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¿Distintos patrones motrices en baloncesto según género?

Different motor patterns in basketball depending on gender?

Padroes distintos de acordo ao genero no basquete?

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Resumen: El objetivo prioritario de la investigación es caracterizar el género mediante el análisis de la conducta motriz en baloncesto. Se seleccionaron dos partidos de alta competición en el campeonato del mundo organizado por la FIBA en el año 2014. A través de una metodología observacional y un diseño nomotético, puntual y multidimensional (Anguera, Blanco-Villaseñor, Hernández-Mendo, & Losada, 2011) fueron registradas conductas motrices relacionadas con la circulación del balón y la eficacia de los lanzadores en base a la presencia o ausencia de oposición durante el lanzamiento. Para ello, fue diseñado un sistema mixto de registro 'ad hoc' formado por 4 facetas y 11 categorías. Tras un período de entrenamiento, dos observadores registraron en dos momentos distintos mediante el software Lince las conductas motrices descritas en el sistema referencial. Tras alcanzar una calidad del dato, cercana a la unidad inter e intra observador se pasó a aplicar dos técnicas de análisis: a) Detección de patrones conductuales mediante Theme (Magnusson, 2000) y b) Árboles de decisión Chaid a través de SPSS. Los resultados evidenciaron la existencia de patrones de juego y regularidades temporales dependiendo del género mientras con ayuda del análisis multivariante Chaid fue incluida la variable género en el segundo nivel de jerarquización explicativa de la variable eficacia. Del presente estudio pueden extraerse pautas que ayuden a construir tareas de entrenamiento para preparadores y entrenadores de baloncesto. Se identificaron diferencias en los patrones conductuales entre hombres y mujeres en baloncesto. El diseño de tareas tiene en la perspectiva de género un motivo para la especificidad.

Palabras Clave: género, baloncesto, metodología observacional, t-patterns.

Abstract: The primary objective of this research is to characterize gender by analysing motor behaviour in basketball. Two high competition matches from the world championship organized by FIBA in 2014 were selected. Through an observational methodology, and a nomothetic, punctual and multidimensional design (Anguera, Blanco-Villaseñor, Hernández-Mendo, & Losada, 2011) motor behaviour related to the movement of the ball and the effectiveness of pitchers based on the presence or absence of opposition when throwing the ball were recorded. To do this, a mixed system of registration 'ad hoc' was designed, based on 4 facets and 11 categories. After a training period, two observers registered at two different times with Lince software to record the driving behavior described in the referential system.

After achieving data quality, close to the inter- and intra-observer unit, two analytical techniques were applied: a) detection of behavioral patterns by Theme (Magnusson, 2000) and b) Chaid decision trees through SPSS. The results showed the existence of patterns of play and temporal regularities depending on gender, while by using Chaid multivariate analysis the gender variable was included in the second level of hierarchy of the effectiveness explanatory variable. From this study, guidelines can be drawn that help basketball coaches and trainers to build training tasks. Differences in behavioral patterns between men and women in basketball were identified. Tasks design has in gender a reason for specificity.

Key Words: gender, basketball, observational methodology, t-patterns

Resumo: O objetivo principal da pesquisa é caracterizar o gênero através da análise do comportamento de condução no basquete. dois jogos foram selecionados alta competição no campeonato mundial organizado pela FIBA em 2014. Através de uma metodologia de observação e modelos nomotético, pontual e multidimensional (Anguera, Blanco-Villaseñor, Hernandez-Mendo, & Losada, 2011) eram comportamento motor registrada sobre a circulação da bola e da eficácia dos jogadores com base na presença ou ausência de oposição durante o lançamento. Para fazer isso, ele foi projetado um sistema misto de registro 'ad hoc' é composto por 4 facetas e 11 categorias. Depois de um período de treinamento, dois observadores registraram em dois momentos diferentes mediante o software Lince comportamentos motores descritos no sistema referencial. Depois de atingir a qualidade dos dados, perto da unidade inter e intra-observador foi passado para aplicar duas técnicas analíticas: a) detecção de padrões de comportamento por Theme (Magnusson, 2000) e b) As árvores de decisão Chaid através SPSS. Os resultados mostraram a existência de padrões de jogo e regularidades temporais dependendo do sexo durante a utilização da análise multivariada foi Chaid incluindo a variável sexo no segundo nível hierárquico da variável explicativa eficácia. Do estudo atual poden-se extrair pautas que ajudam a construir as tarefas de treinos para preparadores e treinadores de basquete. Foram identificadas diferenças nos padrões de comportamento entre homens e mulheres no basquete. A tarefa de design está em sexo uma razão para a especificidade.

