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ORIGINAL

THE FREE SHOT IN BASKETBALL: SUCCESSES IN EVERY MINUTE OF GAME

EL TIRO LIBRE EN BALONCESTO: ACIERTOS EN CADA MINUTO DE JUEGO

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ABSTRACT

We present a descriptive analysis of the free shot produced in 74 games of basketball of the ACB. The number of free throws played by the home team and the away team were counted along with the success percentage per minute of the game. The results indicate that, as the game goes on, the number of free throws increases, especially in the last quarter of the game. During extra time, the away team throws almost twice the amount of free throws and with better percentages. There is a significant correlation between the game minute and the number of throws played by both the home team and the away team. Observations were made of the need to adapt and personalise free throw training, working on aspects of visual and attention control and trying to control and manipulate cognitive anxiety.

KEY WORDS: Free shot, basketball, percentage of successes.

RESUMEN

Se presenta un análisis descriptivo del tiro libre producido en 74 partidos de baloncesto de la categoría ACB. Se han contabilizado el número de tiros libres lanzados por el equipo local y visitante y el porcentaje de aciertos en cada minuto de juego. Los resultados indican que, a medida que transcurren los minutos de juego, se incrementa el número de lanzamientos de tiros libres. Destaca sobre todos el último cuarto en cuanto a producción de tiros libres. En las prórrogas, los equipos visitantes lanzan casi el doble de lanzamientos de tiro libre y con mejores porcentajes. Existe correlación significativa entre el minuto de juego y el número de tiros libres lanzados tanto por el equipo local como por el equipo visitante. Se observa la necesidad de adaptar y personalizar los entrenamientos en tiro libre trabajando los aspectos de control visual y atencionales, tratando de controlar y manipular la ansiedad cognitiva.

PALABRAS CLAVE: tiro libre, baloncesto, porcentaje de aciertos.

INTRODUCTION

In the world of basketball, statistical study and analysis is increasingly more important. The most important basketball competition in Spain (ACB) establishes an assessment ranking by grouping the statistical scores of individuals and teams carrying out detailed scouting studies that focus on the strengths and weakness of the opposition. This is all part of the weekly training in preparation for games. In short, this constitutes a tool that demonstrates how highly useful and important modern basketball is.

Within the field of research, different authors have analysed game statistics between different positions and competitions with the view of finding statistical determining indicators of the final results (Gómez and Lorenzo, 2007; Ittenbach and Esters, 1995; Ibáñez, Sampaio, Feu, Lorenzo, Gómez and Ortega, 2008; Lorenzo, Gómez, Ortega, Ibáñez and Sampaio, 2010; Fierro, 2002; Días, 2007; Ibáñez, García, Feu, Lorenzo and Sampaio, 2009; Sampaio, 1998; Zuzik, 2011).

Different studies allow us to extract multiple conclusions of considerable interest as a way of improving knowledge on the general conditions causing different game situations. It is interesting to be aware of what is more or less efficient depending on circumstances and what elements from a statistical point of view can explain what is happening in the game.

One of the conclusions is seen repeatedly in both long-term championships and large competitions. It is that the percentage of two-point shots, the number of assists, the number of fouls and the number of successful free throws seem to be the most important indicators for predicting victory (Gómez and Lorenzo, 2005; Dias, 2007). In this sense, the successful free throw is particularly

relevant especially during equalising games (Sampaio, 1998; Ibáñez et al. 2008).

Some data from studies revealed that the number of points obtained during games thanks to free throws represents 20-25% of the total of all points obtained during a game (Hays and Krause, 1987; Cárdenas and Rojas, 1997, Lorenzo, Gómez and Sampaio, 2003, Sampaio, Fraga and Silva, 2004). This percentage is higher during the final minutes of the game. This period sees an increase to up to 35% in the last five minutes and then an even further considerable increase of up to 69% in the last minute of the game and equalising finals (Kozar, Vaughn, Lord, Whitfield, 1994; Ibáñez, García, Feu, Parejo, Cañadas, 2009). In summary, as claimed in other studies (Walker, 1985 or Hays and Krause, 1987), free throws determine the result of more than half the games placed within a season.

Jenkins (1977) studied the importance of the free throw on the team's results and concluded that the team with a higher percentage of free throws won in 80% of cases. In addition, Ibáñez et al. (2009) currently make mention to how certain contextual situations can change the statistical aspects that differentiate between winners and losers.

