

Effectiveness of ball handler's offensive movements in ball screen offense in European elite basketball teams

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Abstract

Ball screen is an offensive movement with quite high frequency of occurrence in elite basketball games. The aim of the present study was to clarify tasks performed and their predictors of success or failure related to offensive movements by a ball handler, differences of offensive moves between groups, differences of offensive moves among seven countries. The sample was composed of 2069 ball screens from the Basketball Champions League (2016–2017). Evaluating the teams according to their final ranking, it was found that in the teams of the positions 1-4 the ball handler used a short shot, in the teams 5-8 choose lay-up, while in teams 9-12 used step jump shot and in the teams of the positions 13-16 the greater success observed in case of crossover lay-up. Correspondence analysis revealed that the ball handler in teams of Germany, Turkey, Italy, Lithuania and France uses lay-up and step jump shot with a greater success. Greece and Spain are not clustered together with the other countries. The first uses crossover lay-up and step back in its offenses, whereas the second prefers the short shots. Our findings highlight the philosophy in the way of playing of different countries, and simultaneously the way of unfolding the offense.

Key words: performance indicator, basketball offense, correspondence analysis, pick and roll

Introduction

Winning has become synonymous with success and losing has been linked with failure. Too, often, the social pressures to win become too great for coaches to ignore. The pressure to win in basketball directly affects athletes and coaches (Smith, 1981). Hence, coaches are expected to produce winning programs (Brown, 1995; Jackson & Delehanty, 1995; Riley, 1994). In basketball offense is a planning of moves of continuous action in very limited time (Perše, Kristan, Kovačič, Vučković, & Perš, 2009), and offers the opportunity to study the strategy (Marmarinos, Apostolidis, Kostopoulos, & Apostolidis 2016; Lamas, Santana, Heiner, Ugrinowitsch, & Fellingham, 2015; Wang, Liu, & Moffit, 2009), exciting action, and artistic beauty of the cooperation among players and the intricate ways of execution. A teams success depends on all players working together so all team members fully utilize their offensive abilities to respond to the defensive plays of the opposing team (Fewell, Armbruster, Ingraham, Petersen, & Waters, 2012; Rimmert, 2003).

Ball screen is the most complex offense (van Maarseveen, Savelsbergh, & Oudejans, 2018; Marmarinos, Apostolidis, Kostopoulos, & Apostolidis, 2016; Bi, Gong, & Shan, 2011; Ibáñez, Sampaio, Feu, Lorenzo, Gómez, & Ortega, 2008), and this is confirmed by its occurrence, (Vaquera, Cubillo, García-Tormo, & Morante, 2013; Lamas, Junior, Santana, Rostaiser, Negretti, & Ugrinowitsch, 2011), being almost 40% at World level (Karl, 2003). Bi et al.,(2011) examined the 16th Men's Basketball World Championship that took place in Turkey and proved that European basketball teams prefer the high post area while executing pick-and-roll, in contrast to American teams. Also, the percent of the attempted 3-point shots was 40%-or-more of the overall number of shots. Mattheos, P., Evangelos, T., Georgios, M., & Georgios, Z. (2010) showed the effectiveness of pick and roll in the Basketball World Championship that took place in Japan in 2006. Concerning the Greek National Team, it became evident that the maximization of the effectiveness of pick and roll with respect to the other teams was determined from the side of execution where, on the left side, there was greater effectiveness; but also from transferring the ball from the perimeter to the paint. Studying the Spanish professional championship Gómez, Battaglia, Lorenzo, Lorenzo, Jimenez, & Sampaio, (2015) determined predictive indices of success emphasizing that ball screen is a collective-tactical behavior, quite well predetermined by the coaches during matches in which the scores of the two teams are near each other, but mainly depends on the cooperation, during the screen, of the players who participate in the particular tactical offense. Using a similar sample in the

Spanish Professional Championship, Vaquera, García-Tormo, Gómez Ruano, & Morante, (2016) recorded that ball screens are made mainly on the upper regions right and left. Analyses by Marmarinos, et al., (2016), in the Euroleague basketball championship demonstrated that the analysis of the correlation between the effectiveness variables in the use of pick-and-roll and the final standing of the teams led to a positive relation ($r = -0.41$). In addition, 17% of the variance of the final position of the team can be explained by the effectiveness of the team in pick-and roll. Marmarinos, et al., (2016), stated that the ball handler is more successful when he drives to the basket (10, 85%) rather than executing a 2-point or 3-point shot, (7,33%). In addition, Gomez et al., (2015) observed that the ball handler is more effective while he uses lay up to the basket, (26, 1%).

