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# Is Basketball a Symmetrical Sport?

**Sergio J. Ibáñez *, Pablo López-Sierra, Víctor Hernández-Beltrán and Sebastián Feu**

Optimization of Training and Sports Performance Research Group (GOERD), Faculty of Sports Science, University of Extremadura, 10003 Cáceres, Spain; plopezp@alumnos.unex.es (P.L.-S.); vhernandpw@alumnos.unex.es (V.H.-B.); sfeu@unex.es (S.F.)
* Correspondence: sibanez@unex.es

**Abstract:** Basketball, an intermittent sport with a high impact load, presents a strong probability of lower limb injuries. These injuries can be caused by poor quantification of loads, very intense training sessions or even asymmetries in the lower extremities. The main aim of the present study is to identify whether asymmetries exist in basketball. Specifically, asymmetries depending on: (i) type of task, (ii) type of game situation, (iii) specific positions while training and (iv) specific positions while competing. It is hypothesized that there will be no significant differences between the different conditions. For this purpose, all the training sessions and matches of a professional basketball team belonging to the First Spanish Division were monitored during the preseason. WIMU PRO$^{TM}$ inertial devices were used for data collection. The statistical analysis compared the different cases with an ANOVA test. The results do not show significant differences in the values collected among the type of task, the game situation and the positions of the individual players. It can be concluded that basketball is a symmetrical sport. Despite this, the coaching staff should carefully monitor the training loads and asymmetries of the players to avoid the risk of injury.

**Keywords:** basketball; training; competition; asymmetries; injuries; inertial devices

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## 1. Introduction

Basketball is a very popular sport classified as an invasion game, which has been extensively studied during the last decade [1]. Basketball research has focused on identifying performance indicators [2], technical-tactical aspects [3,4], health [5] and load control [6], among others. Within the area of health, there is a specific term that has experienced exponential growth in recent years: asymmetries. According to the data on articles indexed in the Web of Science database, more articles have been published in the last four years (48) than had been published up to 2018 (35). This exponential growth is further evidence of the scientific progress that is taking place in the sport of basketball, as already shown by Ibañez et al. [7] with the increase in the number of free communications in congresses, scientific productions and specific congresses on the subject. According to the research evolution described by Ibañez et al. [7], this article would be included in the second phase, which is called diagnostic analytics, which describes what has occurred during the period analyzed.

The literature discusses two conditions that could affect player asymmetries, lateral preference and bilateral deficit. Lateral preference refers to the bodily differences that occur between a preferred limb and a stabilizing limb [8]. However, the bilateral deficit refers to the difference that can occur when generating force between two different body segments [9]. Of these terms, only bilateral deficit can pose a health risk, and this is what is known as asymmetry. Physical trainers have been trying for years to reduce asymmetries because of their relationship with the occurrence of injuries [10–12]. However, in recent years, studies have been published that consider that asymmetries do not pose a risk of injury [13], or that work to reduce asymmetries should focus on improving athlete performance [14] rather than seeking a decrease in injury. This debate probably stems from the fact that clinically, asymmetries are considered a health problem if they exceed a 10% difference between the two limbs [15], but more research should be conducted on whether there is a risk in sport and what percentage of asymmetry should be a concern for athletes or technical staff. Some authors, such as Dos'Santos et al. [14], suggest extending this range in the athlete population to 15% or setting the risk threshold by quartiles in each sporting context. It should be noted that the vast majority of studies on asymmetry in sport have focused on the analysis of individual sports such as taekwondo [16], athletics [17,18] or triathlon [19].

Research on asymmetries in team sports, such as basketball, is less than in other invasion sports such as soccer [10,11]. Despite the difference in the number of studies published in the different team sports, they all share a common factor: the research design. Research to date has been conducted with tests that were unrelated to the sport performed by the athletes, using non-specific tests that only allow us to know the presence of an asymmetry, but not to contextualize what the asymmetry is due to. These are useful interventions when detecting asymmetries by physical trainers, but they do not represent an advance in knowledge to investigate the origin of this asymmetry [20–22]. Although inertial devices are validated for the measurement of asymmetries in a sports context in real time [23], research on asymmetries in the basketball environment (with specific tests outside the real game) is scarce, and null when talking about the real sport, either in training itself or even in official competition. Gómez-Carmona et al. [23] designed a battery of specific tests to measure possible asymmetries in invasion games using multiple inertial devices placed at different joint points. This battery allows the identification of horizontal and vertical asymmetries in basketball players in a global way, since information is obtained on the consequences that the different technical movements of basketball have in isolation on the organism. The last step, the one carried out in this study, is to analyze the technical movements of basketball as a whole in competition, not in isolation in a battery of sport-specific tests.