In addition, the type of competition, the quality of the players and the psychological factors associated with the competition are contextual variables that can also influence arbitral decisions. In this sense, the study by Anderson and Pierce (2009) highlights that there is a tendency to give more fouls to either the team that has the least or the away team.

The relevance that the free throw seems to have on the search for excellence, along with considering a greater control over training variables, means that this type of throw must be studied from different perspectives. It is considered that the work of the free throw in terms of notational analysis and from perspectives relating to training at a biomechanical and motor control level (Okubo and Hubbard, 2006; Keetch, Lee y Schmidt, 2008; Tran y Silverberg, 2008; Schneider y Williams, 2010). Considering the implications that must be borne in mind when conducting integrated training activity (Cárdenas, 1998; Getz and Rainey, 2001; Ortega, Cárdenas, Puigcerver and Méndez, 2005; Foster and Weigand, 2006, Arias, Argudo and Alonso, 2012), or bearing in mind the psychological factors like attention, concentration, visual control, anxiety and nerve levels (Whitehead, Butz; Kozar y Vaughn, 1996; Dandy, Brewer and Tottman, 2001; Harle and Vickers, 2001; Larumbe, 2001; Oliveira, Oudejans and Beek, 2008; Mesagno, Marchant and Morris, 2009; Gooding and Gardner, 2009; Otten, 2009; Wilson, Vine and Wood, 2009, Krendl, Gainsburg and Ambady, 2012).

These latest studies relating to psychological aspects aim to shed light on the state of the free throw in training under competitive conditions in terms of anxiety and stress. They also aim to detect what elements should be

considered from an attention and concentration point of view that could result in free throw performance. One of the most studied lines is to link a possible stress factor with throw efficiency (Hanton, Fletcher, and Coughlan, 2005; Dias, Cruz and Fonseca, 2009; Mellalieu, Neil, Hanton and Fletcher, 2009; Murayama, Sekiya and Tanaka, 2010).

At first glance, the free throw is probably the easiest of all throws. Nonetheless, when competing it becomes a complicated task due to factors of stress and fatigue (Sampaio and Janeira, 2003), which presents multiple implications from a psychological point of view for its relevance on the final result.

As for fatigue, the different studies conclude that it has no significant effects, at least on mechanic aspects. Nonetheless, as outlined in other studies, it can have effects on attention and concentration (Montgomery, Pyne, Hopkins, Dorman, Cook and Minahan, 2008; Ibañez et al., 2009; Stoppani, 2009; Uygur, Gottepe, Karabörk and Korkusuz, 2010).

In summary, the above are variables of a psychological nature that can indeed cause effects. Along this line, Labrador, Crespo, Buceta and González (1995), or more recently Lafuente (2005), all believe that we must bear in mind the existence of multiple psychological variables in order to understand the contextual factors implied in free throwing.

OBJECTIVES

Based on the above ideas, the fundamental aim of this study is to analyse the number of free throws in different time fractions throughout the game and the percentage of successful throws in accordance with the different characteristics and circumstances of the game.

More specifically, we have proposed the following objectives:

1. – To analyse the number of free throws by a home and away team and the percentage of successful throws in each minute of the game, in each five minute period, in each quarter, in each half and during each minute of extra time.
2. – To study whether there is a correlation between the game minute, the number of free throws and the percentage of successful throws.

MATERIAL AND METHOD

Sample

The sample used was made up of 74 ACB basketball games from the Copa del Rey and Playoffs from 2008, 2009 and 2010. Some 24.3% of the games are from the Copa del Rey and 75.7% are from Playoffs. 28.1% are from the 2007-

2008 season, 36.7% from 2008-2009 and 35.2% from 2009-2010. 52.4% of games were from the quarter finals, 29.8% from the semi-finals and 17.8% from the finals.

Instruments

This current study used the official statistics player's database of the *Asociación de Clubes de Baloncesto* (ACB), as well as the ad hoc record sheet created for the purpose (appendix 1).

Execution

For each game, two observers used the record sheet to note down two referents of the following variables: Competition and season; qualifiers, teams involved, game order, game minute; number of free throws, scorer and partial in between teams at the moment of the free throws, number of throws noted down, percentage, and final result. The record sheet reflected all of the statistical elements that were later put into the matrix of a statistical programme.

