

ORIGINAL SCIENTIFIC PAPER

Relationship between Offensive Modalities and Results in Elite Basketball Games

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Abstract

Basketball is characterized by a set of alternating offensive and defensive phases generally limited by the change in ball possession, also known as conversion. The aim of this research was to evaluate the difference in offensive types between the winning and losing, noting the variance in game result. A sample composed of 2607 entities representing basketball offense was collected by random selection of 15 Euroleague playoff games. The collected data were processed by the Match Analysis System, and the offense was classified into three basic types: set, transition, and early offense. With nearly equal opponents there is evident a high dynamic balance of transitions, set offenses, as well as other forms of offense, therefore the initial results showed no statistical difference in the distribution and success of offensive forms between opponents in balanced matches. There is significant change evident when focusing on the game periods with the highest point differential. In these periods the winning teams showed above 20% more fast breaks, which is proved to be the most effective type of offense, in addition to significantly better 2-point and 3-point shooting efficiency during set plays. Even though the losing team in balanced matches successfully controlled most of the game, and perhaps even outplayed the opponent, the identified critical intervals ("scoring runs") proved to be a decisive factor in the final outcome of the game.

Keywords: basketball, offensive structure, Euroleague, scoring run, set offense, transition offense, early offense

Introduction

The primary task of scientific research related to the analysis of sports activities is a better understanding of the functional principles and a better practical application. In this regard, basketball proves especially noteworthy, as its popularity and complexity have made it one of the most frequently analyzed sports (Mikolajec, Maszczyk, & Zajac, 2013). Basketball is based both on the cooperation of teammates or the integrated roles of all five players with the aim of preventing the critical intervals of play, and the opposition, meaning the cooperative attempt to disrupt the dynamic balance of the opponent (Trninić, Kardum, & Mlačić, 2010). From a structural point of view, the game is characterized by a series of alternating offensive and defensive phases, which are generally limited by the change of ball possession - conversion. The offensive and defensive components reveal specific classifiable profiles and can therefore be divided into two basic game states - position and transition. The position (set) of

fense/defense and the transition (fast break) offense/defense are two basic states are complemented by the classification of other types and variants of offense and other associated modalities.

The classification of offense types in basketball literature is not strictly defined nor generally consistent. Previous research (Tavares & Gomes, 2003; Bazanov et al., 2006; Ortega et al., 2006; Fewell et al., 2012), highlights different classifications of offenses, however their origin is conclusively based on the state of transition and position. Trninić, Perica, and Pavičić (1994), based on a kinematic approach, introduced the "game states analysis system", and presented the initial, intermediate, and final modalities of set and transition offense in order to determine their balance and dependence towards success in a basketball game. However, there is not enough evidence to examine the differences between the winning and losing teams based on the distribution analysis and efficiency of the basic offensive game types.

The quality of implementation of these two game states is



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a valid indicator of efficiency, therefore, the objective of this study is to examine the distribution of offensive types of in accordance with the final score and their variance among different game periods between winning and losing teams.

Methods

Subjects sample

The entity in this study is a basketball offense. A sample of 2607 entities representing were collected by randomly selecting 15 Euroleague playoff games from the 2010-11 season. The analysis included only games with balanced opponents because they prove to better identify key game-related statistics associated with winning and losing (Gómez et al., 2014; Lupo et al., 2014). The type of offense was evaluated in relation to the entire game, as well as in relation to the quarters with the highest score difference. The analysis was completed by examining the offensive outcome.

The beginning or end of the offensive phase was not determined by ball possession, but by the rules of basketball (Selmanović et al., 2015), resulting in three different offensive outcomes: positive, negative, and neutral. A positive outcome means at least one point was scored. A negative outcome refers to unsuccessful shot and lost ball possession. Neutral means unsuccessful shot and regaining possession of the ball. For each of these outcomes, the corresponding modalities were tested.

