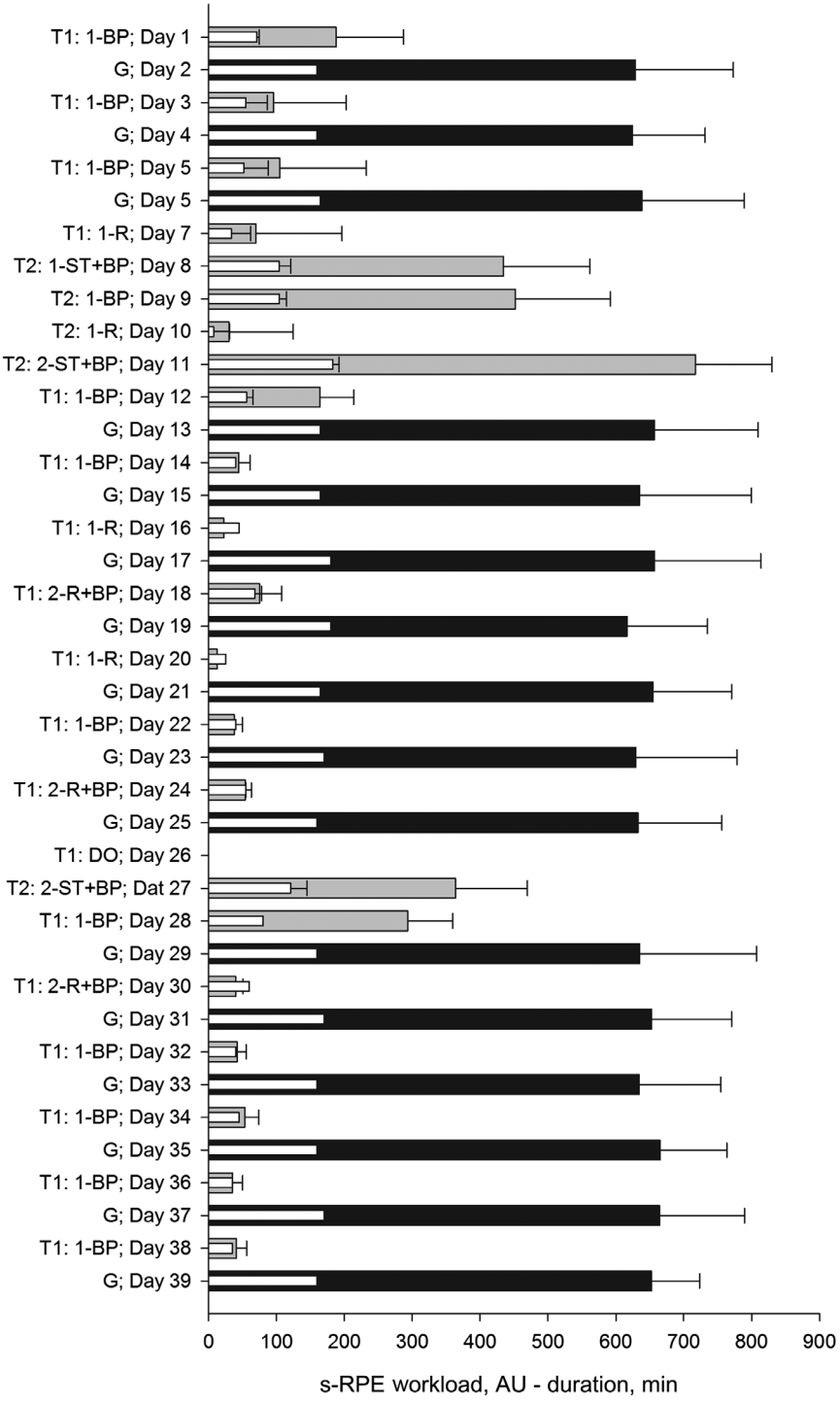

Figure 2 — The daily schedule and s-RPE workloads experienced during the playoff phase in professional male basketball players. Note: The white columns represent the duration of training/game sessions, the gray columns represent workloads experienced during training days, and the black columns represent workloads experienced during game days. 1- indicates 1 daily training session; 2-, two daily training sessions; AU, arbitrary units; BP, basketball practice; DO, day off; G, game day; R, recovery intervention; s-RPE, session-rating of perceived exertion; ST, strength training; T1, day ≤24 hours from a game; T2, day >24 hours from a game.