Data analysis

Statistical handling of data was carried out using a SPSS 15.0 software for Windows. Preliminary and exploratory analyses were carried out in order to determine the characteristics of data. The significance level for all the analyses was fixed at $p < 0.05$. Descriptive analyses were conducted which consisted in the recounting of free throws and the percentage of successful throws achieved in each minute of the game. From the previous data the corresponding studied time periods were obtained: every 5 minutes, every quarter, full time and also for the extra time in those games where extra time has been needed. A Pearson correlation analysis was also carried out along with a comparative analysis using ANOVA and Student's *t*-distribution.

RESULTS

Free throws in different observed time fractions and the success percentage during these periods.

Tables 1 and 2 show the number of throws and the success percentage of the home and away teams during the different observed time fractions. It is evident that as the minutes of the game go on, the number of free throws increases but the success percentage does not have a defined tendency as the game goes on.

During each quarter, Table 1 shows that the highest number of free throws are concentrated in the last two minutes. In other words, during minutes 9-10, 19-20, 29-30 and 39-40.

Table 1. Free throws in each minute of the game and success percentages.

| MINUTE | No. of throws | | | Average success percentage | | |
|-----------|---------------|-----------|--------|----------------------------|-----------|--------|
| | Home Team | Away Team | Totals | Home Team | Away Team | Totals |
| Minute 1 | 14 | 9 | 23 | 85.71 | 79.25 | 82.48 |
| Minute 2 | 16 | 11 | 27 | 55.00 | 66.67 | 60.83 |
| Minute 3 | 16 | 14 | 30 | 94.44 | 83.33 | 88.88 |
| Minute 4 | 24 | 19 | 43 | 85.71 | 68.18 | 76.94 |
| Minute 5 | 22 | 22 | 44 | 77.50 | 88.46 | 82.98 |
| Minute 6 | 16 | 21 | 37 | 90.00 | 70.83 | 80.41 |
| Minute 7 | 26 | 20 | 46 | 88.46 | 60.00 | 74.23 |
| Minute 8 | 53 | 23 | 76 | 75.00 | 76.92 | 75.96 |
| Minute 9 | 52 | 41 | 93 | 80.95 | 75.00 | 77.97 |
| Minute 10 | 38 | 41 | 79 | 62.50 | 75.00 | 68.75 |
| Minute 11 | 20 | 27 | 47 | 77.27 | 76.67 | 76.97 |
| Minute 12 | 16 | 22 | 38 | 72.22 | 81.82 | 77.02 |
| Minute 13 | 23 | 20 | 43 | 73.08 | 80.00 | 76.54 |
| Minute 14 | 31 | 25 | 56 | 70.59 | 77.08 | 73.83 |
| Minute 15 | 35 | 25 | 60 | 73.68 | 78.12 | 75.90 |
| Minute 16 | 37 | 46 | 83 | 77.78 | 73.86 | 75.82 |
| Minute 17 | 41 | 38 | 79 | 60.67 | 93.05 | 76.86 |
| Minute 18 | 39 | 45 | 84 | 80.35 | 69.12 | 74.73 |
| Minute 19 | 47 | 54 | 101 | 77.10 | 78.85 | 77.97 |
| Minute 20 | 39 | 37 | 76 | 77.50 | 91.18 | 84.34 |
| Minute 21 | 12 | 19 | 31 | 83.33 | 85.00 | 84.16 |
| Minute 22 | 16 | 11 | 27 | 83.37 | 66.67 | 75.02 |
| Minute 23 | 30 | 26 | 56 | 73.94 | 74.38 | 74.16 |
| Minute 24 | 30 | 33 | 63 | 100.00 | 64.70 | 82.35 |
| Minute 25 | 34 | 24 | 58 | 77.78 | 80.00 | 78.89 |
| Minute 26 | 42 | 29 | 71 | 70.00 | 85.92 | 77.96 |
| Minute 27 | 32 | 28 | 60 | 90.62 | 89.23 | 89.92 |
| Minute 28 | 44 | 38 | 82 | 73.68 | 73.62 | 73.65 |
| Minute 29 | 51 | 61 | 112 | 80.09 | 71.14 | 75.61 |
| Minute 30 | 72 | 45 | 117 | 74.72 | 84.90 | 79.81 |
| Minute 31 | 19 | 13 | 32 | 45.00 | 56.25 | 50.62 |
| Minute 32 | 23 | 26 | 49 | 76.92 | 76.92 | 76.92 |
| Minute 33 | 29 | 31 | 60 | 62.81 | 70.59 | 66.70 |
| Minute 34 | 55 | 23 | 78 | 74.04 | 78.95 | 76.49 |
| Minute 35 | 37 | 39 | 76 | 65.72 | 76.14 | 70.93 |
| Minute 36 | 40 | 39 | 79 | 73.53 | 78.95 | 76.24 |
| Minute 37 | 69 | 47 | 116 | 80.68 | 76.14 | 78.41 |
| Minute 38 | 48 | 44 | 92 | 58.84 | 78.57 | 68.70 |
| Minute 39 | 88 | 79 | 167 | 81.64 | 88.71 | 85.17 |
| Minute 40 | 130 | 109 | 239 | 74.80 | 71.47 | 73.13 |

