The Quantification of Within-Week Session Intensity, Duration, and Intensity Distribution Across a Season in Australian Football Using the Session Rating of Perceived Exertion Method

The quantification of within week session intensity, duration and intensity distribution across a season in Australian Football using the session RPE method

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Running head: Quantification of session intensity and duration

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Abstract

Purpose: Team-sports training requires the daily manipulation of intensity, duration and frequency with pre-season focusing on meeting the demands of in-season competition and in-season on maintaining fitness. To provide information about daily training in Australian Football (AF), this study aimed to quantify session intensity, duration, and intensity distribution across different stages of an entire season.

Methods: Intensity **(**session Ratings of Perceived Exertion [s-RPE]; CR-10 scale) and duration were collected from forty-five professional male AF for every training session and game. Each s-RPE was categorized into the corresponding intensity zone; Low (<4.0 AU), Moderate (≥4.0 and <7.0), and High (≥7.0) to categorize session intensity. Linear mixed models were constructed to estimate session duration, intensity and distribution between the 3 pre-season and 4 in-season periods. Effects were assessed using linear mixed models, and magnitude-based inferences.

Results: The distribution of the mean session intensity across the season was 29% low-, 57% moderate- and 14% high-intensity. While 96% of games were high-intensity, 44% and 49% of skills training sessions were low- and moderate-intensity, respectively. Running had the highest proportion of high-intensity training sessions (27%). Pre-season displayed higher training session intensity (ES = 0.29-0.91) and duration (ES = 0.33-1.44), while in-season game intensity (ES = 0.31-0.51) and duration (ES = 0.51-0.82) were higher.

Conclusion: By using a cost-effective monitoring tool, this study provides information about the intensity, duration and intensity distribution of all training types across different phases of a season, thus allowing a greater understanding of the training and competition demands of Australian Footballers.

Keywords: Training load, periodization, team sports, ratings of perceived exertion

Introduction

Australian Football (AF) training integrates a number of training modalities into its weekly cycles so as to prepare and recover sufficiently. However, accurately quantifying the session intensity of varying modalities represents a challenge to practitioners, owing to the different physiological and mechanical properties of each training mode, the varying technologies required, the issue of not being able to use some technologies indoors (i.e., GPS), the cost, and the time to monitor multiple athletes within the same session. One monitoring tool that circumvents some of these issues are session ratings of perceived exertion (s-RPE).

The RPE scale was designed as a psychophysical self-report scale with varying psychometric properties, which encompasses a psychological aspect to the level of physical exertion[1]. Indeed, it is suggested that RPE is sensory-discriminative, motivational-affective, and cognitive-evaluative. Moreover, research suggests that RPE can be used as a measure of intensity owing to its relationship with power, heart rate, lactate, and percent maximal oxygen uptake and respiration rate.[2,3]. As such, the RPE method is regarded as "the single best indicator of the degree of physical strain"[1]. Given this backdrop, the RPE method can be applied to all training modes, be easily administered, and is cost- and time-effective[4]. Existing evidence broadly documents the intensity of training and competition in AF (using s-RPE)[5]; however, expanding our knowledge of this important programming variable across varying phases of a season will permit a greater understanding of the demands placed on AF athletes.

Practitioners often multiply the athlete's s-RPE by session duration to form a total load score measured in arbitrary units (AU), which provides information on the total internal load for training sessions, weeks and phases (e.g., microcycles, pre-season, and in-season). Load scores are monitored[6-9] to assess fitness and fatigue over time, which may also identify periods where athletes are exposed to an increased injury risk and/or overtraining[9,10]. While this approach is beneficial for quantifying weekly and training phase load, the specific breakdown of load is unclear. As a composite measure of duration and intensity, it neglects the quantification of the true intensity and duration of a given session, both of which are significant for effective training program design. Furthermore, as various training modes are used in AF across varying days of the week to 'off load legs', protect against increased running-induced injury risk, and to provide additional training stimuli, it would be useful to know more about the day-to-day intensities and durations AF athletes complete. Given the cost and time required to monitor multiple athletes using varying technologies and the issue of not being able to utilize GPS indoors, obtaining just the RPE and duration of each session partially alleviates the limitations imposed by limited human resources.[11] As such, it represents a simple and effective means to better understanding the demands of all components of AF training and complements current understanding of the weekly load distribution. Accordingly, the aim of the current study was to quantify the session intensity, duration and intensity distribution of Australian Rules football across various stages of a season using the s-RPE method.