Results

Daily s-RPE workloads experienced during the regular season and playoff phases are presented in Figures 1 and 2. The s-RPE workloads according to day type (ie, game days, days <24 h from a game, days >24 h from a game) during the regular season and playoffs are presented in Table 1. The 2-way repeated measures analysis of variance showed a significant interaction between day type and competitive period for s-RPE workload ($P = .003$, $\eta_p^2 = .47$, *moderate*). Post hoc analysis revealed no significant difference in s-RPE workload on game days between the regular season and playoffs ($P = 1.000$, $d = 0.37$ [0.64], *small*).

Table 1 Daily s-RPE Workload During Game Days, T1, and T2 Across the Regular Season and Playoff Phase in Professional, Male Basketball Players

Day type	Regular season	Playoff
Game	695 (131)*	642 (77)*
T1	123 (62)	84 (45)
T2	549 (107)*	402 (60)**

Abbreviations: s-RPE, session rating of perceived exertion; T1, day within 24 hours of a game; T2, day >24 hours from a game.
*Significantly ($P < .001$) greater than T1 conditions. **Significantly ($P \leq .01$) different from all other conditions.

Furthermore, no significant differences in s-RPE workload were apparent between game days during both competitive periods (regular season and playoffs) and days >24 hours from games in the regular season (regular season game day: $P = .171$, $d = 1.00$ [0.77], *moderate*; playoff game day: $P = .396$, $d = 0.84$ [0.73], *moderate*). In contrast, significantly greater s-RPE workloads were evident during game days (regular season and playoffs) compared with days ≤24 hours from games in the regular season (regular season game day: $P < .001$, $d = 3.81$ [1.83], *very large*; playoffs game day: $P < .001$, $d = 4.07$ [1.95], *very large*), days ≤24 hours from games in the playoffs (regular season game day: $P < .001$, $d = 3.84$ [1.85], *very large*; playoff game day: $P < .001$, $d = 4.80$ [2.26], *very large*), and days >24 hours from games in the playoffs (regular season game day: $P = .002$, $d = 1.97$ [1.09], *large*; playoff game day: $P < .001$, $d = 2.53$ [1.30], *very large*). Similarly, significantly greater s-RPE workloads on days >24 hours from regular season games were found compared with days >24 hours from playoff games ($P = .010$, $d = 1.61$ [0.96], *large*), days ≤24 hours from playoff games ($P < .001$, $d = 4.22$ [2.01], *very large*), and days ≤24 hours from regular season games ($P < .001$, $d = 4.53$ [2.14], *very large*). Greater s-RPE workloads were also apparent during days >24 hours from playoff games compared with days within 24 hours of regular season games ($P < .001$, $d = 2.88$ [1.45], *very large*) and within 24 hours of playoff games ($P < .001$, $d = 4.89$ [2.30], *very large*). No statistically significant difference was found between s-RPE workloads on days within 24 hours of regular season games and days within 24 hours of playoff games ($P = .855$, $d = 0.69$ [0.68], *moderate*).

Weekly training, game, and total s-RPE workloads during the regular season and playoffs are presented in Figure 3. Training ($P < .001$, $d = 2.35$ [1.24], *very large*) and total ($P = .009$, $d = 1.06$ [0.79], *moderate*) weekly s-RPE workloads were greater during the regular season than the playoffs. In contrast, weekly game s-RPE workloads were greater during the playoffs than the regular season ($P < .001$, $d = 3.93$ [1.89], *very large*).