Palavras-chave: gênero, basquete, metodologia observacional, t-patterns.

Introduction

The identification of gender differences has been widely discussed (Knight, 2002), constituting a constant in the history of research (Maccoby, 1990). Gender differences have been evidenced from the organization of social networks (Szell &

Turner, 2013), financial decisions (Powell & Ansic, 1997) or personality (Feingold, 1994), but also from interdisciplinary approaches (Costa, Terracciano, & McCrae, 2001).

While a preferably competitive orientation rested on male gender, women appeared to be mainly related to cooperative tasks (Shwalb & Shwalb, 1985). In a later review, it became clear that men were more effective and prone to open negotiations in competitive situations (Walters, Stuhlmacher, & Mayer, 1998)

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in similar contexts (Kugler, Kaschner, Reif, & Brodbeck, 2013). Recent studies (Kivikangas, Kätsyri, Järvelä, & Ravaja, 2014) through the implementation of videogames show that male attraction to competition is greater than towards cooperation, since it evokes more positive emotions. On the other hand, the opposite gender shows the same emotional tendency to both cooperative and competitive stimuli. Researchers are concerned, on the one hand, to point out that, it must not be interpreted that women are more cooperative than men, although they are less competitive and, on the other hand, that competitiveness and cooperation do not seem to be antagonistic terms.

There is certainty of research from a gender perspective in sports such as basketball (Gómez, 2007), volleyball (Koch & Tilp, 2009; Palao, Manzanares, & Ortega, 2009), football (Bradley, Dellal, Mohr, Castellano, & Wilkie, 2014) with minor proportions of home advantage by women (Pollard & Gomez, 2014), distance running (Coast, Blevins, & Wilson, 2004) or Olympic tournaments (Kountouris, Drikos, Aggelonidis, Laios, & Kyprianou, 2015), among other disciplines. Basketball is a sport in which the uncertainty of origin (Parlebas, 2001) finds in team partners the allies to create both offensive and defensive actions, while adversaries suppose a permanent opposition. Basketball playing style would be explained by means of seven variables (Ortega, Cárdenas, Sainz de Baranda, & Palao, 2006), taking into account the number and duration of attacks, players involved in the attacks, passes, collective strategies (Courel, Suárez, Ortega, Piñar, & Cárdenas, 2013) used in the attacks, the attack type and effectiveness (Fernández, Camerino, Anguera, & Jonsson, 2009).

Considering tempo as the number of possessions per game, it was concluded that the men's tempo was greater than the women's one (Gómez, 2007; Ibáñez, Feu, & Dorado, 2003) albeit with reservations, since opposite effects were also found (Montaner & Montaner, 2004). It is understood that the end of each possession (Gómez, Lorenzo, Ibáñez, & Sampaio, 2013; Muñoz, Serna, Daza, & Hileño, 2015) is mutually exclusive with the start of the next. On the other hand, the quality of the teams could explain that the best ones also had fewer ball possessions (Ibáñez et al., 2003), which would suggest that the effectiveness of the highest quality teams would rest on the optimization of throws, and / or on hindering the actions of completion of the adversaries. Thus, in this sense, quality and gender seem to affect tempo in basketball.

