ORIGINAL ARTICLE

Analysis of professional basketball team training: Comparing drill types on different playing positions

Nenad Djuricic . *Department of Sport Science. Faculty of Medicine, Health and Sport. European University of Madrid. Madrid, Spain. Department of Real Madrid Graduate School. European University of Madrid. Madrid, Spain.*
Almudena Montalvo-Pérez. *Department of Real Madrid Graduate School. Faculty of Medicine, Health and Sports. European University of Madrid. Madrid, Spain.*
Rafael Manuel Navarro. *Department of Sport Science. Faculty of Medicine, Health and Sport. European University of Madrid. Madrid, Spain.*
Department of Real Madrid Graduate School. European University of Madrid. Madrid, Spain.
Guillermo Muñoz-Andradas. *Department of Sport Science. Faculty of Medicine, Health and Sport. European University of Madrid. Madrid, Spain.*
Department of Real Madrid Graduate School. European University of Madrid. Madrid, Spain.
Carlos Serrano. *Department of Sport Science. Faculty of Medicine, Health and Sport. European University of Madrid. Madrid, Spain. Department of Real Madrid Graduate School. European University of Madrid. Madrid, Spain.*

ABSTRACT

This study investigates the external load experienced during various game-based drills (GBD) in professional basketball, focusing on the most commonly used formats during the competitive season. External load metrics such as total distance (TD), player load (PL), high-speed running (HSR), accelerations (HI ACC), decelerations (HI DEC), jumps (HI JUMP), and landings (HI LAND) were assessed across different GBD types, including 5vs5, 5vs0, and variations in court size. A total of 12 male professional basketball players participated in the study, with data collected over 46 sessions. Results indicated that 5vs5 and 5vs0 formats were most prevalent, with significant differences in external load depending on court size, opposition presence, and player position. Larger court sizes and drills involving opposition resulted in higher physical demands, particularly in PL, and high-intensity actions, where drills without opposition showed high demands in HSR and HI LAND. Positional differences were observed, with guards and forwards exhibiting greater HSR and higher acceleration/deceleration values compared to centers. These findings provide insights into the external demands of GBD, highlighting the importance of customizing training load based on positional roles and the nature of the drills. The study underscores the need for further research to incorporate both external and internal load measures, including data from official games, to enhance understanding of how GBD formats influence player performance and adaptation.

Keywords: Performance analysis, External load, Physical demands, Training drills, Game-based drills.

Cite this article as:
Djuricic, N., Montalvo-Pérez, A., Navarro, R. M., Muñoz-Andradas, G., & Serrano, C. (2025). Analysis of professional basketball team training: Comparing drill types on different playing positions. *Journal of Human Sport and Exercise, 20*(3), 955-965. https://doi.org/10.55860/x5b82x74

Corresponding author. *Department of Sport Science. Faculty of Medicine, Health and Sport. European University of Madrid. Madrid, Spain.*
E-mail: nenad.duricic@universidadeuropea.es
Submitted for publication April 08, 2025.
Accepted for publication May 20, 2025.
Published May 29, 2025.
Journal of Human Sport and Exercise. ISSN 1988-5202.
©Asociación Española de Análisis del Rendimiento Deportivo. Alicante. Spain.
doi: https://doi.org/10.55860/x5b82x74

INTRODUCTION

Basketball is an intermittent game, requiring players to perform high-intensity actions such as sprinting, jumping, and rapid changes of direction (Schelling & Torres-Ronda, 2013), followed by low-intensity activities like walking and jogging (Ben Abdelkrim et al., 2010). The high frequency of games played by professional teams and the limited number of weekly training sessions present challenges for coaching staff in preparing players for matches, therefore, it is essential to involve all staff members in planning the training load (Svilar et al., 2018; Svilar & Jukić, 2018).

Games-based drills (GBD) involve one or more players engaging in competitive games against others (O'Grady et al., 2020). These drills are widely used in training due to their ability to mimic competitive scenarios, which enhances players' perception of technical and tactical elements while introducing variations in physiological and physical stimuli (Aguiar et al., 2012; Clemente, 2016). In basketball, there is a growing body of research on GBD, with studies examining physical and physiological responses to different GBD formats (Klusemann et al., 2012; Sampaio, 2009; Schelling & Torres, 2016). Coaches often manipulate game formats by altering conditions such as court size, number of players, and rule modifications (Clemente, 2016). For instance, reducing the number of players in GBD can significantly alter the physical demands of a training session. Evidence suggests that GBD with fewer players elicits greater physical and physiological demands compared to formats with more players (Conte et al., 2015; Klusemann et al., 2012; O'Grady et al., 2020). For example, Schelling & Torres (2016) demonstrated through accelerometry that 3vs3 and 5vs5 full-court GBD resulted in higher external loads compared to full-court 2vs2 and 4vs4. Similarly, Sampaio et al. (Sampaio, 2009) reported that 3vs3 had higher physiological demands than 4vs4, with their study also showing increased post-counter movement jump (CMJ) performance after 4vs4, indicating lower intensity in this game format.

In terms of court dimensions, larger court sizes contribute to higher external and internal loads (O'Grady et al., 2020), while smaller court sizes are associated with increased directional changes and a higher frequency of technical actions (Klusemann et al., 2012; Schelling & Torres, 2016). Additionally, factors like defence type, shot clock restrictions, and non-stoppage drills can further impact external and internal loads (Ballesta, 2019; Ben Abdelkrim et al., 2010; Bredt et al., 2020; Clemente et al., 2014; Conte et al., 2015; O'Grady et al., 2020; Svilar et al., 2019).

