

## DEVELOPING INDEXES OF EFFICIENCY IN BASKETBALL: TALK WITH THE COACHES IN THEIR OWN LANGUAGE

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### Abstract:

Achieving a high level of performance in ball-game activities such as basketball depends upon (a) the technical skill level of the player within the team and of the whole team, and (b) the psychological, mental, and emotional edge over the opposing team. However, both coaches and players seem to emphasise the technical aspects of the game when preparing for a long-duration championship, a tournament, or a single game. The purpose of this study was to examine the correlational relationship among indexes of efficiency, technical and height variables and the final placing of a team in a 9-day championship. More specifically, two questions were raised in this study: (a) Is it possible to predict the final placing of a team based on its technical playing ability? and, (b) Is it possible to develop appropriate indexes to measure team ability and predict its final success? Based on the data obtained in the European Basketball Championship for teams under 19 years of age, two indexes of efficiency were developed. In addition, nine technical variables of the game of basketball were analysed. Spearman rank-order and Pearson product-moment correlations were used to examine the relationship between each index and variable and the final placing of a team, and the relationships between all variables. It was concluded that it was possible to use indexes of efficiency such as index of playing ability, and technical variables such as final scores and 2-point percentages, to predict the final ranking of a team. However, in order to promote the prediction process in ball-game activities it is recommended that researchers and practitioners develop multi-face indexes in which psychological, as well as technical, variables are considered.

**Key words:** indexes of efficiency, basketball, correlational analyses.

### ENTWICKLUNG VON EFFIZIENZINDEXEN IM BASKETBALL: MIT DEN TRAINERN AUF IHRER SPRACHE KOMMUNIZIEREN

#### Zusammenfassung:

Um ein hohes Aufführungsniveau in einem Ballspiel wie Basketball zu erreichen, sollen die folgenden Bedingungen erfüllt werden: a) ein hoher Grad der technischen Fähigkeiten einzelner Spieler, sowie der ganzen Mannschaft, und b) ein höherer psychologischer, mentaler und emotionaler Rand als die Gegnermannschaft. Doch, in der Vorbereitung auf einen längeren Wettkampf, oder ein Match, betonen Trainer, sowie die Spieler, vor allem die technischen Spielaspekte.

Das Ziel dieser Studie war, die Korrelationen zwischen den Effizienzindexen, technischen sowie Variablen der Spieler, Größe und der Tabellenposition einer Mannschaft am Ende eines 9-tägigen Wettbewerbs festzustellen. Die Studie befasste sich vor allem mit zwei Fragen: a) ob es möglich sei, aufgrund technischer Fähigkeiten einer Mannschaft, ihre Endtabelleposition vorauszusehen und b) ob es möglich sei, die zum Messen der Teamfähigkeiten geeigneten Indexe zu entwickeln und damit das Endresultat voraussagen zu können.

Aufgrund der Daten von der Basketballmeisterschaft Europas für Spieler unter 19 Jahren wurden zwei Effizienzindexe entwickelt. Außerdem wurden 9 technischen Spielvariablen im Basketball analysiert. Mittels der Spearman'schen Rangliste und Pearsonschen Produkt-Moment-Korrelationen wurde die Beziehung zwischen jedem Index, bzw. jeder Variable, und der Endposition, sowie die Beziehung unter allen Variablen geprüft.

Es wurde festgestellt, dass es möglich sei, die Effizienzindexe (z.B. den Spielfähigkeitsindex) und die technischen Variablen (z.B. das Endresultat und das 2-Punkt-Prozent) zu gebrauchen, um die Endposition einer Mannschaft vorauszusehen. Doch, um die Resultate eines Ballspieles besser voraussagen zu können, wird es vorgeschlagen, dass Forscher und Trainer multiple Indexe entwickeln, die die psychologischen, sowie technischen Variablen in Betracht nehmen würden.

**Schlüsselwörter:** Effizienzindexe, Basketball, Korrelationsanalyse

### Introduction

Achieving a high level of proficiency in ball-game activities such as basketball, soccer, and team handball depends upon (a) the technical skill level of an individual within the team and

of the whole team, and (b) the psychological edge, or as coaches call it "the spirit of the team" (Bird, 1986; Wooden, 1980; Wootten, 1992). The assumption which exists among coaches and players is that a combination of the two factors will result in a better team

performance, e.g., ranking high in a tournament or a championship. For that reason, any kind of preparation programme toward a full-length season, a single tournament or an international championship should include both technical and psychological components (Bompa, 1994; Martin & Lumsden, 1987).

It is believed among coaches that the technical skill level of a player within the team and of the whole team should be a major factor in designing practices (Christina & Corcos, 1988). Coaches spend a great amount of time on techniques, fundamentals, and skills in order to enhance learning and facilitate performance. Only after gaining experience with the fundamentals of the game are players exposed to tactics and team strategies (Bompa, 1994; Krause, 1991).

If so much time is spent on the technical skill level of a single player within the team and that of the whole team, then a few questions should be raised with respect to the heavy emphasis put on this aspect of the game: (1) Is it possible to predict the final placing of a team based on its technical skill level?, and (2) Is it possible to develop appropriate indexes to measure team ability and predict its final success? Providing answers to these questions should assist both coaches and the players in increasing their control over the contents of a single practice as well as a lengthy preparation program toward a game or a series of games. In addition, having the answers to these questions should increase the awareness and interest of coaches and players in the relationship between "what is done during practice" and "what is achieved after practice". In other words, coaches and players may be able to examine the effectiveness of preparation programmes in achieving a final placing in a tournament or a championship.