Research analyzing asymmetries in basketball generally compare the differences obtained among groups in test batteries. These test batteries are essentially composed of two types of tests: laboratory tests, in which flexion-extension is measured through peak torque [22,24], and field tests, in which essentially straight runs and vertical jumps with one or two legs are used [20,21]. The first study, analyzing peak torque [24], also includes a battery of tests with jumps and a 10 m sprint. They analyzed 15 professional basketball players without finding dominant side effects. The second study in the literature, analyzing peak torque [22], includes players from various sports, both male and female. They did find differences in some female sports, such as volleyball and soccer, which could indicate that in the female gender there could be sports that generate differences between extremities at the level of force production. This is important for the research question of the study, but the type of test used does not allow us to conclude whether the asymmetries are due to that sport. Nevertheless, no asymmetries were found in basketball players in this study. Regarding the studies that use non-specific test batteries, they conclude that there are no asymmetries in basketball players in the tests performed. However, the study with a basketball-specific battery carried out by Gómez-Carmona et al. [25] with 13 semi-professional basketball players did find asymmetries in the curvilinear running tests, a type of running that occurs frequently in the real game. However, since a specific movement is analyzed, but in a decontextualized manner, it cannot be concluded that these asymmetries affect basketball players, as they may compensate as the game progresses. That is why the need to analyze players within the actual sport in basketball is important to conclude that asymmetries are or are not due to the sport practiced.

The natural lateral dominance of basketball players conditions some of their movements, such as defining the pivot leg or the supporting foot for a jump shot. These technical solutions to tactical problems of the game can affect the impacts that one leg receives versus the other. This lateral dominance does not necessarily generate differences between segments beyond skill or accuracy. As far as is known, there is no research conducted in the natural context that analyzes whether these repeated decompensations over time represent a significant difference between the load accumulated by the two legs, which over time could represent a problem at a physical level or asymmetry, or whether these differences in lateral preference at the level of strength development are compensated for as playing time progresses. Furthermore, these movements have not been tested during training and competition or when taking into account the specific positions of the players.

Due to the scarce scientific production on asymmetries in invasion games in general and in basketball in particular, the objective of this research is to analyze the asymmetries produced in basketball players in real training and competition situations. Specifically, the research objectives were (i) to identify asymmetries according to the type of training task, (ii) to identify differences in asymmetries produced according to the game situation in training tasks, (iii) to discover asymmetries produced according to specific positions in training and (iv) to analyze possible differences in asymmetries produced according to specific positions in competition. This will address the question of whether basketball is a sport that maintains symmetry in the lower body of its players when it is performed in its natural context and in each of its various training situations. The authors hypothesize that in basketball training and competition, differences between players' footrests will be identified. The magnitude of these differences will not be such that asymmetries can be asserted.

## 2. Materials and Methods

### 2.1. Design

Based on O'Donoghue's sports performance analysis research methods [26], this research was considered ex post facto, as the data analysis was conducted retrospectively. In addition, it was of a comparative–casual type since the relationships of asymmetries were analyzed retrospectively between subjects who may or may not have asymmetries. This research was of a natural character [27], because no variable was manipulated by the research group, which limited itself to collecting the data in the usual training context.

### 2.2. Participants

The participants in this study were twelve professional male players from the ACB League (First Spanish Division) during the 2022/2023 preseason (age = 28 $\pm$ 3.075 years; height = 199.75 $\pm$ 9.753 cm). Non-probabilistic convenience sampling was used to select the participants due to the fact that they were top-level professional players, a sample that is not very accessible in general. All team members were informed prior to the research about the possible risks and benefits of participating in this study. An informed consent form was signed by the coaches, managers and basketball players of the team. The research was conducted following the criteria of the Declaration of Helsinki (2013) and was approved by the University Bioethics Committee (233/2019).

#### Eligibility Criteria

The following criteria were used to select the sample participants: (i) officially belonging to the first professional team that participates in the first Spanish league, the ACB league, (ii) having participated in at least 80% of the training sessions and (iii) having played in at least one of the two monitored games.

The exclusion criteria for participants were: (i) having had a lower body injury less than one month before the start of data collection and (ii) having trained with any lower body discomfort in any of the training sessions during data collection.