Schelling & Torres-Ronda (2016) classified GBD based on the number of players involved, categorizing drills as directed-oriented, special-oriented, and competitive-oriented. Competitive-oriented GBD should be prioritized in-season due to its greater similarity to actual gameplay (Schelling & Torres-Ronda, 2016). When examining positional variations in external load during GBD, centers exhibit higher counts of total and high-intensity accelerations compared to forwards and guards (Svilar et al., 2018). Forwards, on the other hand, show higher numbers of total and high-intensity decelerations. This positional data is valuable for coaches, providing insights into the unique demands of different basketball roles and aiding in accurate quantification of training loads (Svilar et al., 2018). Although research on GBD is growing, further studies are required to explore the external load in most used GBD formats in professional basketball during the competitive season.

Therefore, this study aims to identify the most frequently used GBD formats in professional basketball during the season, analyse the external load of these drills, and compare external load demands according to player position.

 © 2025 ARD Asociación Española

METHODS

Participants

Fourteen male professional players who competed in the Spanish second league participated in this observational research (age: 26.3 ± 3.8 years, height: 196.7 cm ± 8.8 cm, body mass: 91.5 kg ± 10.1 kg) (McKay et al., 2022) . One player was excluded due to injury, and another was not part of the team during the whole measurement period. Therefore, a total of 12 players completed the study and they were grouped as follows: guards n = 6 (point guard, shooting guard), forwards = 3 (small forwards and power forwards) and centers n = 3 (Salazar et al., 2020). All players were informed of the aim, risks, and benefits of the study before signing written consent to allow the collection of data for scientific purposes. This study was approved by the Research Ethics Commission of the University (CIPI/18/195), with all procedures conducted following the Declaration of Helsinki.

Design and procedures

Measurements were conducted during the second half of the 2022-2023 regular season, spanning from February to June. In total, 46 basketball sessions were recorded over 13 weeks. Furthermore, only training sessions that involved contact were analysed. All training sessions were planned and organized by the coaching staff. Data collected during warm-ups and breaks were excluded from the analysis to ensure that the results reflected only the external demands of GBD. During the week, the team typically had five basketball sessions (~5·wk^{-1}), three strength training sessions (~3·wk^{-1}), and usually one game. Before each training session, players wore a vest with a GPS device placed on their upper back. GBD was organized based on the number of players, opposition, and court size (O'Grady et al., 2020). We analysed various versions of competitive 5vs5 drills, including drills with 5 players from one team without opposition (5vs0). Half-court GBD was played on only one half of the court, and full court GBD involved a single transition from both teams (Schelling & Torres, 2016). GBD with 1.5 courts started by playing on one half of the court and then involved 2 transitions (Vazquez-Guerrero et al., 2020), where GBD 2+ courts involved more than 2 transitions. 5vs5 live games were GBD where both teams played continuously without stopping the clock and without breaks.

External demands were classified as: total distance (TD) in meters (m), player load (PL), high-speed running distance (HSR) above 18 km·h^{-1} (García et al., 2020, 2022), number of high-intensity accelerations (HI ACC), number of high-intensity decelerations (HI DEC) surpassing 3.5 m·s^{-1} (Svilar et al., 2019), number of high-intensity jumps (HI JUMP), and number of high-intensity landings (HI LAND), representing impacts above 5G-force (Vázquez-Guerrero et al., 2018; Vazquez-Guerrero et al., 2020; Vázquez-Guerrero et al., 2020). PL is a variable used to measure the total body load of athletes across three axes: vertical, anterior-posterior, and medial-lateral. It is commonly utilized to evaluate neuromuscular load among various types of players (Gómez-Carmona et al., 2020). The external load was measured using the WIMU PRO™ system (Realtrack Systems S.L., Almería, Spain), which has been tested for test–retest reliability (%TEM: 1.19), inter-unit reliability (bias: 0.18), and ICC values of 0.65 and 0.88 for x and y coordinates, respectively (Bastida Castillo et al., 2018). The system, consisting of four 3-axis accelerometers, a gyroscope, a 3D magnetometer, a barometer (sampled at 100 Hz), and an ultra-wideband positioning system (sampled at 18 Hz), was used during training sessions where antennas were consistently positioned in the same location and activated sequentially, with the master antenna always activated last (Serrano et al., 2021). The SPRO™ (version 950, RealTrack Systems, Almería, Spain) software was used for the analysis of the GPS data, and all data was exported to Microsoft Excel, where further analysis was conducted.

Statistical analysis

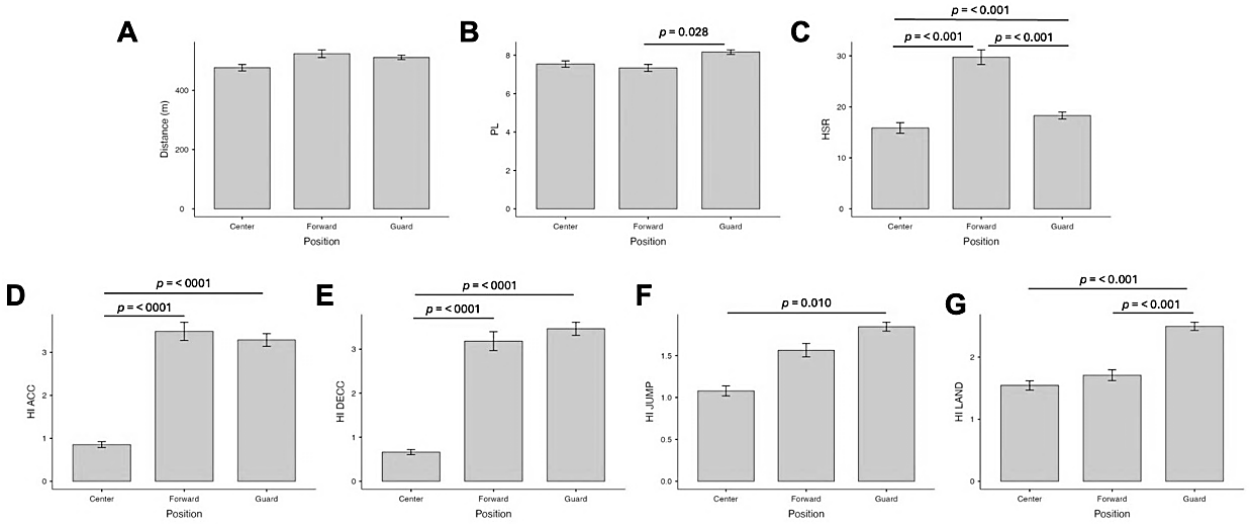
Data normality (Kolmogorov–Smirnov test) and homoscedasticity (Levene's test) were assessed prior to statistical analysis. Normal distribution was confirmed using the Shapiro–Wilk test, and homogeneity of variances was validated by Levene's test ($p > .05$). A two-way analysis of variance (ANOVA) was applied to each dependent variable, with exercise type and position as factors. When significant differences were detected, a Bonferroni post hoc comparison was performed. Data are presented as mean ± standard deviation (SD). Statistical analyses were conducted using SPSS software (version 26.0, SPSS Inc., Chicago, IL), with the significance level set at $\alpha = .05$.

