INSIDE GAME EFFECTIVENESS IN NBA BASKETBALL: ANALYSIS OF COLLECTIVE INTERACTIONS

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Abstract:

The inside game constitutes an essential aspect of modern basketball, particularly in the National Basketball Association (NBA), in where the best players of the world compete. The purpose of this study was to identify players' dynamics that increase game performance when using inside pass in the NBA, considering game contextual effects. The sample included 808 inside passes from 25 randomly selected matches of the 2011 NBA Playoffs series. A series of logistic regression analyses were used to analyse passers and receivers' actions and their effectiveness during inside passes, both isolated and combined. Main results revealed that the interactions combining passer's previous actions (dribbling or faking) with receiver's cuts towards the basket achieved the highest offensive effectiveness. Performing screens in favour to the receiver was an effective alternative to increase inside passing options since it reduces the defensive pressure. Furthermore, player's actions prior to passing the ball were even more successful if combined and synchronized with the receivers' displacements, especially cutting to the basket. This information allows a better understanding of basketball collective strategies, contributing to the design of precise practice tasks and so improving the training process.

Key words: *performance analysis, predictive analysis, team configurations, collective behaviour*

Introduction

In modern basketball, offensive efficiency depends on the balance between the outside game and the post-game (Courel-Ibáñez, Suárez-Cadenas, & Cárdenas-Vélez, 2017; Gomez, Gasperi, & Lupo, 2016; Mavridis, Laios, Taxildaris, & Tsiskaris, 2004). A better understanding of tactical elements through collective behaviour assessment is of vital importance to improve performance, supporting the training process and preparation for the match (Lemmink & Frencken, 2013). A recent review on basketball tactical analysis emphasized on considering variables pertaining to game context, game phase, players' role and game condition when exploring players' behaviours (Courel-Ibáñez, McRobert, Ortega, & Cárdenas, 2017). According to these authors, due to the complex and multidimensional nature of the game, collective performance rely on a variety of factors concerning game context, game phase, players' role and game condition. Particularly in tactics, contextual influence like match status (winning, drawing or losing) or the quality of opposition (team's ranking position) appears to be relevant to players' decision making (Gómez, Lago, & Pollard, 2013); however, variables of this kind are rarely considered in basketball tactical assessment, which highly limit the practical application of the findings (Courel-Ibáñez, McRobert, et al., 2017; Lemmink & Frencken, 2013).

The pass-reception constitutes an essential collective game dynamics in basketball. Pass is the second most common technical action during the game after shooting (Nunes, et al., 2016; Oliver, 2004). Teams that assist more (i.e., a pass that directly leads to a basket) are more likely to win the

game (García, Ibáñez, Martinez De Santos, Leite, & Sampaio, 2013). More specifically, the inside pass (i.e., a pass made to a player stepping into the restricted area) is an action that creates defensive imbalance, creates more 1 on 1 situations close to the basket, generates open spaces for shooting and increases scoring options (Courel, Suárez, Ortega, Piñar, & Cárdenas, 2013). In the NBA, there is a greater use of the inside pass compared to the European teams (Mavridis, Tsamourtzis, Karipidis, & Laios, 2009). In basketball, the majority of possessions are solved in the inside, chiefly in the NBA due to the athletic complexion of centers, making them specialists in shooting near the basket and dunking with a higher rate of effectiveness (Erčulj & Štrumbelj, 2015). Previous research exploring NBA playoffs series reported greater effectiveness in ball possessions when using inside pass (Courel-Ibáñez, McRobert, Ortega Toro, & Cárdenas Vélez, 2016). Particularly, offensive success rate increased from 51.8% to 70.2% if the reception was dynamic (the receiver gets the ball after a fake or displacement), and rose up to 86.7% if receiving on the weak side (away from the ball) and against no defensive help (briefly leaving the direct pair to defend the unmarked receiver's action). Therefore, it is suggested that specific passer-receiver interactions could result in a positive outcome when playing the inside pass.