| | | | | | | |
|-----------|---|----|----|--------|--------|--------|
| Minute 41 | 2 | 2 | 4 | 100.00 | 100.00 | 100.00 |
| Minute 42 | 2 | 5 | 7 | 50.00 | 66.67 | 58.33 |
| Minute 43 | 6 | 12 | 18 | 100.00 | 89.00 | 94.50 |
| Minute 44 | 4 | 4 | 8 | 100.00 | 100.00 | 100.00 |
| Minute 45 | 5 | 12 | 17 | 33.50 | 83.25 | 58.37 |

In addition, Table 2 shows how the second half of each quarter saw a higher number of throws than in the first half of this same quarter. The last quarter saw more throws than the third quarter and descending in the second and first quarter respectively.

With regards to success percentages, a defined tendency was not observed in any of the observed time fractions. However, the success percentage increase in the extra time minutes is striking.

Table 2. Free throws and success percentages

| MINUTE | No. of throws | | | Average success percentage | | |
|----------------|---------------|-----------|--------|----------------------------|-----------|--------|
| | Home Team | Away Team | Totals | Home Team | Away Team | Totals |
| Minute 1-5 | 92 | 75 | 167 | 79.50 | 78.30 | 78.90 |
| Minute 6-10 | 185 | 114 | 299 | 77.25 | 72.63 | 74.94 |
| Minute 11-15 | 125 | 119 | 244 | 73.19 | 78.51 | 75.85 |
| Minute 16-20 | 201 | 220 | 421 | 74.73 | 80.75 | 77.74 |
| Minute 21-25 | 122 | 113 | 235 | 83.06 | 73.52 | 78.29 |
| Minute 26-30 | 241 | 211 | 452 | 78.59 | 78.98 | 78.78 |
| Minute 31-35 | 163 | 132 | 295 | 67.02 | 71.20 | 69.11 |
| Minute 36-40 | 375 | 318 | 693 | 79.20 | 78.67 | 78.93 |
| Minute 41-45 | 19 | 35 | 54 | 76.70 | 87.78 | 82.24 |
| QUARTER | | | | | | |
| First Quarter | 277 | 221 | 498 | 78.05 | 74.72 | 76.38 |
| Second Quarter | 326 | 339 | 665 | 74.07 | 79.88 | 76.97 |
| Third Quarter | 363 | 324 | 687 | 80.23 | 77.01 | 78.62 |
| Fourth Quarter | 538 | 450 | 988 | 74.81 | 76.19 | 75.50 |
| TIME | | | | | | |
| First Quarter | 603 | 560 | 1163 | 75.91 | 77.73 | 76.79 |
| Second Quarter | 901 | 774 | 1675 | 77.10 | 76.55 | 76.84 |
| Extra time | 19 | 35 | 54 | 76.70 | 87.78 | 82.24 |

Success percentages in the different time periods

Table 3 shows the results of the different comparative analyses carried out. Comparisons were made for the different observed time fractions separately for home and away teams. As you can see from the table, no comparison turned

out to have significant results (all p-values were >0.05). Consequently, for both home and away teams we cannot confirm whether the success percentage in a given time interval is higher or lower than that observed in another interval.

We also wanted to compare the success percentages in two more extreme time fractions. Consequently, when comparing the average free throw success rate during the first five minutes of the game with the average rate during the last five minutes, no significant differences were found neither in home teams (79.50 compared to 79.20) nor away teams (78.30 compared to 78.67).