Methods

Subjects

Forty-five professional male AF players (mean ± SD: age, 24.7 ± 4.3 y; height, 187.2 ± 7.5 cm; body mass, 85.5 ± 8.9 kg), from the same AF club during the 2015 season participated in the study. The participating athletes competed in the Australian Football League (AFL) and when not selected for the AFL side, played in the Victorian Football League (VFL). All participants provided written consent to participate prior to commencement of the study. The study was approved by the Victoria University Human Research Ethics Committee.

Design

A total of 15,502 individual observations were recorded during the 2014-15 season, spanning a total of 45 weeks. To consider for the effects of injury, player's data whilst in an injured state was accounted for in the analysis and subsequently excluded. The period excluded for a player was deemed as the day the injury transpired to the point of return to full training with the squad. Injury was classified by the senior physiotherapist of the club and recorded on the club's database. There were a total of 34 players impacted resulting in a median loss of 34 (range: 5-145) observations to injury. As such, a total of 14,101 individual observations remained. To determine session volume, intensity and distribution across a season, we adopted a similar approach to previous research[7]. The season was divided into seven blocks such that pre-season was subdivided into pre-season 1 (PS1), pre-season 2 (PS2) (divided by the Christmas break), and pre-season 3 (PS3). This latter period of pre-season incorporated 3 practice matches. The competition phase was subdivided into four blocks; in-season 1 (IS1) and in-season 3 (IS3) - each containing 10 and 11 games, respectively, which were divided by a single bye week (in-season 2, (IS2)). In-season 4 (IS4) included finals period and for this season for this club amounted to one week. A schematic representation of the season overview can be seen in Figure 1. It has been reported that there is an increase in high-intensity activity during AF finals[12]; thus, we aimed to quantify the session volume and intensity of training during this period, in the context of the regular home and away season. The session volume and intensity presented in each block and for each mode represent the mean duration and intensity for a given session of a given modality for that block. This also accounts for the slight variation in number of weeks per block.

Methodology

This study adopted an approach used previously in AF in order to quantify session intensity[5]. Each individual athlete was presented with the Borg CR-10 scale[13] and asked in isolation and face-to-face to rate their perceived exertion (RPE). Their RPE was recorded on a pre-made collection sheet. Timing of RPE collection has been shown to not interfere with ratings of perceived exertion in team sport athletes[14] or steady state and interval exercise.[15] Therefore, for practicality, s-RPE was collected within 10 min after cessation of training and 30 min after cessation of competition. All the athletes were well versed and educated in the use of the s-RPE CR-10 scale. Following collection of the s-RPE, scores were divided into three separate intensity zones, Low (<4.0 AU), Moderate (≥4.0 and <7.0), and High (≥7.0-10.0), as used previously in endurance cross-country skiers[16], rugby league players[17] and AF players[5]. Whilst it should be noted that comparing modes by intensity using s-RPE has its limitations[18], in team sports with a squad of players up to 45, the s-RPE method is a valid, reliable, time- and cost-efficient way to obtain information on each session[4]. Session duration was recorded to quantify the session volume and for each seasonal block, the mean session duration for each modality in each block was calculated.

Similar to previous studies in AF[5,7], training modes were categorized into games (all matches players competed in), skills (skill focused training sessions), UB weights (upper-body gym sessions), LB weights (lower-body gym sessions), 'other' (cycling, boxing, swimming, cross-training) and running (conditioning focus field-based running sessions). Individual extras and recovery sessions were not included in the analysis. Training intensity and duration was also quantified according to day type; recovery skills day, main training day, captains run day and game day. Captains run was performed the day prior to game day, whilst recovery skills was performed either 24 or 48 h post-game. Main training day was classified as per Tuesday and Thursdays. Irrespective of whether participants competed in the AFL or VFL competition, their planned weekly schedule in relation to training day type was the same.