To detect dynamics of the game and quantify its effectiveness, players' performance evaluation becomes one of the main aims for basketball coaches (Cervone, D'Amour, Bornn, & Goldsberry, 2014; Gomez, et al., 2016). The better the players move and cooperate, the more likely the attack succeeds. Players' dynamics are determined by specific offensive aims such as to create free space to pass and shoot, enhance effective scoring options and minimize defensive pressure (Remmert, 2003). Through the categorization of player interactions in matches, research studies have identified a variety of actions used in the offence to create (1 vs. 1, screens on and off the ball, cuts towards the basket) and protect (defensive help, switch, screen deny) space (Lamas, et al., 2011; Santana, et al., 2015). These techniques have been implemented to analyse and model offensive and defensive interactions in elite teams (Lamas, Santana, Heiner, Ugrinowitsch, & Fellingham, 2015; Lorenzo Calvo, García, & Navandar, 2017; Vaquera, García-Tormo, Gómez Ruano, & Morante, 2016). Therefore, identifying trends and game patterns are key to the preparation of training sessions aimed at improving players' tactical performance and decision-making according to specific game situations and constraints (Eccles, Ward, & Woodman, 2009). However, current information on game dynamics is primarily from the European basketball teams and there are limited studies using the National Basketball Association (NBA), the most popular and important basketball league in the world (Courel-Ibáñez, McRobert, et al., 2017).

In sum, achieving a play inside the paint constitutes an essential offensive aim in basketball; however, to the best of our knowledge, there is no report available on how players should interact to enhance inside game options and performance in the NBA. Notational analysis allows recording and quantifying data through the observation of emerging players' behaviours during the competition (O'Donoghue, 2015). Recently, Lamas et al. (2011, 2015) have defined a series of actions to effectively explore players' interactions through observational analysis. This information is essential in detecting players' strength and weakness and, more importantly, in evaluating the quality of the players' decisions and its contribution to the whole attack phase (Cervone, et al., 2014). The purpose of this study was therefore to identify those passer and receiver's actions that increase offensive performance when passing the ball to the inside in the National Basketball Association (NBA), the most important basketball competition.

Methods

Sample

Eight hundred and eight (808) inside passes from 25 matches of the 2011 NBA Playoffs series were recorded for further analysis. Games were randomly selected considering particular inclusion (we included four teams from each conference with a win and a defeat for each team) and exclusion criteria (we excluded overtime games). Based on previous proposals (Gomez, et al., 2016; Sampaio & Janeira, 2003), the ball possessions were included in the analysis if the current score difference was below 10 points (i.e., close score difference). The choice of this specific sample was deliberate to explore inside game dynamics and supported by previous studies (Courel-Ibáñez, et al., 2016; Courel-Ibáñez, Suárez-Cadenas, et al., 2017); first, the NBA is the most important basketball club competition and recruits the best inside players of the world; most of them receive the highest salaries in their teams (Berri, Brook, Frick, Fenn, & Vicente-Mayoral, 2014); second, the playoffs confront the top 16 teams of the season for becoming the champion, thus a similar competitive level between teams is expected (Moreno, Gómez, Lago, & Sampaio, 2013), and third, possessions in close score differences make the game becoming unpredictable and force teams to show their highest performance to beat the opponent (Gomez, et al., 2016).

Measures

Inside pass was considered when the receiver player was stepping into the zone or paint. Variables

pertaining to players' (passer and receiver) actions and interactions, offensive and defensive performance and game context were included in the analyses. Players' actions were classified following the proposal by Lamas et al. (2011) as shown in Table 1. Then, two different analyses were conducted: first, we explored isolated effects (e.g., a pass made after the ball dribbled, a reception after the on-ball screen); second, we combined both players' actions to study the effects of passer and receiver interactions (a pass and reception due to the ball dribbled after the on ball screen).

Offensive and defensive performance was explored through dichotomous categorical variables (Courel-Ibáñez, et al., 2016). Offensive performance assessment comprised (i) effectiveness (successful ball possessions: when the offensive team scored a 2- or a 3-point field-goal, secured a rebound, or received a foul, including foul throw; unsuccessful ball possession: when the offensive team missed a 2- or 3-point field-goal, received a block shot, committed a foul, made a turnover, or made any other rule violation, and (ii) shooting options (shot: a receiver's shot right upon receiving the ball; no shot: when the receiver made a pass, dribbled the ball or stayed positional). Defensive performance involved (i) defensive pressure (Csataljay, James, Hughes, & Dancs, 2013), maximal pressure was considered when the receiver got the ball contacting or very close to an opponent, and (ii) defensive help (help: a teammate defender briefly leaves his/her direct pair in order to stop the receiver's action; no help: no other opponent rather than the direct pair tried to stop the receiver's action).

Finally, contextual variables were considered as covariates, by measuring: (i) team ranking (top 4 and low 4 teams according to the end-of-season classification), (ii), game period (first to fourth quarter); (iii); game location (home and away team), and (iv) match status (whether the team was winning, drawing or losing at the moment of the pass). Match status was obtained using the accumulative differences between points scored and allowed in each ball possession and then converted into a categorical variable using a two-step cluster analysis (Sampaio, Drinkwater, & Leite, 2010). Three clusters were identified and categorised as "moderate disadvantage" (differences between -10 and -4 points), "balanced" (differences between -3 and 3 points), "moderate advantage" (differences between 4 and 10 points).

