

EFFECTS OF STARTING QUARTER SCORE, GAME LOCATION, AND QUALITY OF OPPOSITION IN QUARTER SCORE IN ELITE WOMEN'S BASKETBALL

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Original scientific paper

UDC: 796.323.2:796.093.432-055.2

Abstract:

The aim of the present study was to identify the effects of a starting score-line on the game quarter final score (final quarter outcome except for the first period) when considering the quality of the opposition and game location. The sample comprised 1,456 game quarters from the Spanish women's professional league (seasons 2009/2010 and 2010/2011). A *k*-means cluster analysis classified the game quarters as balanced (difference in score equal or below by six points, *n*=1,000) and unbalanced game quarters (difference in score above six points, *n*=456). The effects of the situational variables in the game quarter outcome (difference between points scored and points conceded) in an entire game and in the second, third, and fourth game quarters were analyzed using linear regression analysis. The results showed the importance of a starting quarter score only during the second game quarters when one analyzed the entire game and unbalanced quarters. Also, the results showed that the situational variables of game location and quality of the opposition affected during the entire game quarters and unbalanced game quarters. These results established that the game dynamics in women's basketball are strongly influenced by situational variables. The results of the present study help the coaches to develop appropriate game strategies considering the situational variables and the game dynamics.

Key words: *situational variables, women's basketball, performance analysis, starting score-line*

Introduction

One of the most interesting research topic that has emerged recently under the scope of performance analysis (in team sports) is the effect of situational variables. These variables have a great influence on teams' and players' performances, therefore these variables should be studied in depth to increase the knowledge about the situational conditions that affect the performances (Gómez, Lago-Peñas, & Pollard, 2013). The situational variables were game location, quality of opposition, score-line or game period in performance (Bloomfield, Polman, & O'Donoghue, 2005a, b; Gómez & Pollard, 2011; Lago-Peñas & Lago-Ballesteros, 2011; O'Donoghue & Tenga, 2001; Shaw & O'Donoghue, 2004; Taylor, Mellalieu, James, & Shearer, 2008). Performance analysis during specific game periods of basketball matches has pointed out the importance of different

tactical and technical demands and their influence in game pacing and intensity (Sampaio, Lago, & Drinkwater, 2010a). From a physiological point of view, the available literature showed higher playing intensities during the first and third game quarters (Ben Abdelkrim, Castagna, El Fazaa, & El Ati, 2010). In the same way, the quality of the opposition has been associated to different physiological profiles during game periods with an effect of competitive level over game demands in basketball, but the differences according to offensive and defensive strategies were not significant in work-ratio profiles (Ben Abdelkrim, et al., 2010; Rodríguez-Alonso, Fernandez-Garcia, Pérez-Landaluce, & Terrados, 2003). Indeed, all high scoring sports have specific dynamics and constraints during the game, and this fact may generate that players do not use their higher physical capacities during the entire

game moments (Marcelino, Sampaio, & Mesquita, 2012). For example, the United States of America basketball team in the 2008 Beijing Olympic Games played with a faster game pace during the first half of the game and with a slower game pace during the second half, which resulted in a decrement of tactical and physiological performances (Sampaio, et al., 2010a). Indeed, other available studies stated that the starting game quarter score-line (score difference at the beginning of the period) was only important in unbalanced situations with very similar effects among game quarters. Indeed, Sampaio, Lago, Casais, and Leite (2010b) found that greater differences in an accumulated score at the beginning of each quarter resulted in more points recovered by the teams who were losing.

Since the situational variable *quality of the opposition* has been suggested as an important variable on sport performance, the team and players have been classified from a diverse point of view as strong and weak, successful and unsuccessful, and final ranking classification (Gómez, et al., 2013). When considering the interactive effect of quality of the opposition and game quarters in basketball, the effects from the quality of the opponent in the second and third quarters were found, as well as an effect of game location in the second quarter (Sampaio, et al., 2010b).