Procedure

In this work, the following four types of offenses are categorized and analyzed: set offense, transition offense, early offense, and other (miscellaneous) types. According to Škegro et al. (2011), the set offense is executed either by running a set play only or by combining the set play with the with the transition, in which case the set play lasts considerably longer than

the transition and involves the defense that fully controls all five offensive players. In the transition offense, the defense has no control over the offensive players due to unfavorable position in the counterbalance of offensive action. The early offense is characterized by a brief play setup and attempted shot before the defenders can establish the proper defensive positions, even though all defensive players are strictly positioned in the front-court. The category of other types does not classify an offense into any of the above categories, therefore, they are not included in the statistical analysis because their realization has remote and no significant impact on the final outcome of the offense. These operational definitions were set as criteria for the video game analysis. The collected data were processed using the program Match Analysis System (MAS), which contains analytic tools for a complete description of the offensive characteristics.

Statistical analysis

The basic features of offensive actions were tested in relative frequency values per game as a whole, and then selected according to the periods (quarters) that showed the greatest difference in results. Differences in qualitative variables between the winning and losing teams were tested using the nonparametric Hi-squared test (χ^2) at $p < 0.05$ significance level. Data was analyzed using the statistical package Statistica ver. 8.0.

Results

According to the set criteria, the study showed that there are about 175 offensive phases per game at the highest level of European competition. Regarding the basic types of offense in the result-balanced matches, there are no statistically significant differences between the winners and the defeated ($X^2=1.915$; $p=0.590$).

Table 1. The difference in the offense distribution in the result-balanced matches

	Set	Early	Transition	Other
Winners	68.28%	5.44%	8.89%	17.39%
Defeated	68.31%	6.37%	9.37%	15.95%

$X^2=1.915$; $df=3$; $p=.590$

Note: X^2 - Chi-square test value; df - degrees of freedom; p - level of significance

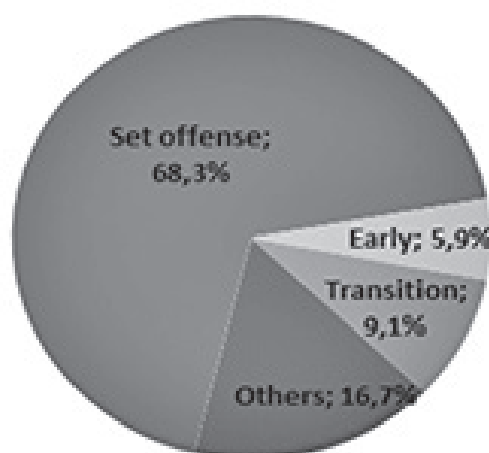


FIGURE 1. Distribution of basic offensive types

Transition offenses assure the highest productivity (Tsamourtzis, Karypidis, & Athanasiou, 2005), but they account for less than 10% of the total share of offense (Figure 1). The set offenses are predominant and account for 2/3 of

the total number of offensive actions, indicating their significant influence on the final outcome of the match. Although the winning teams were expected to be much more efficient, the parameters in Table 2 show no significant difference in the

Table 2. Difference in the outcome of certain types of offenses in the result-balanced matches

	Set offense			Early offense			Transition offense		
Outcome	% POS	% NEG	% NEU	% POS	% NEG	% NEU	% POS	% NEG	% NEU
Winners	38.3	43.1	18,6	43.4	40.9	15.7	53.5	29.3	17.2
Defeated	35.1	46.3	18,6	54.9	33.8	11.3	41.0	37.7	21.3
chi square	$X^2=2.274$; df=2; p=.321			$X^2=2.112$; df=2; p=.348			$X^2=3.719$; df=2; p=.156		

Note: X^2 - Chi-square test value; df - degrees of freedom; p - level of significance

realization of set offense in a match between two equal opponents.

The score difference after each quarter was used as criterion to group the periods and analyze the distribution and out-

come of offenses between winning and losing teams. Although there are no drastic deviations regarding the game as a whole, the quarters with high point differential showed considerably different distribution of offensive types ($X^2=6.709$; $p=0.034$).

