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Determinants of the effectiveness of fast break actions in elite and sub-elite Italian men's basketball games

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ABSTRACT: The aim of this study was to examine the determinants of successful and unsuccessful fast-break (FB) actions in elite and sub-elite basketball games. Fifteen 1st-division (elite) and fifteen 3rd-division (sub-elite) Italian men's championship games were analysed across two seasons (2012/2013 and 2013/2014). A binary logistic regression analysis was performed, and the fast-break outcome (successful vs. unsuccessful) was adopted as the dependent variable separately in both elite and sub-elite games. FB execution (initiation, advance and completion phases), typology (primary and secondary break) and the number of players involved (equal number or superiority) were used as independent variables. The results showed that the rate of success of FB actions was 63.5% and 59.7% in elite and sub-elite games, respectively. Moreover, successful FBs were more likely to be completed in the lane in relation to unsuccessful ones in both elite and sub-elite games ($p<0.05$). Finally, descriptive statistics showed that both elite and sub-elite teams executed FBs similarly. This study highlighted that completion zone was the only predictor of a successful fast break in basketball, while the typology and number of players involved did not predict fast break effectiveness. Moreover, elite and sub-elite teams executed fast break actions similarly. These findings might be useful for basketball coaches to optimize the training of FB actions.

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INTRODUCTION

Notational analysis has been demonstrated to be a valid tool to interpret technical and tactical aspects of performance in team sports [1]. The current literature has shown a growing interest in studies on both offensive and defensive systems related to different team sports, such as volleyball [2, 3], handball [4, 5], water polo [6, 7] and basketball [8-13].

The fast break (FB) action, defined as the fastest and most efficient way to make the transition from defence to offence, is considered one of the key elements within a basketball offensive system [14]. Consequently, FB actions increase the team's chance of scoring due to two main aspects: outnumbering the defence and/or not allowing it to become effectively organized [14]. In fact, according to Wootten [15], the FB is the first option in any offence at any time during a basketball game due to its efficiency. FB actions are composed of two temporal phases: the primary and secondary break. The primary break is the first phase characterized by the initial break of one or more players moving rapidly toward their offensive basket. The secondary break occurs if one or more trailing players enter and take part in the FB sequence [16].

A variety of team sports offensive system analyses showed that most of the ball possessions were played using set offense situations compared to FB actions [7, 12, 17]. Despite the small number of FB actions performed during a basketball game, FB activity has been specifically examined in the scientific literature due to the fact that it is a discriminating factor between winners and losers in elite male [17] and youth basketball games [12]. In elite male basketball competitions, FB actions represented 15.6% and 13.8% of the total offensive attacks for winning and losing teams, respectively [17]. Garefis et al. [18] noted that most of the FBs started with rebound and steal actions, with more than 80% of them finishing in the lane with a rate of success of 73% in elite men's European championship games. Furthermore, the distribution of primary and secondary breaks was 89.6% and 10.4%, respectively [19]. However, although FB has been considered a main tactical parameter by both basketball coaches [14, 15] and sport scientists [20], only a few descriptive studies have investigated the execution, typology, effectiveness and the number of players involved in the FB actions [17-19], while additional studies are necessary to assess the predictors of FB effectiveness.

Moreover, in basketball, the level of competition of performance is an additional parameter affecting both physical [21, 22] and technical [23] demands. Conversely, no study has analysed the tac-

tical – and specifically FB – determinants in relation to different levels of competition. Specifically, only one study has considered the FB execution and effectiveness in two different leagues [18], although both were elite basketball championships (Greek A1 teams vs. the Greek National Team). The understanding of the predictors of tactical parameters in different levels of competition could allow both elite and sub-elite basketball coaches to develop sound training sessions. Thus, this study aimed to assess the variables better predicting successful and unsuccessful FB in elite and sub-elite games.