Procedures

Four pairs of observers specialising in basketball analysed all games after a 3-week training period. The observers' objectivity (inter-observer reliability) and reliability (intra-observer reliability) were assessed using the multi-rater k free index (Randolph, 2008) and Cohen's kappa respectively. The inter-observer reliability scores obtained were over 0.87; intra-observer reliability scores were over 0.91. Thus, objectivity and reliability were classified as 'almost perfect agreement' (Altman, 1991). Ball possessions were recorded using the LINCE software (Gabin, Camerino, Anguera, & Castañer, 2012), a flexible digital recording software that allows data exportation for its treatment on statistical packages. Then, variables were numerically encoded from the first category (lowest value) to the last category (highest value). For instance, game period was coded from the first quarter (1) to fourth quarter (4); passer's action from the ball dribbled (1) to positional (4); receiver's action from OBS and roll (1) to positional (6). Dichotomous variables, like team ranking, game location, attack effectiveness, shooting options, defensive pressure and defensive help, were coded considering 1 and 2 values. The present study follows the research ethics guidelines

Table 1. Definitions of passer and receiver's actions; modified from Lamas et al. (2011)

Passer action	**Description**
Ball dribbled (BD)	Individual actions by dribbling the ball.
Ball not dribbled (BND)	Similar to BD but without a dribble, using only body displacement techniques (i.e., ball fakes, jab step).
On ball screen (OBS)	One or more players try to free a teammate with the ball by interposing their body to the path of the defender.
Positional (P)	Player states without making BD or BND.
Receiver's action	**Description**
OBS and roll (OBS&roll)	The screener moves towards the basket after blocking and receives the ball.
Out of ball screen (OoBS)	Similar to OBS but freeing a teammate without the ball.
OoBS and roll (OoBS&roll)	Similar to OBS&roll when performing OoBS.
Space creation w/o ball (WB)	Previous movement without the ball to create space and receive it properly.
Dive cut (DC)	Displacement from the outside towards the basket.
Positional (P)	Player states with no previous actions.

Note. w/o: without

established by Liverpool John Moores University, in accordance with the Helsinki Declaration as revised in 2013.

Statistical analysis

Descriptive analysis included frequencies and percentages of the studied variables. Odds ratio (OR) and 95% confidence intervals (CI) were calculated by a multiple binomial logistic regression to identify the effects of players' interaction (predictor) and game context (covariate) on offensive and defensive performance (dependent variables). The Cox and Snell and the Nagelkerke R2 were used to assess the effect size as the final amount of variance explained by the regression models tests, considering 0.10 = small effect, 0.30 = medium effect, and 0.50 = large effect (Fritz, Morris, & Richler, 2012). Significance of associations was assessed by means of Wald's test ($p<.05$). Independence of observations was assumed, as interactions between players during ball possessions constitute an unpredictable task and environment-related functional information (Duarte, Arajo, Correia, & Davids, 2012). Statistical analyses were conducted in IBM SPSS v. 20.0 for Macintosh (Armonk, NY: IBM Corp.).

Results

Table 2 displays distribution of factors, covariates and game performance variables. Individually, P and BD passers' actions accounted for the 71.2% of the total, whilst P, DC and OBS&roll receivers' actions were the most prevalent with 83.8%. Besides, we detected 17 passer-receiver interactions, being the most common BD – DC, P – P, OBS – OBS&roll, BD – P and BD – WB (75.7%).

Table 3 shows the effects of isolated passer and receiver's actions on game performance when using the inside pass. Passer action reported positive effects on receivers' shooting options (BD), defensive pressure (BD and BND) and defensive help (BD), not finding differences in attack effectiveness. Receiver's actions, however, did not show any significant effect. Regarding covariates influence, receiver players from high-ranked teams were capable to make more shots right after getting the ball in the inside. Moreover, defensive pressure increased during the first and third quarter compared to the last period. In particular, receiver's positional standing during the first quarter raised maximal opposition situations and enlarged the appearance of defensive help.

