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TECHNICAL PERFORMANCE PROFILE OF THE FOUR-TIME COSTA RICAN SENIOR BASKETBALL LEAGUE CHAMPIONSHIP TEAM

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ABSTRACT

The purpose of this study was to analyze and compare the technical performance profile of the four-time Costa Rican Senior Basketball League championship team. A total of 142 games was recorded throughout the 2007, 2008 and 2009 seasons. Performance indicators selected were: two and three-point shots (converted, missed, effectiveness rates), free throws (converted, missed, effectiveness rates), points, offensive and defensive rebounds, fouls, turnovers, assists and ball steals. The information was described based on absolute and relative frequency values. Data was compared by season and by playing period based on the following non-parametric techniques: U-test, Friedman test and Chi-square. In all cases, SPSS version 15.0 was used with a significance level of $p \leq 0.05$. Results showed a better profile of technical performance in the 2008 season, characterized by better percentages of two-point shots, free throws, fewer turnovers and more ball steals and assists. In relation to the playing period, the team showed a better technical performance profile during the second half of the matches. In general, the effectiveness rate of two-point shots and free throws was above 60% in both playing periods, while the three-point shot percentage ranged between 26.4% and 29.2%. In conclusion, the team showed a similar technical performance profile to that reported in the literature, as well as a clear evidence of the importance of recording and following up on technical performance indicators in basketball.

KEYWORDS: technical performance indicators, technical performance, effectiveness rates.

PERFIL DE RENDIMIENTO TÉCNICO DEL EQUIPO TETRACAMPEÓN DE LA LIGA SUPERIOR DE BALONCESTO DE COSTA RICA

ABSTRACT

El propósito de este estudio fue analizar y contrastar el perfil de rendimiento técnico del equipo tetracampeón de la Liga Superior de Baloncesto de Costa Rica. Se registró 142 juegos a lo largo de las temporadas 2007, 2008 y 2009. Los indicadores de rendimiento escogido fueron: lanzamientos de dos y tres puntos (convertidos, fallados, porcentaje de efectividad), lanzamientos de tiro libre (convertidos, fallados, porcentaje de efectividad), puntos, rebotes defensivos y ofensivos, faltas, pérdidas de balón, asistencias y robos de balón. La descripción de la información se basó en valores de frecuencia absoluta y relativa. El contraste de datos por temporada y periodo de juego se hizo con base en las técnicas no paramétricas U-test, test de Friedman y el Chi 2. En todos los casos se utilizó el SPSS versión 15.0 con un nivel de significancia de $p \leq 0.05$. Los resultados mostraron un mejor perfil de rendimiento técnico en la temporada 2008, caracterizándose por mejores porcentajes en tiros de 2, tiros libres, menor número de pérdidas de balón y mayor cantidad de robos del balón y asistencias. En relación con el periodo de juego, el equipo mostró un mejor perfil de rendimiento técnico durante los segundos tiempos del partido. En general, el porcentaje de efectividad de tiros de 2 y tiros libres estuvo arriba del 60 % en ambos periodos de juego, mientras que el porcentaje de tiros de 3 osciló entre el 26.4 % y el 29.2 %. En conclusión, el equipo mostró un perfil de rendimiento técnico similar al reportado en la literatura y deja clara evidencia de la importancia que tiene el registro y seguimiento de los indicadores de rendimiento técnico en el baloncesto.

PALABRAS CLAVE: indicadores de rendimiento técnico, rendimiento técnico, porcentajes de eficacia.