MATERIALS AND METHODS

Subjects

The study was approved by an institutional review board, and meets the ethical standards in sports and exercise science research [24]. Fifteen 1st-division (elite) and fifteen 3rd-division (sub-elite) Italian men's championship games were analysed during the 2012/2013 and 2013/2014 seasons.

Methodology

A total of 398 FBs were analysed. In each division, eight and seven regular season games were randomly selected for the 2012/13 and 2013/14 season, respectively. The mean score difference was 11.2 ± 0.8 and 10.5 ± 0.7 in elite and sub-elite games, respectively. At the beginning of the study Italy was positioned in the top 25 and 20 of the world and European ranking of the International Basketball Federation, respectively. The Italian 1st division championship included the best 16 men's teams playing the regular season and the top 8 teams qualifying for the play-off stages. The Italian 3rd division championship was played by 18 teams during the regular season, with the top 4 teams qualifying for the play-off stage and the teams ranked between 11th and 18th positions for the play-out one. According to the International Basketball Federations rules, games consist of four 10-min quarters, with two 2-min breaks between the first and last two quarters and a 10-min break between the second and third quarters. Only games with a winning and losing team at the end of the 4th quarter were considered for the study, while those ending in a tie were excluded from the analysis.

A FB was defined as possession with duration below eight seconds, indicating a quick transitional style of play in offense [25]. The number, execution, typology and outcome of FB actions were assessed through the notational analysis technique in elite and sub-elite games separately. The same notational analysis sheets were used for the analysis of the games in both leagues. The footages were downloaded from the official website of the Italian Basketball Federation and analysed using the software Kinovea (www.Kinovea.org), which has been previously adopted for notational analysis in basketball [26, 27].

FB execution was categorized based on three successive temporal phases: 1) initiation, 2) advance and 3) completion [19]. For each phase, different types of actions (*initiation*: rebound, steal and throw-in action; *advance*: dribbling and passing; *completion*: successful 2-point shot, successful 3-point shot, missed 2-point shot, missed 3-point shot, suffered foul and turnover) and playing zones (*initiating*: lane, baseline-free throw line (not including the lane area), free throw line-half court line, frontcourt, out of bound; *advance*: centre and sideline; *completion*: lane, intermediate and outside 3-point line) (figure 1) were evaluated [19].

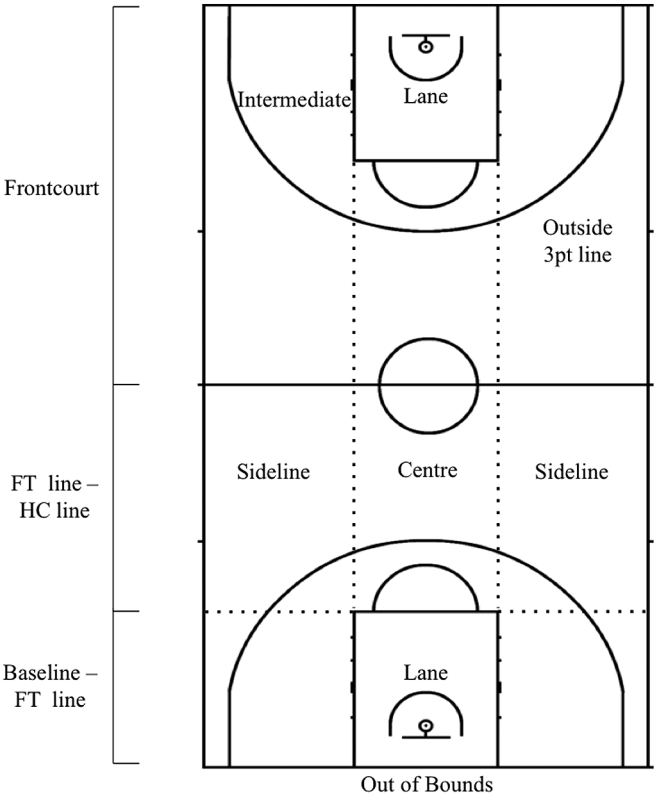

FIG 1. Description of fast break playing zones (initiating, advance and completion). FT= free throw; HC= half court.