Finally, results from passer and receiver interactions are presented in Table 4. Combined actions revealed a greater influence on both the offensive and defensive performance in the inside pass situations. A series of positive effects were observed: a greater attack effectiveness (BD – DC and BND – DC), larger shooting options (BD – P, BD – DC, and P – DC), a lower defensive pressure (BD – OoBS&roll, BD – OoBS, BD – P, BD – DC, BND – OoBS&roll, OBS – OBS&Roll, OBS – OBS&Roll, and P – DC) and lower defensive helps (BD – P, BND – OoBS&roll, BND – WB, and OBS – OBS&Roll). In overall, receivers' dive cut through the basket increased shooting options, being the most effective way to score, whilst the use of screens considerably decreased defensive pressure. Regarding covariates, although the best-positioned teams in the ranking were able to make more shots right after receiving the ball, interactive effects were not conclusive to make interpretations.

Table 2. Data frequency counts and percentage of total inside pass ball possessions (n=808)

Players' actions	n	%	Game context	n	%	Game performance	n	%
Passer's action			*Team ranking*			*Attack effectiveness*		
Ball dribbled (BD)	286	35.4	Top-4	466	57.7	Successful	516	63.9
Ball not dribbled (BND)	103	12.8	Low-4	342	42.3	Unsuccessful	292	36.1
On ball screen (OBS)	129	16.0	*Game period*			*Shooting options*		
Positional (P)	289	35.8	1st quarter	257	31.8	Shot	545	67.4
Receiver's action			2nd quarter	199	24.6	No shot	263	32.6
OBS and roll (OBS&roll)	121	15.0	3rd quarter	196	24.3	*Defensive pressure*		
Out of ball screen (OoBS)	33	4.1	4th quarter	157	19.4	Maximal	317	39.2
OoBS and roll (OoBS&roll)	43	5.3	*Game location*			No maximal	491	60.8
Space creation without ball (WB)	55	6.8	Local	412	51.0	*Defensive help*		
Dive cut (DC)	241	29.8	Away	396	49.0	Help	437	54.1
Positional (P)	315	39.0	*Match status*			No help	371	45.9
			Moderate advantage	345	42.7			
			Balanced	307	38.0			
			Moderate disadvantage	156	19.3			

Table 3. Effects of players' actions (isolated) on game performance during inside pass situations. Values expressed in odds ratio and their 95% interval confidence (IC)

Parameter	Offensive performance		Defensive performance	
	Shooting (a)	*Effectiveness (b)*	*Defensive pressure (c)*	*Help (d)*
Passer's action (1)				
Ball dribbled (BD)	**1.91 (1.32-2.76)***	1.87 (1.30-2.70)	**2.44 (1.72-3.48)***	**1.53 (1.08-2.15)***
Ball not dribbled (BND)	0.88 (0.53-1.44)	1.20 (0.72-1.99)	**2.02 (1.21-3.36)***	1.26 (0.77-2.06)
On ball screen (OBS)	2.60 (0.51-13.20)	0.84 (0.21-3.33)	1.29 (0.32-5.16)	1.18 (0.29-4.71)
Receiver Action (1)				
OBN and roll (OBN&roll)	0.36 (0.06-1.91)	1.04 (0.24-4.36)	2.24 (0.53-9.52)	1.86 (0.44-7.83)
Out of ball screen (OoBS)	0.94 (0.44-2.03)	0.81 (0.37-1.74)	2.30 (1.00-5.26)	0.96 (0.46-2.01)
OoBS and roll (OoBS&roll)	0.94 (0.48-1.84)	0.70 (0.36-1.36)	1.43 (0.73-2.80)	0.59 (0.30-1.16)
Space creation without ball (WB)	0.70 (0.33-1.47)	0.96 (0.44-2.08)	0.79 (0.43-1.47)	1.51 (0.83-2.78)
Dive cut (DC)	0.91 (0.33-2.46)	1.07 (0.39-2.97)	1.15 (0.80-1.66)	1.08 (0.76-1.54)
Covariates				
Team ranking (2)	**1.44 (1.07-2.01)***	0.84 (0.62-1.14)	0.94 (0.69-1.27)	0.84 (0.62-1.13)
Game period (3)				
1st quarter	0.89 (0.66-1.20)	1.00 (0.62-1.59)	**0.62 (0.36-0.98)***	**0.57 (0.37-0.88)***
2nd quarter	0.74 (0.46-1.17)	0.74 (0.46-1.17)	0.71 (0.44-1.13)	0.93 (0.60-1.45)
3rd quarter	1.03 (0.64-1.66)	1.03 (0.64-1.66)	**0.60 (0.38-0.96)***	1.08 (0.69-1.69)
Game location (4)	0.81 (0.59-1.11)	0.83 (0.61-1.13)	1.02 (0.76-1.38)	1.07 (0.80-1.43)
Match status (5)				
Moderate advantage	1.33 (0.97-1.83)	1.01 (0.88-1.65)	0.94 (0.61-1.47)	1.31 (0.85-2.02)
Balanced	1.03 (0.70-1.49)	1.02 (0.70-1.50)	0.96 (0.66-1.39)	1.22 (0.85-1.75)