Statistical Analysis

Linear mixed models were constructed to estimate session volume, intensity and distribution across the season. Random effects were specified to adjust for different between-player standard deviations between season-phase, and also different within-player standard deviations between season-phases. Fixed effects were included in these models to adjust for the athletes injury state (un-injured or injured), playing position (forward, midfield, defender) and professional status training age (1st year, 2-3 years, 4-7 years and 8+ years). Pairwise comparisons between season-phase, playing position and training age were evaluated using the

Least Squares Mean test, and were further assessed using a non-clinical magnitude based inference network[19]. Effects were assessed using non-clinical magnitude-based inferences, using standardized effect sizes (ES), classified as; ≤0.2 trivial, <0.6 small, <1.2 moderate, <2.0 large, <4.0 very large and >4.0 as very large[20]. Each effect was expressed as 90% confidence limits (CL) and as probabilities that the true effect was substantially positive or negative, with effects declared clear only at the 75% likelihood level. Statistical analyses were performed using R Studio statistical software (v 1.0.136).

Results

Overall session intensity and distribution

The session intensity distribution between low, moderate and high are shown in Table 1 and Figure 1. When all sessions are pooled across the season, 29% were low-intensity, 57% moderate-intensity and 14% high-intensity. Game intensity was higher compared to all training modes (Skills, ES = 1.43; ±90% CL 0.60; running, 1.02; ±0.43; 'other', 1.15; ±0.48; upper-body weights, 1.02; ±0.43; lower-body weights, 1.32; ±0.56). Conversely, skills training intensity was lower compared to running (ES = 0.30; ±0.13), and upper-body weights (ES = 0.51; ±0.22). Upper-body weights intensity was higher compared to lower-body weights (ES = 0.48; ±0.20), and lower compared to 'other' training (ES = 0.26; ±0.11). Lower-body weights intensity was lower than running (ES = 0.33; ±0.14) (Table 1).

Session intensity and duration by season period

The pooled mean session intensity and breakdown of intensity and duration for each season block is shown in Table 2. Pooled session intensity during PS3 was lower compared to PS1 (ES= 0.44; ±0.19) and PS2 (ES= 0.45; ±0.19), but compared to in-season periods were unclear to trivial. Pooled session intensity during PS1 was higher compared to IS1 (ES = 0.69; ±0.29), IS2 (ES = 0.30; ±0.12), IS3 (ES = 0.82; ±0.34), and IS4 (ES = 0.37; ±0.16). Similarly, PS2 was higher compared to IS1 (ES = 0.69 ±0.29), IS2 (ES = 0.31; ±0.13), IS3 (ES = 0.82; ±0.35), and IS4 (ES = 0.39; ±0.17).

Game intensity in PS3 was lower compared to all in-season periods (ES = IS1 = 0.48; ±0.20, IS3 = 0.51; ±0.21 and IS4 = 0.31; ±0.13). Similarly, game duration in PS3 was lower compared to all in-season periods (ES = IS1 = 0.80; ±0.40, IS3 = 0.82; ±0.41 and IS4 = 0.51; ±0.25).

Skills intensity during PS1 was lower compared to PS2 (ES = 0.25; ±0.10), but higher than PS3 (ES = 0.31; ±0.13), IS1 (ES = 0.52; ±0.22), IS2 (ES = 0.29; ±0.12), IS3 (ES = 0.54; ±0.23), and IS4 (ES = 0.33; ±0.14). Comparatively, PS2 was higher than PS3 (ES = 0.59; ±0.25), IS1 (ES = 0.89; ±0.37), IS2 (ES = 0.42; ±0.18), IS3 (ES = 0.91; ±0.38), and IS4 (ES = 0.48; ±0.20). Skills duration during PS1 was higher than PS3 (ES = 0.45; ±0.19), IS1 (ES = 0.73; ±0.31), IS2 (ES = 0.41; ±0.17), IS3 (ES = 0.79; ±0.33), and IS4 (ES = 0.42; ±0.18). Likewise, PS2 was higher than PS3 (ES = 0.74; ±0.31), IS1 (ES = 1.10; ±0.47), IS2 (ES = 0.54; ±0.23), IS3 (ES = 1.18; ±0.50), and IS4 (ES = 0.56; ±0.24).