The FB actions were also categorized as successful (scoring a basket or being fouled) or unsuccessful (missing a shot or when a turnover occurred) [18]. Moreover, in considering the number of players participating, each FB action was classified as a primary (1on0; 1on1; 2on1; 2on2; 3on2; 3on1; 3on3; 4on2) or secondary (4on3; 4on4; 5on4) break [17, 18] and into those performed with an equal (attacking vs. defending team) or unequal (superiority for the attacking team) number of players. To assess the number of players involved in each FB, only those actively involved in the actions were considered. Defensive players were considered actively involved in the FB action if they were in their defensive half court between the imaginary line of the ball parallel to the end line and the defended basket. Offensive players were considered actively involved if they were in the offensive half court: 1) touching the ball, 2) being over the imaginary line of the ball parallel to the end line and gaining an advantage from their position and/or 3) influencing the opponents.

All games were scored by the same expert match analyst with five years of experience as a basketball coach and a video analyst to avoid any inter-observer variation in the measures. To assess the test–retest reliability, before the study the observer scored a single game twice, each observation separated by 15 days. Absolute and relative reliability were assessed using the coefficient of variation (CV) and intraclass correlation coefficient (ICC), resulting in high test-retest reliability (CV= 1-4%; ICC=0.97) as reported in previous investigations [13, 21, 26, 27].

Statistical analysis

Percentages were calculated as descriptive statistics. Binary logistic regression analyses were performed and the FB outcome (successful vs. unsuccessful) were adopted as dependent variables separately in both elite and sub-elite games. FB execution, typology and the number of players involved were used as independent variables. In univariate analyses, each independent variable was tested separately and the association between the single variables and the probability of winning a game or performing a successful FB was assessed. In

TABLE 1. Univariate logistic regression analysis of the fast break execution in elite and sub-elite games including p value, effect size (odds ratio) and its 95% confidence interval (95% CI) and interpretation.

	Univariate									
	Elite					Sub-elite				
	p value	Odds ratio	95% CI		Interpretation	*p* value	Odds ratio	95% CI		Interpretation
Initiating action	0.568					0.087				
Rebound	0.772	0.825	0.225	3.028	Trivial	0.233	0.257	0.027	2.401	Moderate
Steal	0.839	1.143	0.316	4.129	Trivial	0.525	0.484	0.052	4.516	Small
Throw in										
Initiating zone	0.629					0.072				
Lane	0.928	1.061	0.294	3.834	Trivial	0.376	0.365	0.039	3.394	Small
Baseline – ft line	0.501	0.612	0.147	2.554	Small	0.106	0.147	0.014	1.506	Moderate
ft line half court	0.974	1.023	0.265	3.947	Trivial	0.667	0.604	0.061	5.98	Small
Frontcourt	0.496	2.000	0.272	14.699	Small	0.736	0.625	0.04	9.65	Small
Out of bounds										
Advance action										
Dribble	0.369	1.325	0.717	2.447	Trivial	0.685	0.866	0.432	1.736	Trivial
Pass										
Advance zone										
Centre	0.669	1.141	0.623	2.09	Trivial	0.58	1.189	0.644	2.197	Trivial
Sideline										
Completion zone	>0.001					0.001				
Lane	>0.001	5.714	2.851	11.455	Moderate	0.001	3.749	1.731	8.119	Moderate
Intermediate	0.589	1.429	0.391	5.216	Trivial	0.876	0.885	0.189	4.142	Trivial
Outside 3pt line										
Number of players										
Superiority	0.060	1.702	0.979	2.959	Small	0.468	1.252	0.682	2.298	Trivial
Equal number										
FB typology										
Primary	0.055	2.075	0.984	4.377	Small	0.063	2.032	0.962	4.294	Small
Secondary										