Note. *Wald's test p<.05; effect size: R2>.10 (small effects). Dependent variable references: (a) not shooting; (b) unsuccessful; (c) maximal pressure; (d) help. [Note that positive defensive OR indicate higher pressure and more helps]. Predictor references: (1) positional; (2) low-4 teams [Note that it is a dichotomous variable]; (3) fourth quarter; (4) away team; (5) moderate disadvantage.

Table 4. Effects of players' actions (combined) on game performance during inside pass situations; values expressed in odds ratio and their 95% interval confidence (IC)

Parameter	Offensive performance		Defensive performance	
	Shooting (a)	*Effectiveness (b)*	*Defensive pressure (c)*	*Help (d)*
Passer-receiver interaction (1)				
BD – OoBS&roll	0.81 (0.19-3.48)	2.50 (0.46-13.63)	**11.91 (1.40-100.99)***	0.85 (0.19-3.80)
BD – OoBS	0.90 (0.25-3.18)	2.55 (0.63-10.24)	**15.13 (1.86-122.87)***	0.88 (0.25-3.11)
BD – WB	1.77 (0.42-7.37)	1.51 (0.39-5.83)	3.34 (0.80-13.90)	4.70 (0.93-23.65)
BD – P	**2.04 (1.17-3.57)***	1.55 (0.90-2.67)	**2.78 (1.61-4.81)**	**1.90 (1.10-3.26)***
BD – DC	**4.40 (2.51-7.72)***	**4.99 (2.84-8.75)***	**3.35 (2.03-5.55)***	1.22 (0.72-1.9)
BND – OoBS&roll	2.20 (0.64-7.65)	0.61 (0.17-2.00)	**5.29 (1.37-20.34)***	**5.74 (1.21-27.24)***
BND – OoBS	2.60 (0.62-10.75)	1.52 (0.40-5.80)	1.58 (0.43-5.86)	0.69 (0.18-2.64)
BND – WB	0.96 (0.22-4.08)	2.88 (0.55-14.95)	2.71 (0.61-11.92)	**3.13 (0.60-16.31)***
BND – P	0.70 (0.30-1.6)	1.47 (0.62-3.46)	1.92 (0.82-4.49)	0.29 (0.11-0.78)
BND – DC	1.50 (0.65-3.38)	**3.47 (1.38-8.74)***	**5.18 (2.06-13.04)***	1.91 (0.83-4.37)
OBS – OBS&Roll	1.37 (0.87-2.29)	1.47 (0.88-2.46)	**3.70 (2.17-6.29)***	**2.03 (1.21-3.41)***
OBS – P	3.18 (0.65-16.7)	1.12 (0.21-4.48)	1.83 (0.45-7.35)	1.19 (0.29-4.80)
P – OoBS&roll	1.21 (0.37-3.98)	3.55 (0.92-13.75)	2.67 (0.81-8.77)	0.22 (0.04-1.00)
P – OoBS	1.73 (0.68-4.38)	1.12 (0.45-2.75)	1.88 (0.77-4.57)	0.54 (0.21-1.38)
P – WB	1.13 (0.53-2.44)	1.82 (0.82-4.04)	0.87 (0.39-1.90)	1.05 (0.49-2.24)
P – DC	**2.29 (1.27-4.13)***	2.58 (1.42-4.69)	**2.14 (1.22-3.75)***	1.17 (0.67-2.04)
Covariates				
Team ranking (2)	**1.38 (1.00-1.90)***	0.79 (0.57-1.09)	0.90 (0.66-1.23)	0.87 (0.64-1.18)
Game period (3)				
1st quarter	1.04 (0.65-1.69)	0.70 (0.43-1.14)	0.63 (0.39-1.00)	0.58 (0.37-0.91)
2nd quarter	0.70 (0.44-1.13)	0.74 (0.45-1.21)	0.69 (0.43-1.11)	0.92 (0.58-1.45)
3rd quarter	1.02 (0.63-1.65)	0.86 (0.54-1.40)	0.60 (0.37-0.96)	1.09 (0.69-1.72)
Game location (4)	0.89 (0.65-1.22)	1.00 (0.73-1.36)	1.01 (0.74-1.36)	1.10 (0.82-1.47)
Match status (5)				
Moderate advantage	0.93 (0.59-1.47)	0.91 (0.58-1.43)	0.91 (0.58-1.43)	1.31 (0.84-2.02)
Balanced	0.99 (0.67-1.46)	1.32 (0.90-1.94)	0.93 (0.64-1.35)	1.21 (0.84-1.74)