As a result, the target of the present study was to clarify the predictive indices of success or failure that are related to the execution of offensive movements in a ball screen offense. We assumed that the tactical behaviors during ball screens depend on the offensive variations in the movements of athletes who have the ball in possession.

Material & methods

Participants

The sample consisted of the 16 best clubs from 7 different countries that participated in the 2016-2017 season of the FIBA Basketball Champions League (BCL). Analyses of ball screen actions were performed for 16 clubs from the regular season, play-offs and final four. All games of the BCL are played in accordance with the Official Basketball Rules by the International Basketball Federation (FIBA). The teams that participated in the league and analyzed in our research were: 1) Spain (Tenerife); 2) France (Monaco, Vilerban, Le Mans); 3) Turkey (Banvit, Karsiyaka, Besiktas); 4) Italy (Venezia, Sassari, Avelino); 5) Germany (Ludwigsburg, Oldenburg); 10) Lithuania (Neptunas); 11) Greece (AEK, Aris, PAOK).

Procedure

The study was designed to examine the effectiveness of ball screen offense in the FIBA European Men's Basketball Champions League (BCL). A total of 2069 ball screen plays were selected and examined. The analysis was based on the scoring outcome of success or failure of every offensive possession, with ball screen plays classified into the following categories: Ball handler's offensive movements in ball screen offense: 1) Short shots (step-through runner (made or missed), step-through leaner (made or missed), Fade away shot (made or missed), 2) Drive step jump shot 3) Drive-step crossover jump shot - 2 point shot (made or missed), 4) Drive-step crossover - 3 point shot (made or missed), 5) Drive-step step-back jump shot - 2 (made or missed), 6) Drive-step step-back jump shot - 3 (made or missed), 7) Drive-step straight drive (made or missed), 8) Drive-step crossover drive (made or missed), 9) Drive-step reverse drive (made or missed). For each of the categories listed above, ball screen was categorized into the following sub-categories: Variations of pick-and-roll: (a) pick and roll, (b) pick and pop, (c) slip the pick. Differences between groups in the final classification: Group A, 1-4; Group B, 4-8; Group C, 8-12; Group D, 12-16. Differences among teams from 7 different countries: 1) Spain; 2) Turkey; 3) France; 4) Italy; 5) Germany; 6) Lithuania; 7) Greece.

Instruments

The instruments used for this study were: a laptop with installed operating system Windows 10 Pro, MS Office 2010, SportScout STA Version 3.2 and the software pack SPSS 22.

Statistical analysis

In order to investigate the existence of significant dependence between the successful movements in terms of groups, country and group ranking, the chi-square independence test and correspondence analysis were used. Using the chi-square independence test, it was investigated whether the dependence between the variables is statistically significant. Correspondence analysis is an exploratory technique that aims to analyze tables of two or more variables of frequencies, while extracting a match measurement between rows and columns. This analysis is also descriptive of the data because it greatly simplifies the complex relationships that may be developed by the vast collection of data without the loss of significant information (Greenacre, 2007). Correspondence analysis is based on the multivariate treatment of the data, taking into account multiple categorical variables, without resorting to the pair wise examination of the variables. As a result, it is the creation of X-Y graphs of points resulting from columns and rows, with the aim of finding structural relationships between categorical variables and observations. The necessity to use the method increases dramatically when there is a large amount of data which makes it difficult to simply review and perceive a structural relationship between them, when there is homogeneity among the variables, and therefore it is essential to estimate the statistical distances between columns and rows and when there is no prior information on the nature of the connection of the elements to each other, SPSS version 25 software was used to analyze the data.