RESULTS

A total of 55 distinct GBD were recorded during practices, with 5vs0 and 5vs5 variations accounting for 58% of the sessions, where GBD with and without opposition were 79.8% vs 20.2% respectively. The absolute mean ± SD values of external load for various GBD are presented in Table 1.

The half-court GBD showed the lowest values for TD, PL, HSR, and HI ACC. The highest PL and TD values were observed in the 5vs5 1.5 court GBD, while the highest HSR was recorded in the 5vs0 2+ court, with no significant difference when compared to the 5vs5 1.5 court GBD. In half-court GBD, TD, PL, and HI JUMP were lower in drills without opposition. In Full court GBD, significant differences were observed for TD, HSR, and HI LAND, with these values being higher in drills without opposition.

Figure 1 illustrates the absolute differences in external load variables across positions. No positional differences were observed for TD.



Note: GBD- game-based drill; A) TD- Total distance; B) PL-Player load; C) HSR- High-Speed Running; m, meters D) HI ACC-High intensity acceleration; E) HI DEC- High intensity deceleration; F) HI JUMP- High intensity jumps; G) HI LAND- High intensity landings.

Figure 1. Comparison of total external load based on players positions.

For PL, significant differences were found between forwards-guards (FG) (7.3 ± 3.7 vs. 8.2 ± 3.9, respectively). For HSR, differences were observed between all positions: center-guards (CG), center-forwards (CF), and FG (15.9 ± 23.1 vs. 18.3 ± 21.8; 29.7 ± 29.5 vs. 18.3 ± 21.8, respectively).

 © 2025 ARD Asociación Española

Table 1. Differences in training load indicators according to the basketball exercises.

Drill	Distance (m)	PL	HSR	HI ACC	HI DECC	HI JUMP	HI LAND
5:0 1.5 courts (1)	466.0± 166.4[3.4.5.7]	6.9 ± 2.3[3.4.5.7]	27.2 ± 26.7[2.4.8]	2.6 ± 3.4	2.9 ± 4.1	1.3 ± 1.1[5]	2.3 ± 2.0
5:0 2+ courts (2)	324.7 ± 79.4[3.5.7]	4.4 ± 1.1[3.5.6.7]	70.1 ± 52.9[3.4.6.7.8.9]	5.4 ± 3.0[4]	5.5 ± 3.7[4.8]	1.5 ± 1.2[4.5]	1.5 ± 1.1
5:0 Full court (3)	697.2 ± 225.5[4.6.7.8.9]	9.4 ± 3.0[4.5.8.9]	31.3 ± 28.4[4.7.8.9]	3.3 ± 4.7[8]	3.3 ± 4.6[8]	1.6 ± 1.6[5.7]	3.1 ± 2.5[4.6.7.8.9]
5:0 half court (4)	271.8 ± 156.4[5.6.7.8.9]	3.6 ± 2.0[5.6.7.8.9]	3.5 ± 7.6[5.6.7.9]	1.4 ± 2.4[6.7]	1.5 ± 2.2[6.7]	0.7 ± 0.9[6.7.8.9]	1.3 ± 1.5[5.7]
5:5 1.5 courts (5)	760.1 ± 308.1[6.7.8.9]	12.5 ± 5.3[6.7.8.9]	40.9 ± 30.4[7.8.9]	3.8 ± 4.5[8]	3.9 ± 4.7	2.9 ± 2.7	3.4 ± 3.1[6.7.8.9]
5:5 2+ courts (6)	521.3 ± 352.8[8]	8.4 ± 5.8[8]	32.3 ± 27.0[8]	5.6 ± 6.6[8.9]	5.5 ± 6.0[8.9]	1.4 ± 1.5[8]	1.7 ± 1.9
5:5 Full court (7)	572.1 ± 257.8[8.9]	9.1 ± 4.2[8.9]	26.8 ± 24.6[8.9]	3.5 ± 5.1[8.9]	3.5 ± 5.2[8.9]	1.9 ± 1.8	2.2 ± 2.0[8]
5:5 half court (8)	395.7 ± 175.7[9]	6.3 ± 2.8[9]	5.2 ± 11.7[9]	1.8 ± 3.1	1.8 ± 3.1	1.4 ± 1.4	1.7 ± 1.6
5:5 live game (9)	460.2 ± 181.8	7.5 ± 3.0	21.2 ± 20.2	2.4 ± 4.2	2.5 ± 4.3	1.6 ± 1.6	1.9 ± 1.7