### 2.3. Sample

All the training sessions, 10 sessions with a total of 64 tasks, and two official matches were monitored during two preseason training microcycles of a professional team from the first division of Spanish basketball (ACB League) during the 2022–2023 season. For each session, the load value of each foot strike was extracted, with data corresponding to each contact, thus analyzing the asymmetries produced by the difference in load supported by both legs consecutively. The sampling frequency used was 100 Hz, due to the longitudinal design of the intervention. The total number of cases analyzed was 243,897, with 122,075 cases referring to the left leg and 121,821 cases to the right leg.

## 2.4. Variables

The independent variables of this study were the type of task, the game situation, the specific positions and the sport context in which the activities were performed. The dependent variable analyzed were the foot strikes performed during the training process and the games played. The dimensions of these variables can be seen in Table 1. The variables were not manipulated by the researchers during the training process.

**Table 1.** Types of variables with their respective dimensions.

| Type of Variable | Variable | Variable Dimensions |
|---|---|---|
| Independent | Type of tasks | Unopposed, Individual, Small Sided Games Equality (SSGe), Small Sided Games Inequality (SSGi), Full Game. |
| | Game situation | $1 \times 0, 1 \times 1, 1 \times 2, 2 \times 0, 2 \times 1, 2 \times 2, 2 \times 3, 3 \times 0, 3 \times 1, 3 \times 2, 3 \times 3, 3 \times 4, 4 \times 0, 4 \times 1, 4 \times 2, 4 \times 3, 4 \times 4, 4 \times 5, 5 \times 0, 5 \times 1, 5 \times 2, 5 \times 3, 5 \times 4, 5 \times 5, 5 \times 6, \ldots, n \times n$. |
| | Specific positions | Guard, Shooting Guard, Forward, Power Forward, Center. |
| | Sport context | Training, Competition. |
| Dependent | Foot strikes | Contact time.<br>Flight time.<br>Average acceleration of the foot strike.<br>Average foot speed.<br>Average contact force.<br>Asymmetries between strikes with different feet. |

The definition of the different dimensions of the foot strike variable and its unit of measurement can be seen in Table 2.

**Table 2.** Description of the dimensions of the dependent variable foot strike.

| Variable | Unit of Measure | Description |
|---|---|---|
| Contact time | Milliseconds (ms) | Contact time of each foot strike. |
| Flight time | Milliseconds (ms) | Time elapsed between two consecutive foot strikes. |
| Average acceleration of the foot strike | G-force (G) | Acceleration with which the foot reaches the ground to produce a foot strike. |
| Average foot speed | Kilometers per hour (km/h) | Average speed of the foot between two consecutive strikes. |
| Average contact force | Newtons (N) | Force with which the foot makes contact with the ground. |
| Asymmetries between supports with different feet | Arbitrary unit | Difference of support force measured in Newtons in two consecutive foot strikes with different laterality. |

In addition, the laterality of the support was taken into account. For this purpose, in the data analysis, positive values were used for the left leg data and negative values for the right leg.

## 2.5. Instruments

WIMU PRO$^{TM}$ inertial devices (Real-Track Systems, Almeria, Spain) were used to quantify the foot strikes and extract the data of the dependent variables. The players' positioning data signal came from an ultra-wideband (UWB) radiofrequency system consisting of a total of eight antennas that allowed for quantifying loads in indoor spaces accurately [28].

### 2.6. Procedure

The design of the data collection was carried out jointly with the team's physical trainer, together with whom the training sessions to be monitored were agreed upon, explaining the advantages and disadvantages that would result from the data collection.

The data were collected during all the training sessions carried out during two preseason microcycles, including two official matches of the Regional Cup. For this purpose, the pavilion was equipped with a UWB system with eight antennas distributed throughout the court. The measurement error was validated using the protocol for data quality analysis (covering all the perimeter lines of the court with two inertial devices together) before starting the data collection and was 0.068 $\pm$ 0.04 m over the entire surface, which was considered acceptable for the analysis to be performed. Before entering the training area, the players were equipped with the inertial devices. After training, the data were stored in a cloud for retrospective analysis.

### 2.7. Statistical Analysis

In this research, the default level of significance chosen by the researchers, Alpha ($\alpha$), was 5%. The level of statistical significance, $p$-value ($p$), was set at 0.05. After training monitoring, all data were screened, creating an exclusive database with those variables that were to be analyzed from the total number of variables provided by the inertial devices used. Criteria assumption tests (normality and homoscedasticity) were performed, identifying the use of parametric models to test the hypotheses [29]. ANOVA analysis was used to identify differences between groups. SPSS Statistics v25 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY, USA: IBM Corp.) was used, setting the significance level at 0.05. The effect size was computed using partial eta-squared ($\eta^2$), where effect sizes between 0.01 and 0.06 were classified as small, effect sizes between 0.06 and 0.14 were categorized as medium and effect sizes greater than 0.14 were considered large [30].