Results

Ball screen characteristics

In Table 1 are given the descriptive results of the 2069 pick and roll frequencies that were recorded. The results showed that most of the ball screens were recorded for the Aris ($n = 150, 7.2\%$), ASVEL Vilerban ($n = 148, 7.2\%$) and Neptunas ($n = 148, 7.2\%$) while the fewer pick and rolls were recorded for the PAOK group (n

= 62, 3%). The two most frequently variation were pick and roll (n = 832, 40.2 %) and pick and pop (n = 683, 33%). In addition, it was observed that 81.4% (n = 1684) of the attempts were for two-shoot points while in 18.6% (n = 385) the attempts were on three-point shootout.

Table 1. Frequency distribution (%) of ball screen characteristics

		n	%
Team	Tenerife	121	5.8%
	Banvit	146	7.1%
	Monaco	138	6.7%
	Venezia	134	6.5%
	Lunwigsburg	135	6.5%
	Kasiyaka	125	6.0%
	ASVEL Vilerban	148	7.2%
	Sasari	145	7.0%
	Neptunas	148	7.2%
	AEK	105	5.1%
	Avelino	132	6.4%
	Oldenburg	145	7.0%
	Besiktas	119	5.8%
	ARIS	150	7.2%
	Le Mans	116	5.6%
	PAOK	62	3.0%
Variations	P n roll	832	40.2%
	Pick n pop	683	33.0%
	Slip pick	337	16.3%
	Stretch	217	10.5%
Shots	2 points	1684	81.4%
	3 points	385	18.6%
	jump switch	396	19.1%
Movements	Runner extends layup	68	3.3%
	Shot Fade Away	50	2.4%
	Step Through Leaner	59	2.9%
	Step Jump Shot	896	43.3%
	Lay up	355	17.2%
	Crossover jump shot	163	7.9%
	Crossover lay-up	190	9.2%
	Step reverse	45	2.2%
	Step back jump shot	243	11.7%
Outcome	made	1132	54.7%
	missed	937	45.3%

Accuracy of ball screen

Results on the selected movement showed that 43.3% (n = 896) were step jump shot, 17.2% (v = 355) were lay-up, 11.7% (n = 243) were stepwise jump shot and 9.2% (n = 190) related to crossover lay-up. A lower frequency was recorded for movements such as runner extends layup (n = 68, 3.3%), shot fade away (n = 50, 2.4%)

2.4%), step through leaner (n = 59, 2.9% 7.9%) and step reverse (v = 45, 2.2%). Finally, it emerged that out of a total of 2069 attempts were 1132 successful attempts corresponding to 54.7% rate of accuracy.

Table 2. Frequency distribution (%) of offense outcome regarding offensive movement

Offense	Points	Outcome		
		Success	Failure	Accuracy (%)
Shorts shots	2 points	success	88	49.7%
		failure	89	50.3%
Step Jump Shot	2 points	success	355	46.7%
		failure	405	53.3%
	3 points	success	70	51.5%
		failure	66	48.5%
Lay up	2 points	success	231	65.1%
		failure	124	34.9%
Crossover jump shot	2 points	success	32	52.5%
		failure	29	47.5%
	3 points	success	67	65.7%
		failure	35	34.3%
Crossover lay-up	2 points	success	126	66.3%
		failure	64	33.7%
Step reverse	2 points	success	23	51.1%
		failure	22	48.9%
Step back jump shot	2 points	success	49	51.0%
		failure	47	49.0%
	3 points	success	91	61.9%
		failure	56	38.1%

The results about frequency distribution (%) of offense outcome regarding offensive movement are given in Table 2. The result indicates that accuracy of short shots was 49.7% (n = 88), accuracy of step jump shots was 46.7% (n = 355) for two-point attempts and 51.5% (n = 70) for three-point attempts. Moreover, the accuracy of lay-up was 65.1% (n = 231), accuracy of crossover jump-shot was 52.5% (n = 32) for two-point attempts and 65.7% (n = 67) for three-point attempts. Finally, accuracy of crossover lay-up was 66.3% (n = 126), accuracy of step reverse was 51.1% (n = 23) and accuracy of step back jump shot was 51% (n = 49) for two-point attempts and 61.9% (n = 91) for three-point attempts.