On the other hand, O'Donoghue and Tenga (2001) studied elite soccer games trying to analyze the effect of score-line and work-rate. Their results showed different trends for winning, losing and drawing teams with the winning teams assuming ball retention strategy and slowing down the game pace. In particular, Jones (2007) studied the National Basketball Association (NBA) League and studied the influence of score-line and game location. The results showed that the home teams accumulated in the first quarter two thirds of the overall advantage reached at the end of the game. More recently, Gómez and Pollard (2011) confirmed and quantified the existence of home advantage in the professional leagues of Europe (i.e. Turkey, Greece, Romania, Spain, Bulgaria, Russia and Lithuania) and in the NBA in North America. In essence, the available literature in men's basketball has identified that situational variables have interactive effects with game period when a starting score-line is considered.

The available research in women's basketball is quite scarce and mostly focused on discriminating teams' performances according to the final outcome (Gomez, Lorenzo, Sampaio, & Ibáñez, 2006; Gómez, Lorenzo, Ortega, Sampaio, & Ibáñez, 2009). The contrast between women's and men's basketball showed that men's tactics were different as a consequence of physiological and anthropometric differences (Sampaio, Ibáñez, & Feu, 2004). Pollard and Gómez (2012) established that gender

differences in team and players' performances might be explained from different perspectives (i.e. cognitive, perceptual, motor, psychological, biological or from the point of view of daily activity). Indeed, women's teams play with slower game paces (Oliver, 2004) and could be disturbed by negative behaviors or self-confidence during the game (Pendleton, 2001). This way, it is likely that the game dynamics are different according to gender and that situational variables interact differently with the starting score-line. Therefore, the aim of the present study was to identify the effects of a starting score-line on a game quarter final score when considering the quality of the opposition and game location.

Methods

Data were gathered from all 364 games played by fourteen participating teams in the 2009/2010 and 2010/2011 regular seasons of the Spanish women's professional league. Archival data were publicly available and obtained from the open-access official Spanish Basketball Federation (www.feb.es) play-by-play records. All data were gathered on-court by professional technicians of the league. However, thirty-six games were randomly selected to test data reliability and the results showed perfect agreement (ICC=1.0) for points scored and conceded for both teams (home and away) at the start and end of each game quarter. The games were analyzed using the box-score game-related statistics to record the score differences at the beginning of each quarter and the quarter final score ($n=1,456$). The extra times were excluded from the sample to avoid inconsistencies in data analysis. In order to control for situational variables, the quality of the opposition (difference between end-of-season rankings of the opposing teams) and the game location (home or away) were also registered.

Three predictor variables were included to explain the game quarter outcome (QO): the score difference at the beginning of each quarter (*Score Difference*: SC); the game location has been registered as "home" or "away" (*Game Location*: GL); and the quality of the opposition was collected as the difference in the end-of-season ranking between teams (*Opposition*: OP). β_0 is the intercept and β_1 , β_2 and β_3 are the impacts of each predictor variable of the independent variables. Finally, ε_i is the disturbance term. This variable captures all other factors which influence the dependent variable QO_i other than the regressors. The model is as follows:

$$QO_i = \beta_0 + \beta_1 X SC + \beta_2 X GL + \beta_3 X OP + \varepsilon_i$$

A *k*-means cluster analysis was performed to identify a cut-off value in the final score differences and classify games quarters (Rost, 1995; Sampaio, et al., 2010b). The results identified one cluster (unbalanced games quarters) with a difference

in the score of more than eight points, averaging 11.24 ± 3.1 points (range 8–23, $n=456$), and a second cluster (balanced games quarters) with a difference of less than seven points, averaging 3.4 ± 2.1 points (range 0–7, $n=1,000$). The linear regressions were performed for all the game quarters, for balanced and unbalanced game quarters. Statistical analysis was performed using SPSS 20.0 for windows. Statistical significance was set at $p < .05$.

Results

The means and standard deviations in the final point differences between the confronting teams are presented in Table 1, for unbalanced, balanced and all game quarters.

