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Discriminating Factors between Successful and Unsuccessful Teams: A Case Study in Elite Youth Olympic Basketball Games

Koon Teck Koh, Wang John, and Clifford Mallett

Abstract

Archival data was gathered from the FIBA33 games during the 1st inaugural Youth Olympic Games held in Singapore. Data collected from 70 basketball games played by boys from 20 participating countries were gathered for analysis. Analysis of game-related statistics and FIBA33 final rankings differentiated successful from unsuccessful teams. Ninety-five percent of the cases were correctly classified using discriminant analysis and in the cross-validation (leave-one-out method) the correct re-classification was 75 percent. Data triangulated from interviews and field notes were used to determine key factors contributing to team's success in the FIBA33 games. Results of the present study showed that players from the top 10 successful teams could be differentiated from those in the bottom 10 unsuccessful teams. The determining factors were taller, had better shooting percentages, played aggressively (i.e., recorded more team fouls and the ability to draw fouls on opponents during games). Coaches can use these results to improve player's recruitment process, reinforce the importance of fundamental skills such as shooting, individual offensive and defensive concepts under different game situations during trainings.

KEYWORDS: basketball, elite youth level, team success, game-related statistics, discriminant analysis

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Basketball has become a popular sport and attracts the interest of the general public, fans, scientists and sport experts in many ways (Pojskić, Šeparović, & Užičanin, 2009). It is a sport that provides exciting entertainment. Many studies have examined the performance of basketball teams at different levels of competition such as European Basketball Leagues, American NBA, FIBA World Championships and Olympic Games (e.g., Đurković, Gjergja, Marelić, Antekolović, & Rešetar, 2005; Gómez, Lorenzo, Sampaio, Ibáñez, & Ortega, 2008; Ibáñez, Sampaio, Feu, Lorenzo, Gómez, & Ortega, 2008; Karipidis, Fotinakis, Taxildaris, & Fatouros, 2001; Šeparović, & Nuhanović, 2008a; 2008b). Many of these studies sought to determine factors contributing to a team's success using game-related statistics during the finals games or over the course of a season. Different variables that correlate to a team's success have been identified (e.g., Ibáñez et al., 2008; Pojskić et al., 2009); for example, Ibáñez et al. (2008) tracked the Spanish Basketball League for two regular seasons. Games statistics of over 870 games in total were analyzed. The results showed that successful season-long performance may be determined by players' and teams' passing skills and defensive preparation. In another similar study, Pojskić et al. (2009) found that assists, parameters of shooters' field goal efficiency, defensive rebound, and number of points made by bench players were variables that made the most difference between successful and unsuccessful teams during the Olympic tournament in Beijing in 2008. The results also suggested that successful teams' performances are usually determined by: (1) the quality of players' fundamental physical skills, (2) the use of appropriate tactical strategies and decision-making, (3) adequate mental toughness and physical conditioning. The aforementioned research findings might be helpful for basketball coaches to plan and develop quality programs to prepare players for high level competitions in future. Hence, it is argued that effort in continuing the same line of research to identify factors contributing to successful basketball teams is warranted to advance our knowledge in competitions preparation, improve quality of coaching sessions and enhance players' performance in high level basketball competitions. An examination of elite youth teams might reflect some developmental differences.

The International Olympic Council (IOC) initiated the 1st Inaugural Youth Olympic Games (YOG) in 2008. The aims of YOG are mainly to: (1) promote Olympic values to young athletes, and (2) provide a platform for young athletes to gain high level competition exposure and realize their potential. The YOG received huge media attention globally after IOC announced the successful bid of the host country in 2008. The event was hosted by Singapore from 15 to 23 August 2010. Another unique feature of the YOG was that a number of sports and games underwent modifications to attract interest and promote youth participants' enthusiasm. One such modified sport was FIBA33, which was introduced by the International Basketball Federation (FIBA).