Note: Media ± SD; HI ACC, High acceleration; HI DECC, High Deceleration, HI JUMP, High Jump, HI LAND, High Land; HSR, High Speed Running; m, meters; n, numbers, PL, Player Load. Numbers in superscripts indicate Bonferroni Post Hoc p < .05

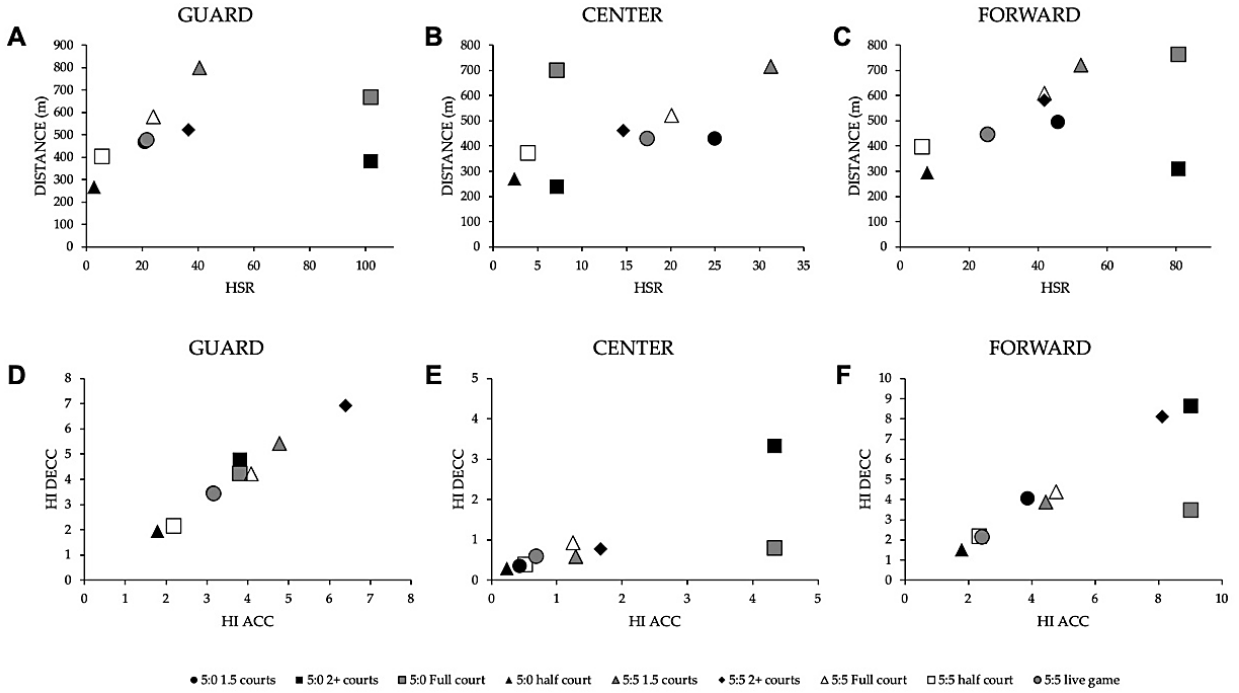
Table 2. Differences between basketball drills and positions.