Ball handler success in ball screens regarding teams

Table 3 gives the findings on frequency distribution (%) of successful offensive movement regarding team. The results of the chi-square test showed that there is a significant dependence between the group and the selected attack movement, $\chi^2(90) = 210.9, p < .01$.

Table 3. Frequency distribution (%) of successful offensive movement regarding team

	Movements													
	Shorts shots		Step Jump Shot		Lay up		Crossover jump shot		Crossover lay-up		Step reverse		Step back jump shot	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Tenerife	10	58.8%	16	40.0%	15	83.3%	6	46.2%	4	33.3%	5	83.3%	8	53.3%
Banvit	16	69.6%	27	61.4%	20	64.5%	4	57.1%	17	70.8%	0	0.0%	12	70.6%
Monaco	12	66.7%	16	34.0%	17	56.7%	9	81.8%	10	55.6%	0	0.0%	7	50.0%
Venezia	4	44.4%	16	30.8%	14	77.8%	11	68.8%	7	46.7%	0	0.0%	9	42.9%
Lunwigsburg	8	66.7%	26	54.2%	24	80.0%	9	60.0%	7	63.6%	1	33.3%	8	50.0%
Kasiyaka	3	20.0%	29	52.7%	16	66.7%	3	42.9%	8	72.7%	3	100%	6	60.0%
Greece	8	4.3%	66	35.1%	29	15.4%	19	10.1%	27	14.4%	8	4.3%	31	16.5%
ASVEL Vilerban	3	21.4%	34	57.6%	20	57.1%	6	50.0%	3	37.5%	0	0.0%	13	68.4%
Sasari	2	25.0%	29	40.3%	24	77.4%	2	28.6%	8	57.1%	0	0.0%	3	25.0%
Neptunas	2	16.7%	38	48.1%	11	57.9%	8	66.7%	6	75.0%	0	0.0%	9	52.9%
AEK	7	70.0%	28	56.0%	12	80.0%	4	66.7%	2	50.0%	4	66.7%	10	71.4%
Avelino	5	62.5%	27	50.0%	10	52.6%	9	81.8%	10	83.3%	3	60.0%	15	65.2%
Oldenburg	6	75.0%	57	63.3%	11	78.6%	6	60.0%	4	66.7%	3	75.0%	7	53.8%
Besiktas	5	62.5%	27	52.9%	15	60.0%	6	54.5%	9	100.0%	0	0.0%	9	69.2%
ARIS	1	25.0%	30	46.2%	13	52.0%	8	61.5%	11	84.6%	2	40.0%	18	72.0%
Le Mans	0	0.0%	23	38.3%	8	44.4%	7	100.0%	13	81.3%	2	66.7%	4	44.4%
PAOK	4	50.0%	2	6.7%	1	33.3%	1	20.0%	7	77.8%	0	0.0%	2	40.0%

The first group consists of Tenerife AEK, Oldenburg and Kasiyaka. These teams seem to have greater success in step reverse and step back jump shot comparing to other teams. The second group consists of Sasari, Le Mans, Besiktas, Neptunas, ASVEL Vilerban, ARIS and Avelino. These teams seem to have greater success in step

jump shot comparing to other teams. The third group consists of PAOK who seem to have great success only in crossover lay-up.

Ball handler success in ball screens regarding team ranking

Table 4 gives the findings on frequency distribution (%) of successful offensive movement regarding team position in the final ranking. The results of the chi-square test showed that there is a significant dependence between the group and the successful offensive movement, $\chi^2(18) = 83.37, p < .01$.