Upper-body weights intensity during PS1 was higher than IS3 (ES = 0.26; ±0.11), and PS2 was higher than IS1 and IS3 (ES = 0.24; ±0.10, and 0.27; ±0.12, respectively). In contrast, upper-body weights duration during PS3 was higher than PS1 (ES = 0.25; ±0.11), PS2 (ES = 0.30; ±0.12), IS1 (ES = 0.38; ±0.16), IS2 (ES = 0.42; ±0.18), and IS3 (ES = 0.60; ±0.25). IS4 duration was higher than IS2 (ES = 0.35; ±0.15) and IS3 (ES = 0.34; ±0.14). IS2 upper-body weights duration was lower than PS1 (ES = 0.29; ±0.12) and PS2 (ES = 0.27; ±0.11), while IS3 was also lower than PS1 (ES = 0.33; ±0.14) and PS2 (ES = 0.30; ±0.12).

Lower-body weights intensity during PS1 was higher than IS1 (ES = 0.90; ±0.45), IS2 (ES = 0.39; ±0.19), IS3 (ES = 1.29; ±0.65), and IS4 (ES = 0.63; ±0.32). Similarly, PS2 was higher than IS1 (ES = 1.04; ±0.52), IS2 (ES = 0.46; ±0.23), IS3 (ES = 1.44; ±0.72), and IS4 (ES = 0.68; ±0.34). Furthermore, lower-body weights intensity during PS3 was higher compared to

IS3 (ES = 0.36; ±0.18) and IS4 (ES = 0.28; ±0.14). Lower-body weights duration was higher during PS1 than PS2 (ES = 0.38; ±0.16), PS3 (ES = 0.27; ±0.11), IS1 (ES = 0.30; ±0.12), IS2 (ES = 0.33; ±0.14), IS3 (ES = 0.52; ±0.22), and IS4 (ES = 0.29; ±0.12).

'Other' training intensity during PS1 was higher than PS2 (ES = 0.25; ±0.10), IS1 (ES = 0.53; ±0.22), and IS3 (ES = 0.73; ±0.31). Comparatively, PS2 'other' intensity was higher than IS1 (ES = 0.35; ±0.15) and IS3 (ES = 0.53; ±0.23). 'Other' training duration during PS1 was higher than IS1 (ES = 0.85; ±0.36) and IS3 (ES = 0.87; ±0.37). Similarly, PS2 was higher than IS1 (ES= 0.74; ±0.31) and IS3 (ES = 0.74; ±0.31). However, PS3 was lower than PS1 (ES = 0.44; ±0.19) and PS2 (ES = 0.35; ±0.15).

Where running intensity during PS1 was higher than PS2 (ES = 0.33; ±0.14), PS1 and PS2 running intensity was together higher compared to all in-season periods (ES = 0.57-1.68). PS3 was higher compared to IS1 (ES = 0.37; ±0.16), IS3 (ES = 0.52; ±0.22) and IS4 (ES = 0.42; ±0.18) but trivial compared to IS2. Running intensity during IS2 was higher than IS3 (ES = 0.34; ±0.14) and IS4 (ES = 0.25; ±0.11). Running duration during PS1 was higher than PS2 (ES = 0.36; ±0.15), IS1 (ES = 0.31; ±0.13), IS3 (ES = 0.52; ±0.22), and IS4 (ES = 0.29; ±0.12). IS2 running duration was higher than PS2 (ES = 0.25; ±0.10), IS3 (ES = 0.34; ±0.15) and IS4 (ES = 0.26; ±0.11).

Comparison of session duration and intensity by day type

Overall, game day duration was longer than main training (ES = 1.32; ±0.56), captains run (ES = 1.34; ±0.57) and recovery (ES = 1.53; ±0.64) days, and higher intensity than main training (ES = 2.48; ±0.84), captains run (ES = 4.52; ±1.52) and recovery (ES = 3.31; ±1.11) days. Comparatively, main training day was longer than captains run (ES = 0.43; ±0.18) and recovery (ES = 0.45; ±0.19) days and higher intensity than captains run (ES = 1.42; ±0.48) and recovery (ES = 0.70; ±0.23) days.

Discussion

The aim of the current study was to quantify the session duration, intensity and distribution of AF across various phases of a season. Although the weekly demands of training and competition are relatively well documented, information about the session duration and intensity of AF is lacking. This study reports that only 14% of total sessions across a season are rated high-intensity, 57% as moderate-intensity and 29% as low-intensity. This study also reports novel data on all training modes across a season, showing that pre-season training contains higher durations and intensities of skills, weights, running and 'other' training sessions, while in-season, game days contribute the greatest duration and intensity of any mode type. Together, these data provide a level of detail about the specific daily training practices of Australian Rules Footballers across a season, which further enhances the overall appreciation of the demands of Australian Football.