Table 3. Free throw success percentage during each time period

| | TIMES | N | Average | Typical Deviation | F | Sig .P |
|--------------------------------------|----------------|-----|---------|-------------------|-------|-----------|
| Success Percentage (Home Team) | Minute 1-5 | 50 | 79.50 | 31.82 | 1.71 | .09 |
| | Minute 6-10 | 89 | 77.25 | 33.42 | | |
| | Minute 11-15 | 69 | 73.19 | 34.92 | | |
| | Minute 16-20 | 93 | 74.73 | 33.61 | | |
| | Minute 21-25 | 62 | 83.06 | 25.70 | | |
| | Minute 26-30 | 107 | 78.59 | 27.69 | | |
| | Minute 31-35 | 83 | 67.02 | 35.89 | | |
| | Minute 36-40 | 147 | 79.20 | 26.64 | | |
| Success Percentage (Away Team) | Minute 1-5 | 43 | 78.30 | 33.04 | 0.95 | .47 |
| | Minute 6-10 | 74 | 72.64 | 31.83 | | |
| | Minute 11-15 | 64 | 78.52 | 29.16 | | |
| | Minute 16-20 | 100 | 80.75 | 27.72 | | |
| | Minute 21-25 | 56 | 73.52 | 33.00 | | |
| | Minute 26-30 | 99 | 78.98 | 31.02 | | |
| | Minute 31-35 | 64 | 71.20 | 37.04 | | |
| | Minute 36-40 | 129 | 78.67 | 29.54 | | |
| Success percentage (Local) | First quarter | 139 | 78.06 | 32.76 | 1.10 | .35 |
| | Second quarter | 162 | 74.07 | 34.08 | | |
| | Third quarter | 169 | 80.23 | 26.98 | | |
| | Fourth quarter | 230 | 74.81 | 30.79 | | |
| | Extra time | 8 | 77.13 | 36.65 | | |
| | Total | 708 | 76.60 | 31.20 | | |
| Success percentage (Away Team) | First quarter | 117 | 74.72 | 32.25 | 0.73 | .57 |
| | Second quarter | 164 | 79.88 | 28.22 | | |
| | Third quarter | 155 | 77.01 | 31.75 | | |
| | Fourth quarter | 193 | 76.19 | 32.31 | | |
| | Extra time | 13 | 84.62 | 21.99 | | |
| | Total | 642 | 77.23 | 30.97 | | |
| Success percentage (Home Team) | First Quarter | 301 | 75.91 | 33.477 | -0.50 | .62 |
| | Second Quarter | 399 | 77.11 | 29.328 | | |
| Success percentage (Away Team) | First Quarter | 281 | 77.73 | 30.021 | 0.47 | .64 |
| | Second quarter | 348 | 76.55 | 32.023 | | |
| Success percentage (Home Team) | Minute 1-5 | 50 | 79.50 | 31.82 | 0.06 | .95 |
| | Minute 36-40 | 147 | 79.20 | 26.64 | | |
| Success percentage (Away Team) | Minute 1-5 | 43 | 78.30 | 33.04 | -0.07 | .95 |
| | Minute 36-40 | 129 | 78.67 | 29.54 | | |

$p > .05$. (Non significant differences).

Correlations between game time, free throws and success percentage.

Table 4 shows that there is a significant correlation between the game minute and the number of free throws for both the home and away teams. There is also a correlation between the number of free throws by the home and away teams.

Nonetheless, there is no correlation between the game minute and the success percentage both for the local and away teams when carrying out free throws.

Table 4. Correlations between game time, free throws and success percentage (Pearson Correlation)

| | Period | Home Team throws | Home Team Percentage | Away Team Throws |
|----------------------|----------|------------------|----------------------|------------------|
| Home Team Throws | .52 (**) | | | |
| Home Team Percentage | - .01 | .01 | | |
| Away Team Throws | .53 (**) | .89 (**) | .07 | |
| Away Team Percentage | .010 | - .02 | - .01 | .01 |

**Significant correlation at the level of 0.01 (bilateral).

DISCUSSION

This study had two objectives. The first was to analyse the number of free throws and then the success percentage in different time fractions. Our results indicate that, as the game goes on, the number of free throws increases in the case of both the home and away teams. Nonetheless, the average success percentage does not display any defined pattern in any of the two teams.

The second objective was to study whether there is a correlation between the game minute, the number of free throws and the percentage of successful throws. We saw that there was a positive correlation between the game minute and the number of free throws for both the home and away team. Nonetheless, there is no correlation between the game minute and the success percentage both for the local and away teams when carrying out free throws.

In short, as the game unfolds (game time) the number of free throws increases but the success percentage undergoes significant changes depending on the game minute. This was also found in other studies (Kozar et al., 1994; Ibáñez et al., 2009).