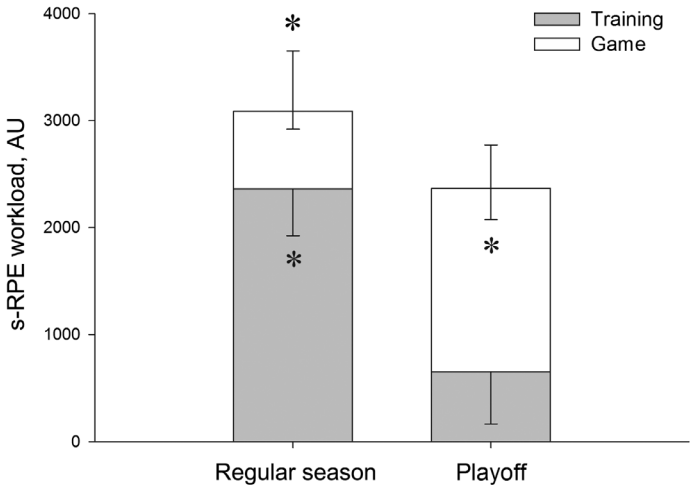

Figure 3 — Total weekly s-RPE workloads during the regular season and playoff phase with relative contribution of training sessions (gray) and games (white) in professional male basketball players. Note: Negative error bars are presented for training and game workloads, whereas positive error bars are presented for total workloads. sRPE indicates session rating of perceived exertion. *Significant ($P < .05$) difference between competitive periods for the same s-RPE workload variable (training, game, or total).

Discussion

The present study provides an exploratory investigation of the internal workloads encountered by professional, male basketball players during the playoffs, highlighting differences in loading from the regular season. Although significant *moderate–very large* differences were found in weekly s-RPE workloads (training, games, and total weekly loading) between the playoffs and regular season, internal workloads imposed by games across these periods were similar ($P > .05$, *small*).

This study presents the first data quantifying the internal workload of professional basketball players during an entire playoff phase lasting 39 days and including 16 games. Overall, individual games during the playoffs induced a similar internal workload to individual games monitored at the end of the regular season, suggesting the phase of the competitive period does not affect internal responses during games in players. Accordingly, it is plausible that, despite higher-level opponents being more consistently faced during the playoffs than the regular season, game demands remain relatively unchanged and the *small* discrepancies observed between these phases may be attributed to game-to-game variations.[8]

In contrast to comparisons between the regular season and playoff game day workloads, the daily s-RPE workload during days within ≤24 hours of regular season and playoff games were considerably lower (*very large*) than all other day types (ie, game days and days >24 h from games). This finding might be expected, given that each playoff series involved games being played every 2 days, with coaching staff typically prescribing 1 training session including a recovery intervention or tactical basketball practice at low intensities on days between games. Similarly, during the regular season the coaching staff typically prescribed a low-intensity team basketball practice the day before the game and a day off after a game day.[15,29] Different strategies were adopted in workload management during days >24 hours from game days during the regular season and playoffs. Specifically, daily s-RPE workload experienced >24 hours from games during the playoff phase substantially increased compared with s-RPE workload on days within 24 hours of games but without reaching the workloads evident on game days. On the contrary, *moderately* greater s-RPE workloads were encountered during days >24 hours from games in the regular season compared with the playoffs, reaching s-RPE workloads similar to game days. The more closely matched s-RPE workloads during training and game days in the regular season compared with playoffs is likely due to the longer periods between regular season games (ie, 7 d), allowing practitioners to plan more

frequent training sessions (ie, up to 2 sessions per day) and players to undergo greater training demands.

When comparing the present findings with research on the topic, it can be noticed that a similar approach in workload management (ie, less loading on days ≤24 h from games compared with days >24 h from games) was reported in professional, male basketball players competing in the first Portuguese[13] and Spanish[29] divisions during the regular season. While the authors are unable to compare these findings during playoff games with past investigations due to the novelty of the data, comparisons in regular season game workloads indicate the s-RPE workload experienced by the players in this study are higher than previously reported by Manzi et al[15] in professional, male players (695 [131] vs 522 [51] AU). Despite investigating players from the same league (ie, Italian first division), discrepancies across studies may be due to temporal changes in game demands. Specifically, the authors provide a more contemporary analysis of s-RPE workloads during basketball games than Manzi et al[15] (ie, regular seasons investigation in 2015–2016 vs 2006–2007). Consequently, it is plausible that the internal game demands imposed on professional basketball players have increased across this time frame due to the greater professionalism and physical capacities of modern basketball players.[30] In addition, differences in game s-RPE workloads between studies may be attributed to different tactical strategies adopted by each of the recruited teams.[31] Furthermore, a methodological difference in s-RPE data collection was apparent between this study and the study conducted by Manzi et al.[15] In the present study, the authors included warm-up activity (~30 min)[2,6] when calculating s-RPE, which was not considered by Manzi et al.[15] As such, depending on the team environment, excluding warm-up activity from monitoring data may underestimate the complete workloads sustained by basketball players, and, therefore, practitioners may need to consider including warm-up activity when calculating entire game workloads using the s-RPE method.