Recently, by using an observational methodology (Anguera, Magnusson, & Jonsson, 2007) the men's basketball league (ACB) has been characterized (Romarís, Refoyo, & Lorenzo, 2016) in comparison to the women's league (LF) of the first division of Spanish basketball. The main conclusion of the previous study pivoted on the largest number of attack-defense transitions and counterattacks from the feminine side. The ecological value of observational methodology has favored its consolidation (Anguera & Hernández-Mendo,

2014; Anguera & Hernández-Mendo, 2016) to study game performance in different sports. Some studies explore the temporal dimension of the registration of motor actions (Parlebas, 2001). Applying the technique of detecting patterns, by using Theme 6 software (Magnusson, 1996; 2000) free throws in basketball (Fernández et al., 2009) were analyzed, and the decisional complexity of the game performance was also undertaken in basketball (Echevarría, Ajamil, Anguera, & Idiákez, 2011) to reveal temporal regularities (e.g., errors made by the observed team regarding outside shots). Pattern detection (Magnusson, 1996) has been used to investigate different sports, with wide following among the scientific community (Lapresa, Álvarez, Arana, Garzón, & Caballero, 2013; Lapresa, Camerino, Cabedo, Anguera, Jonsson, & Arana, 2015; Zurloni, Cavalera, Diana, Elia, & Jonsson, 2014).

Other analysis techniques, however, do not resort to the temporal dimension but offer a complementary approach. Specifically, the classification or decision tree, developed by Morgan and Sonquist (1963), is an algorithm that can automatically construct contingency tables. This algorithm classifies data on the basis of explanatory variables whose relationship to the response is revealed through different levels of significance or importance. This algorithm has been used for motor games research (Lavega, Alonso, Etxebeste, Lagardera, & March, 2014).

Among the utilities this study presents, the identification of regular motor sequences could help to reframe the gender perspective from its specificity. The influence of throwing effectiveness, what influence can the presence of opposition to the throws have, or the influence of pass in the development of the plays, are some of the challenges addressed. Given the scarcity of research analyzing game performance from a gender perspective in basketball, the present study has as a primary objective the identification and comparison of game performance in women and men.

Method

Observational Design

The design in which the present study is located, within the observational methodology, corresponds with quadrant III (Anguera, et al, 2011). It is nomothetic, since the actions of different basketball players have been recorded; punctual, since the events from two basketball games were registered without making any follow-ups; and it is a multidimensional design because several dimensions were considered in order to study basketball game performance.

Participants

Two high competition games ($n = 2$) were selected: the United States versus Spain final in the women's section, and the

men's final between the USA and Serbia in the same world championship, organized by the International Basketball Federation (FIBA) in Spain in 2014. The public dissemination of the sporting event did not require the monitoring protocol described by the American Psychological Association (American Psychological Association, 2002).

Instrument

A mixed system of registration 'ad hoc' was designed from the fusion of a field format and a system of categories (Anguera et al., 2007). The tool was configured by four facets and eleven categories.

Table 1. Mixed recording system used by the evaluators.