Table 4. Frequency distribution (%) of successful offensive movement regarding team position

	Group							
	1-4		5-8		9-12		13-16	
	n	%	n	%	n	%	n	%
Short shots	42	14.4%	19	6.3%	17	5.6%	10	4.2%
Step Jump Shot	75	25.7%	116	38.5%	152	50.2%	82	34.7%
Lay up	66	22.6%	75	24.9%	58	19.1%	32	13.6%
Crossover jump shot	30	10.3%	24	8.0%	20	6.6%	25	10.6%
Crossover lay-up	38	13.0%	27	9.0%	20	6.6%	41	17.4%
Step reverse	5	1.7%	4	1.3%	7	2.3%	7	3.0%
Step back jump shot	36	12.3%	36	12.0%	29	9.6%	39	16.5%

The results from Figure 1 show that four groups were created. The first group consists of the teams that achieved a position 1-4 in final ranking. These teams seem to be closer in successful short shots. The second group consists of the teams that achieved a position 13-16 in final ranking. These teams seem to be closer in successful crossover lay-up, step reverse and step back jump shot. The third group consists of the teams that achieved a position 9-12 in final ranking. These teams seem to be closer in successful step jump shot. The fourth group consists of the teams that achieved a position 5-8 in final ranking. These teams seem to be closer in successful lay-up.

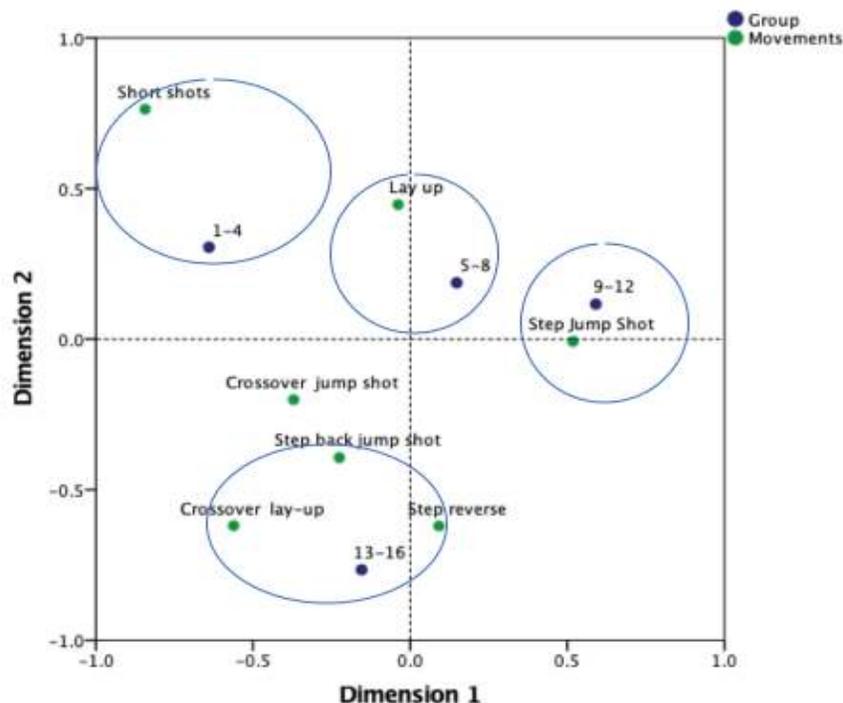


Figure 1. Correspondence analysis results: Distribution of the series (team position in the final scoreboard) and column (successful movements) categories into a two-dimensional component graph

Ball handler success in ball screens regarding country

Table 5 gives the findings on frequency distribution (%) of successful offensive movement regarding country of teams. The results of the chi-square test showed that there is a significant dependence between the group and the successful offensive movement, $\chi^2(36) = 73.56, p < .01$.

Table 5. Frequency distribution (%) of successful offensive movement regarding country

	Movements													
	Shorts shots		Step Jump Shot		Lay up		Crossover jump shot		Crossover lay-up		Step reverse		Step back jump shot	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spain	10	16.4%	15	24.6%	15	24.6%	6	9.8%	3	4.9%	5	8.2%	7	11.5%
France	15	7.4%	80	39.4%	40	19.7%	19	9.4%	22	10.8%	0	0.0%	27	13.3%
Turkey	26	11.2%	84	36.2%	49	21.1%	12	5.2%	29	12.5%	4	1.7%	28	12.1%
Italy	15	7.3%	65	31.6%	51	24.8%	21	10.2%	27	13.1%	2	1.0%	25	12.1%
Germany	12	6.8%	81	46.0%	37	21.0%	15	8.5%	11	6.3%	4	2.3%	16	9.1%
Lithuania	2	3.0%	34	51.5%	10	15.2%	7	10.6%	7	10.6%	0	0.0%	6	9.1%
Greece	8	4.3%	66	35.1%	29	15.4%	19	10.1%	27	14.4%	8	4.3%	31	16.5%