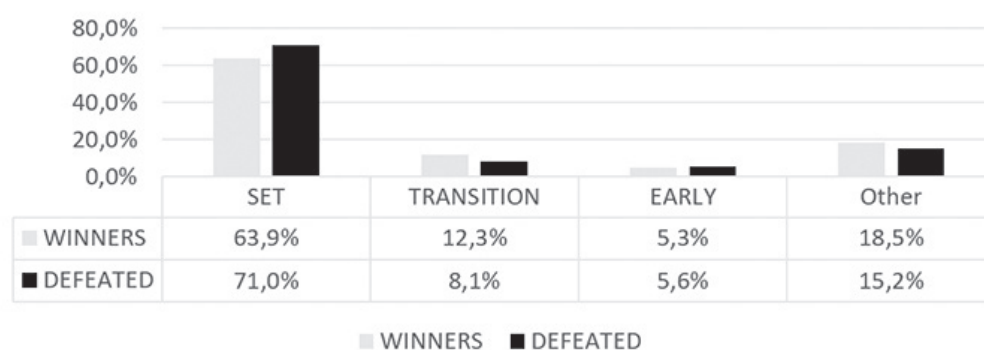


FIGURE 2. Distribution of basic offensive types in unbalanced quarters

Targeted periods showed that winning teams provoked 4% more transitions, while losing teams demonstrated 7% more of set offenses. The parameters of offensive success also showed

significant differences. The statistical indicators presented in Table 3. show that the winning teams had considerably higher efficiency in all observed types.

Table 3. Difference in the outcome of some types of offense after grouping the quarters by difference in the result

	Set offense			Early offense			Transition offense		
Outcome	% POS	% NEG	% NEU	% POS	% NEG	% NEU	% POS	% NEG	% NEU
WINNERS	40.4	42.6	17.0	53.3	33.3	13.3	62.9	25.7	11.4
DEFEATED	30.5	50.6	18.9	31.3	56.2	12.5	39.1	53.5	17.4
chi square	$X^2=8.280$; df=2; p=.016			$X^2=3.609$; df=2; p=.165			$X^2=6.313$; df=2; p=.043		

Note: X^2 - Chi-square test value; df - degrees of freedom; p - level of significance

The biggest difference in the outcomes of the offensive actions is evident in the efficiency of the transition offense, which is more than 20% in favor of the winning teams. More effective performance, that is by 10% is also seen in the set offenses. These findings are extremely remarkable considering the over-

all high quantity of offenses. Despite the apparent difference in the early offense category, a smaller sample of entities did not generate a statistically significant difference between the opposing teams. There are no major discrepancies in the values of the neutral offense outcomes.

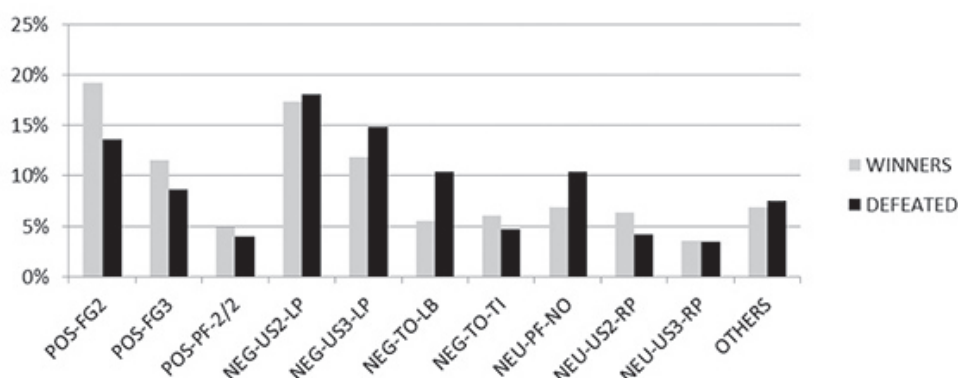


FIGURE 3. Structure of a set offense outcome in unbalanced quarters

Figure 3. shows the modalities of the dominant outcomes on offense, with the winning team plainly having better field goal success (POS-US2; POS-US3) and both free throws after the drawn foul (POS-IOP-2/2). In addition to poor efficiency,

losing teams have more turnovers during critical intervals of the game when the ball remains in play (steals-NEG-IPL-LS) and are only slightly better in terms of turnovers when the offense starts out of bounds (NEG-IPL-LS).