TABLE 2. Multivariate logistic regression analysis of the fast break execution in elite and sub-elite games including p value, effect size (odds ratio) and its 95% confidence interval (95% CI) and interpretation

	Multivariate									
	Elite					Sub-elite				
	p value	Odds ratio	95% CI		Interpretation	*p* value	Odds ratio	95% CI		Interpretation
Initiating action	0.873					0.234				
Rebound	0.744	1.473	0.145	15.010	Trivial	0.540	0.397	0.021	7.644	Small
Steal	0.661	1.639	0.180	14.937	Small	0.853	0.760	0.042	13.91	Trivial
Throw in										
Initiating zone	0.514					0.055				
Lane	0.576	0.602	0.102	3.560	Small	0.830	0.813	0.124	5.349	Trivial
Baseline – ft line	0.278	0.358	0.056	2.293	Small	0.124	0.219	0.032	1.512	Moderate
ft line half court	0.327	0.409	0.068	2.445	Small	0.803	0.782	0.113	5.424	Trivial
Frontcourt	Estimation terminated because parameter estimates changed by less than.001					Estimation terminated because parameter estimates changed by less than.001				
Out of bounds										
Advance action										
Dribble	0.240	1.571	0.739	3.338	Small	0.937	1.034	0.452	2.366	Trivial
Pass										
Advance zone										
Centre	0.764	0.901	0.456	1.781	Trivial	0.774	1.113	0.537	2.307	Trivial
Sideline										
Completion zone	>0.001					0.006				
Lane	>0.001	4.898	2.306	10.403	Moderate	0.005	3.387	1.444	7.947	Small
Intermediate	0.636	1.401	0.347	5.651	Trivial	0.771	0.782	0.150	4.082	Trivial
Outside 3pt line										
Number of players										
Superiority	0.081	1.786	0.930	3.431	Small	0.679	1.165	0.565	2.403	Trivial
Equal number										
FB typology										
Primary	0.322	1.595	0.633	4.022	Small	0.431	1.426	0.590	3.448	Trivial
Secondary										

multivariate analyses, all the independent variables were entered and tested in a single step. In this way, we could investigate the relationship between each independent variable and the probability of performing a successful FB, adjusted for the other independent variables. From this model, an odds ratio with 95% confidence interval was calculated. Odds ratios were interpreted using Hopkins' benchmarks [28] considering 1.0, 1.5, 3.5, 9 and 32 as a trivial, small, moderate, large and very large effect size, respectively. Data were analysed using the software SPSS (version 21.0; IBM Corporation, Armonk, NY, USA), and the level of significance was set at $p<0.05$.

RESULTS

The FBs analysed in elite and sub-elite games showed a rate of success of 63.5% and 59.7%, respectively. The results of the univariate and multivariate regression analyses showed statistical significance ($p<0.05$) in the completion zone in both elite and sub-elite games (Tables 1-2).

Specifically, successful FB actions were more likely to be completed in the lane in both elite and sub-elite games with respect to unsuccessful FBs. The relative frequencies of occurrence of the FB executions referring to the total number, successful and unsuccessful FBs in elite and sub-elite games are shown in Table 3. FBs were

TABLE 3. Relative percentage (%) of the frequency of occurrence of the execution in total, successful and unsuccessful fast break actions in elite and sub-elite games.