INTRODUCTION

Recording technical performance indicators in sports is an essential tool for coaches and game analysts to implement interventions during games and practices (García, Ibáñez, & Feu, 2009; Ibáñez, García, Feu, Lorenzo & Sampaio, 2009; Chicote, Morante & Vaquera, 2009; Morante, 2008; Gómez, Lorenzo, Sampaio, & Ibáñez, 2006; Dias, 2006). Basketball was one of the first sports in which game observation and notational analysis were used as a tool to assess and give feedback on player performance (García et al., 2009). Ortega, Cárdenas, Saiz and Palao (2006) mention that most studies that have analyzed technical performance in basketball include indicators such as shots and effectiveness rates, assists, turnovers, ball steals, fouls, points and rebounds. Studies on the contribution of game indicators that mostly influence the success of teams highlight the importance of two-point shots as the indicator that mostly affects victories or defeats (Ortega et al., 2006; Sampaio et al., 2009; Ibáñez et al., 2009). In this regard, Ibáñez et al. (2009) inferred that this is because a two-point shot is the most commonly performed technique during a game. They mention that in the NBA 62.8% of the shots are two-point shots, against 21.4% for free throws and 15.7% for three-point shots. Sampaio (1987) also states that winning teams convert more two-point shots and obtain better effectiveness rates, although there is no evidence of any relationship between the number of shot attempts and victories in the games. Even though in the end technical efficiency is calculated from the percentage of successful shots (Morante, 2004), there is no doubt that this percentage is the variable that mostly affects performance of teams (Alarcón, Cárdenas Miranda, Ureña, & Piñar, 2010; Ibáñez et al., 2009). These authors report several studies, which showed that winning teams are those with the best percentages in two and three-point shots (Alarcón et al., 2010). Another crucial indicator of victories and defeats is the free throw (Ibáñez et al., 2008; Ortega et al., 2006; Sanz & Gutiérrez, 2004; Sampaio et al., 2009). For Sampaio et al. (2009), free throws have a particular impact in the final moments of balanced games. Teams that win more games convert more free throws as a result of higher percentages, although no relationship is reported between the amount of free throws attempted and victories in games. According to Ibáñez et al. (2008), in balanced games free throws and fouls are important indicators of success or failure. The largest number of free throws occurs during the second half, even though the highest number of fouls also happens during this playing period. This could be due to the increased offensive intensity in the second half (Ibáñez et al., 2009; García et al., 2009). According to Ortega et al. (2006), the effectiveness rate in the free throw should be approximately 70%; therefore, a good effectiveness rate in free throws is critical to success. According to data from the Spanish professional league, the number of free throw shots increases as the game advances (first quarter 22.7%, second quarter 20.5%, third quarter 25.4%, and fourth quarter 33.5%). This data is similar to the one obtained in the Spanish amateur league, where free throws occur 16.5% in the first quarter, 22.0% in the second, 25.1% in the third, and 35.8% in the fourth (Ibáñez et al., 2007). Significant differences have also been reported in favor of winning teams in terms of total defensive rebounds captured (De Rose, 2004; Forde, 2002; García, Parejo, De la Cruz, Domínguez, & Saveedra, 2007; Ibáñez, Sampaio, Sáenz-López, Giménez & Janeira, 2003; Karipidis, Fotinakis, Taxildaris & Fatouros, 2001; Montaner & Montaner, 2004, Sanz & Gutiérrez, 2004). Defensive rebounds represent a team's ability to retrieve the ball after the opponent has failed to shoot, allowing greater opportunity to attempt field goals, increase the score and obviously hope to win the game (Ibáñez et al., 2008). García et al. (2010) report studies that analyze different types of competition and different phases of the competition. They note that, in the regular phases, the determining actions to win or lose a basketball game are defensive rebounds and two and three-point shots scored. In addition, in postseason games the most important indicators are offensive and defensive rebounds and assists. On the other hand, in the case of national teams, the indicators that best discriminate between

winners and losers are offensive and defensive rebounds, two-point shots, free throws and assists. In contrast to these results, Ibáñez et al. (2003) suggest that defensive rebounds and two and three-point shots two are the indicators that best make the difference between winners and losers. Dias (2006) conducted an analysis of the technical efficiency of the teams participating in the 2006 World Basketball Championship and identified a number of technical performance indicators to be critical to their success, including the effectiveness rate of two-point shots, the overall percentage of shots, free throws converted, fouls, and the number of assists. In this study, defensive rebounds, total rebounds and turnovers showed no significant influence on the final outcome of the matches. This study also stresses the importance of an aggressive offensive rebound, efficiency in free throws and selection of field goals. It is emphasized that a good defensive stance minimizes the possibility of making fouls, which is a determining factor especially when games are very well balanced. Despite some inconsistencies, most studies agree that two and three-point shots, free throws and rebounds play a decisive role in the success of basketball teams. According to the literature, recording the team's technical indicators for each game and throughout the seasons is clearly important. This type of information allows the coach to change and modify the actions of the team and strengthens both defensive and offensive aspects. Based on this frame of reference, the purpose of this study was to analyze the technical performance profile of the four-time Costa Rican basketball championship team by recording technical performance indicators collected during three consecutive seasons and comparing them by seasons and playing periods (first half and second half).

METHODOLOGY

This research is based on notational analysis studies. The study design was descriptive and qualitative and data was recorded using observational techniques (Ibáñez et al., 2009).