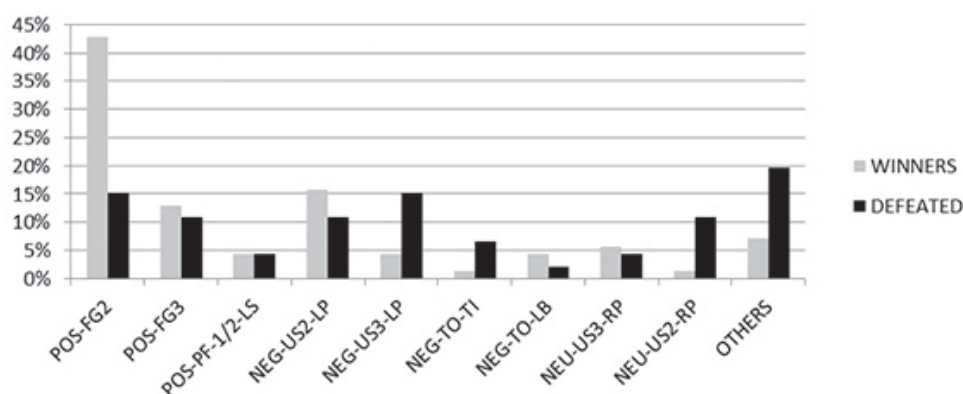


FIGURE 4. Structure of the transition offense outcome in unbalanced quarters

The outcome of the transition offense in the periods analyzed show that a 2-point field goal proved to be a key factor regarding the difference between the winners and the defeated (POS-US2); the difference in efficiency showed to be as much as 28% in favor of the winning team. Although the winning team has a lower scoring rate on 2-point shot success (NEG-US2-IPL), the above parameter annuls this deficit and proves the winning team as capable of taking advantage of the opponent's critical intervals; this is achieved by creating significantly more transitions, in addition to the overall higher success. In the other parameters, the low efficiency of the 3-point shots of the losing team (NEG-IPL-IPL) should be acknowledged.

Discussion

The main findings of the study relate to general offensive structure and efficiency in basketball, as well as the importance of "scoring runs" that generated unbalanced quarters and played a major factor in determining the final score of a basketball game.

Initially, the results indicated a high level of interdependence between offense and defense, therefore confirming that in the game there is a strong dynamic balance of these two phases - it is noticeable that the set offense is mainly followed by the opponent's set offense, and the fastbreak offense is followed by the opponent's fastbreak.

The results show that about 2/3 of the total offensive actions refer to set offense, i.e., 5:5 organized offense with planned tactical solutions. Since a fully formed defense has full control over all offensive players, the probability of a successful defense in the set offense exceeds the efficiency of the offensive players by about 10%. On the contrary, taking advantage of inadequate defense in the early offensive phase is more likely to result in a positive outcome, either in the transition phase or at the opportunal moment of the early stage of set offense (early offense).

The transition offense is most likely to lead to a positive outcome; there is a logical tendency to challenge the opponent to make as many mistakes as possible, which then, in turn, fast breaks and increased scoring opportunities. In general, the transition offense is only 9% of the total offense, however, while combined with early offense, it covers 15% of

the total share of offense. Although transition and, in most cases, early offense, are characterized by unpredictable and spontaneous circumstances (making them less susceptible to schematic practice), they should not be neglected in training, especially due to their high efficiency value (Refoyo et al., 2009). The statistical dominance of the set offense (68.3%) proves its importance in a team's situational preparation. This offense can be more easily prepared in advance because of its structure. Considering the great influence on the final result of a match, the structure of the offense requires extensive technical and tactical (individual and team) preparation.

The following key point of this research refers to a non-linear increase in scoring as evidence of an inconsistent team performance. A "scoring run" of ten or more points is often noticeable and is defined here as a critical interval for the opponent. Furthermore, a team's ability to maintain a high level of intensity and take advantage of an opponent's critical interval makes a major difference in elite basketball. The research also shows that such phases have an unbalanced transition offense and a significant difference in their realization. Although the losing team may have provided an adequate match-up, or possibly even outplayed the winning team for a majority of the game, such phases prove to be a decisive factor in the final defeat.