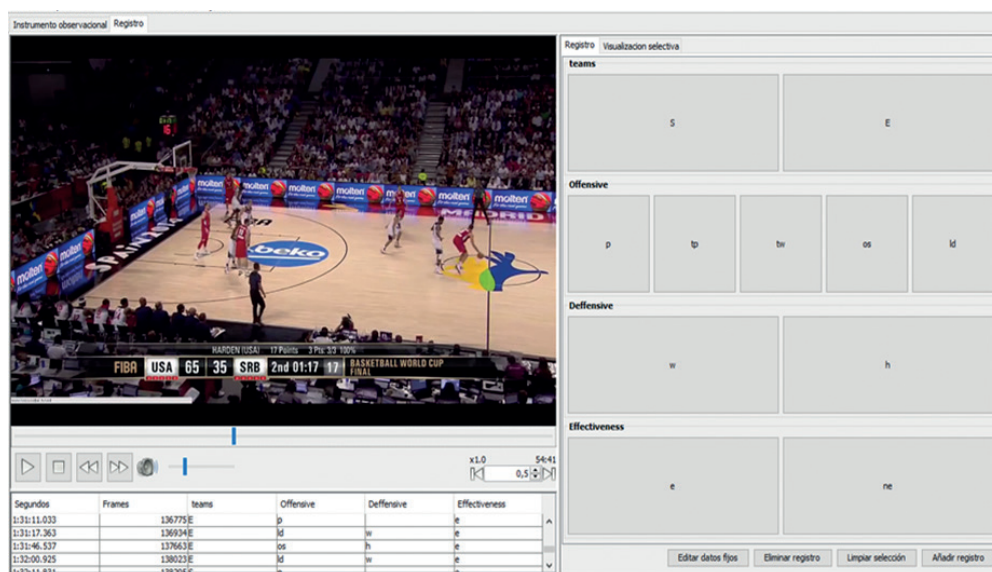
Criteria	Codes and categorical description
Teams	The analyzed teams received the name of (S) for Spain or Serbia, while (E) for the United States team in both matches
Offensive	Each pass made in the field rival among fellow players registered (p); launchings after the three-point line (tp); two-point launches (tw); free shots(l); plays ending at the rim, either by performing plays in depth and / or near the ring such as trays or matt's(ld).
Defensive	Defensive opposition action performed on the opponent trying to neutralize the opponent's throw (w); lack of defense or opposition to the throw or attempt to get basket by the opponent (h).
Effectiveness	Effective offensive ending action or fine shot by the throwing player (e); ineffective or failed offensive ending action by the throwing player (ne)

In Table 1 the four criteria selected for the study are described. With the first criterion (Team) we refer to teams'actions, while with the second criterion (Offensive) offensive actions such as passes and shots by players are registered. The third criterion (Defensive) is referred to actions that could influence the accumulation of points on the score, i.e. whether there was an obvious defense against the opponent's shot. Finally, according to the order in which events happen in basketball, the effectiveness or ineffectiveness of offensive actions against the defensive actions taken by the teams were registered.

Procedure

The encoded registration (Figure 1) was performed by using LINCE software v.1.1 (Gabín, Camerino, Anguera, & Castañer, 2012), on images downloaded from the website YouTube. The records were subjected to data quality control (Blanco-Villaseñor & Anguera, 2000). The registration process covered two different times, with a separation of two weeks, and was double-blind conducted by two independent observers, from two perspectives: a) From a classical perspective, in which Pearson correlations were taken into account. b) From the perspective of Generalizability Theory (Cronbach, Gleser, Nanda, & Rajaratnam, 1972), through which indices of reliability and generalizability were obtained.

Figure 1. Recording instrument: LINCE v.1.1 (Gabin, Camerino, Anguera, & Castañer, 2012).



Observational reliability was obtained by calculating Pearson interobserver concordance on the first (0,997) and second observer (0,998); on the other hand, for each evaluator with themselves, the value (0,999) at both time points was reached. Interobserver and intraobserver reliability were calculated through a facets design (observer and categories = C:O) and (time and categories = C:M). Variance components were estimated in a nonending way, revealing the unmistakable source of variability 0% attributed to both times and evaluators. These facets presented absolute and relative generalization coefficients close to one, so that the quality of the records would be ensured.