Sample: The sample consisted of all games played by the Ferretería Brenes team from Barva, Heredia, Costa Rica in the qualifying stages of the 2007 season (45 games), 2008 (45 games) and 2009 (52 games), for a total of 142 games.

Instruments and materials: The official game statistics of the Ferretería Brenes team from Barva for the 2007, 2008 and 2009 seasons were used to determine technical performance indicators. These statistics included the following indicators: two and three-point shots (converted, missed, effectiveness rate), free throws (converted, missed, effectiveness rate), points, offensive and defensive rebounds, fouls, turnovers, assists and ball steals. Statistics were reviewed and approved by the coaching staff, who have over 20 years of experience in national and international basketball. This mechanism ensured the face validity of the observation instrument used. Information on technical performance indicators was recorded by a scorer trained for such purposes, a basketball coach with extensive experience (more than 5 years) in managing game statistics, which allows for high levels of reliability.

Procedure: Game statistics were collected after each match by the team during each season. For this purpose, a technical performance indicator observation sheet was used to record each indicator by occurrence in every game. Based on the technical performance indicator record defined, a database was prepared and statistically analyzed.

Statistical analysis: Due to the nature of the data collected (categorical values), descriptive statistical techniques were used to characterize the recorded information in terms of frequency

and percentages, as well as non-parametric techniques: U-test, Friedman test and Chi-square. The U-test was used to compare average ranks for the first and second half times. The (z) value is reported since groups are large. The Friedman test was used to compare the average ranks registered for each technical performance indicator in each of the three seasons. Statistics reported were the Chi square. All data was analyzed with SPSS version 15 with a significance level of 0.05.

RESULTS

Table 1 includes average performance results by the three seasons.

Table 1: Average values and comparison of average technical performance by season

	Season	Season	Season		
	2007	2008	2009		
Variable	Average	Average	Average	Chi ²	P
3-pt shots missed	5.54 ± 1.67	5.80 ± 1.81	5.66 ± 1.83	0.42	0.81
3-pt shots converted	2.08 ± 1.15	2.66 ± 1.32	2.23 ± 1.08	3.77	0.15
3-pt shot percentage	25.66 ± 12.95	30.33 ± 12.51	27.46 ± 12.14	2.94	0.23
2-pt shots missed	10.87 ± 2.11	6.65 ± 2.39	7.61 ± 3.07	52.12	0.00
2-pt shots converted	14.18 ± 3.95	11.75 ± 3.12	12.22 ± 3.38	8.09	0.01
2-pt shot percentage	56.01 ± 8.94	63.93 ± 8.73	61.31 ± 10.60	15.01	0.00
Free throws missed	4.80 ± 2.31	5.21 ± 1.89	5.15 ± 2.17	1.90	0.38
Free throws converted	7.96 ± 2.31	10.59 ± 7.98	9.02 ± 2.95	6.05	0.04
Free throw percentage	62.32 ± 13.67	64.51 ± 10.14	63.98 ± 12.10	0.64	0.72
Points	42.58 ± 9.11	45.18 ± 6.87	43.32 ± 7.35	2.84	0.24
Offensive rebounds	5.16 ± 1.86	5.96 ± 1.94	6.19 ± 2.26	5.67	0.05
Defensive rebounds	12.95 ± 2.46	11.85 ± 3.22	13.00 ± 2.29	4.52	0.10
Fouls	8.97 ± 2.04	9.94 ± 2.17	9.71 ± 2.60	2.33	0.31
Turnovers	8.75 ± 2.35	7.89 ± 2.25	8.86 ± 1.91	7.32	0.02
Ball steals	6.10 ± 2.41	7.32 ± 2.34	7.25 ± 2.68	6.78	0.03
Assists	7.50 ± 3.11	9.28 ± 2.76	9.16 ± 3.15	9.88	0.00

Based on the information presented in Table 1, the overall comparison of the team's performance by season showed significant differences in the following variables: two-point shots missed, two-point shots converted, two-point shot percentage, free throws converted, fouls, ball steals and assists. The second season was the best season since it shows significantly better performance in terms of increased number of free throws converted, two-point shot percentage, effectiveness of free throws, fewer turnovers, more ball steals and more assists. However, the first season was significantly more efficient in terms of two-point shots. According to recorded data, the worst season was the third. Performance percentage for three-point shots ranged from 25.66% to 30.33% throughout the seasons. As for effectiveness rate in two-point shots, the team's

performance varied between 56.01% and 63.93%, while the effectiveness rate in free throws ranged from 62.32% to 64.51%.