The increase in free throws as the game goes on could be due to a question of tactics which is reflected indirectly in the free throw. Towards the end of the game is when more tactical fouls are committed (Anshel and Wells, 2000). This

can also be put down to the fact that there is a relation with game situations and the use of each possession (Lorenzo, Gómez and Sampaio, 2003).

The fact that no statistically significant differences were found when comparing the free throw success percentage in different time fractions brings us to question the incidence of some recurring variables for explaining free throw fouls. For example, we refer to the lack of warm-ups usually characteristics at the beginning of the game or rather the physical fatigue or higher incidence caused by the capacity to control stress when the free shot has direct incidence with the scorer and it game is coming to an end. Probably, in other lower ACB categories significant differences can be found in the free throw success percentage depending on the game minute or the location of the scorer when throwing.

In games with extra time, the average free throw success was lower than away teams. The same trend takes place towards the end of the game, although in this case the difference between averages is less than in the extra time period. In any case, it turned out to be striking that in the extra time period the free shot success period increased. This could be down to the high level of player concentration and their capacity to control stress in the face of the importance of scoring in this period close to the end of the game. The player is also more fatigued during this period and is more anxious.

Our results reveal other interesting data which we will now explain. In the first and second encounter period, a higher number of free shots were played during the first three minutes, but mostly during the second to last minute. On the other hand, during the third and fourth periods, the highest number of free throws is concentrated in the last two minutes. It is evident that more free throws are played during the last two minutes of the fourth period, something which is significantly higher during the last minute. We also have one other important piece of information: whereas in the minute previous to last minute, the average free throw percentage is a rather high 85.17% and in the final minute this drops considerable to 73.13%. This is possibly due to the fact that in the minute previous to last minute, the performance level is optimal and even allows for an above average percentage during a key time in the game. However, it is not completely decisive. However, the last minute leaves no margin for error and the player worries more (Bakhshayesh, Nia and Neisi, 2010). This anticipation of the consequence can cause an increase in the self-awareness of the situation (Dandy, Brewer and Tottman, 2001; Otten, 2009). This turns into a decrease in success (Whitehead et al., 1996).

The results for the number of free shots in each 5 minute period and the success percentage showed stability in the percentages for all time frames, except in the first five minutes of the last quarter. Although in each time frame the average of 75% was exceeded, at this particular time it decreases to 70%. There could be multiple reasons for this: it could be the period in which the highest number of supplies are used or the game could be played more by the inner player, which display a lower free throw success percentage (Gómez and

Lorenzo, 2007), meaning that they commit fouls towards the end of the game. The reality is that we do not have enough data to explain this tendency that gives rise to an average percentage of 69.11%.

Fatigue could be neither a possible answer despite considering the game accumulation time. Different studies (Montgomery et al., 2008; Ibáñez et al., 2009; Stopani, 2009; Uygur et al., 2010) show that at least in mechanic aspects this element does not cause great alterations in the free shot. Furthermore, the psychological strain during this moment does not seem to be excessive when compared with moments before or after. We also have data for the last five minutes which shows that the success percentage increases to up to 78.93%, returning to average figures in other moments of the game.

Consequently, the explanation to a large extent seems to be a question of tactics that is indirectly reflected in the free shot. Towards the end of the game is when more tactical fouls are committed (Anshel and Wells, 2000). This can be understood as a stress factor in 60% of players and for 100% of players it is stressful to miss a throw when considered to be easy (Anshel and Wells, 2000).

This is an element to be born in mind if we manage to increase free throw percentages and choking control produced during stressful situations, we know that the final rate would considerably increase too, especially during equalising finals where differences are so small that the free throw point could determine the final result. This happened in the final Play off of 2010.

When the number of free throws in the last quarter is higher than previous quarters, and when there are no differences between the second and third quarters, we can deduce that it is related to the defence to save fouls at the beginning and then over time increase intensity. This leads to situations of contact (plus fatigue, which causes later defensive actions and a tendency towards foul increase). Whatever the cause, the last quarter sees the most free throws and the worse percentages.

Another question to outline is that although the percentage of home teams is better than that of visitors in the second half compared to quarters, the away teams are more effective (although they throw on less occasions). During extra time, the away team makes almost double the amount of free throws with better percentages. The stressful situation of extra time at home, when no team wins during reglamentary time, seems to go against the home team in this specific situation in accordance with Baumeister and Steinhilber (1984), or Tauer, Guenther and Rozek (2009), when results are adverse. Although these studies focus more on the advantage and not on home team playing when reaching an equal number of victories in each qualifier Playoffs.