## 3. Results

Table 3 shows the values that allow for describing total training and match foot strikes, differentiated according to laterality.

After the descriptive analysis, it was found that more strikes were performed with the left leg than with the right leg. The contact time presented an average of 277.79 ms, while the flight time was slightly lower, at 53.24 ms. The contact force was higher on average with the left leg than with the right leg, an average difference of close to 9 N.

Table 4 shows the results obtained in the imbalances classified according to the type of training tasks. The results show that in the SSG tasks, the highest mean imbalances occurred in favor of the right leg. As for the extreme values, the maximum values in both legs were found in the unopposed tasks. Regarding the asymmetry means, these do not present significant differences between any of the training tasks' means. The results revealed a small effect size, with an eta-squared value of 0, indicating that the variance in the asymmetries were not explained by the type of task.

Table 5 presents the results obtained from the analysis of asymmetries according to the game situation in each task.

The descriptive results of the asymmetries according to the game situation show higher maximum values in the tasks in which the participation is $1 \times 0$ in favor of both legs. Regarding the averages, the highest is $4 \times 4$ in favor of the right leg and $1 \times 0$ in favor of the left leg. Neither poses a risk to the players, but the $4 \times 4$ mean is quite high compared to the rest.

There were no significant differences between the different game situations when calculating asymmetries. The results revealed a small effect size, with an eta-squared value of 0, indicating that the variance in the asymmetries were not explained by degree of opposition.

**Table 3.** Descriptive analysis of the foot strikes according to laterality.

| | Left Leg | | | | | Right Leg | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* |
| Contact time (ms) | 122,075 | 277.79 | ±0.20 | 60 | 490 | 121,821 | 278.26 | ±0.20 | 90 | 490 | 243,896 | 278.02 | ±70.01 | 60 | 490 |
| Flight time (ms) | 122,075 | 53.24 | ±0.15 | −30 | 360 | 121,821 | 53.29 | ±0.15 | −30 | 340 | 243,896 | 53.26 | ±52.45 | −30 | 360 |
| Average acceleration of the foot strike (G) | 122,075 | 0.22 | ±0.00 | | | 121,821 | 0.21 | ±0.00 | | | 243,896 | 0.21 | ±0.02 | | |
| Average foot speed (Km/h) | 122,075 | 8.54 | ±0.01 | | | 121,821 | 8.57 | ±0.01 | | | 243,896 | 8.55 | ±4.39 | | |
| Average contact force (N) | 122,075 | 129.62 | ±0.39 | −528 | 1269 | 121,821 | 120.79 | ±0.39 | −1526 | 1252 | 243,896 | 125.21 | ±135.36 | −1526 | 1269 |

**Table 4.** Descriptive and difference analysis of asymmetries depending on the training tasks.

| **Type of Task** | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *F* | *p* | $\eta^2$ | $\phi$ |
|---|---|---|---|---|---|---|---|---|---|
| Unopposed | 89,633 | 0.01 | ±85.52 | −350 | 340 | | | | |
| Small Sided Games | 30,739 | −0.05 | ±97.70 | −320 | 330 | 0.05 | 0.995 | 0.000 | 0.051 |
| Full Game | 82,017 | 0.01 | ±94.53 | −340 | 330 | | | | |
| Total | 202,389 | 0.00 | ±91.16 | −350 | 340 | | | | |

**Table 5.** Descriptive and difference analysis of asymmetries according to game situation in training tasks.

| **Game Situation** | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *F* | *p* | $\eta^2$ | $\phi$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 × 0 | 51,551 | 0.07 | ±83.74 | −350 | 340 | | | | |
| 3 × 3 | 9765 | −0.04 | ±95.93 | −310 | 310 | | | | |
| 4 × 4 | 9240 | −0.09 | ±97.37 | −320 | 330 | 0.017 | 0.999 | 0.000 | 0.053 |
| 5 × 0 | 38,082 | −0.07 | ±87.87 | −340 | 320 | | | | |
| 5 × 5 | 93,751 | 0.00 | ±95.15 | −340 | 330 | | | | |
| Total | 202,389 | 0.00 | ±91.16 | −350 | 340 | | | | |

Table 6 shows the results obtained by specific positions depending on the training sessions. It is observed that there were no differences by specific position, therefore no player is at risk due to the asymmetry he suffers, with the guard being the one who suffers the greatest average asymmetry. The extreme values were found in the right leg of the small forward and the left leg of the center. The averages of the asymmetries according to the specific positions did not show significant differences between them. The results revealed a small effect size, with an eta-squared value of 0.004, indicating that only approximately 0.1% of the variance in the asymmetries were explained by the specific position during training.