Note. *Wald's test p<.05; effect size: R2>.10 (small effects). Dependent variable references: (a) not shooting; (b) unsuccessful; (c) maximal pressure; (d) help. [Note that positive defensive OR indicate higher pressure and more helps]. Predictor references: (1): positional; (2) low-4 teams [Note that it is a dichotomous variable]; (3) fourth quarter; (4) away team; (5) moderate disadvantage.

Discussion and conclusions

The current study aimed at identifying game dynamics that increased offensive performance when using the inside pass. Regression analyses identified important influences of passer and receiver's actions and interactions on game offensive and defensive effectiveness. Overall results revealed positive outcomes if the passer included previous displacements with (dribble) or without the ball (fake), and the receiver moved towards the basket or set a screen. More importantly, the analysis of the combined passer and receiver interaction pointed out specific game dynamics that resulted in a greater performance. For instance, passer's previous ball dribbling may be followed by dive cuts (increased scoring likelihood and shooting opportunities), out of ball screen and roll (decreased defensive pressure) or a rolling after a screen on the ball (diminished defensive help). Although the notion of developing game dynamics to increase the inside pass effectiveness has been reported earlier (Courel-Ibáñez, et al., 2016), the current research provides novel insights into specific perimeter and post players' configurations that contribute to game performance. This information allows a better understanding of basketball collective behaviours, contributing to the design of precise practice tasks and so improving the training process. Moreover, the reported influence of contextual variables may promote the design of game drills to be prepared against specific game situations, especially during the first and third quarter.

Offensive performance

Interactions combining passer's previous actions with receiver's cuts towards the basket achieved the highest offensive effectiveness (Figure 1). First, dribbling towards the basket creates mismatch and defensive unbalance (Gómez, Battaglia, et al., 2015; Guppillotte, 2008; Lorenzo Calvo, et al., 2017). Particularly in the NBA, outside players have great 1 on 1 skills and are extremely athletic, with optimal jump, speed and power skills, making them really dangerous when approaching to the basket (Mateus, et al., 2015; Sampaio, et al., 2015). Similarly, faking actions and movements when having the ball are aimed at catching the opponent's attention, reducing the interpersonal space and avoiding possible help to other defenders, thus making easy for the teammates to receive a pass. Second, our results indicate that these actions preceding passing the ball, are more successful if combined and synchronized with the receivers' displacement, especially teammate's to the basket. Hence, it is supported the greater benefits of overlapping and concatenation of disruptive actions for progressively creating sufficient space and enhance scoring odds in basketball (Lamas, et al., 2015; Remmert, 2003). Certainly, NBA players are characterized by a superior strength, jump conditions (Gonzalez, et al., 2013; Sampaio, Lago, & Drinkwater, 2010) and a strong role specialization (Sampaio, et al., 2015). Then, it seems logical to promote predefined and coordinated outside-inside behaviours like cutting towards the basket for an alley-oop, since players' physical condition allows them to easily score through dunking (Erčulj & Štrumbelj, 2015). More importantly, our findings point out the importance of specific inside players' displacement without the ball to increase odds of receiving the ball in optimal conditions as close to the basket as possible, enhancing scoring options. To this purpose, it is suggested developing inside players agility to quickly fake, move, and act to