Data analysis

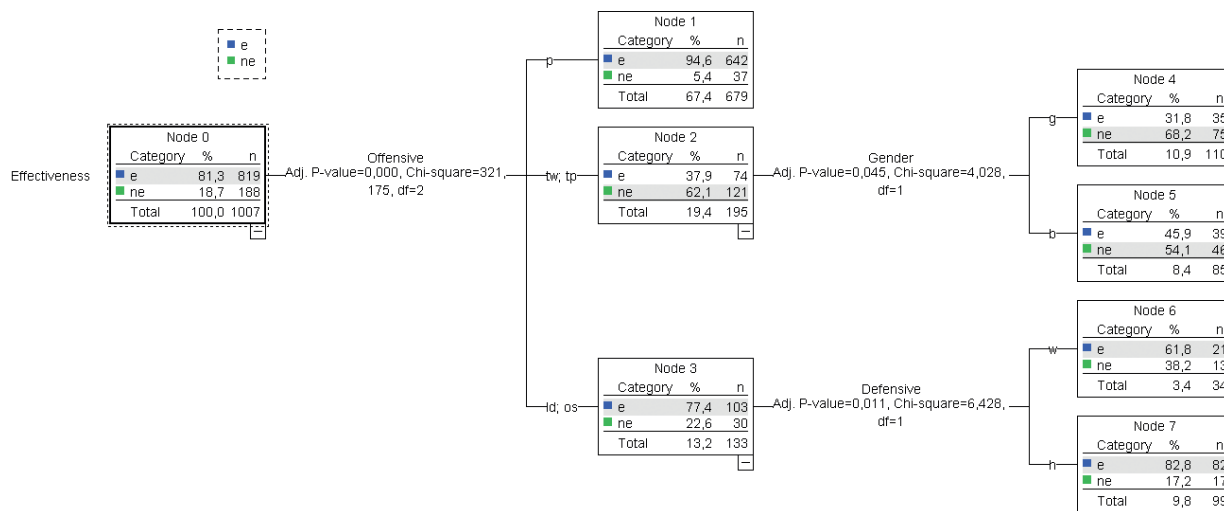
A multivariate analysis was carried out by using SPSS version 20 software. It was specifically applied, using the CHAID model, to study its predictive ability from the following restrictions: a) cross-validation, b) 3 maximum levels of depth, c) parent nodes established from 100 cases for 25 of their respective branches. For the detection of motor action temporary structures (T-Patterns) by using THEME v.6 software, the following parameters were established: a) free patterns,

b) significance level of ,005 and c) a minimum frequency of 4 occurrences to form T-Pattern was required. In addition, patterns present in 70% and 40% of the records were sought.

Results

The classification-tree hierarchical segmentation technique (Figure 2) was used to establish the predictive capacity of the different independent variables in relation to effectiveness. Given the sum (tw and tp) is higher for women (tw) (110 throws) than for men (85 throws). The tree showed that, for the first predictive variable 'Offensive' (nodes 1, 2 and 3), significant differences were found between ($\chi^2 (2) = 321,175 (p <,000)$). From node 2 (tw, tp), the model took the gender variable ($\chi^2 (2) = 4028,175 (p <, 045)$) forming nodes 4 and 5 with different proportions of effectiveness for women and men, around 14 percentage points in favor of men over women. However, starting from node 3 (ld, os the 'defensive' variable ($\chi^2 (2) = 6428 (p <,011)$) was segmented into nodes 6 (w) and 7 (h). The frequencies reached in these nodes would indicate a percentage between defending or not defending with a difference of around 21 points.

Figure 2. Tree of predictive variables for the motor model, by gender (women=g; men=b), effectiveness defensive and offensive behaviour.



43 different patterns were found in the records of the women, while 122 were found in the men' records. As showed in Table 2, it was found that while some temporal patterns remained similar between women and men (1st or 3rd), others were characterizing because of its uniqueness or absence regarding the opposite gender. It can be seen that for women,

three-point shots pattern (2nd) with opposition and effectiveness needed prior effective passes ((p, e p, e) (tp, w, e, tw, e) before throwing against the rival opposition. However, men did not necessarily need previous passes in the same situation (tp, w, e, p, e).