	Elite			Sub-elite		
	Total (%)	**Successful (%)**	**Unsuccessful (%)**	**Total (%)**	**Successful (%)**	**Unsuccessful (%)**
Initiating action						
Rebound	39.6	36.9	44.4	43.8	37.1	53.5
Steal	55.4	58.2	50.6	53.4	59.0	45.1
Throw in	5.0	5.0	4.9	2.8	3.8	1.4
Initiating zone						
Lane	54.1	55.3	51.9	54.5	54.3	54.9
Baseline – ft line	13.1	10.6	17.3	15.3	9.5	23.9
ft line half court	23.9	24.1	23.5	23.3	27.6	16.9
Frontcourt	4.1	5.0	2.5	4.0	4.8	2.8
Out of bounds	5.0	5.0	4.9	2.8	3.8	1.4
Advance action						
Dribble	73.9	75.9	70.4	74.4	73.3	76.1
Pass	26.1	24.1	29.6	25.6	26.7	23.9
Advance zone						
Centre	72.1	73.0	70.4	60.2	61.9	57.7
Sideline	27.9	27.0	29.6	39.8	38.1	42.3
Completion zone						
Lane	73.0	85.1	51.9	74.4	84.8	59.2
Intermediate	5.4	3.5	8.6	5.1	2.9	8.5
Outside 3pt line	21.6	11.3	39.5	20.5	12.4	32.4
Number of players						
Superiority	57.7	62.4	49.4	56.8	59.0	53.5
Equal number	42.3	37.6	50.6	43.2	41.0	46.5
FB typology						
Primary	85.1	88.7	79.0	80.1	84.8	73.2
Secondary	14.9	11.3	21.0	19.9	15.2	26.8

similarly executed in both elite and sub-elite games. Moreover, most of the FB actions were played in superiority, and the main typology adopted was the primary break in both elite and sub-elite games (Table 3).

DISCUSSION

This is the first study to analyse the fast break activity in elite and sub-elite games in basketball assessing the determinants of the effectiveness of FB actions. The main findings of this study were as follows: 1) the completion zone is the main predictor of a successful FB in both elite and sub-elite games; 2) FB actions were similarly executed in elite and sub-elite games.

The FB is considered one of the most effective actions in basketball, allowing players to shoot more quickly and successfully when comparing it with a set offense [14]. It has been reported that 13.4% of the points were scored using FBs during the 2012-2013 season in the National Basketball Association [29], which is the men's professional basketball league in North America and is considered the world premier league. Furthermore, a previous study showed that elite teams performing more FBs won a greater percentage of their games [17]. Therefore, the FB can be considered a key element for elite teams in basketball to win a game. In this study we found that most of the FB actions were successful in both elite (63.5%) and sub-elite teams (59.7%), confirming the result previously reported in elite men's basketball games [18] where 73% of FBs were successful. The percentage of successful set offense actions in elite men's basketball games reported in a previous investigation [30] was also higher than unsuccessful actions (54.5% vs. 45.5%), but still lower

than that reported in FB actions in our study (63.5%). According to this consideration, the FB should always be selected as the first option during basketball games in both elite and sub-elite teams due to its effectiveness.

Previous investigations mostly studied FB actions only in elite games [17-19], de facto limiting the generalizability of results across different levels of competition. Moreover, no previous study has specifically analysed the variables predicting successful FBs. This is the first study to analyse the determinants of successful FB, showing that the completion zone is the most important predictor of successful FBs in both elite and sub-elite games. In particular, the FBs finishing in the lane were the most likely to be successful. This result was largely expected considering that actions finishing closer to the basket are more likely to be successful compared to actions finishing outside the lane or the three-point line. In fact, FBs are mainly executed with a reduced number of players, which creates a greater manoeuvre area for the offensive team in order to create an optimal space-time opportunity inside the lane. Moreover, this result confirms that reported in a previous investigation [9], in which in the middle thirty minutes of Spanish basketball professional league games the most successful FBs finished in the lane.

Surprisingly, in the current study, no other variables predicted successful FBs in either elite or sub-elite games. The number of players involved was a potential predictor of successful FBs, considering that one of the main aims of executing an FB is to outnumber the defensive team to score more easily. However, no statistical significance was observed in number of players involved, with small and trivial effect sizes in both elite and sub-elite games, respectively. The main reason for this result could be that although FB actions played with superiority could provide the possibility to score more easily, FB actions played with an equal number of players are also able to create easy shots. In fact, most of the FB actions played with an equal number of players were primary break (i.e. 1on1, 2on2, 3on3) and therefore were executed with a reduced number of players that could generate a greater manoeuvre area and create scoring opportunities.