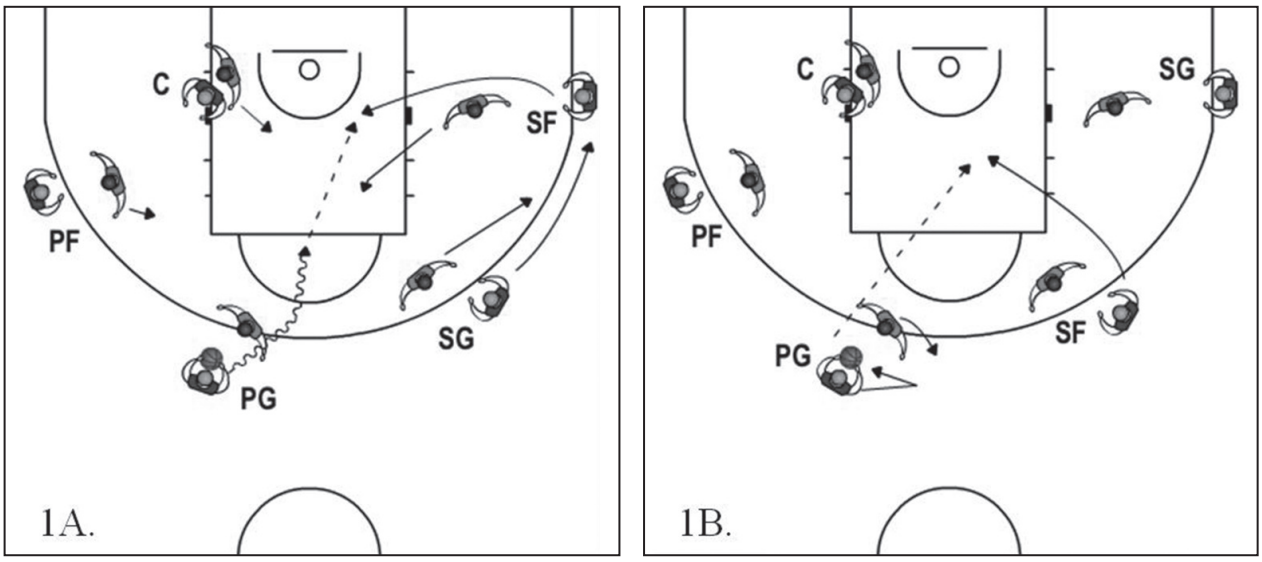

Figure 1. Interactions with a greater effectiveness. Diagram 1A shows BD – DC interaction: (PG) dribbles through the middle unbalancing the defense and (SF) takes advantages to back cut to the basket. Diagram 1B shows BND – DC interaction: (PG) makes a jab step to the right and (SG) back cuts to the basket. Continuous arrows indicate player movement without the ball, dotted arrows indicate a pass, and a T indicates a screen.

provide the passer with a clear target to pass the ball (Guppillotte, 2008). Likewise, it is reinforced the increasing need in modern basketball of a spatiotemporal coordination (timing) between the ball handler, the future receiver, and the rest of teammates to succeed in passing and receiving the ball, chiefly in overprotected locations such as the inside (Lamas, Barrera, Otranto, & Ugrinowitsch, 2014).

Defensive performance

Interactions including on-ball and out-of-ball screens reduced defensive pressure and help on the receiver however they did not produce the highest effectiveness or enlarge shooting options (Figure 2). These results concur with those of Lamas et al. (2015) who observed that pick actions were the most prevalent space creation dynamics, being used both to attempt scoring and to initiate offenses. Ball screen effectiveness relies on how the dribbler perceives defender's actions and how well the screener sets the screen to free the player with the ball (Gómez, et al., 2015; Hollins, 2003; Vaquera, et al., 2016). On the contrary, out-of-ball screens involve at least three players (the passer, the receiver, and the screener), multiplying offensive options and creating serious difficulties to the defence, particularly if the screener rolls. Considering the fact that the post area is naturally well protected for its proximity to the basket, it is proposed performing screens in favour of the receiver as an effective alternative to increase inside passing options since it reduces the defensive pressure. This aligns with the study by Lamas et al. (2015), who reported that making the ball to reach the post generates a concentration of defensive players inside the zone to protect the basket, which often leads to the concatenation of a new offensive action. It is also worth noting that the linkage of teamwork actions should be performed under a relative intensity, which requires an active player cooperation (i.e., performing a sequence of screens and rolls during a limited ball possession time) to avoid defensive anticipation (Bazanov, Haljand, Võhandu, & Vohandu, 2005; Cárdenas, et al., 2015).

Contextual variables

An important aspect of the present study was the analysis of contextual variables during specific basketball actions (Gómez, Alarcón, & Ortega, 2015). According to our findings, the high-ranked teams get more shooting options when using the inside pass, especially if dribbling the ball before passing, which may suggest that a better ball handling ability of best teams allow them to increase shooting rates in optimal conditions during inside pass situations. This was quite unexpected since similar offensive ability standard can be hypothetically assumed within the NBA Playoff Finals teams, particularly when performing such common actions like dribbling or passing in the inside. Unfortunately, we were not able to provide solid reasons to explain this finding since the interactive effects obtained were not strongly conclusive, probably due to a limited sample size as a result of data splitting (Gómez, et al., 2013). Additionally, there is a lack of variables pertaining to shooting in the current study. In this line, recently interesting approaches made in elite basketball (Cervone, et al., 2014) evaluated how tactical decisions quality, such as consider rebound players' disposal or passing