Training design in team sports involves the manipulation of volume, intensity and frequency, and is often depicted by the stage of the season, with pre-season focused on meeting the demands of in-season competition and in-season training focusing on recovery from competition and maintenance of fitness levels. This study extends current knowledge of AF by showing that intensity for all training modes (skills, weights, other and running) is higher during pre-season than in-season. Conversely, game intensity is higher during in-season than it is during pre-season. These patterns are consistent with previous data in AF[7], where it was reported that weekly training volume is higher during the pre-season, and weekly game volume is higher during the in-season. Of note in the current study, skills, running and 'other' duration were also higher in the pre-season (i.e., before onset of games), than any time in-season. While the patterns of loading between mode types during pre-season and in-season are likely unsurprising, when taken together with previous data in AF, it is apparent that load intensity and volume are closely aligned. Indeed, it has been difficult to ascertain from empirical evidence the difference in intensity and duration of training during the pre-season and in-season phases. This study has attempted to address this gap by demonstrating that different loading patterns occur between pre-season and in-season due to the manipulation of intensity *and* duration, not just the change of one variable over the other. Indeed, when there are no games (i.e., pre-season) training is maximized for intensity and volume, while during the in-season, games possess the greatest intensity and volume, indicating the need for reduced training intensity and an emphasis on recovery during the in-season phase.

In assessing the recovery element of training in AF, this study demonstrates that recovery skills days, which are performed 24-48 h post-match, are lower intensity and duration than main training days and game days. Additionally, this study shows that captains run day, sometimes referred to as match day -1 in other field based sports[8], is the lowest stimulus of the week, thus potentially representing a form of taper. This is consistent with recent data in professional soccer[21], where running volume and intensity is reduced on the day prior to competition. Despite these emerging data, what is currently not well understood, and therefore warranting further investigation, is whether this observed reduction in volume and intensity the day before competition in both the present study and previous studies results in more optimal performance. Consistent with weekly loading patterns in AF[7], whereby weekly training loads equate to approximately 50% of total weekly load, this study also reports that on main training days, intensity and duration is just below half of that of competition duration and intensity. This possibly reflects a greater emphasis on technical and tactical training while concomitantly protecting against load-induced injury. When taken together, it is becoming increasingly clear that training and recovery is periodised within each micro-cycle (i.e., per week), with the belief that it enhances recovery and preparation for subsequent competition.

The distribution of training intensity is an important factor to consider in relation to understanding training design. It has been reported that approximately 75% of elite endurance runners' training sessions are performed at 'low' intensity as determined by the CR-10 RPE scale (<4 RPE), with 7% of the remaining 25% performed at moderate intensity and 18% at high-intensity[16]. While this depicts a polarized approach to training, it may be speculated that this approach is not suitable for field-based team sport athletes, due to their requirement to perform repeated high-intensity intermittent running. The present study shows that AF athletes perform 29% of training at low intensity, 57% at moderate intensity and 14% at high intensity. This is consistent with Moreira et al.[5], where a similar intensity distribution was observed during the pre-season (26.7%, 55.2% and 18.1% at low, moderate and high intensity, respectively). Other team sports, such as soccer[22] and rugby league[17] have also reported training intensity distribution is non-polarized suggesting that compared to endurance athletes, team sport athletes perform a larger percentage of training at moderate intensities. Putting this into context, it is important to consider the composition of a given skills training session. Indeed, a session is often made up of varying drills targeting various energetic pathways, while concomitantly focusing on the individual's and teams technical and tactical requirements. As such, retrospective s-RPE is limited in that it only provides a snapshot of the mean of the session. Circumventing this issue, practitioners now have the capability to also monitor; the external load of training through GPS allowing accurate quantification of both the intermittent nature of training and specific running speeds.

