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Effects of defensive pressure on basketball shooting performance

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Abstract

Reasons behind successful team performance were explained through analysing the effects of defensive pressure on basketball shooting performance. Team success, shooting efficiency and defensive opposition were analysed from 3344 shooting attempts with Wilcoxon signed ranks tests, Friedman tests and odds ratio calculations. Results of the analysis identified significant differences between winners and losers for close 2 point and 3 point shooting percentages. The increased level of defensive pressure had influential effect on the shooting performance and the game outcome. It was concluded that winning teams achieved more effective shooting percentages as the consequence of better team cooperation, because players could work out more opened scoring opportunities without any active defensive presence. The other occasion of the higher shooting percentages was the level of defensive performance because winners more times forced their opponent to try under maximal defensive pressure. After all, perhaps the most important difference between winning and losing teams was that winners could exploit their scoring opportunities more effectively, not only without defensive opposition but also from the hardest situations under high level of defensive pressure also.

Keywords: basketball, defensive pressure, shooting performance, team success

1. Introduction

Previous research in basketball has identified performance indicators that distinguish winning and losing teams usually based on outcome variables e.g. two and three point shooting performance or number of rebounds, steals, turnovers, assist passes (Choi *et al.*, 2006; Ibanez *et al.*, 2008; Ibanez *et al.*, 2009; Lorenzo *et al.*, 2010; Sampaio and Janeira, 2003). Many of the authors emphasized the importance of 2 point shots (Choi *et al.*, 2006; Gomez *et al.*, 2006a,b; Ibanez *et al.*, 2009; Lorenzo *et al.*, 2010; Sampaio and Janeira, 2003) and 3 point shooting performance (Choi *et al.*, 2006; Csataljay *et al.*,

2009; Gomez *et al.*, 2006a,b; Ibanez *et al.*, 2009) as distinguishing factors that contribute to successful team performance. However a better understanding of the processes that lead to better shooting performance would provide the reasons behind success. Consequently data collection and analysis on process variables would potentially enable a more comprehensive explanation for performance differences.
Analysis of game situation process variables can be found for performance analysis of basketball for both offensive (Bazanov *et al.*, 2005; Remmert, 2003; Tavares and Gomes, 2003; Tsamourtzis *et al.*, 2005) and defensive phases (Alvarez *et al.*, 2009; Gomez *et al.*, 2006) of the game. Ortega and Fernandez (2007) analyzed the effectiveness of 3 point shots from the U19 Spanish championship in 2005 based on several process variables such as the phase of offence, the number of defensive players affecting the shot, the level of defensive pressure at the moment of shooting and the previous offensive actions in that particular possession. For example, 3 point shots were deemed the most efficient when there was no defensive pressure. It was also found that the majority of 3 point shots were taken under partial defensive pressure where an increased level of defensive pressure caused lower shooting efficiency. Ibanez *et al.* (2007) also showed a significant relationship between the shooting efficiency and the defensive pressure when they analyzed 152 games from the Spanish ACB League. Alvarez *et al.* (2009) analyzed defensive efficiency during the 2008 Olympic Games and determined that the defense did effect the opponent's shooting performance but there was no significant relationship between the types of defensive pressure and team success.

Distinguishing winning and losing teams based on outcome variables has been a popular research activity in notational analysis as it is felt that distinguishing performance indicators is important for coaches. However the processes that lead to obtaining successful performance indicators would seem to be more important in terms of offering useful information for performance improvement (James, 2009). Consequently this paper will investigate shooting performance from various distances in relation to defensive pressure on the shooting player in the context of team success.

2. Methods

Using Focus X2 software, an analysis of 52 team performances of 26 games of a Hungarian first division basketball team (Falco Basketball Club, Szombathely) in the regular season of 2007/2008, enabled 3344 shooting attempts to be notated. Shooting attempts were divided into successful and unsuccessful shots from the 3 s restricted area (2 pts from close distance), from mid-range (2 pts from far distance) and behind the 3 point line and each of the shots were grouped into winning or losing team performances based on game outcomes. Types of defensive pressure (minimal, half and maximal) were also recorded for each shooting attempt. A definition of defensive pressure on the shooting player was established based on the distance between the shooter and the defender, which was related to the optimal defensive distance. Thus the level of defensive pressure was determined and notated for the moment that the ball was released during the shot. Data were processed in Excel and SPSS 18 statistical software. The influential effects of the 3 different levels of defensive pressure were analysed by Friedman tests. A series of Wilcoxon signed ranks tests were used to compare shooting

efficiency and frequency of shots for winners and losers under different defensive conditions. The effects of defensive pressure on shooting efficiency were reported in terms of odds ratios. As two of the predictors had more than two categories, effects were broken down into 2x2 contingency tables. Odds ratios were calculated to compare the shooting performance of winners and losers in three categories related to the defensive aggression.