In addition to daily variations in s-RPE workload, the authors observed differences in the weekly s-RPE workloads sustained during the regular season and playoffs, which may reflect the different periodization strategies adopted during these phases of the competitive period. The greater total weekly s-RPE during the regular season compared with the playoffs (3087 [564] vs 2365 [408] AU, *moderate*) is a clear consequence of the greater weekly training workloads delivered to players during the regular season (2362 [437] vs 650 [485] AU, *very large*). Moreover, the team competed in only 1 game per week during the regular season (compared with 1–4 games per week during the playoffs), providing greater freedom for coaching staff to plan multiple training sessions across the week (encompassing both basketball practice and strength training sessions). As such, players in the present study completed weekly training workloads during the regular season that were over 3-fold greater than during the playoff phase. To the contrary, weekly game workloads during the playoff phase were considerably greater than the regular season (1715 [289] vs 725 [166] AU, *very large*) as a consequence of the different game schedules encountered. In line with this finding, previous investigations demonstrate that more games played within the same week lead to lower total weekly s-RPE workloads in collegiate[14] and professional male basketball players.[15] As such, it appears fundamental to implement recovery interventions for preservation of physical status in players during congested weekly schedules (eg, playoffs) and to include sufficient loading during training plans to avoid detraining effects during single-game weeks (eg, regular season).

There are some limitations that should be considered when interpreting these findings. First, due to the difficulties in recruiting professional players from multiple teams for research purposes during the playoff phase, the sample size is limited, and the players were recruited from only 1 team. Consequently, these data might not be considered as representative of all basketball player populations. Second, it was not possible to perform an analysis according to playing role (starters vs bench players) or position (guards vs forwards vs centers) due to the small sample of players recruited. Third, only internal perceptual workload was monitored in this study, and, therefore, these results might not be representative of more objective internal workload variables or external workload variables. Therefore, further research is encouraged, encompassing wider workload variables that investigate the training and game demands encountered during the playoffs in different basketball leagues. Furthermore, although the present findings were gathered using an observational study, the authors recommend future experimental research being implemented to examine the effect of daily and weekly workloads on in-game performance and to determine the most appropriate periodization strategy to be adopted during different week types and seasonal phases.

Practical Applications

The present study provides novel insight regarding the periodization strategies adopted surrounding games during the regular season and playoff phases of the competitive period in professional basketball. Overall, it appears a logical coaching strategy to ensure that players sustain lower workloads during the days ≤24 hours from a regular season or playoff game to avoid high levels of fatigue leading into games and to permit optimal recovery following games.[15,29] On the contrary, during days >24 hours from games, basketball practitioners should increase workloads where appropriate to avoid potential detraining and maintain an optimal level of stress being placed on players in preparation to meet game demands.[14,15] However, these strategies should be carefully developed considering the different timeframes available between games. In this regard, the present findings indicate that different periodization strategies should be adopted according to the phase of the competitive period encountered across the season in professional basketball.[1] Specifically, it appears that reaching daily s-RPE workloads similar to those experienced on game days may not be recommended during the playoffs wherein congested schedules (ie, games every 2 d) and higher weekly game workloads are faced compared with the regular season. Thus, including appropriate recovery interventions (eg, cold water immersion, massage, nutritional approaches)[32] in addition to training sessions should be planned as opposed to multiple training sessions per day across the playoff phase. During the regular season, higher daily s-RPE workloads and multiple training sessions per day can be prescribed, but tapering strategies should be adopted before games to optimize players' physical readiness to compete.[9,15,29]

Conclusions

The present study provides the first investigation of the internal workloads sustained by professional basketball players during the playoff phase of the competitive period with comparisons made to the regular season. Professional basketball players undergo greater internal workloads (weekly training and total s-RPE workload) during the regular season than the playoffs. In contrast, players experience greater weekly game workloads during the playoffs

compared with the regular season while experiencing similar daily individual game workloads across these periods.

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