FIBA33: Modified Youth Basketball

FIBA33 is a modified game of the standard 5-on-5 basketball games. Each team consists of four players. Three players will be on court at all times with one reserve on the bench and one coach. The game is played on a half court with one basket over two periods of 5 minutes each. Most of the FIBA (5-on-5) rules regarding scoring and fouling were enforced. The first team scoring 33 points or leading the game after the regular game time is the winner. If the score is tied at the end of the last period, the game shall continue with as many extra periods of two minutes as is necessary to determine the winner. A player who has committed five fouls must leave the game. A team is in a penalty foul situation when it has committed four fouls in a period. The team must attempt a shot for a field goal within 10 seconds by making a minimum of two passes. Substitution is permitted when the ball becomes dead and the game clock is stopped. There are no time-outs granted to any team at any time.

The YOG FIBA33 basketball competition comprised 20 Girls' and 20 Boys' teams. The 20 teams from each gender were divided into four groups of five teams. A round-robin system was adopted for the preliminary games. Subsequently, placement game system was adopted to determine each team's final ranking at the end of the tournament. A total of 70 matches (for each gender) spread over 8 days were played. Every game was allocated 30 minutes and all games were played under covered shelters.

Purpose of the Study

Current research findings from high level basketball competitions (e.g., FIBA World Championships, Olympics Games and NBA) showed that a high successful percentage of field goals, rebounds (offensive and defensive), as well as strong bench players' contributions are critical determinants of a team's success in the standard 5-on-5 basketball games (e.g., Ibáñez et al., 2008; Pojskić et al., 2009). As mentioned earlier, FIBA33 is a modified game format introduced by FIBA for youth participants and, therefore, some rules and the playing area were different from the standard basketball games. Hence, it is plausible that the determining factors for successful elite youth teams in the FIBA33 competition might differ from that of standard elite senior basketball competitions. Moreover, there is no data available from the literature for this particular group of basketball players. Perhaps there are some developmental differences between youths and elite senior players in determining team success. The change in rules and court size might also impact upon key performance indices. Therefore, the purpose of the study was to identify the determinants for successful youth men's teams that participated in the 1st inaugural YOG. Furthermore, this study also sought to

examine the similarities and differences between team preparations (training and competitions) for FIBA33 and standard 5-on-5 competitions. The findings from the present study might inform player and team selection and preparation for future YOG competitions.

Methods

Participants

The participants were 80 male athletes representing 20 countries that qualified for the YOG FIBA33 basketball games. The players were aged between 16 to 17 years old ($M = 16.8$ years old) and their average height was 1.90 meters ($SD = 0.08$; $Range = 1.70$ to 2.11). Eight out of 20 possible coaches agreed to take part in this study. Their age ranged from 26 to 34 years old. All of them had at least four years ($Range = 4$ to 7 years) of coaching experience at the elite youth level.

Procedure

Before the commencement of the study, permission was obtained from the FIBA33 Competition Site Manager. Ethics approval has also been sought from the Basketball Association of Singapore to conduct the study. Following that, the Liaison Officers for the participating teams were briefed about the study. The first author approached the coaches and encouraged them to participate in the study. Coaches were informed about the aims of the study and advised that their participation was voluntary. A room at the competition site was reserved for the interviews, which were conducted immediately after the teams' finished games debriefs. Total time taken to conduct an interview was between 20 to 30 minutes. The participant coaches gave approval for audio-taping the interviews and transcribed verbatim for future data analysis.

Measures

Games-related Statistics. Performance statistics from all 70 games played by the 20 teams (males) were used for the present study. The YOG Competition Manager provided games statistics to the first author in hard copies one week after the conclusion of YOG. The game-related statistics gathered from the scores sheet included: (a) player average playing time/minute, (b) team points/game, (c) team shots/game, (d) team field goals percentage, (e) team shooting/game which included 2 points and 3 points shots, (f) team shooting percentage for 2 points and 3 points, (g) team free throw/game, (h) team rebounds/game, (i) team personal fouls/game, and (j) team turnovers/game. All variables were normalized

according to minutes played and transformed to z-scores. This transformation was carried out to provide a normative measure that best compares teams' performances (Ibáñez et al., 2008). Successful (Level 1 performance) teams were defined as those that were ranked from 1st to 10th place at the FIBA33 competition. Teams ranked from 11th to 20th place were classified as unsuccessful (Level 2 performance) for data analysis.