The effects of the independent variables are presented in Table 2. The independent variable of the starting quarter score explained the game quarter outcome only when analyzing the entire game quarters and the second game quarter. For

each point of difference in the accumulated score the teams reduced the game quarter outcome by -0.04 to -0.10 points. On the other hand, the situational variables of game location and quality of the opposition explained the game quarter outcome in all the game quarters (entire, first, second, third and fourth). Playing at home increased the game quarter outcome by 1.68 to 2.74 points compared with playing away. Playing against top-ranked team implies a reduction on the game quarter outcome by -0.43 to -0.55 points.

The effects of the independent variables on the game quarter outcome in unbalanced games are presented in Table 3. The entire game and second game quarter were explained by the starting quarter score. For each point of difference in the accumulated score at the start of each quarter, the teams decreased the game quarter outcome by 0.10 and 0.31 points, respectively. On the other hand, game location and quality of the opposition explained the game quarter outcome in all the game quarters. Playing away decreased the game quarter outcome by -2.42 to -6.51 points. Playing against a strong team decreased the game quarter outcome by -0.94 to -1.20 points.

The effects of the independent variables on the game quarter outcome in balanced games (see Table 4) showed that the game quarter outcome in all the game quarters was explained by the quality of the opposition. For each point of difference in the final standings between the competing teams increased/decreased the game quarter outcome by 0.13 to 0.18 points.

Table 1. Final point differences between teams for balanced (difference of six points or less), unbalanced (difference of six points or more) and all game quarters

Game quarter	All quarters (n = 1,456)	Unbalanced quarters (n = 456)	Balanced quarters (n = 1,000)
First	6.0±4.6	11.7±3.7	3.5±2.2
Second	5.8±4.4	11.2±2.8	3.2±2.1
Third	5.8±4.3	11.3±2.9	3.5±2.1
Fourth	5.8±4.2	10.9±2.7	3.5±2.2

Table 2. Effects of starting quarter score on quarter final outcomes in all games

Variables	Entire game	Second quarter	Third quarter	Fourth quarter
Starting quarter score	-0.04 (.01)**	-0.10 (.04)**	-0.02 (.03)	-0.02 (.02)
Game location	-1.72 (2.50)**	-0.74 (.89)**	-1.31 (.49)**	-1.68 (.52)**
Quality of the opposition	-0.52 (.02)**	-0.53(.05)**	-0.55 (.05)**	-0.43 (.06)**
Intercept	0.88 (.18)	1.39 (.35)	0.68 (.34)	0.86 (.36)
Number of observations	1456	364	364	364
R ²	.17	.19	.19	.12

* $p < .05$. ** $p < .01$

Table 3. Effects of starting quarter score on quarter final outcomes in unbalanced game quarters

Variables	Entire game	Second quarter	Third quarter	Fourth quarter
Starting quarter score	-0.10 (.03)**	-0.31 (.08)**	-0.10 (.07)	-0.04 (.05)
Game location	-3.70 (.32)**	-6.51 (1.13)**	-2.42 (1.23)*	-3.76 (1.30)**
Quality of the opposition	-1.10 (.06)**	-1.20 (.10)**	-1.20 (.12)**	-0.94 (.14)**
Intercept	1.88 (.43)	3.25 (.80)	1.32 (.87)	1.88 (.90)
Number of observations	456	119	108	120
R ²	.37	.44	.42	.28

* $p < .05$. ** $p < .01$

Table 4. Effects of starting quarter score on quarter final outcomes in balanced game quarters

Variables	Entire game	Second quarter	Third quarter	Fourth quarter
Starting quarter score	-0.02 (.01)	0.03 (.03)	-0.01 (.02)	-0.03 (.02)
Game location	-0.22 (.18)	-0.07 (.04)	-0.32 (.37)	.08 (.36)
Quality of the opposition	-0.16 (.02)**	-0.13 (.03)**	-0.18 (.04)**	-0.15 (.04)**
Intercept	0.12 (.12)	0.06 (.02)	0.16 (.25)	0.02 (.25)
Number of observations	1,000	245	256	244
R ²	.05	.05	.05	.04