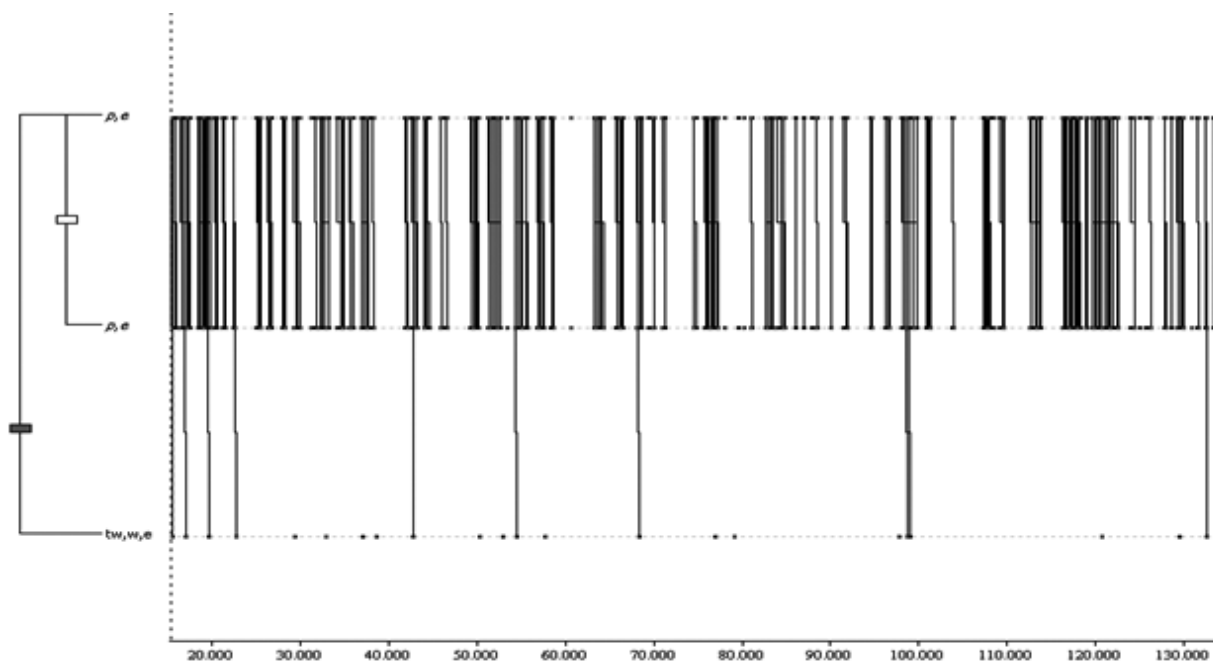
Table 2. Number of searched patterns and correspondence between women and men through Theme

Nº	T-patterns	Women	Men
1º	p,e	(p,e)	(p,e)
2º	tp,w,e	((p,e p,e)(tp,w,e tw,e)	(tp,w,e p,e)
3º	tp,w,ne	((p,e p,e)tp,w,ne)	((p,e p,e)tp,w,ne)
4º	tp,h,ne		(p,e tp,h,ne)
5º	tw,w,ne	(p,e tw,w,ne)	
6º	tw,h,e	((p,e p,e)tw,h,e)	(tw,h,e(p,e p,e))
7º	tw,w,e		((p,e p,e) tw,w,e)
8º	ld,h,e		((p,e p,e)ld,h,e)

It was observed that there was no pattern (4th) from figure 2 in women, while in men it could be noticed that effective passes were made before an unopposed failed three-point shot (p, e tp, h, ne). However, in the next time pattern (5th), it became clear that women performed effective passes before making two-point throws with opposition without scoring (tw, w, ne), with no such pattern for men.

The search for pattern (5th) highlighted what happened in pattern (2nd), that is women performing preparatory effective passes, trying to find spaces clear of rivals to make throws without opposition (h), although this preparation could not be verified in men. However, passes prior to effective shots with opposition were detected ((p, e p, e) tw, w, e), while this could not be identified in women. The same happened in (8th) unopposed and effectively.