**Table 6.** Descriptive analysis of differences in asymmetries according to specific position in training tasks.

| Specific Position | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *F* | *p* | $\eta^2$ | *ϕ* |
|---|---|---|---|---|---|---|---|---|---|
| Guard | 31,326 | 0.03 | ±93.197 | −340 | 310 | | | | |
| Shooting guard | 20,738 | −0.01 | ±92.320 | −320 | 330 | | | | |
| Forward | 88,810 | 0.00 | ±91.326 | −350 | 330 | 0.001 | 1.000 | 0.004 | 0.05 |
| Power forward | 16,240 | −0.02 | ±89.332 | −340 | 300 | | | | |
| Center | 45,275 | 0.00 | ±89.496 | −340 | 340 | | | | |
| Total | 202,389 | 0.00 | ±91.156 | −350 | 340 | | | | |

Table 7 shows the results of the asymmetries according to the specific positions during competition.

**Table 7.** Descriptive and difference analysis of asymmetries according to the specific position in the matches.

| Specific Position | *n* | $\bar{x}$ | *SD* | *Min.* | *Max.* | *F* | *p* | $\eta^2$ | *ϕ* |
|---|---|---|---|---|---|---|---|---|---|
| Guard | 6379 | 0.04 | ±1.198 | −320 | 310 | | | | |
| Shooting guard | 8769 | 0.00 | ±1.016 | −320 | 320 | | | | |
| Forward | 15,002 | −0.02 | ±0.753 | −340 | 370 | 0.05 | 995 | 0.001 | 0.05 |
| Power forward | 6139 | 0.02 | ±1.151 | −300 | 340 | | | | |
| Center | 5098 | −0.01 | ±1.254 | −290 | 300 | | | | |
| Total | 41,387 | 0.01 | ±1.074 | −340 | 370 | | | | |

The descriptive results show that no specific position is at risk, with the highest mean value being that of the point guard, as in training. The highest extreme values are found in the forwards. Differences between the means are somewhat greater among the positions, without being significant in any of the cases offered. The results revealed a small effect size, with an eta-squared value of 0.001, indicating that only approximately 0.1% of the variance in the asymmetries was explained by the specific position during matches.

## 4. Discussion

The main objectives of this study were to characterize the foot strikes that occur in basketball during training and competition, as well as the possible asymmetries that could derive from the difference in force between two consecutive foot strikes with different feet.

The average vertical force obtained in training and competition is 125 N, the average ground contact time is 278 ms and the average flight time is 53 ms. These data are different from those obtained by Delextrat et al. [31], where the values are much higher for vertical force (850 N on average) and quite reduced for flight (85 ms) and contact (170 ms) time. This is because, although both studies are basketball studies, the study by Delextrat et al. [31] measures imbalances with a four-second sprint before and after the competition. There are numerous studies that use non-specific tests to measure asymmetry [20,21,24], something that is useful to determine if a player has asymmetries, but not to determine if the sport itself has produced such asymmetry. In order to conclude whether a sport is symmetrical or not, it is necessary to know if its movements can produce an asymmetry, for which sport-specific tests can be used, as conducted by Gómez-Carmona et al. [23,25]. However, by analyzing the sport-specific movements in isolation, we know if the movement produces a decompensation in the force used between both legs, but it is not known if throughout the training or match the total force exerted by the supports is compensated for. Using a natural methodology such as the one used in this research, it is possible to know if the imbalance in the force produced by both legs is a consequence of the practice of the sport or if it is due to other factors.