Drill	Distance (m)			PL			HSR			HI ACC			HI DECC			HI JUMP			HI LAND		
	C	F	G	C	F	G	C	F	G	C	F	G	C	F	G	C	F	G	C	F	G
5:0 1.5 courts (1)	432.5 ± 131.6	495.5 ± 213.7	468.7 ± 161.2	6.9 ± 2.0	6.3 ± 2.4	7.2 ± 2.4	24.9 ± 24.0	45.5 ± 34.5 [4.8]	20.8 ± 21.1 [2.4.5.8]	0.4 ± 0.8	3.9 ± 3.7	3.1 ± 3.6	0.4 ± 0.6	4.1 ± 3.7	3.5 ± 4.7	1.6 ± 1.3	1.5 ± 0.9	1.1 ± 1.2 [5.7]	2.6 ± 1.9	1.5 ± 1.0	2.5 ± 2.3
5:0 2+ courts (2)	240.2 ± 47.7	311.2 ± 60.0	383.6 ± 54.9	3.6 ± 0.8	3.7 ± 0.8	5.3 ± 0.8	**7.1 ± 1.0** [CF CG]	**80.4 ± 21.5** [4.8.9]	**101.7 ± 49.4** [3.4.5.6.7.8.9]	4.3 ± 1.5	9.0 ± 2.7	3.8 ± 2.2	3.3 ± 1.2	8.7 ± 3.8	4.8 ± 3.7	1.7 ± 1.5	1.3 ± 0.6	1.4 ± 1.5	1.3 ± 1.2	1.3 ± 1.2	1.6 ± 1.3
5:0 Full court (3)	703.2 ± 214.6	764.0 ± 269.0	670.8 ± 208.6	9.7 ± 2.9	9.0 ± 3.2	9.5 ± 3.0	**29.1 ± 33.9** [4.8 CF]	**54.2 ± 25.9** [4.8.9 FG]	**23.9 ± 21.9** [4.5.8]	0.9 ± 1.8	4.0 ± 4.2	4.0 ± 5.3	0.8 ± 1.6	3.5 ± 4.3	4.2 ± 5.2	1.6 ± 1.8	1.9 ± 2.0	1.5 ± 1.4 [5.7]	3.0 ± 2.5	2.8 ± 2.7	3.3 ± 2.5
5:0 half court (4)	268.5 ± 173.8	294.9 ± 149.1	266.0 ± 153.3	3.7 ± 2.3	3.1 ± 1.3	3.7 ± 2.0	2.4 ± 6.0 [5]	7.9 ± 11.4 [5.6.7]	2.6 ± 6.4 [5.6.7.9]	0.2 ± 0.8	1.8 ± 2.5	1.8 ± 2.7	0.3 ± 0.9	1.5 ± 2.3	2.0 ± 2.3	0.8 ± 0.8	1.0 ± 0.9	0.6 ± 0.9 [5.7.9]	0.8 ± 0.8	1.0 ± 0.9	1.6 ± 1.9
5:5 1.5 courts (5)	716.7 ± 317.6	722.2 ± 286.2	797.5 ± 316.6	11.9 ± 5.8	11.0 ± 4.6	13.5 ± 5.4	31.3 ± 28.7 [8]	52.4 ± 29.7 [8.9]	40.4 ± 30.5 [7.8.9]	1.3 ± 1.7	4.4 ± 3.5	4.8 ± 5.3	0.6 ± 1.0	3.9 ± 2.7	5.4 ± 5.6	2.1 ± 2.1	2.8 ± 2.7	3.4 ± 2.8 [8.9]	2.3 ± 1.7	2.4 ± 2.7	4.3 ± 3.6
5:5 2+ courts (6)	462.1 ± 358.5	581.0 ± 407.7	521.1 ± 337.5	7.8 ± 6.2	8.4 ± 6.4	8.8 ± 5.6	14.7 ± 21.5	41.7 ± 34.6 [8]	36.4 ± 22.1 [8]	1.7 ± 1.5	8.1 ± 8.6	6.4 ± 6.6	0.8 ± 1.0	7.3 ± 7.0	6.9 ± 5.9	0.6 ± 1.0	1.2 ± 1.2	1.9 ± 1.6	1.0 ± 1.1	1.4 ± 2.4	2.1 ± 2.0
5:5 Full court (7)	521.3 ± 235.1	608.2 ± 271.3	580.9 ± 259.7	8.5 ± 3.8	8.6 ± 4.0	9.6 ± 4.4	**20.1 ± 25.0** [8 CF]	**41.7 ± 29.3** [8.9 FG]	**24.1 ± 19.7** [8]	1.3 ± 1.7	4.8 ± 5.4	4.1 ± 5.7	0.9 ± 1.5	4.4 ± 5.5	4.2 ± 5.8	**1.1 ± 1.3** [CG]	**1.7 ± 1.6** [FG]	**2.3 ± 2.0** [8]	1.4 ± 1.4	1.6 ± 1.8	2.8 ± 2.2
5:5 half court (8)	374.1 ± 177.5	398.0 ± 180.2	403.7 ± 173.0	6.1 ± 2.9	8.6 ± 4.0	6.6 ± 2.8	3.8 ± 9.8 [9]	6.2 ± 12.1	5.4 ± 12.3 [9]	0.5 ± 1.1	2.3 ± 2.8	2.2 ± 3.6	0.4 ± 0.9	2.2 ± 3.0	2.2 ± 3.5	**0.9 ± 1.0** [CG]	1.4 ± 1.5	**1.6 ± 1.5**	1.1 ± 1.3	1.6 ± 1.4	1.9 ± 1.7
5:5 live game (9)	432.0 ± 162.3	446.6 ± 193.3	479.1 ± 184.3	7.1 ± 2.7	6.8 ± 2.9	8.0 ± 3.1	17.3 ± 18.2	25.4 ± 21.7	21.4 ± 20.3	0.7 ± 1.2	2.4 ± 3.6	3.2 ± 5.0	0.6 ± 1.2	2.2 ± 3.6	3.5 ± 5.2	**0.9 ± 1.0** [CG]	1.3 ± 1.5	**2.0 ± 1.7**	1.4 ± 1.3	1.4 ± 1.3	2.3 ± 1.9

Note. *Note: Media ± SD; HI ACC, High acceleration; HI DECC, High Deceleration, HI JUMP, High Jump, HI LAND, High Land; HSR, High Speed Running; m, meters; n, numbers, PL, Player Load. C, Center; F, Forward; G, Guard. Numbers and letters in superscripts indicate Bonferroni Post Hoc p < .05.*

Significant differences in HI ACC and HI DEC were found between CF (0.9 ± 1.5 vs. 3.5 ± 4.4 for HI ACC; 0.7 ± 1.3 vs. 3.2 ± 4.3 for HI DEC) and CG (0.9 ± 1.5 vs. 3.3 ± 4.9 for HI ACC; 0.7 ± 1.3 vs. 3.5 ± 4.9 for HI DEC). For HI JUMP, differences were observed for CG (1.1 ± 1.3 vs. 1.9 ± 1.8), while for HI LAND, differences were found between CG (1.5 ± 1.6 vs. 2.5 ± 2.2) and FG (1.7 ± 1.8 vs. 2.5 ± 2.2). When analysing differences between positions and drills, no differences were observed for TD, PL, HI ACC, and HI DEC (Table 2).

Differences were found in HSR for the following scenarios: 5vs0 2+ courts for CF (7.1 ± 1.0 vs. 80.4 ± 21.5) and CG (7.1 ± 1.0 vs. 101.7 ± 49.4), 5v0 full court CF (29.1 ± 33.9 vs. 54.2 ± 25.9) and FG (54.2 ± 25.9 vs. 23.9 ± 21.9), and 5v5 full court: CF (20.1 ± 25.0 vs. 41.7 ± 29.3) and CG (41.7 ± 29.3 vs. 24.1 ± 19.7). Positional differences for TD and HSR, HI ACC and HI DEC are shown in Figure 2.



Note: HI ACC-High intensity acceleration; HI DEC- High-intensity deceleration, HSR- High-Speed Running; m, meters.

Figure 2. Comparison of external load between GBD and playing positions.