Interviews. Semi-structured interview questions were also used to gather qualitative data from participation coaches and FIBA experts to complement the quantitative games data. Some of the interview questions included: (a) What are the key differences between FIBA33 games and standard 5-on-5 games?; (b) What are the majors factors that a team should consider when preparing for FIBA33 games as opposed to standard 5-on-5 games?; and (c) What are the critical success factors for a team to do well in the FIBA33 games? The questions for interviews were constructed by the first author with the specific purpose of gaining a deeper understanding into 'what' and 'how' the participants' perceived the FIBA33 format (Patton, 2002). The questions were given to second and third authors for discussion and debate (Lindlof & Taylor, 2002). All the three authors agreed that the questions were appropriate in terms of their potential to elicit responses to the topic and areas under investigation (Miles & Huberman, 1994).

Data Analysis

First, we computed the descriptive statistics of the top 10 teams (Level 1) and bottom 10 teams (Level 2) according to FIBA33's final rankings. Next, we conducted two Multivariate Analyses of Variance (MANOVAs) and one-way ANOVA to examine the differences between the top and bottom groups of teams. In the first MANOVA, all the shooting percentages (team field goals, 2 points and 3 points field goals) were included as the dependent variables. In the second MANOVA, we used team average free throws, rebounds, fouls (team, personal, committed and received), turnovers, assist, steal and block shots per game as the dependent variables. In the one-way ANOVA, we examined the differences in height among the two performance levels.

In the main analysis, we conducted a canonical discriminant functions analysis to identify the key variables that best discriminate the top and the bottom teams. We used a cut off of ± 0.30 for the structure coefficients to interpret the discriminant function (Tabachnick & Fidell, 2007). The results of the discriminant analysis were cross-validated by using the leave-one-out method. This method involves generating the discriminant function on all but one of the participating team ($n - 1$) and then testing for group membership of that team. The process is repeated for each team (n times) and the percentage of correct classifications

generated through averaging for the n trials (Ibáñez et al., 2008). The statistical analysis was performed using SPSS software version 17.0 and statistical significant level was set at $p \leq 0.05$.

Interviews transcripts were content analyzed. The first author repeatedly read each transcript and significant statements relating to and illustrating the linkage across participants within the context of this investigation were highlighted and included in this paper. The statements were reviewed by the second author, which generated a discussion allowing both authors to agree on the key statements made in this study (van Manen, 1998).

Results

Descriptive Statistics

The descriptive statistics for the top 10 and bottom 10 teams are shown in Table 1. Results showed that the team field goal percentage for the top 10 teams was higher ($M = .35$, $SD = .03$) than the bottom 10 teams ($M = .28$, $SD = .05$). The top 10 teams as a group also recorded higher number of team personal fouls ($M = 8.74$, $SD = 1.25$) as opposed to the bottom 10 teams ($M = 7.28$, $SD = 1.41$). The number of ‘fouls on’ (create fouls on opponents) for successful teams was higher ($M = 9.20$, $SD = 1.20$) compared to unsuccessful teams ($M = 6.66$, $SD = 1.74$). It was also noted that players from the top 10 teams are taller ($M = 1.93$, $SD = .04$) than those from the bottom 10 teams ($M = 1.90$, $SD = .06$). It was worth noting that the number of rebounds reported by the successful and unsuccessful teams was very high ($M = 16.59$ and 15.79 respectively) compared to the standard 5-on-5 basketball games, though it was not statistically significant to a team’s success.

Table 1
Descriptive Statistics of the Teams by Achievement (Top 10 vs. Bottom 10)

	Top 10 Teams		Bottom 10 Teams	
	Mean	SD	Mean	SD
Team Field Goal Percentage	.35	.03	.28	.05*
Successful 3-point Percentage	.23	.04	.16	.04*
Successful 2-point Percentage	.40	.05	.32	.07*
Team Personal Fouls	8.74	1.25	7.28	1.41*
Team Assist	2.80	.92	2.13	.66
Team Free Throw Awarded	10.30	2.39	8.19	3.53
Team Rebounds	16.59	2.47	15.79	2.32
Team Fouls On	9.20	1.20	6.66	1.74*
Team Average Height (m)	1.93	.04	1.90	.06*