In summary, it is important to increase free shot efficiency due to its effect on the overall outcome of the basketball game. However, this is a closed task. Trainings systems cannot be based solely on working on this variable since we

understand that there are multiple factors affecting the free throw during competitions. As some authors mention, one thing is the results in training and another is player performance during competitions in which they may be faced with stressful situations (Wilson, Vine and Wood, 2009; Dandy, Brewer, and Tottman, 2001). According to different studies this is produced by the level of concentration or attention that the sportsperson is capable of maintaining (Whitehead et al., 1996; Wilson et al., 2009).

One of the limitations of our study is that we have only focused on the ACB category and it would be important to study other lower categories and younger players. In these cases, psychological factors involved in the free throw can have a more determining incidence. In addition, we did not analyse the success percentage of players depending on their field position (base, winger, and centre). The above limitations should be considered in future investigations in order for greater knowledge on the different factors involved in free throw success.

CONCLUSIONS

As the game unfolds, the number of free throws increases for both the home and away team. However, the success percentage undergoes significant changes depending on the game minute.

We have not found any statistically significant differences when comparing free throw success percentages in different time fractions or when comparing the first and last five minutes of each game.

The above conclusion could bring us to question the incidence of some recurring variable that explain free throw fouls, such as the lack of warm-ups at the start or end of games, physical fatigue or the capacity to control stress when the free throw has a very direct incident on the scorer.

Probably, in other lower ACB categories significant differences were found in the free throw success percentage depending on the game minute or the location of the scorer when throwing.

In any case, it turned out to be striking that in the extra time period the free shot success period increased. This could be down to the high level of player concentration and their capacity to control stress in the face of the importance of scoring in this period close to the end of the game. The player is also more fatigued during this period and is more anxious.

In any case, we have observed the need to adapt and personalise free throw training by working on aspects of visual and attention control and trying to control and manipulate cognitive anxiety.

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APPENDIX 1: Example of the record sheet used
COPA DEL REY 2008-09. QUARTER FINALS: ESTUDIANTES-DKV

| Minute | No of Home Throws | Result when throwing | Succes ses | % succe ss | No of Away Throws | Results when throwing | Succes ses | % succe ss |
|--------|-------------------|----------------------|------------|------------|-------------------|-----------------------|------------|------------|
| 2 | | | | | 2 | 0-0 | 1/2 | 50 |
| 2 | 2 | 1-0 | 1/2 | 50 | | | | |
| 5 | 2 | 7-4 | 1/2 | 50 | | | | |
| 11 | 2 | 17-15 | 2/2 | 100 | | | | |
| 14 | | | | | 2 | 23-17 | 2/2 | 100 |
| 14 | 2 | 23-19 | 1/2 | 50 | | | | |
| 16 | | | | | 1 | 24-26 | 1/1 | 100 |
| 17 | 2 | 24-29 | 2/2 | 100 | | | | |
| 18 | 2 | 28-32 | 2/2 | 100 | | | | |
| 22 | 2 | 36-34 | 1/2 | 50 | | | | |
| 23 | | | | | 2 | 40-34 | 2/2 | 100 |
| 26 | | | | | 1 | 47-43 | 1/1 | 100 |
| 28 | | | | | 2 | 53-48 | 1/2 | 50 |
| 30 | | | | | 2 | 53-49 | 2/2 | 100 |
| 31 | 2 | 53-53 | 2/2 | 100 | | | | |
| 32 | | | | | 2 | 57-53 | 2/2 | 100 |
| 33 | | | | | 2 | 57-55 | 1/2 | 50 |
| 34 | 1 | 59-60 | 0/1 | 0 | | | | |
| 34 | | | | | 1 | 59-62 | 1/1 | 100 |
| 35 | | | | | 2 | 59-65 | 1/2 | 50 |
| 36 | | | | | 2 | 61-66 | 1/2 | 50 |
| 36 | 2 | 61-67 | 2/2 | 100 | | | | |
| 36 | 2 | 63-67 | 1/2 | 50 | | | | |
| 37 | 2 | 67-69 | 2/2 | 100 | | | | |
| 39 | | | | | 2 | 73-71 | 1/2 | 50 |
| 39 | 2 | 73-72 | 1/2 | 50 | | | | |
| 40 | 2 | 74-74 | 2/2 | 100 | | | | |
| 40 | | | | | 2 | 76-74 | 1/2 | 50 |
| 40 | 2 | 76-75 | 2/2 | 100 | | | | |
| 40 | 2 | 78-75 | 2/2 | 100 | | | | |
| | | | 24/31 | 77.4% | | | 18/25 | 72% |