*p<.05. **p<.01

Discussion and conclusions

The aim of the present study was to identify the effects of a starting score-line on a game quarter final score when considering the quality of the opposition and game location. The results from the present study supported the hypothesis that women's basketball game dynamics were influenced by situational variables. The effects of game location and quality of the opposition on game dynamics were very different when compared to the results identified in men's basketball (Sampaio, et al., 2010b).

Men's and women's teams have different performances in sport due to differences in motor, physiological, anthropological, biological and daily physical activity (Pollard & Gómez, 2012). In basketball, the studies have reflected the main importance of physical, technical and tactical performance differences that generate different tactics and strategies during games (Gómez, et al., 2006, 2009; Sampaio, et al., 2004). The significant effects of a starting quarter score, game location and quality of the opposition in the present study may be associated to psychological or cognitive factors. Recent research suggests that female basketball players can be more affected by situational variables than men. Indeed, Gómez, Lorenzo, Ibáñez, and Sampaio (2013) analyzed the importance of basketball performance indicators in predicting the effectiveness of ball possessions in men's and women's basketball, when controlling for game location, league stage, score-line and game periods. The results showed no interaction with situational variables in men's basketball. However, the league stage (regular season or playoff games) was important from 0-35 minutes in women's basketball games, and the score-line was important from the last 5 minutes of the games. Therefore, it seems likely that the importance of each game context (i.e. balanced or unbalanced game quarters, starting quarter score) modifies the importance of each situational variable and their contribution to the changes in each quarter outcome.

The effects of a starting quarter score were only significant in all the games and in the second quarter of unbalanced game quarters, whereas they

were not significant in balanced game quarters. When analyzing all the games, a ten-point lead at the start of the second quarter will likely be decreased by one point. In contrast, when analyzing the second quarter of unbalanced quarters, an 18-point lead at the start of the second game-quarter will likely be decreased by 5.58 points. During the second game quarters, the effect of the starting quarter score in decreasing the point differences may be associated with higher game intensity. Indeed, research has found the importance of the first half in the final outcome of men's basketball games probably due to higher pacing (Sampaio, et al., 2010a). However, it seems clear that if a team is winning by a larger margin of points, there might be a trend to reduce the game pace (Sampaio, et al., 2010a, b). This reduction may be reflected in longer ball possessions with more passes, and it is probably identified also in the psychological approach to the remaining playing time, with players exhibiting less concentration. These constraints will probably benefit the losing teams that will try to increase the defensive pressure and to reduce the differences in the score. However, there is no research providing evidence of this trend.

The effects of the quality of the opposition with a starting quarter score were significant in all situations, with equal importance across the game. These results reflected a higher predictability in unbalanced game quarters (R² ranged .28–.44; see Table 3) and lower predictability of balanced game quarters (R² ranged .04–.05; see Table 4). As it was found in men's basketball, these values reflect that balanced and unbalanced game quarters were affected differently by the situational variables (Sampaio, et al., 2010b). The balanced game quarters showed regression coefficients ranging between -.13 and -.18. These results are similar to those found earlier in men's basketball, showing that the quality of the opposition affected strongly the second and the third game quarters (Sampaio, et al., 2010b). Indeed, physiologically based research has shown that women's basketball demands are affected by the quality of the opposition, and that the energetic requirements were higher during balanced games (Rodríguez-Alonso, et al., 2003).

The regression coefficients of the quality of the opposition in unbalanced game quarters were substantially higher and ranged between -0.94 and -1.20. Similar to the results found for men's basketball, they suggest that the quality of the opposition must be considered at all times (Gómez, et al., 2006; Sampaio, et al., 2010 a, b).