In further understanding the impact of seasonal periods on training, this study also examined the effect of playing finals football on training intensity. Indeed, it has been reported that AF finals games have increased high-intensity running activity compared to the regular home and away in-season period[12]. From an applied perspective, this may also follow true for training, such is the importance of finals football and the increased focus and preparation of these games. Nevertheless, this study shows no difference in training intensity during finals preparation compared to that of during the regular in-season periods. While the coaching philosophy on training may have been a factor it also demonstrates the importance for practitioners to recognize the varying training and competition demands across phases of the season.

Although this study presents novel findings, there are also some limitations that should be acknowledged. Despite a dataset comprising >14,000 observations, this study is only of one professional AF team during the course of a single AF season. Therefore, the observed volume, intensity and distribution may only be relevant to the players and coaching philosophy of the club. In addition, it is acknowledged that the only method to capture intensity was using RPE. Although this method has been shown to be valid, reliable and effective to use within team sports[4,17,23], it not only describes internal response to exercise, but it also uses the same scale to quantify intensity of different training modes. This may be problematic in terms of the different physiological and mechanical components of the adopted training modes. One way to possibly circumvent this issue is to adopt the differential RPE (dRPE) method, which discriminates between discrete sensory inputs, i.e., central and peripheral exertion signals, allowing specific quantification of intensity pertaining to the legs and/or breathlessness[24].

Practical applications:

- The s-RPE method represents a time- and cost-effective approach to quantifying session intensity for all types of training performed in Australian Football.
- Coaches and practitioners should use a range of monitoring approaches to quantify the intensity, volume and distribution of team sport athlete's training and competition so to accurately determine all aspects of load, and inform future training plans.
- Within-week training design undergoes periodization such that early in the week (i.e., recovery) and late in the week (i.e., day before a game) is focused towards low intensity work and low durations, while the main training stimulus is performed in the middle part of the week (i.e., furthest point away from competition).

Conclusions:

This study demonstrates that intensity distribution is non-polarized in professional AF. Similar to previous studies that show training volume in professional AF are highest in the pre-season, this study shows that pre-season contains higher intensity of all training modes than in-season, whereas, in-season competition is of higher intensity than any training mode type and pre-season competition. Finally, this study shows that the during the in-season phase the middle part of the week contains the highest intensity and duration of any training with lower intensities and durations at the start (recovery) and end (taper) of the week - indicating weekly micro-cycle periodization.

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Figure 1. A schematic representation of the study overview and seasonal periods

Figure 2. The intensity distribution of all pooled training modes for the season

Table 1. Total number of observations and intensity (measured by RPE) distribution by mode type. Intensity data is shown as mean ± SD

Table 2. Quantification of session intensity (measured by RPE) and duration (min) throughout each seasonal period for games, skills, UB weights, LB weights, running and other. Standardized differences are denoted by letters and expressed by effect size. Data is shown as mean ± SD

Table 3. Quantification of session intensity (measured by RPE) and duration (min) by day type for games, skills, UB weights, LB weights, running and other. Standardized differences are denoted by letters and expressed by effect size. Data is shown as mean ± SD

Table 1. Total number of observations and intensity (measured by RPE) distribution by mode type. Intensity data is shown as mean ± SD.

Mode	***RPE Intensity***	**# of observations**	**Low**			**Moderate**			**High**		
			RPE Intensity	***#***	***%***	***RPE Intensity***	***#***	***%***	***RPE Intensity***	***#***	***%***
Games	9.5 ± 0.9 $^{M\text{-}L}$	926	-	0	0	6.4 ± 0.9	41	4	9.6 ± 0.6	885	96
Skills	4.0 ± 2.1 ^{S}	5054	2.0 ± 0.8	2246	44	5.2 ± 1.0	2455	49	8.3 ± 0.5	353	7
Running	5.4 ± 2.5 ^{S}	1408	2.6 ± 0.6	461	33	5.5 ± 1.2	571	41	8.7 ± 0.7	376	27
Other	5.4 ± 2.2 ^{S}	1982	2.1 ± 0.8	457	23	5.9 ± 1.0	1261	64	8.4 ± 0.6	264	13
LB weights	4.2 ± 1.8 ^{S}	1787	2.3 ± 0.7	695	39	5.4 ± 1.0	1072	60	8.2 ± 0.4	20	1
UB weights	5.1 ± 1.1	2944	2.7 ± 0.6	211	7	5.3 ± 0.9	2703	92	8.1 ± 0.3	30	1

Superscripts indicate small (S), moderate (M) or large (L) effects for mean RPE as follows:
Games M vs. Other, Running, and UB weights. L vs. LB weights and skills.
Skills S vs. Running and UB weights.
Running S vs. LB weights
Other S vs. UB weights
LB weights S vs. Running and UB weights

Table 2. Quantification of session intensity (measured by RPE) and duration (min) throughout each seasonal period for games, skills, UB weights, LB weights, running and other. Standardised differences are denoted by letters and expressed by effect size. Data is shown as mean ± SD.