Appendix 2. List of analysed games

Sample of Copa del Rey Games

| SEASON | | |
|--------------------------------------|--|---|
| 2007-2008 | 2008-2009 | 2009-2010 |
| Bilbao-Barcelona (Quarter Finals) | Estudiantes-Dkv (Quarter Finals) | P. Valencia-Estudiantes (Quarter Finals) |
| Tau-Unicaja (Quarter Finals) | Tau-Pamesa (Quarter Finals) | Barcelona-Cajasol (Quarter Finals) |
| Tau-Bilbao (Semi-finals) | R.Madrid-Barcelona (Quarter Finals) | Bilbao-Caja Laboral (Quarter Finals) |

| | | |
|--------------------------|--|--|
| Tau-Juventud (Finals) | Unicaja-G. Canaria (Quarter Finals) | R. Madrid-Dkv Joventut (Quarter Finals) |
| | Estudiantes-Unicaja (Semi-finals) | Caja Laboral-R. Madrid (Semi-finals) |
| | Barcelona-Tau (Semi-finals) | P. Valencia-Barcelona (Semi-finals) |
| | Unicaja-Tau (Finals) | Barcelona-R. Madrid (Finals) |

Sample of Play-Offs Games

| SEASON | | |
|---|--|---|
| 2007-2008 | 2008-2009 | 2009-2010 |
| Joventut-Girona (Quarter Finals) | Barcelona-Pamesa (Quarter Finals) | Cajalaboral-Estudiantes (Quarter Finals) |
| Girona-Joventut (Quarter Finals) | Pamesa-Barcelona (Quarter Finals) | Estudiantes-Cajalaboral (Quarter Finals) |
| Joventut-Girona (Quarter Finals) | Tau-Bilbao (Quarter Finals) | R. Madrid-Cajasol (Quarter Finals) |
| Barcelona-Bilbao (Quarter Finals) | Bilbao-Tau (Quarter Finals) | Cajasol-R. Madrid (Quarter Finals) |
| Bilbao-Barcelona (Quarter Finals) | Unicaja-G. Canaria (Quarter Finals) | R. Madrid-Cajasol (Quarter Finals) |
| Tau-Pamesa (Quarter Finals) | G. Canaria-Unicaja (Quarter Finals) | Barcelona-G. Canaria (Quarter Finals) |
| Pamesa-Tau (Quarter Finals) | Unicaja-G. Canaria (Quarter Finals) | Gran Canaria-Barcelona (Quarter Finals) |
| Tau-Pamesa (Quarter Finals) | R. Madrid-Joventut (Quarter Finals) | Valencia-Unicaja (Quarter Finals) |
| R. Madrid-Unicaja (Quarter Finals) | Joventut-R. Madrid (Quarter Finals) | Unicaja-Valencia (Quarter Finals) |
| Unicaja-R. Madrid (Quarter Finals) | R. Madrid-Joventut (Quarter Finals) | Barcelona-Unicaja (Semi-finals) |
| Dkv Joventut-Barcelona (Semi-finals) | Barcelona-Unicaja (Semi-finals) | Barcelona-Unicaja (Semi-finals) |
| Barcelona-Dkv Joventut (Semi-finals) | Unicaja-Barcelona (Semi-finals) | Cajalaboral-R. Madrid (Semi-finals) |
| Tau Cerámica-Unicaja (Semi-finals) | Barcelona-Unicaja (Semi-finals) | Cajalaboral-R. Madrid (Semi-finals) |
| Unicaja-Tau Cerámica (Semi-finals) | Tau-R. Madrid (Semi-finals) | R. Madrid-Cajalaboral (Semi-finals) |
| Barcelona-Tau (Finals) | R. Madrid-Tau (Semi-finals) | R. Madrid-Cajalaboral (Semi-finals) |
| Barcelona-Tau (Finals) | Tau-R. Madrid (Semi-finals) | Cajalaboral-R. Madrid (Semi-finals) |
| Tau-Barcelona (Finals) | Tau-Barcelona (Finals) | Barcelona-Cajalaboral (Finals) |
| | Tau-Barcelona (Finals) | Barcelona-Cajalaboral (Finals) |
| | Barcelona-Tau (Finals) | Cajalaboral-Barcelona (Finals) |

Barcelona-Tau
(Finals)