In order to compare the team's technical performance by playing period, average values were compared for the first and second half (Table 2).

Table 2: Comparison of average technical performance by playing period over the three seasons

VARIABLE	1° HALF		2° HALF		Z	P
	X	DT	X	DT		
3-pt shots missed	6.00	2.20	5.33	2.36	-2.85	0.00
3-pt shots converted	2.29	1.57	2.90	6.82	-0.19	0.84
3-pt shot percentage	26.46	16.98	29.23	17.57	-1.79	0.07
2-pt shots missed	8.33	3.94	8.23	3.47	-0.08	0.93
2-pt shots converted	12.62	4.35	12.70	4.39	-0.30	0.76
2-pt shot percentage	60.93	13.7	60.18	11.70	-0.28	0.77
Free throws missed	3.94	2.43	6.19	3.14	-6.21	0.00
Free throws converted	7.31	3.48	11.04	9.32	-6.29	0.00
Free throw percentage	64.93	18.13	62.37	14.78	-1.33	0.18
Points	42.17	9.12	45.22	10.23	-3.39	0.00
Offensive rebounds	5.82	2.77	5.79	2.67	-0.07	0.94
Defensive rebounds	12.47	3.47	12.76	3.64	-0.55	0.58
Fouls	7.48	2.91	11.64	3.28	-8.77	0.00
Turnovers	8.41	2.65	8.61	3.28	-0.32	0.74
Assists	6.92	3.15	6.92	3.16	-0.52	0.66

As seen in Table 2, after comparing the team's performance by playing period (first half and second half), the first half shows significant differences only in the three-point shots missed, while in the second half there were significant differences in: free throws converted, free throws missed, total points and fouls. In addition, in the second half the team missed significantly less three-point shots. In the rest of the variables analyzed there were no significant differences between the team's performance in the first and second half. Overall, percentage for two-point shots and free throws was above 60% in both playing periods, while the percentage for three-point shots ranged from 26.46% to 29.23%.

The team's technical performance was also compared by season per playing period. In the first season significant differences were found between the first and second half in the following variables: three-point shots missed, free throws missed, free throws converted and fouls. In the second half, the team missed significantly less three-point shots ($Z = -2.44$, $p = 0.01$), although it missed significantly more free throw shots ($Z = -3.28$, $p = 0.00$) but it also converted more shots from the free throw line ($Z = -3.03$, $p = 0.00$). Finally, the team committed significantly more fouls.

In the second season, differences were recorded between the first half and second half in the following variables: two-point shots missed, two-point shot percentage, free throws missed, free throws converted, and fouls. In the first half, the team missed significantly less two-point shots ($Z = -2.02$, $p = 0.04$) and also showed a higher percentage of two-point shots ($Z = -2.08$, $p = 0.03$). In the second half, the team missed more free throws ($Z = -4.16$, $p = 0.00$), converted more free throws ($Z = -3.89$, $p = 0.00$) and committed more fouls ($Z = 12.08$, $p = 0.00$).

In the third season, there were differences between the first half and the second half on the following technical performance variables: three-point shot percentage, free throws missed, free throws converted, total points, defensive rebounds and fouls. In the second half a better performance was recorded in the three-point shot percentage (-1.97 , $p = 0.04$), total points ($Z = -2.51$, $p = 0.01$) and defensive rebounds ($Z = -2.25$, $p = 0.02$). In this playing period, the team missed more free throws ($Z = -3.31$, $p = 0.00$), converted more free shots ($Z = -3.83$, $p = 0.00$) and committed more fouls ($Z = -5.74$, $p = 0.00$).

A comparison of the team's performance over the three seasons in the first half showed significant differences in relation to the following variables: three-point shots converted, three-point shot percentage, two-point shots missed and two-point shot percentage. The second season showed significantly better results than the first and third seasons in three-point shots ($X^2 = 8.04$, $p = 0.01$), three-point shot percentage ($X^2 = 6.46$, $p = 0.04$), fewer two-point shots missed, ($X^2 = 43.99$, $p = 0.00$) and better two-point shot percentage ($X^2 = 17.86$, $p = 0.00$).