Note: * Significant level at $P \leq 0.05$

The results of the first MANOVA showed that there were significant differences among the top and bottom teams in shooting performance (Wilk's $\Lambda = .415$, $F(3, 16) = 7.51$, $p < 0.01$, $\eta^2 = .59$). Follow-up one-way ANOVA tests showed that shooting percentage for overall field goals, 2 points and 3 points percentages were significantly different between the top and bottom teams, with top 10 teams recorded higher percentage in successful shots (all $ps < .05$). The following excerpt from one of the successful coaches (Kelvin) during interview also supported the importance of having accurate shooting skill. He said:

Basketball is all about shooting and scoring ...We spent a lot of time working on individual fundamental skills, especially shooting in every training session. Players were exposed to taking shots under different difficult game situations to 'condition' themselves. It is one of the important skills I think players should master.

The results of the second MANOVA found marginal multivariate effect in all other statistics (Wilk's $\Lambda = .328$, $F(8, 11) = 2.82$, $p < 0.05$, $\eta^2 = .67$). Follow-up tests showed that significant differences were found in team personal fouls ($F(1, 18) = 10.66$, $p = 0.05$, $\eta^2 = .25$) and fouls on ($F(1, 18) = 32.39$, $p < 0.01$, $\eta^2 = .45$). Specifically, the top 10 teams recorded higher personal fouls and higher fouls on (drawing fouls on opponents), compared to the bottom 10 teams.

The results of the one-way ANOVA showed that there were significant differences in players' height among the two levels ($F(1, 18) = 7.92$, $p < 0.05$, $\eta^2 = .31$). Specifically, players from the top 10 teams were taller than those from the bottom 10 teams. It is worthy to note that having physical height alone might not be good enough to be successful. The following quote provided by a successful team's coach (John) provided strong support for this claim:

When we played the team with tall centre, we know the weakness of our opponents. He can only get rebounds... We defended him well during game. He is no threat to us...In the end, he has to be taken out of the game and rest on the bench for most of the time.

Table 2 shows the results of the canonical discriminant function analysis. The discriminant function analysis was able to classify 95% of the cases correctly and in the cross-validation (using leave-one-out method). The correct re-classification was 75%.

Table 2
Discriminant Function Structure Coefficients (SC) and Tests of Statistical Significance

Game Statistics	SC
Successful 3-point Percentage	.53*
Team Fouls On	.52*
Team Field Goal Percentage	.49*
Successful 2-point Percentage	.43*
Team Average Height	.39*
Team Personal Fouls	.34*
Team Assist	.25
Team Free Throw Awarded	.22
Team Rebounds	.10
Eigenvalue	2.95
Wilks' Lambda	.25
Canonical Correlation	.86
Chi-squared	18.56
Significance	0.05
Reclassifications	75%

Note: *SC discriminant value $\geq |0.30|$
 * Significant level at $p \leq 0.05$

In summary, the players of the top 10 teams could be differentiated by a height advantage, superior shooting percentages, an ability to draw fouls on opponents (fouls on), and be more aggressive during games (i.e., commit more team/personal fouls).

Discussion

The purpose of this study was to identify the key performance factors that separated the successful YOG basketball teams from the unsuccessful teams in the Singapore competition. By identifying the discriminating performance indices, we might be able to improve the process for players' selection and inform specific training programs to successfully prepare elite young basketball players for future YOG games and beyond. Findings of the present study will be discussed with reference to previous studies on successful and unsuccessful basketball teams at the international senior competitions (e.g., Ibáñez et al., 2008; Pojskić et al., 2009).

Factors Contributing to Team's Success

Results of the present study show that successful team field goal percentage (including 2 points and 3 points) is one of the key factors in determining a team's success, which is consistent with others studies on standard 5-on-5 basketball games (e.g., Ibáñez et al., 2008; Pojskić et al., 2009). In the present study, the 2 points and 3 points team field goal percentage for the successful teams was higher than the unsuccessful teams. The reason for the superior field goal shooting could be due to the 10 seconds time limit for shooting that requires the offensive team to make two passes before players could take a shot in the half court area. It is worth mentioning that having more field goal attempts might not necessary lead to a team's success. It is the ability to convert attempts to successful team field goals (2 points and 3 points) that differentiate the successful teams from the unsuccessful teams (e.g., Ibáñez et al., 2008; Pojskić et al., 2009). Hence, preparing young basketball players to shoot accurately under different game situations should be the key focus for coaches during training. Accordingly, coaches should work with players to set field goal targets (individuals and team) and monitor the progress on successful field goal percentage closely during trainings and competitions. Shooting drills should be designed and practice under different game situations to better prepared the players for the FIBA33 games.