DISCUSSION

In our study, we first aimed to identify the most commonly used GBD formats in professional basketball during the competitive season. The prevalence of 5v5 and 5v0 GBD is consistent with expectations, indicating a strong emphasis on game preparation during this period (Schelling & Torres-Ronda, 2013). Previous research conducted during the preseason revealed that GBD involving opposition accounted for 38.3% of all tasks, while 61.7% were GBD without opposition (Calle et al., 2025). During the preseason, the primary objective is to enhance players' technical skills and conditioning, which guides the approach to training tasks (Calle et al., 2025). In contrast, in-season GBD involving opposition offer players valuable opportunities to engage in specific, realistic training scenarios (Schelling & Torres-Ronda, 2013).

 © 2025 ARD Asociación Española

When examining external load, TD was found to be lowest in half-court GBD and highest in full-court 5v5 (Vazquez-Guerrero et al., 2020). However, in basketball, the intensity of the distance covered seems to be more important, as elite players reach higher velocities than non-elite players (Petway et al., 2020). Therefore, in HSR, the highest values were found in 5v0 GBD with two courts, as the lack of opposition allows players to perform pre-planned movements at higher intensities (Sansone et al., 2023). Additionally, increased court size provides opportunities for faster transitions, or coaches may emphasize a faster-paced game, consequently elevating the speed of play. Introducing this type of GBD, which increases the distance covered at high speed, can have a protective effect and reduce the risk of injury (Vazquez-Guerrero et al., 2020).

The 5v5 GBD on 1.5 courts also showed the highest values in PL and HI LAND, which is consistent with previous research (Gamonales et al., 2023; Vazquez-Guerrero et al., 2020). However, other studies have shown that drills such as 3v3 (Sampaio, 2009; Schelling & Torres, 2016), 2v2 (Conte et al., 2016), and 1v1 (Torres-Ronda et al., 2016) impose the highest physical load on players. Interestingly, these particular drills were not frequently utilized during the competitive season by the team in this study. This could be attributed to the coach's emphasis on practicing team tactics, leading to a preference for GBD that prioritize team dynamics. Furthermore, when examining acceleration and deceleration, the highest number of HI ACC and HI DEC were observed in GBD using two or more courts, both with and without opposition. These drills showed higher values compared to half-court GBD, where the larger court size allows players to reach higher velocities, which may significantly influence HI ACC and HI DEC demands (Vazquez-Guerrero et al., 2020). This information is crucial as the acceleration and deceleration demands are higher in games than in training (Petway et al., 2020). By using appropriate GBD with a higher frequency of HI ACC and HI DEC, we prepare players more effectively for the physical demands of the game (Feu et al., 2023; Petway et al., 2020). An intriguing finding is that 5v5 live games did not exhibit higher loads compared to other 5v5 GBD played on a full court. This contrasts with the findings of Svilar et al. (Svilar et al., 2019), where non-stoppage 5v5 GBD showed higher values in terms of total decelerations, PL per minute, accelerations, and changes of direction compared to regular stoppage 5v5 drills. The lower values observed in live games may be attributed to the continuous nature of play, which can induce fatigue and limit players' ability to perform high-intensity actions (Conte et al., 2015).

When examining positional differences, no significant differences were observed in TD. For HSR, the highest values were recorded for forwards, followed by guards, and then centers. This can be explained by their style of play and their preparedness for the most demanding scenarios (García et al., 2020). In terms of PL, the highest values were found in guards, with no significant difference compared to centers. Centers exhibit high PL values due to their increased internal load, which is a result of inside play characterized by frequent contact and jumps (Calle et al., 2025). However, in our study, guards recorded the highest PL values compared to forwards, which may be attributed to their increased frequency of accelerations and decelerations (Dalen et al., 2016; Portes, 2019). For HI ACC and decelerations HI DECC, centers showed the lowest values, while forwards displayed the highest HI ACC and guards recorded the highest HI DECC, with no significant differences between these positions. The explanation for guards may lie in the technical aspects of the game and specific situations, whereas forwards, as previously mentioned, achieve higher speeds during training (Vázquez-Guerrero et al., 2018). It seems that both positions require more high-intensity actions than centers (Svilar, positional differences). Furthermore, guards exhibited the highest values for HI JUMP and high-intensity landings (HI LAND) compared to other positions, these types of actions often occur during offensive plays in basketball (Svilar et al., 2018). However, when examining specific GBD and positional differences, no differences were found for TD, PL, HI ACC, HI DECC, and HI LAND. Differences were identified in HSR during 5v0 on two courts for guards and 5v0 full-court and 5v5 full-court

drills for forwards which highlights the importance of larger court sizes in facilitating higher velocities (Vázquez-Guerrero et al., 2018). For HI JUMP, differences were observed in 5v5 full-court, half-court, and live games for guards. Therefore, monitoring these variables closely during training sessions and games is crucial for effective player workload management. Individualizing training based on position is essential to replicate the demands of games (Vázquez-Guerrero et al., 2018).

While this study has provided valuable insights into the understanding of GBD in professional basketball, it is important to acknowledge certain limitations. First, the total training load includes both external and internal load, and the reliance on only external load data limits our ability to draw conclusions about the training responses and adaptations in professional players (Portes, 2019; Scanlan et al., 2014). Another limitation is the lack of data from official games. In the Spanish basketball leagues during the season 2022-2023, GPS devices are not permitted during official games, which restricts our understanding of the actual load experienced in these games. Having data from official games would help establish a clearer relationship between GBD and game demands. Additionally, a final limitation is that the study was based on data from a single professional team and only covered the final part of the season, which may limit the generalizability of the findings.

CONCLUSION

This study offers valuable insights into the external load experienced during GBD in professional basketball during the competitive season. The findings highlight the prevalence of 5v5 and 5v0 GBD, emphasizing game preparation as a core focus during this period. The external load, particularly in terms of TD, HSR, and acceleration/deceleration metrics, varies across different GBD formats and positional roles. Larger court sizes and drills with opposition often lead to higher physical demands, suggesting their importance for replicating game scenarios. Notably, the study found no significant differences in TD across positions but observed positional variations in high-intensity actions like acceleration and deceleration and HSR.