In this research, no significant differences were identified between the SSG and Full Game tasks. Gómez-Carmona et al. [25,32] found differences in the horizontal load supported by the lower body in male and female basketball players, respectively. These asymmetries were identified using a specific test battery, finding a greater load on the leg outside the direction of rotation of the athlete. However, these differences in a closed test are not identified during the development of the training tasks since during practice the players perform multiple turns in different directions, balancing the asymmetries that occur when only turning in a single direction. The inclusion of a reduced game situation ecological test allows the asymmetries to be identified during competition [23]. In a comparative study between men and women, Gómez-Carmona [33] did not identify either vertical or horizontal asymmetries in a small-sided game situation (SSG), which shows that the real game does not produce asymmetries in basketball. The results of this research have shown that in Full Game situations in training and real competition, players do not generate asymmetries in their movements. The richness of movements caused by the tactical-technical situations of basketball, with right and left turns, one- and two-legged jumps, changes in direction, and continuous accelerations and decelerations do not cause asymmetries measured through the steps.

In cyclic sports such as athletics, Antúnez et al. [19] found small kinematic asymmetries, which were compensated by the anatomy of the musculoskeletal system in a situation more similar to the competitive environment. Track running, with a straight and a curved segment, can generate an asymmetry, which does not impact an athlete's performance. The use of ecological tests, like the real situation of competition, allows us to identify whether sports practice generates imbalances in athletes. In this research, data have been collected in a natural way, both during training and during competition, specifically analyzing the sporting reality without altering the behavior of the basketball players.

The results of this intervention regarding the difference between asymmetries produced as a function of a game situation do not show significant changes in the means depending on the grouping of players used in the tasks. Studies such as that of Cáceres-Sánchez et al. [34] show that there is a direct relationship between the external workload and the grouping of players in basketball, which does not seem to be reflected in the decompensation that occurs in the force exerted when supporting the lower body. Basketball coaches at different levels design tasks with different groupings of players and game situations [35]. The diversity of tasks in which players face several opponents with the presence of several teammates cause varied stimuli, with diverse motor responses that affect the load borne by the athletes [36]. The modification of the number of players is one of the constraints that coaches manipulate to modify the training load [37]. All these diverse game situations enrich an athlete's motor skills. The number of players included in a task does not alter the asymmetries in the players' supports.

In the specific literature on basketball, there are investigations that highlight the differences between players depending on their playing position, both at a technical-tactical level [4], at an external load level [38], at an internal load level [39] and at a performance level [40]. Players perform specific movements according to their specific position, which is reflected in the load they support, identifying specific demands for each of them. Despite this, in this study, no significant differences were observed in terms of the asymmetries caused in their movements and supports, neither in training nor in competition. Analyzing the design of the training sessions during the preseason period, it was found that the coach designs general and global tasks in which all players participate in the same activities regardless of their specific position in the game [4]. Although during the development of some tasks the players have a specific function (e.g., to bring the ball up, play for interior spaces, etc.), this does not generate an asymmetry in their movements.

Regarding the decompensation generated by competition, results such as those of Parpa et al. [22] support the findings of this study, showing no significant differences in the asymmetries produced by competition. These authors point out that the asymmetries produced in basketball are much smaller than those produced in other sports such as soccer and volleyball. Barrera-Domínguez et al. [21] do not find a relationship between sport and the appearance of asymmetries, considering that the relationship is more individual and depends on each subject. Even so, authors such as Bakaraki et al. [20] and Schiltz et al. [24] conclude that basketball is a symmetrical sport. Although players have specific positions and different functions during the competition, these do not generate significant differences in their supports, ratifying the symmetrical concept of the sport of basketball.

The main limitation is the small number of participants, due to the fact that it is a measurement of a professional team, a population that is not very accessible. In addition, only a single professional team was measured, so the players are already physically trained for basketball, and it is difficult to identify asymmetries in the players. As a strength, it should be noted that this is an ecological study that includes games at the highest Spanish competitive level, something scarce in the literature related to the field of study. As a future prospect, it is recommended that more ecological studies be carried out, since they are limited in comparison with studies that use specific or unspecific tests outside the game context, in which asymmetries are found that subsequently do not occur in the real context or that are due to factors unrelated to the practice of this sport.

## 5. Conclusions

Basketball is a symmetrical sport, in which there are no differences in asymmetries that could be produced by training and competition, different tasks, game situations or specific positions in the players. The asymmetries that may derive from the natural movement of the sport are compensated for by subsequent movements. However, there may be specific cases of players in which an asymmetry does appear, although its origin is not in the practice of basketball. In these cases, it is important that the coaching staff detects the asymmetry as soon as possible and performs compensatory work to minimize it or make it disappear.

It is important to measure during different moments of the season to identify if training produces asymmetries. In addition, controls should be applied to players of different ages to know if they are correctly trained. This will help to increase performance and eliminate possible long-term injury.

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