Figure 3. Dendrogram generated by Theme for women (present in 40% of records) and men (present in 70% of records).



In Figure 3 it can be seen that effective passing was constant when looking for two-point throws with opposition and effectiveness (tw, w, e). In the case of men, this pattern was found in 70% of the analyzed data, but this percentage had to be reduced to 40% in order to find the same pattern for women.

Discussion and Conclusions

The main objective of comparing women's and men's behaviour while playing basketball through observational

methodology has been achieved. The two analytical approaches used give two different but complementary visions in order to reveal what strategic routes were taken by women and men throughout international elite basketball games.

In the decision tree (figure 2) we saw that the different effectiveness in two (tw) and three (tp) point throws between men and women was significant in favor of men. However, this information is decontextualized because it is unknown whether these two and three points throws were performed in the presence or absence of a direct opposition. Nevertheless, we found that the active opposition of rival actions (ld

and os) were profitable for defenders because they increased the chances of rival fail. It should not be overlooked that the temporal pattern number (5th: p, e tw, w, ne) was found in women but not in men, which would suggest that women were more likely to fail throws (tw) with adversary opposition. In fact, after searching the same pattern but effectively, evidence was found in men ((p, e p, e) tw, w, e) but not in women. Effectiveness (Fernández et al., 2009) in throws appeared to be key to characterize men in this regard, accepting Theme temporal regularity (Magnusson, 1996) as a priority when detecting behavioral patterns.

Considering the category (ld) and the pattern search (ld, h, e), it could be seen that women did not include penetration actions or actions under the hoop, such as lay-ups or dunks, among their strategic repertoire just as men do it ((p, ep, e) ld, h, e). It could be said that these plays would point to a different 'mixed' offensive game which would also include defensive features in order to try to neutralize the opponent's actions. Destabilizing a defensive system could demand great physical and strategic requirements, and possibly a greater physical performance. In this sense, the thesis that the men's game was more temporarily structured could be supported, as men tripled the women's number of behavioral patterns. On the other hand, it could also be suggested that this could be due to the greater success of the shots (tw and tp) made by men, or even due to a certain comfort state before competitive challenges (Kivikangas et al., 2014) that women do not experience.

With the data analyzed in this investigation it would be risky to make a statement regarding the differences between men's and women's basketball pace of play (Gómez, 2007; Ibáñez et al., 2003; Montaner & Montaner, 2004) or respond to gender competitiveness degree (Walters et al., 1998). On the one hand, the decision tree confirmed that defensive tasks and gender were explanatory variables of success in basketball, while employing Theme (Fernández et al., 2009)

helped to reveal which regularities could be temporarily dependent to establish a gender comparative.

Among the limitations that can be highlighted in the present study, the following ones could be found: a) the composition of the sample, b) the mixed registration system. Despite being an exploratory work, a more ambitious sample composition could enrich future studies. In this sense, the results must be accepted with caution. The number of parties analyzed could be extended to find bigger statistical consistency. The algorithm used by the decision trees technique requires a large sample to establish hierarchies or levels of importance of the explanatory variables, making it difficult, for example, that the gender variable could establish new branches from defensive actions. The design of the mixed registration system was conditioned by the size of the sample, so perhaps new research should enrich the registration system with more criteria and categories to respond to more strategic routes that could identify the model of play employed by teams depending on the covered distance.

The study analyzed the structure of motor behavior in basketball, showing that while some behavioral and temporal or timeless phrases remained similar between women and men, others were more specific and singular.

Practical applications

Revealing on which temporary and decision structures rests a greater effectiveness of men and women opens an opportunity to enrich the strategic approach and interpretation of the games, with consequences on training routines. Being able to discriminate which behaviors reflect a strategic structure can be vital for basketball coaches, discriminating behavioral 'waves' from true strategic phrases. Thus, distinguishing the way women and men play implies a look at the specific routines, but also at the enrichment of the strategic route of the opposite gender.

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