In the second half times, significant differences were found in the following variables: two-point shots missed, two-point shots converted, defensive rebounds, ball steals, and assists. The team's performance was higher in the first season as far as two-point shots converted ($X^2 = 9.30$, $p = 0.00$) and assists ($X^2 = 6.45$, $p = 0.04$). However, in the second season, the team's performance was significantly superior from the rest of the seasons regarding fewer two-point shots missed ($X^2 = 31.11$, $p = 0.00$). Finally, the third season showed better performance in defensive rebounds ($X^2 = 8.55$, $p = 0.01$) and ball steals ($X^2 = 6.45$, $p = 0.04$).

DISCUSSION

The purpose of this study was to identify and compare the technical efficiency profile of the four-time Costa Rican Senior Basketball League championship team over three seasons. Results showed significant differences by season in the following indicators: two-point shots missed; two point shots converted; two-point shot percentage, free throws converted, free throw percentage, turnovers, ball steals and assists. With the exception of the two-point shot converted variable, the team showed the best technical efficiency profile in the second season. These are regarded as decisive indicators for the team's success or failure (Alarcón et al., 2010; Gómez et al., 2006; Karipidis et al., 2001, Ortega et al., 2006, Sampaio et al., 2009; Ibáñez et al., 2009). This means that any team that registers good efficiency in these indicators is very likely to win. Particularly, the authors referred to above highlight the two-point shot as the most important indicator for the success of a team (Alarcón et al., 2010). Without any particular order of importance, Dias (2006) mentions the free throw as another key indicator in the success of the teams. According to Sanz

and Gutiérrez (2004), the more free throws are made and converted, the greater the likelihood of success in games. This argument clearly suggests a strong offensive game dynamic that generates the choice of many free-throw shots, very important resource for success. It is also argued that teams' success is largely determined by a small number of turnovers, as this guarantees the possession of the ball, the team's own initiative and therefore the possibility of throwing and scoring (Sampaio, 1987). In addition, assists and ball steals are factors that significantly influence the success of the teams and make the difference between winners and losers (Fierro, 2002; De Rose, Barros, & Marcos, 2003). Consequently, the technical performance profile during the second season was characterized by efficient two-point shots, precise free-throws, reduced turnovers and a good performance in ball steals and assists. The team showed a good technical-tactical performance, which ultimately lead to a championship. This information provides, without doubt, an important criterion when planning technical-tactical training and of course when managing during a game.

The comparison between playing periods showed significant differences in the following technical performance indicators: three-point shots missed, free throws missed, free throws converted, points and fouls. All second half times in the three seasons analyzed showed a profile characterized by more accurate three-point shots, free throws, related to more free throws missed and points scored, as well as fouls committed. Better accuracy in three-point shots coincides with what has been reported by Ibáñez et al. (2009), who point out that this type of shot is the only one that seems to improve over the course of the game. It is a technical resource used to shorten or enlarge differences, which seems to sharpen the players' accuracy. Proof of this is the spectacular three-point shots that often decide games in the final seconds of a match. In an attempt to explain the differences between the dynamics of the first and second playing periods, Ibáñez et al. (2009) and García et al. (2009) argue that in the first half periods teams tend to be more relaxed, with less offensive intensity and less defensive pressure, which is associated with less fatigue, fewer personal fouls, less turnovers, and generally more efficient shots. On the contrary, in the second half times, the teams seek to ensure a positive outcome in the match, increasing the game's intensity and the offensive volume, as well as the defensive pressure. Consequently, this also increases physical strain, which is associated to a greater number of fouls and therefore more free throws, turnovers and scores. The dynamics of the second half times, as noted before, require special training strategies, particularly in regard to handling the pressure of the game itself so as not to deteriorate the technical efficiency of the players.

As for the percentages of overall technical efficiency, it was evident throughout the three seasons and the different playing periods that values agree with what has been reported internationally (Ibáñez et al., 2009, Ortega et al., 2006). For example, the effectiveness rate in three-point shots ranged from 25.66% to 30.33%, while the field goal percentage ranged between 56.01% and 63.93%. Finally, effectiveness rate for free throws was between 63.32% and 64.51%. In general, these values indicate a good technical-tactical performance throughout the seasons.

As a general conclusion, the information recorded in this study evidenced the value of certain technical performance indicators in basketball. Therefore, coaches should pay special attention to using these technical elements in the practice since they will make the difference between

winning and losing. Similarly, control, management and planning of practices should address conditions similar to those experienced in the second half time involving fatigue and psychological pressure and demanding higher effectiveness rates in different technical performance indicators.

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