The results from Figure 2 show that three groups were created. The first group consists of the Spanish teams. These teams seem to be closer in successful short shots. The second group consists of teams from Germany, Turkey, Italy, Lithuania and France. These teams seem to be closer in successful step jump shot and lay-up. The third group consists of teams from Greece. These teams seem to have greater success in step back jump shot and crossover lay-up.

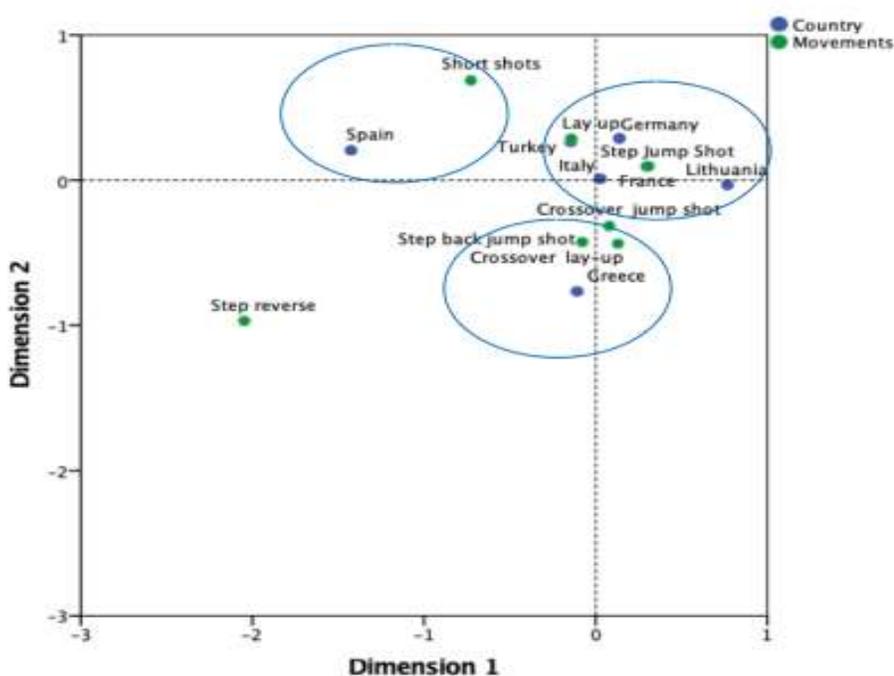


Figure 2. Correspondence analysis results: Distribution of the series (team country) and column (successful movements) categories into a two-dimensional component graph

Discussion

Analyses of ball screen actions were performed for 16 best clubs from 7 different countries that participated in the 2016-2017 season of the FIBA Basketball Champions League (BCL). A total of 2069 ball screen actions were selected and examined.

Regarding the offensive movements after executing the ball screen, greater success is observed in the use of crossover lay-up, which is something that agrees with the analysis by Marmarinos et. al., (2016). The ball handler's best option is to perform a penetration toward the basket after a crossover dribble. There is a change in the direction of motion, which brings the ball handler away from the defender. This happens because it is hard for the defense to adjust itself and provide help. The second option is crossover jump shot 3-points. Third option is the lay up, followed by step back jump shot 3 points, a backward move by the ball handler that brings him to an advantageous position. This is in line with Mattheos et al. (2010) who claimed that there is more effectiveness by the ball handler while executing drive to the basket followed by shot. The crossover jump shot 2 point follows, an offensive move in which there is a change of direction, but this time a 2-point shot is attempted, bringing the offensive movement away from the defender. Following is the step jump shot 3-points, a back movement that contributes to the improvement of the position with respect to the defensive player. Step reverse follows, a movement after pivot that leads to a slow execution so that the defender is given enough time to position himself in the defense. Following, always with regard to effectiveness, is step back jump shot 2-point, a

backward movement of the offensive player so that he increases his distance from the defender. There follows short shots such as step-through runner, step-through leaner, fade away shot. These are followed by step jump shot-2 point, a movement where the ball handler takes advantage of the numeric imbalance.