Future research should incorporate both external and internal load measures and include data from official games to further refine our understanding of how GBD impact player performance and adaptation in professional basketball. Monitoring and individualizing training load based on positional demands will be crucial for optimizing player performance and reducing injury risk.

AUTHOR CONTRIBUTIONS

Research concept and study design, R.M.N, and N.D.; Literature review, N.D., A.M and C.S.; Data Collection, N.D., R.M.N. and G.M. Data analysis and interpretation, A.M., N.D. Statistical analysis A.M. and G.M. Writing of manuscript, N.D.; Review and Editing N.D.; R.M.N and C.S.. All authors have read and agreed to the published version of the article.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

 © 2025 ARD Asociación Española

REFERENCES

Aguiar, M., Botelho, G., Lago, C., Maças, V., & Sampaio, J. (2012). A Review on the Effects of Soccer Small-Sided Games. Journal of Human Kinetics, 33(2012), 103-113. https://doi.org/10.2478/v10078-012-0049-x

Ballesta, A. S. ; A. J. ; C. T. (2019). Accelerometry in Basketball. Study of External Load during Training. / Accelerometria en bàsquet. Estudi de la càrrega externa durant els entrenaments. , 2019, n. 135, p. 100-117, . Apunts: Educació Física i Esports, 135, 100-117. https://doi.org/10.5672/apunts.2014-0983.cat.(2019/1).135.07

Bastida Castillo, A., Gómez Carmona, C. D., De la Cruz Sánchez, E., & Pino Ortega, J. (2018). Accuracy, intra- and inter-unit reliability, and comparison between GPS and UWB-based position-tracking systems used for time-motion analyses in soccer. European Journal of Sport Science, 18(4), 450-457. https://doi.org/10.1080/17461391.2018.1427796

Ben Abdelkrim, N., Castagna, C., Jabri, I., Battikh, T., El Fazaa, S., & Ati, J. El. (2010). Activity Profile and Physiological Requirements of Junior Elite Basketball Players in Relation to Aerobic-Anaerobic Fitness. Journal of Strength and Conditioning Research, 24(9), 2330-2342. https://doi.org/10.1519/JSC.0b013e3181e381c1

Bredt, S., Torres, J., Diniz, L., Praça, G. M., Andrade, A., Morales, J., Rosso, T., & Chagas, M. (2020). Physical and physiological demands of basketball small-sided games: the influence of defensive and time pressures. Biology of Sport, 37(2), 131-138. https://doi.org/10.5114/biolsport.2020.93038

Calle, O., López-Sierra, P., Feu, S., & Ibáñez, S. J. (2025). Analysis of tasks and training load during pre-season training in professional basketball. Apunts Sports Medicine, 60(225), 100466. https://doi.org/10.1016/j.apunsm.2024.100466

Clemente, F. M. (2016). Small-Sided and Conditioned Games in Basketball Training. Strength & Conditioning Journal, 38(3), 49-58. https://doi.org/10.1519/SSC.0000000000000225

Clemente, F. M., Wong, D. P., Martins, F. M. L., & Mendes, R. S. (2014). Acute Effects of the Number of Players and Scoring Method on Physiological, Physical, and Technical Performance in Small-sided Soccer Games. Research in Sports Medicine, 22(4), 380-397. https://doi.org/10.1080/15438627.2014.951761

Conte, D., Favero, T. G., Niederhausen, M., Capranica, L., & Tessitore, A. (2015). Physiological and Technical Demands of No Dribble Game Drill in Young Basketball Players. Journal of Strength and Conditioning Research, 29(12), 3375-3379. https://doi.org/10.1519/JSC.0000000000000997

Conte, D., Favero, T. G., Niederhausen, M., Capranica, L., & Tessitore, A. (2016). Effect of different number of players and training regimes on physiological and technical demands of ball-drills in basketball. Journal of Sports Sciences, 34(8), 780-786. https://doi.org/10.1080/02640414.2015.1069384

Dalen, T., Jørgen, I., Gertjan, E., Geir Havard, H., & Ulrik, W. (2016). Player Load, Acceleration, and Deceleration During Forty-Five Competitive Matches of Elite Soccer. Journal of Strength and Conditioning Research, 30(2), 351-359. https://doi.org/10.1519/JSC.0000000000001063

Feu, S., García-Ceberino, J. M., López-Sierra, P., & Ibáñez, S. J. (2023). Training to Compete: Are Basketball Training Loads Similar to Competition Achieved? Applied Sciences, 13(22), 12512. https://doi.org/10.3390/app132212512

Gamonales, J. M., Hernández-Beltrán, V., Escudero-Tena, A., & Ibáñez, S. J. (2023). Analysis of the External and Internal Load in Professional Basketball Players. Sports, 11(10), 195. https://doi.org/10.3390/sports11100195

García, F., Schelling, X., Castellano, J., Martín-García, A., Pla, F., & Vázquez-Guerrero, J. (2022). Comparison of the most demanding scenarios during different in-season training sessions and official

matches in professional basketball players. Biology of Sport, 39(2), 237-244. https://doi.org/10.5114/biolsport.2022.104064

García, F., Vázquez-Guerrero, J., Castellano, J., Casals, M., & Schelling, X. (2020). Differences in Physical Demands between Game Quarters and Playing Positions on Professional Basketball Players during Official Competition. Journal of Sports Science & Medicine, 19(2), 256-263.