	Pooled		**Games**		**Skills**		**UB Weights**		**LB Weights**		**Other**		**Running**	
	Intensity	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*
Pre-season 1 (PS-1)	5.8 ± 1.8 [S-M]	41 ± 21 [S]	-	-	5.3 ± 1.8 [S]	63 ± 18 [S-M]	5.6 ± 1.0 [S]	40 ± 10 [S]	5.5 ± 1.2 [S-M-L]	24 ± 10 [S]	6.2 ± 2.0 [S-M]	39 ± 13 [M]	7.2 ± 1.9 [S-M-L]	27 ± 27 [S]
Pre-season 2 (PS-2)	6.1 ± 1.9 [S-M]	44 ± 28 [S]	-	-	5.9 ± 2.2 [S-M]	72 ± 29 [S-M]	5.7 ± 1.0 [S]	39 ± 7 [S]	5.9 ± 1.0 [S-M-L]	20 ± 2	5.7 ± 2.1 [S]	37 ± 14 [M]	7.8 ± 1.5 [M-L]	16 ± 16
Pre-season 3 (PS-3)	4.7 ± 2.1 [S]	43 ± 20	8.5 ± 1.2 [S]	80 ± 19	3.7 ± 1.8	46 ± 16 [S-M]	5.3 ± 1.1	44 ± 6 [S]	3.4 ± 1.4	20 ± 5	5.6 ± 1.7 [S]	29 ± 16 [S]	5.9 ± 1.8 [S]	20 ± 16
In-season 1 (IS-1)	4.4 ± 2.5	41 ± 27	9.6 ± 0.8	101 ± 18 [M]	3.2 ± 1.7	39 ± 16	4.9 ± 1.1	38 ± 9	3.5 ± 1.5 [S]	21 ± 10	4.0 ± 1.9	20 ± 8	3.9 ± 1.6	17 ± 16
In-season 2 (IS-2)	3.8 ± 1.8	29 ± 12	-		2.6 ± 1.5	32 ± 9	4.4 ± 1.2	32 ± 7	3.4 ± 1.8 [S]	17 ± 4	5.0 ± 1.3	32 ± 11	4.5 ± 1.6	29 ± 17 [S]
In-season 3 (IS-3)	4.2 ± 2.5	38 ± 28	9.6 ± 0.8	100 ± 16 [M]	3.1 ± 1.7	37 ± 17	4.6 ± 1.0	35 ± 10	2.6 ± 1.1	17 ± 5	3.3 ± 1.6	19 ± 7	3.2 ±1.1	13 ± 8
In-season 4 (IS-4)	4.0 ± 2.6	40 ± 28	10.0 ± 0.0	103 ± 16 [S]	2.7 ± 1.5	35 ± 15	4.8 ± 0.9	45 ± 0 [S]	2.0 ± 0.8	15 ± 0	4.6 ± 1.5	34 ± 2	2.8 ± 0.9	11 ± 6