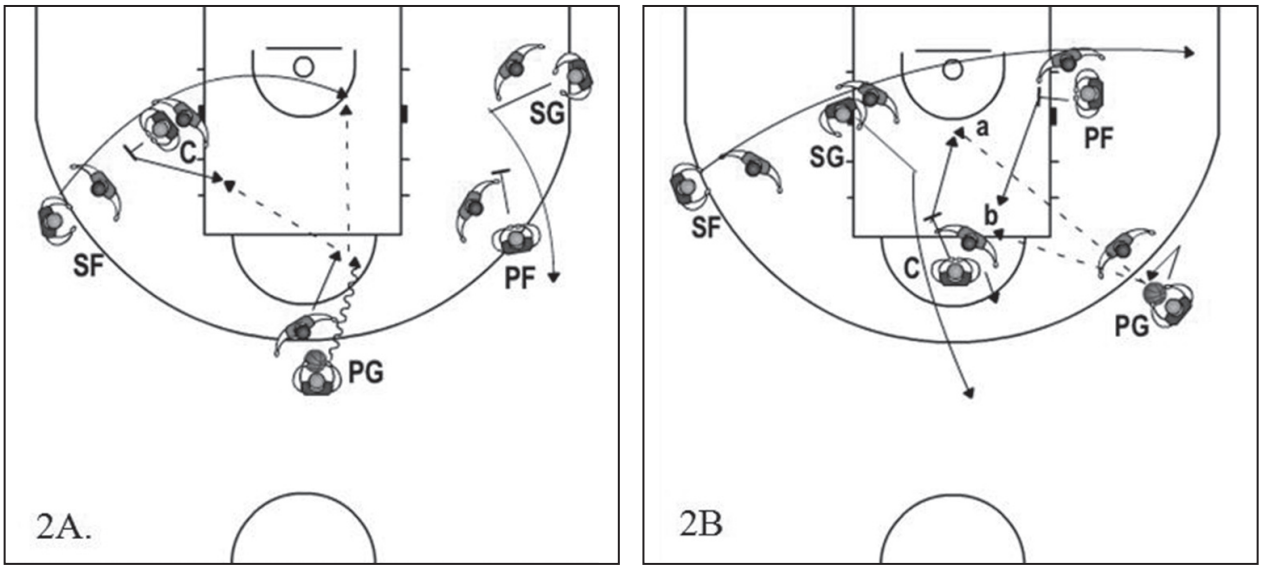

Figure 2. Interactions to lower the defensive pressure. Diagram 2A shows BD – OoBS: (PG) dribbles to the basket and passes the ball to (SF) who has received a screen from (C). Diagram 2B shows BND – OoBS&roll: (PG) fakes while (SF) makes a deep cut from the outside position, receiving a screen from (SG) and (PF) sequentially; simultaneously, after blocking, (SG) makes a zipper cut receiving a screen from (C), then, it emerges two inside pass situations for (PF) and (C) rolls. Continuous arrows indicate player movement without the ball, dotted arrows indicate a pass, and a T indicates a screen.

to an open mate, might contribute to the team success. However, there is still an open challenge in basketball performance analysis to understand how players should behave and cooperate to support the ball handler (in shooting or passing) or another teammate (in receiving the ball in optimal conditions) to increase offensive effectiveness.

This study has important limitations that should be acknowledged. The current game dynamics were obtained from the 2011 season which could not totally reflect the current trends in the NBA. Given the absence of previous reports concerning passer and receiver's actions during inside game situations, these data may encourage future studies to confirm whether or not the findings reflect the real performance of the NBA teams. Another limitation of the present study is the absence of taking into consideration specific defensive actions. As recently reported (Lamas, et al., 2015; Santana, et al., 2015), every offensive action is influenced by the defensive reaction, thus future studies should be improved by including a complete tactical modelling design exploring offensive-defensive interactions. Furthermore, we only explored behaviour of passers and receivers during offence; so we were not able to determine how the other teammate's collaboration might have influenced the inside pass effectiveness. Hence, according to Cervone et al. (2014), what is now required is a better understanding of how players' actions contribute to the whole possession success and not just the events that end it, for instance, by applying network metrics (Fewell, Armbruster, Ingraham, Petersen, & Waters, 2012). Also, considering that the NBA recruits the best inside players of the world, most of whom receive the highest salaries in their teams (Berri, et al., 2014), it would be interesting to identify and describe specific inside players' profiles in order to optimize practice planning and game performance according to individual and collective characteristics.

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