The analysis of the execution in elite and sub-elite games showed that most of the FBs started in the lane (elite: 54.1% and sub-elite: 54.4%) with a steal (elite: 55.4% and sub-elite: 53.4%). These results confirm those reported by Tsamourtzis et al. [17] (47.6% and 49.1% of rebounds and steals, respectively), and Refoyo et al. [19] (32.2% and 59.4% of rebounds and steals, respectively). Conversely, Garefis et al. [18] reported different results (56.0% of rebounds and 41.0% of steals) in elite men's games. The reason for these differences might be the continually evolving nature of the game. The first two studies analysed games played more recently (2004–2008) than the third one (2001–2002 season). In fact, it has been suggested that the evolution of the game strategies and the optimization of the training process in recent years could be potential reasons for increased physical and physiological demands in basketball games [31, 32]. More specifically, the increases in the physical capacities of the athletes could contribute to a more aggressive basketball defensive system that produces more steals as FB starting actions.

The main FB advance actions and zones were dribble and centre, respectively, in both elite and sub-elite competitions. A previous investigation reported a contrasting result with a tendency to advance the ball closer to the sideline [19]. However, the same authors noted a higher success rate for FBs conducted within the centre zone of the court. Traditionally, basketball coaches teach players to advance the FB action through the centre zone to be able to keep both side zones as an option when trying to score a basket [14]. The higher rate of FBs conducted by the centre zone in both elite and sub-elite games could imply a more direct and quicker route to the basket.

The analysis of primary and secondary breaks demonstrated similar results to Ortega et al. [12] and Refoyo et al. [19], with primary breaks occurring more frequently than secondary ones in both elite and sub-elite games. The reason for this result could be that a primary break is the first and quickest solution during an FB that does not allow the opponents to organize a proper defence, while the secondary break implies a longer duration for the trailing players to enter the action. The longer time required to perform the secondary break could allow opponents to better organize their defence and effectively stop the FB action changing to a set offense situation. Thus, both elite and sub-elite teams may prefer the use of the primary FB solution than the secondary one. Moreover, the lower number of players involved during the primary break should benefit the offensive teams in scoring an easy basket due to the greater space of manoeuvre players have. Future research should specifically study the effectiveness of primary and secondary FBs.

From a practical standpoint, both elite and sub-elite basketball coaches should develop drills that specifically train FB actions. In particular, coaches should design offensive drills aiming to conclude the FB action in the lane and defensive drills aiming to protect the lane. The use of ball drills or small-sided games, which are useful to simultaneously develop players' physical capabilities and technical/tactical skills [33], would be useful for these purposes, in particular using overloaded and underloaded situations by means of floater players. Furthermore, in both levels of competition FB drills should start with steals or defensive rebounds, and the action should be developed on three lines, dribbling the ball in the middle one. Moreover, coaches of both levels of competition should prefer the training of the primary break, and optimize the training of the secondary break in order to make it as quick as possible, not allowing an organized defence. Finally, because FBs are so successful, coaches should also consider defensive strategies to prevent their initiation or to disrupt their execution.

One of the limitations of this study is that we did not consider the different game strategies adopted in the analysed games. Probably, playing against a zone-style defence would encourage more FBs to advance the ball before the zone defence can set up. In addition, another limitation is that we did not distinguish between winner and

loser teams in each considered level of competition. Winning teams would likely have a more efficient offensive system compared to losing teams, which could involve different variables as predictors of successful FB actions. Further studies should focus on the effectiveness and execution of FB actions in relation to different playing-style defences and be separately studied in winning and losing teams.

CONCLUSIONS

In conclusion, this study highlighted that completion zone was the only predictor of a successful fast break in basketball, while the number of players involved did not predict fast break effectiveness. Moreover, elite and sub-elite teams executed fast break actions similarly. These findings might be useful for basketball coaches to optimize the training of fast break actions.

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