Superscripts indicate small (S), moderate (M) or large (L) differences between periods within mode type as follows:
Pooled intensity: PS-1 S vs. IS-2 and IS-4. PS-1 M vs. IS-1. PS-2 S vs. IS-2 and IS-4. PS-2 M vs. IS-1. PS-3 S vs. PS-1 and PS-2.
Pooled duration: PS-1 S vs. IS-3. PS-2 S vs. IS-1 and IS-3.
Games intensity: PS-3 S vs. IS-1, IS-3 and IS-4.
Games duration: PS-3 M vs. IS-1 and IS-3. PS-3 S vs IS-4.
Skills intensity: PS-1 S vs. PS-2 and PS-3, and all IS periods. PS-2 S vs. PS-3, IS-2 and IS-4. PS-2 M vs. IS-1 and IS-3.
Skills duration: PS-1 S vs. IS-2 and IS-4. PS-1 M vs. IS-1 and IS-3. PS-2 S vs. IS-2 and IS-4. PS-2 M vs. IS-1 and IS-3. PS-3 S vs. PS-1 and IS-3. PS-3 M vs PS-2.
UB Weights intensity: PS-1 S vs. IS-3. PS-2 S vs. IS-1 and IS-3.
UB Weights duration: PS-1 S vs. IS-2 and IS-3. PS-2 S vs IS-2 and IS-3. PS-3 S vs. PS-1, PS-2, IS-1 and IS-2. PS-3 M vs. IS-3. IS-4 S vs. IS-2 and IS-3.
LB Weights intensity: PS-1 S vs. IS-2. PS-1 M vs. PS-3, IS-1 and IS-4. PS-1 L vs. IS-3. PS-2 S vs IS-2. PS-2 M vs. PS-3, IS-1, and IS-4. PS-2 L vs. IS-3. IS-1 S vs. IS-3 and IS-4. IS-2 S vs. IS-3 and IS-4.
LB Weights duration: PS-1 S vs. all PS and IS periods.
Other intensity: PS-1 S vs. PS-2 and IS-1. PS-1 M vs. IS-3. PS-2 S vs. IS-1, IS-3. PS-3 S vs. IS-3.
Other duration: PS-1 M vs. IS-1, and IS-3. PS-2 M vs. IS-1, and IS-3. PS-3 S vs. PS-1 and PS-2.
Running intensity: PS-1 S vs. PS-3 and IS-2. PS-1 M vs. IS-1 and IS-4. PS-1 L vs. IS-3. PS-2 M vs. PS-3, IS-2 and IS-4. PS-2 L vs. IS-1, IS-3 and IS-4. PS-3 S vs. IS-1 and IS-3. IS-2 S vs. IS-3 and IS-4.
Running duration: PS-1 S vs PS-2, IS-1, IS-3 and IS-4. IS-2 S vs. PS-2, IS-3 and IS-4

Table 3. Quantification of session intensity (measured by RPE) and duration (min) by day type for games, skills, UB weights, LB weights, running and other. Standardised differences are denoted by letters and expressed by effect size. Data is shown as mean ± SD

	Pooled		**Games**		**Skills**		**UB Weights**		**LB Weights**		**Other**		**Running**	
	Intensity	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*	*Intensity*	*Duration*
Recovery skills day	4.0 ± 1.9 M	32 ± 14	-	-	2.5 ± 1.3 S	35 ± 13 S	4.9 ± 1.1	40 ± 10	3.7 ± 1.8	17 ± 6 S	5.0 ± 2.2	32 ± 13	3.8 ± 1.6 S	17 ± 14
Main training day	5.4 ± 1.8 L	42 ± 24 S	-	-	5.5 ± 1.6 L-VL	64 ± 20 L	5.3 ± 1.1 S	38 ± 9	4.4 ± 1.8 S	21 ± 8	6.3 ± 1.9 L	38 ± 18	6.5 ± 2.4 M	18 ± 19
Captains run day	2.4 ± 1.4	23 ± 10	-	-	2.1 ± 1.0	22 ± 9	4.6 ± 0.9	33 ± 8	-	-	5.1 ± 1.9	26 ± 12	4.8 ± 2.4	32 ± 24
Game day	9.5 ± 0.9 VL	98 ± 18 L	9.5 ± 0.9	98 ± 18	-	-	-	-	-	-	-	-	-	-

Superscripts indicate small (S), moderate (M) or large (L) differences between periods within mode type as follows:
Pooled intensity: VL vs. recovery skills day, main training day and captains run day. M vs. main training day and captains run day. L vs. captains run day.
Pooled duration: L vs. recovery skills day, main training day and captains run day. S vs. recovery skills day and captains run day.
Skills intensity: L vs. recovery skills day. VL vs captains run day. S vs. captains run day.
Skills duration: L vs. recovery skills day and captains run day. S vs. captains run day.
UB Weights intensity: S vs. captains run day and recovery skills day.
LB Weights intensity: S vs. recovery skills day.
LB Weights duration: S vs. main training day.
Other intensity: L vs. recovery skills day
Running intensity: M vs. captains run day and recovery skills day. S vs. captains run day.