The critical interval of the losing team in the set offense is mainly characterized by more turnovers with the ball remaining in play (roughly 5%) and poor defense of 3-pointers (3%). A well-organized set offense and better shooting position for the winning team during these intervals is reflected in higher 2-point shooting efficiency (6%), 3-point shooting efficiency (3%), and slightly more successful free throws. These findings coincide with previous research that identified 2-point shooting percentages (Pojskic et al., 2009; Markoski et al., 2012; Russo et al., 2012) and 3-point percentages (Witkos, 2010; Csataljay et al., 2013) as distinguishing indicators between winning and losing teams. During a scoring run, the winning team's 2-point field goal of transition offense is by 28% more efficient. The significantly worse 3-point shooting efficiency (11%) of the losing team reveals improper shot selection and finishing action; a fast-paced game leads to a higher number of turnovers. During critical interval, it is important to note that the winning team had

2% more turnovers due to poor passing, traveling and double dribbling, while the losing team suffered more steals (5%), and this type of conversion is ideal for the effectiveness of the opponent's counterattack. According to Van Wieran (1993), scoring runs are regularly initiated by opportune transition attacks. The fast and easy points are achieved through fast-break and thus the enthusiasm of a team increases in contrast to the low morale of the opponent. Furthermore, it increases the team's scoring rate and creates circumstances situations for more free throws.

From a situational perspective of the game of basketball, the results reveal an importance in neutralizing the opponent's potential scoring run. In order to suppress these critical intervals, it is imperative to emphasize practice tasks or playing methods during individual and group training that ensure the gradual development of athletes' specific phosphagen and glycolytic anaerobic capacities. Under these circumstances, basketball skills are further developed because of the influence of high lactic acid content and accumulated oxygen deficit when, among other things, inhibition occurs in certain parts of the brain. In this way, athletes are trained to efficiently tolerate and/or delay the suppressive processes during situational performance at hormonal, biochemical, and neuropsychological levels (Sekulić, 2007).

Furthermore, in such situations, the coach plays a key role in both perceiving the team's mental and physical decline (and acting accordingly, i.e., using available timeouts), as well as placing emphasis on the consolidation of the team's unstable offensive and defensive efforts – meaning primarily in terms of ball control, disciplined generation of open shots, hindering the opponent's ball advancement (initially through offensive rebound attempts), quick rebounding, and prompt defense that would successfully prevent the opponent's transition. The results also indicate a tactical orientation to aggressive and agile defense, which is a prerequisite for a greater number of prospective fastbreaks. This is mainly reflected in the intense pressure on both the ball and players on the “first pass” by preventing easy ball flow and ultimately securing a defensive rebound by strictly boxing out the offensive player after the shot.

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Conflict of Interest

The author declares that there is no conflict of interest.

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This study provides insight into offensive modes, including their ratio and benefit value and helps coaches adjust tactical decisions with the aim of avoiding critical intervals during the game. The added value of this research could contribute the inclusion of sub-modalities of the observed offense types, preferably on a larger game sample. Further research is recommended to evaluate the “scoring run” in more detail, e.g., duration, cause, and effect. Comparison of obtained results with other studies is suitable only if there are assured identical operational definitions of game states, which did causes a certain limitation of this study. The suggested approach of game analysis in this research provided a specific model for evaluation of game states and offensive efficiency in basketball.

Conclusion

The game of basketball clearly demonstrates the coherence of defense and offense. A successful offense depends largely on the preceding defense and vice versa. Dissociated specific offensive profiles - set, transition, early and other (miscellaneous) offenses - are evenly distributed and equally effective between opponents in the resulting balanced matches. However, the dynamic balance of the transition and set offensive and defensive systems changes significantly when focusing on certain game periods (quarters) with greater point differential. The point differential is primarily caused by a scoring run during the match, so in practical terms the study emphasizes the importance of controlling the opponent's potential positive intervals.

It can be concluded that in balanced matches there are crucial short intervals of time when the winning teams benefit from the opponent's physical and psychological decline through a series of successful offenses and defenses. The combination of quality performance, as well as the ability to maintain high intensity levels, will successfully nullify the opponent's scoring runs; doing so would ensure a period of time with a greater number of transitional offenses (the most efficient offense), and a successful implementation of set offenses (the most frequent), which would, in turn, prove to be a decisive factor in the outcome of a match.

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