It is interesting to note that committing more team personal fouls in the present study was a significant determinant associated with team success. During the FIBA33 games, it was noted that all teams employed 'man-to-man' defense during games. Man-to-man defense is a defensive strategy that required each player to follow a particular offensive player throughout the game. Such a strategy tends to give more pressure to the offensive team and force players to make mistakes (Isley, Koh, & Wang, 2008). Under such situations, the offensive players are required to read the game fast and make quick and appropriate decisions whether to shoot, dribble, or pass the ball to their teammates before the 10 seconds shot clock expires. Teams that are weak in man-to-man defense and offense are likely to commit higher team and personal fouls during games; therefore, helping young players to strengthen their individual fundamental skills such as defensive and offensive concepts are key areas of focus that coaches should do during trainings.

The top 10 teams from the present study committed higher number of team personal fouls and reported higher number of 'fouls on' (fouls received) than the bottom 10 teams during games. The results differed from those reported in earlier studies that a high number of team fouls might negatively affect the team's performance and outcome (e.g., Ibáñez et al., 2008; Pojskić et al., 2009). The reason for committing a high number of team fouls and receiving more 'fouls on' during offense is probably due to the view that the FIBA33 is a shorter and faster

game that requires different level of fitness, power and muscular strength compared to the standard 5-on-5 format (Zoran, Personal communication, 15 November, 2010). The offensive team has to make two passes, including sending the ball outside the 3-point line before they can shoot. Under such restrictions, players might have to use aggressive tactics during offense with a lot of 1-on-1 penetration lay-up shots, which could lead to an ‘easy shot’ such as a free throw (Pojskić et al., 2009). Hence, it is likely to increase the chances of having more team fouls (committed and received). Moreover, each player is entitled for five personal fouls in a short 10 minutes game as opposed to the standard 5-on-5 games where players have to sustain for 40 minutes with the same number of fouls allowed. Players in the FIBA33 games can afford to commit more personal fouls and yet be able to continue with the game without much disadvantage to the team. This strategy seemed to work well for the successful teams in the present study.

Another reason for high team personal fouls percentage might be due to the ‘maturity’ level of the players and their understanding of individual defense and offense concepts. Results of the present study suggest that some players might not be able to make appropriate responses, especially during defense, to avoid committing unnecessary fouls. While committing more fouls might not be the serious problem to an individual or the team in the FIBA33 games, it is certainly an issue that could potentially affect the outcome of a team’s performance at the higher level of standard 5-on-5 basketball competitions (e.g., Ibáñez et al., 2008; Pojskić et al., 2009). This is because in the 5-on-5 games, players are entitled for the same number of personal fouls as the FIBA33 games but they need to play for a longer period of time (40 minutes instead 10 minutes). If they committed more fouls during early part of the game (e.g., first 10 minutes), it might affect their playing time and the team’s performance might also be affected eventually. Moreover, most of the youth players from the FIBA 33 games might move on to represent their countries in the senior squad later on to participate in higher level of standard 5-on-5 basketball games. In this aspect, teaching and helping players to understand the proper individual defensive and offensive concepts should be an important task for coaches to work with elite young players. In addition, FIBA might want to consider reviewing the existing rule for personal fouls, i.e., reduce the number of personal fouls allowed for each player per game (e.g., from five to four per game) to discourage players from committing unnecessary fouls at the younger age.

During on-site interviews, one of the coaches reported that the short 10 seconds shot clock and two passes rules during offense have limited players’ ability to read and react to game situations appropriately. A lot of inappropriate decisions were made and rush shots were taken during games, which might not be good for young players’ development. The FIBA Expert coach (Mike) made the

same point when he was interviewed on the existing rules on young players' development. He felt that the 10 seconds shot clock and two passes rules for offensive team do not provide sufficient time for players to make sound decisions during games. Hence, FIBA might want to reconsider the current rule to allow more time for players to read and react to games situations – an important skill that would help them play competently at higher level of competitions in future.