Odds for shooting performance were calculated separately for winning and losing teams with the following equations:

Odds for shooting performance = Successful shots / Missed shots

Odds ratios were calculated from the previously counted odds of winning and losing teams:

Odds ratios = Odds for winning teams / Odds for losing teams

Using the number of successful and missed shots instead of calculating shooting percentages for odds ratio allows comparing both the shooting efficiency and the amount of shooting situations worked out under different conditions (distance and defensive pressure) between successful and unsuccessful teams.

3. Results

3.1. Frequency and efficiency of shooting

Wilcoxon signed ranks tests identified statistically significant differences between game winners and losers for the efficiency of 2 point shots from close distance ($z = -2.1$, $p < 0.05$) and 3 point shots ($z = -2.7$, $p < 0.01$) when solely shooting percentages were considered. However, winning performances can be characterized by better shooting percentages from each of the observed shooting distances (Table 1). Interestingly both the winning and losing teams reached higher percentages from 3 points shots than from mid-range 2 points shots.

Table 1. Shooting efficiency of winners and losers from different distances.

	Winners (mean±SD)	Losers (mean±SD)
2 pt Close	61.8±11.4 *	55.3±9.9
2 pt Far	37.9±16.0	33.8±15.0
3 pt	41.7±10.1 **	34.6±10.7

Significantly different to losing team: * $p < 0.05$, ** $p < 0.01$

Table 2 indicated that game winner teams could carry out higher number of opened scoring opportunities without defensive pressure from all the three distances compared

to losing teams. On the other side winning teams forced their opponent to make shots more frequently under maximum defensive pressure from close distance and the 3 point area. The only statistically significant difference between winners and losers was found for the frequency of close shots under maximal defensive pressure ($z = -2.5$, $p < 0.05$).

Table 2. Frequencies of shots worked out against different categories of defensive pressure.

	Min. pressure		Half pressure		Max. pressure	
	Winners (mean±SD)	Losers (mean±SD)	Winners (mean±SD)	Losers (mean±SD)	Winners (mean±SD)	Losers (mean±SD)
2 pt Close	10.2±4.9	8.7±2.9	2.8±2.3	3.2±1.7	15.8±4.6 *	19.6±5.9
2 pt Mid-range	3.5±1.9	2.6±1.8	2.0±1.5	1.8±1.6	5.3±2.3	4.7±2.3
3 pt	9.5±4.4	8.5±3.6	6.6±2.1	5.8±2.8	8.5±2.9	9.3±4.0

Significantly different to losing team: * $p < 0.05$

The analysis of the influencing effect of defensive pressure on shooting efficiency (Table 3) shows that winning teams attempted with higher shooting percentages almost from all distances and against each types of defensive pressure. The only exception is the case of 3 point shots under half pressure where game winner teams achieved lower shooting percentages than losing ones. Testing differences by Wilcoxon signed ranks tests showed significantly higher shooting percentages for winners under maximal pressure from behind the 3 point line ($z = -2.2$, $p < 0.05$).

Table 3. Shooting efficiency of winners and losers against different categories of defensive pressure.

	Min. pressure		Half pressure		Max. pressure	
	Winners (mean±SD)	Losers (mean±SD)	Winners (mean±SD)	Losers (mean±SD)	Winners (mean±SD)	Losers (mean±SD)
2 pt Close	85.6±12.2	80.1±14.9	70.8±27.7	68.7±34.2	46.6±16.8	41.7±9.1
2 pt Mid-range	50.5±28.4	40.2±35.4	36.6±38.3	32.7±40.7	34.3±25.8	30.9±20.1
3 pt	46.3±19.1	40.4±21.8	36.6±18.7	37.5±25.9	40.6±21.8 *	27.1±17.2

Significantly different to losing team: * $p < 0.05$

Friedman tests revealed that the increased level of defensive pressure significantly affected the efficiency of shots both for winners ($\chi^2_2 = 23.1$, $p < 0.001$) and for losers ($\chi^2_2 = 24.1$, $p < 0.001$) when close attempts were considered. Although the values of shooting percentages were reduced due to the increasing level of defensive pressure, the analysis could not identify statistically significant differences for mid-range and 3 point shooting percentages. The only case when the shooting percentages did not fall down in contempt of the increasing defensive opposition was the 3 point shots of winning teams.