Gómez-Carmona, C. D., Bastida-Castillo, A., Ibáñez, S. J., & Pino-Ortega, J. (2020). Accelerometry as a method for external workload monitoring in invasion team sports. A systematic review. PLOS ONE, 15(8), e0236643. https://doi.org/10.1371/journal.pone.0236643

Klusemann, M. J., Pyne, D. B., Foster, C., & Drinkwater, E. J. (2012). Optimising technical skills and physical loading in small-sided basketball games. Journal of Sports Sciences, 30(14), 1463-1471. https://doi.org/10.1080/02640414.2012.712714

McKay, A. K. A., Stellingwerff, T., Smith, E. S., Martin, D. T., Mujika, I., Goosey-Tolfrey, V. L., Sheppard, J., & Burke, L. M. (2022). Defining Training and Performance Caliber: A Participant Classification Framework. International Journal of Sports Physiology and Performance, 17(2), 317-331. https://doi.org/10.1123/ijspp.2021-0451

O'Grady, C. J., Fox, J. L., Dalbo, V. J., & Scanlan, A. T. (2020). A Systematic Review of the External and Internal Workloads Experienced During Games-Based Drills in Basketball Players. International Journal of Sports Physiology and Performance, 15(5), 603-616. https://doi.org/10.1123/ijspp.2019-0785

Petway, A. J., Freitas, T. T., Calleja-González, J., Medina Leal, D., & Alcaraz, P. E. (2020). Training load and match-play demands in basketball based on competition level: A systematic review. PLOS ONE, 15(3), e0229212. https://doi.org/10.1371/journal.pone.0229212

Portes, R. ; N. R. M. ; S. C. ; T. J. J. ; J. S. L. (2019). Monitoring and Interpreting External Load in Basketball: A Narrative Review. Rev. Psicol. Deporte 2019,, 119-131. Rev. Psicol. Deporte, 28, 119-131.

Salazar, H., Castellano, J., & Svilar, L. (2020). Differences in External Load Variables Between Playing Positions in Elite Basketball Match-Play. Journal of Human Kinetics, 75(1), 257-266. https://doi.org/10.2478/hukin-2020-0054

Sampaio, J. , A. C. , L. N. (2009). Power, heart rate and perceived exertion responses to 3x3 and 4 × 4 basketball small-sided games. Rev. De Psicol. Del Deporte , 18, ., 463-467.

Sansone, P., Gasperi, L., Makivic, B., Gomez-Ruano, M., Tessitore, A., & Conte, D. (2023). An ecological investigation of average and peak external load intensities of basketball skills and game-based training drills. Biology of Sport, 40(3), 649-656. https://doi.org/10.5114/biolsport.2023.119291

Scanlan, A. T., Wen, N., Tucker, P. S., & Dalbo, V. J. (2014). The Relationships Between Internal and External Training Load Models During Basketball Training. Journal of Strength and Conditioning Research, 28(9), 2397-2405. https://doi.org/10.1519/JSC.0000000000000458

Schelling, X., & Torres, L. (2016). Accelerometer Load Profiles for Basketball-Specific Drills in Elite Players. Journal of Sports Science & Medicine, 15(4), 585-591.

Schelling, X., & Torres-Ronda, L. (2013). Conditioning for Basketball. Strength & Conditioning Journal, 35(6), 89-94. https://doi.org/10.1519/SSC.0000000000000018

Schelling, X., & Torres-Ronda, L. (2016). An Integrative Approach to Strength and Neuromuscular Power Training for Basketball. Strength & Conditioning Journal, 38(3), 72-80. https://doi.org/10.1519/SSC.0000000000000219

Serrano, C., Sánchez-Sánchez, J., Felipe, J. L., Hernando, E., Gallardo, L., & Garcia-Unanue, J. (2021). Physical Demands in Elite Futsal Referees During Spanish Futsal Cup. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.625154

 © 2025 ARD Asociación Española

Svilar, L., Castellano, J., & Jukic, I. (2019). Comparison of 5vs5 Training Games and Match-Play Using Microsensor Technology in Elite Basketball. Journal of Strength and Conditioning Research, 33(7), 1897-1903. https://doi.org/10.1519/JSC.0000000000002826

Svilar, L., Castellano, J., Jukic, I., & Casamichana, D. (2018). Positional Differences in Elite Basketball: Selecting Appropriate Training-Load Measures. International Journal of Sports Physiology and Performance, 13(7), 947-952. https://doi.org/10.1123/ijspp.2017-0534

Svilar, L., & Jukić, I. (2018). Load monitoring system in top-level basketball team. Kinesiology, 50(1), 25-33. https://doi.org/10.26582/k.50.1.4

Torres-Ronda, L., Ric, A., Llabres-Torres, I., de las Heras, B., & Schelling i del Alcazar, X. (2016). Position-Dependent Cardiovascular Response and Time-Motion Analysis During Training Drills and Friendly Matches in Elite Male Basketball Players. Journal of Strength and Conditioning Research, 30(1), 60-70. https://doi.org/10.1519/JSC.0000000000001043

Vázquez-Guerrero, J., Casals, M., Corral-López, J., & Sampaio, J. (2020). Higher training workloads do not correspond to the best performances of elite basketball players. Research in Sports Medicine, 28(4), 540-552. https://doi.org/10.1080/15438627.2020.1795662

Vazquez-Guerrero, J., Reche, X., Cos, F., Casamichana, D., & Sampaio, J. (2020). Changes in External Load When Modifying Rules of 5-on-5 Scrimmage Situations in Elite Basketball. Journal of Strength and Conditioning Research, 34(11), 3217-3224. https://doi.org/10.1519/JSC.0000000000002761

Vázquez-Guerrero, J., Suarez-Arrones, L., Casamichana Gómez, D., & Rodas, G. (2018). Comparing external total load, acceleration and deceleration outputs in elite basketball players across positions during match play. Kinesiology, 50(2), 228-234. https://doi.org/10.26582/k.50.2.11

This work is licensed under a Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0 DEED).