In executing the offense, the screener performs three variations: in the first one he executes a Roll, in the second a Pop, and in the third a Slip the Pick. In Pick and Pop, the distance between the players who participate cooperating in the offense increases, and there cannot be defensive help; for this reason, there is greater success in this variation. Slip the Pick is interesting because it is a “fake” movement that tricks the defender who guards the ball handler. In that way, the defender finds himself in a defensive imbalance, and the ball handler is given the chance to take advantage of that particular moment, so that he is more successful in the offense. Finally, in the trap situation the ball handler take advantage of the fact two players are guarding him without any of the two being solely responsible for the defense, exploits the moment so as to attack. In ball screen now, it appears to be the most common offense for ARIS, Neptunas και Vilerban comparing to other clubs in the BCL.

Interesting findings were also deduced regarding the effect of the ball handler’s offensive movements on the teams. The results showed that the selection of the step jump shot by the ball handler is justified more than the others on the court. The ball handler, taking advantage of the fact that two players are guarding him without any of the two being solely responsible for the defense, exploits the moment so as to attack. Next in importance seems to be the offensive movement drive step reverse jump shot which is justified to a considerably lesser degree. A movement that includes a pivot, which results in the ball handler committing a violation, such as an offensive foul or a turnover.

Evident also is the percent of success based on the different offensive moves of the ball handler of each team. In teams Tenerife, Ludwigsburg, Sassari, AEK, and Oldenburg, there appear greater percents of success when the ball handler uses the straight lay-up. This finding agrees with Gomez et al., (2015), who, in their research, show that the dribbler's action after the screen drives to the basket. Teams Monaco and Venezia have greater success when the ball handler chooses as offensive move the crossover jump shot. Teams Banvit, Karsiyaka, Neptunas, Avelino, Besiktas, Le Mans, PAOK, and ARIS, have greater success when they use the crossover lay-up. The particular offensive move that the ball handler chooses after the crossover dribble creates a distance from the defender and gives the offender the chance to move fast toward the basket executing a lay-up. Finally, the team Asvel Vilerban shows greater success when the ball handler uses the Step back jump shot, a backwards move that creates more space between offender and defender.

Evaluating the teams according to their final standings, it was found that in the teams of the first four positions (1–4) the ball handler used a short shot, and more specifically, a runner extends lay up. Runner (extended shot) is a shot in which the offensive player throws the ball after making a small step toward the basket. Ball handlers in teams 5–8 chose the offensive move crossover lay-up. Ball handlers in teams with a general standing of 9–12 used short shot, and more specifically step through leaner: the shot leaner step through, as the ball handler attempts to execute the shot among tall players. In teams with a standing of 13–16, the ball handler’s choice after executing the ball screen offense is the offensive move crossover lay-up. It is interesting that in all four cases the ball handler has a greater percent of success when he moves toward the basket, a result which is in agreement with the findings of Gomez et al. (2015).

Regarding the ball handler’s offensive moves per country, interesting results were found. Countries form clusters according to common characteristics. The ball handler in teams of Turkey, Italy, and Germany, uses lay-up and step jump shot with a greater frequency. In teams of Lithuania and France, the ball handler chooses the step jump shot and the crossover jump shot. Greece and Spain are not clustered together with the other countries. The first uses crossover lay-up and step back in its offenses, whereas the second prefers the short shots.

In conclusion, the ball handler is a player distinguished for his solid personal mastery of the basic skills, which he uses at will, according to the personal defense. Through his moves, he tries to create distances, and to use different ways of executing the ball screen offense. Our findings highlight also the philosophy in the way of playing of different countries, and simultaneously the way of unfolding the offense. The selection of the ball handler by a team is made based on his ability to create by himself the proper conditions for his teammates, but also for himself, with greater effectiveness. The results of this particular research can be used in coaching programs, since they offer the chance for the defense to predict the various kinds of offensive moves by the ball handler.

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