3.2. Effect sizes in shooting performance

Calculating effect sizes for total shots indicated that without defensive pressure winners were 1.27 times more likely to make successful shots related to losing teams (Table 4). The odds ratio is 1.26 when maximal defensive pressure is considered. The lowest odds

ratio was counted for shots under half pressure when all the shots were analysed. There was no statistically significant difference between the frequencies and shooting percentages of winners and losers when close shots without defensive pressure were compared (Table 2,3), although the odds ratio indicates that winning teams could score 1.28 times more from these situations. The reason of the higher effect size was that the slightly higher efficiency and frequency together extended the effects of each other. For the same reason winning teams reached higher odds ratios when 3 point shots without defensive pressure (1.46) were considered. The highest value of odds ratios (1.97) was identified for the mid-range shooting attempts under half pressure, however, because of the low occurrences of 2 point shots from far distances (Table 2) this fact does not extend the odds ratios for total shots under half defensive pressure. Winners achieved higher odds ratios (1.24) for close distance attempts under high pressure because losing teams were forced to attempt more frequently from these situations (Table 2). In the case of strongly defended 3 point shots the significantly higher shooting efficiency (Table 3) contributed to enhance the level of odds ratio (1.52).

Table 4. Odds ratios for contrasting winning and losing shooting performances.

Defensive pressure	2 pt shots from close distance	2 pt shots from mid-range	3 pt shots	Total shots
Minimal	1.28	1.09	1.46	1.27
Half	1.02	1.97	1.02	1.06
Maximal	1.24	1.15	1.52	1.26

4. Discussion

The results of the current analysis indicated the importance of shooting efficiency as an important factor that contributes to achieve successful team performance. Significant differences were found between game winner and loser teams for the shooting percentages of situations under the basket and 3 point shots. This fact coincides with the results of some previous researchers who identified 2 point shooting percentages (Hofler and Payne, 1997; Markoski *et al.*, 2012; Pojskic *et al.*, 2009; Russo *et al.*, 2012) and 3 point percentages (Csataljay *et al.*, 2009; Csataljay *et al.*, 2012; Witkos, 2010) as distinguishing indicators between winning and losing teams. The higher shooting efficiency of 3 point shots related to 2 point mid-range shots both for winners and losers might looks surprising at first sight. However, some of the basketball coaches build up their defensive philosophy to avoid layups from close distance and 3 point shots from set position after out passes from penetration or from low post moves; and to force the opponent to try mid-range jump shots after one or two dribbles which is considered to be one of the less effective individual technical element in modern basketball (Messina, 2011).

The analysis of shooting performances from several distances supports the statement of Tsamourtzis *et al.* (2005) that the highest shooting efficiency in basketball can be reached when a team creates situations near to the basket without the active presence of

any defensive players. The current research demonstrated that game winner teams not merely achieved higher shooting performances but on the defensive side they forced their opponent into higher number difficult scoring situations. Winners showed better defensive performance as losers were forced to accomplish their shots more frequently with increased level of defensive pressure form close distance which is considered as the most effective area for shots (Tsamourtzis *et al.*, 2005). On the other hand winners could organize more effectively their offenses in order to avoid difficult shooting situations under maximal pressure. The other main difference between winning and losing teams was the better shooting performance from 3 point shots under maximal defensive pressure.

The analysis of shooting performances, defensive pressure and team success from 52 team performances agrees with the conclusions of previous researchers (Ibanez *et al.*, 2007; Ortega and Fernandez, 2007) who determined that the level of defensive pressure is a very important influencing factor of the shooting efficiency and contributes to achieve long term team success. In conflict with the findings of Alvarez *et al.* (2009), the results of the current research revealed statistically significant differences between match winners or losers for the level of defensive pressure on shooting attempts.

Calculating effect sizes using frequencies of successful and unsuccessful shots enabled the probability of making a basket to be compared between winners and losers. The value of odds ratios were found above 1.0 for each types of defensive pressure. This fact indicated that game winner teams showed better performance when shooting and defensive aspect of the games were considered at the same time.

5. Conclusions

Defensive pressure as a process variable was used to provide a comprehensive explanation for performance differences between shooting efficiency of winning and losing basketball teams. The results of the statistical analysis identified differences between shooting percentages and defensive performances of winners and losers. The more effective shooting of winning teams was found as the consequence of better team cooperation as players could work out more opened scoring opportunities without any active defensive presence. The other occasion of the higher shooting percentages was the level of defensive performance because winners more times forced their opponent to try under maximal defensive pressure. After all, perhaps the most important difference between winning and losing teams was that winners could exploit their scoring opportunities more effectively from each distance, not only without defensive opposition but also from the hardest situations under high level of defensive pressure also.

Considering the results of this research can help for better understanding of the process that lead to successful shooting performance, however, questions for future research might arise, e.g. analysis of shooting efficiency related to defensive pressure could be more informative when performance of guards, wings and centres are observed separately, as height of players facing each other also may affect the level of defensive pressure.

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