Additionally, the interactive effects of situational variables may affect the trends found, and the quality of the opposition variable may somehow obscure the influence of the game location effects. The results reflect the lack of statistical significance of game location in balanced game quarters. This situational variable was only important in unbalanced game quarters (range -2.42 to -6.51) but particularly high during the second game quarter (-6.51). These results may reflect the importance of home advantage effects during the first half of the game, such as crowd support, familiarity and playing tactics (Pollard & Gómez, 2012), but they are still present during the second half and at the end of the games. This trend may reflect the importance of self-confidence and self-efficacy in female players because they may be more affected by environmental conditions, self-mistakes or the opponents' crowd supports (Bray, Jones, & Owen, 2002). In particular, Madrigal and James (1999) studied the influence of team quality in the home advantage effect in women's basketball and showed that best teams won more games when confronting worst teams (95% of home wins) than when confronting the best teams (70% of home wins).

Finally, there are some limitations of the present study, which are relevant to take into account in future research. An analysis of interactive effects of situational variables in women's team sports should be considered with other performance indicators (game-related statistics) and factors such as travel distance between teams or game attendance. And also, the analysis of the end-season ranking may not be the best criterion to assess the momentary performance of a team in a season. Therefore, further research should control the limitations addressed to increase the knowledge of performance analysis and situational variables in women's team sports.

As was argued, women's teams were differently affected by situational variables than men's teams (Pendleton, 2001; Pollard & Gómez, 2012). However, the obtained results may reflect the importance of analyzing each game context and the interactive effect of situational variables. The men's team results showed greater importance of the starting quarter score in the first half of the game (Sampaio, et al., 2010b). However, the present results in women's basketball showed the importance of the starting quarter score only during the second game quarters (first half of the games), but the situational variables of game location and quality of the opposition affected during the entire game quarters. Overall, the results of the present study help coaches to prepare game strategies and tactical drills according to the gender of the team and the situational variables.

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Submitted: April 18, 2012

Accepted: March 1, 2013

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UTJECAJ REZULTATA S POČETKA ČETVRTINE, MJESTA ODIGRAVANJA UTAKMICE I KVALITETE PROTIVNIKA NA REZULTATE ČETVRTINA U VRHUNSKOJ ŽENSKOJ KOŠARCI

Cilj ovog istraživanja bio je identificirati utjecaj aktualnog rezultata utakmice s početka pojedine četvrtine na završni rezultat četvrtine (svih četvrtina osim prve četvrtine) kada se u obzir uzmu kvaliteta protivnika i mjesto igranja utakmice. Uzorak se sastojao od 1.456 četvrtina košarkaških utakmica španjolske profesionalne ženske lige (sezona 2009./10. i 2010./11.). Pomoću klaster analize četvrtine su bile klasificirane kao uravnotežene (razlika u rezultatu bila je 6 ili manje poena, n=1.000) i neuravnotežene četvrtine (razlika u rezultatu bila je veća od 6 poena, n=456). Utjecaj situacijskih varijabli na završni rezultat četvrtina (razlika u postignutim i primljenim poenima) za cijelu utakmicu te druge, treće i četvrte četvrtine posebno bile su analizirane linearnom regresijskom analizom. Re-

zultati su pokazali važnost početnog rezultata četvrtine samo tijekom druge četvrtine kada su analizirane cijele utakmice i neuravnotežene četvrtine. Također, rezultati su pokazali da su situacijske varijable *mjesto odigravanja utakmice* i *kvaliteta suparnika* utjecale na rezultat tijekom svih četvrtina utakmice te neuravnoteženih četvrtina utakmice. Ovim rezultatima utvrđeno je da je dinamika igre u ženskoj košarci snažno pod utjecajem situacijskih varijabli. Rezultati ovog istraživanja pomoći će trenerima da razviju prikladne strategije igre uzimajući u obzir situacijske varijable i dinamiku igre.

Ključne riječi: situacijske varijable, ženska košarka, analiza uspješnosti, početni rezultat