The number of 'fouls on' (fouls received) reported by the successful teams in the present study was higher than the unsuccessful teams. These results suggest that players from the successful teams are likely to be stronger and more aggressive in terms of individual offensive skill. They are able to draw more fouls on opponents and likely to gain easy points such as from 'free throws' during games. Such offensive capability is likely to put the opponents in the disadvantage position, paralyze their offensive and defensive abilities, and lead to positive team's success.

Results from the present study revealed that players' height was found to be a significant factor contributing to a team's success. The top 10 teams were generally taller than players in the bottom 10 teams. These findings have important implications on recruitment and players' selection. Teams with taller players, good individual fundamental physical skills, the ability to penetrate the opposition and shoot or create shooting opportunities for teammates, and higher shooting percentage, are likely to be more successful. While height is an important determinant in a team's success, it is noted that having tall players with restricted skills might not necessarily be successful. Every player is important to a team's success. He must be equipped with strong individual fundamental skills and be able to contribute to the team's performance during games. For example, in the present study, the average height for the champion team was 1.97 meters, which was slightly shorter than the team in the 4th position with average height of 2.00 meters. One of the participant coaches (Nelson) reported that the critical success factor was that players from the champion team are active all-rounders and are able to contribute to the team's scores. They have the speed and superior one-on-one physical skill; they are fast decision makers and strong finishers. Accordingly, coaches should focus on looking at players' strong fundamental skills rather than just physical height alone when recruiting and selecting players for FIBA33 competitions. It was also noted in the present study that some teams played without traditional fixed individual roles, e.g., centre, guard and forward (Sampaio et al., 2006) and can still be successful.

In the present study, the number of team's rebounds (defensive and offensive) reported by the successful and unsuccessful teams was higher

compared to the standard 5-on-5 basketball games¹ though the result was not significant to a team's success. This finding contradicts those in previous studies, which showed that team defensive rebounds is one of the critical factors for success at standard 5-on-5 international basketball competitions (e.g., Akers, Wolf, & Buttross, 1991; Ibáñez et al., 2008; Pojskić et al., 2009). One of the possible reasons for the high number of rebounds reported in the present study might be due to the short game duration (10 minutes per game with 1 minute interval), and 10 seconds shot clock that promotes teams to take quick shots and gather more rebounds. Moreover, the modified game is played in a half court instead of full court. This probably promotes more shooting attempts for both teams. Accordingly, the number of offensive and defensive rebounds reported by the successful and unsuccessful teams was likely to be higher compared with the 24 seconds shot clock in the standard full court 5-on-5 games.

Limitations

While the current study shed some lights on the process of better recruitment of young players and prepare them for future FIBA33 games, there are limitations which warranted acknowledgement. First, the study only focused on elite male youth Olympic players between 16 to 17 years. Hence, the results cannot be generalized to other populations. Future studies might examine elite young female Olympic basketball players to determine whether the same discriminating factors in determining success are identical in a similar competition to advance our knowledge in this line of research. Second, it was noted through interviews with participant coaches that not all the participating teams are represented by their first string players due to domestic competitions or other commitments. Hence, the results might be different if all teams were represented by top players from the participating countries.

Conclusion

The purpose of the present study was to examine the differences in game-related statistics in discriminating successful from unsuccessful teams that took part in the YOG FIBA33 games. With the identification and perhaps understanding of the key factors contributing to successful teams' performance, it is anticipated that coaches might make use of the information to improve the selection process of players and guide the preparation plan to perform and excel in FIBA33 games. Results from the present study showed that having taller players with high

¹ Source provided by FIBA (2010, November) from the FIBA World Championship for Men games statistics. The results were converted from the regular 40 minutes games to an average of 10-minute games for ease of comparison purposes.

successful field goal percentage (2 points and 3 points), adopting aggressive offensive and defensive playing styles such as drawing more fouls on opponents, and committing more team fouls were the key factors that determined a team's success. Therefore, coaches should consider investing more time working with younger players on fundamental physical skills (e.g., shooting, aggressive individual defense and offense) under game-like conditions during training, which is likely to empower them to play effective basketball in future.

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