There have been some attempts in the literature to examine the correlational relationship between technical variables and indexes of efficiency which reflect achievement in the prominent technical fundamentals of the game, and the final placing of basketball teams (Furukawa, 1974; Lidor & Arnon, 1997; Spurgeon, Spurgeon, & Giese, 1980). One of the purposes of these studies was to investigate the contribution of the technical aspect of the game to the final success of a team.

In a recent study, Lidor and Arnon (1997) examined the correlational relationship between 12 technical variables, such as number of points achieved on offence, number of assists, and number of steals, and the final placing of basketball teams participating in the Second European Basketball Championship for teams under 22 years of age. It was found in this study that it was not necessary to excel in a majority of the technical variables of the game of basketball in order to be ranked higher in the championship. In fact, all 12 teams participating in the championship were ranked among the top three places in at least one technical variable. The team of Byelorussia, for example, which ranked first in the championship, excelled only in two technical measurements: number of steals (2nd place) and number of blocks (1st place). The best team in the championship did not rank among the top three places in any other technical aspect of the game. It was observed in this study that it was difficult to predict the final placing of a team based only on its technical achievements.

In an early study, Furukawa (1974) examined the usage of indexes of efficiency in basketball, such as the index of general playing ability (a multiplication of shooting success and positive and negative elements in basketball), and the index of shooting ability (the ratio between successful and unsuccessful shots made by the team) in predicting the final ranking of basketball teams participating in Tokyo and Mexico Olympic Games. In addition, Furukawa investigated the relationship between the height variable, which is assumed to be an important contributor to the final success of a basketball team, and the final placing of the teams taking part in these Olympic Games. Unfortunately, little normative data on height as well as other anthropometric characteristics of basketball players exist in the scientific literature (Ackland, Schreiner, & Kerr, 1997). Although it seems important to recruit tall players in competitive basketball, there is not enough evidence to claim that the "taller (player) is better" for achieving a team success.

It was found in Furukawa's study that there were correlational relationships between indexes of efficiency and height and the final ranking of the teams, however not as they were expected to be. Put simply, techniques

and height do contribute to the success that the teams achieved at the Games, but not as much as coaches and players would like to see these factors influencing the final achievement of their teams.

The indexes developed in Furukawa's study attempt to examine the contribution of some technical variables of the game to the final success of the team. Coaches and players in ball-game activities spend a great amount of time looking at statistical reports which emerge from the games' activity. In a typical situation, the coach is provided with a statistical report during the break between the first and the second halves of the game. He/she is provided with another report at the end of the game. The coach uses this statistical information while working with the players during the practices following the game. Furthermore, the coach would like to know if this information, which reflects the technical ability of the individual players within the team, and consequently the whole team, can assist him/her in predicting future performances of a single player and/or the team. Developing indexes of efficiency which reflect "what's going on during the game" are a familiar means for the coach, and thus can provide him/her with more in-depth analyses of the players' and the team's playing ability. Coaches can use these indexes as practical cases in demonstrating to their players what they did during a game, and more importantly, what they need to do to improve their performance in the next game.

An attempt was made in this study to further examine the utilisation of indexes of efficiency in basketball. More specifically, it was the purpose of this study to investigate the relationship among indexes of efficiency, height and technical variables in young basketball players. The data collected by Furukawa (1974) and Lidor and Arnon (1997) reflected playing ability of adult basketball players, e.g., elite Olympic players and international players at age 22. It was assumed that statistical information might assist coaches, particularly when guiding near-the-top players who had not yet gained enough skill level and experience. Both coaches and players can use indexes of efficiency and other technical variables of the game to effectively evaluate progress during practices. This information can assist coaches in better planning practices in order to assist their

inexperienced players reach another level in their lengthy developmental process. To achieve the summit and maintain a high level of performance in sport, any kind of instructional aid available should be used by the coach, teacher, and instructor (Schmidt & Lee, 1999).

For this purpose, the data obtained from the 1994 European Basketball Championship for male players under 19 years of age were analysed. Indexes of efficiency and correlational analyses were calculated on a variety of variables related to the game.

## Method

### Participants

One-hundred and forty-four basketball players participating in the final stage of the 1994 European Basketball Championship for teams under 19 years of age took part in the study. The championship took place in Israel and lasted for nine consecutive days. The players were aware of the fact that some "statistical measurements" concerning their playing ability were being recorded during each game of the Championship. The players and their coaches were naive to the purposes and the assumptions of the study.

### Procedure

Twelve basketball teams from all over Europe took part in the final stage of the European Basketball Championship for teams under 19 years of age. Each team played seven games in nine competition days. The teams played in sub-divisions during the first stage of the championship. The teams in each sub-division played against each other. At the end of this stage, the teams that ranked higher in their sub-division advanced to the quarterfinals. Those that won in the quarterfinals advanced to the semi-finals, and the two winning teams met each other at the final game of the Championship. The teams that ranked lower in their sub-divisions followed a similar procedure, however, only to improve their final ranking. Thus, the teams participating in this Championship did not play in a all-round competition system, but in a partial one.

A trained crew of observers prepared a statistical report on each team for each day of the championship, which included quantitative

information on the: (1) number of points scored by a team, (2) number of (total) rebounds taken by a team, (3) number of steals made by a team, (4) number of assists made by a team, (5) number of blocks made by a team, (6) number of turnovers made by a team, (7) percentages of success of free-throw shots, (8) percentages of success of 2-point shots, and (9) percentages of success of 3-point shots.

Statistical reports were collected for each game played during the championship. In other words, data were collected from all 84 games which took place in the championship. These reports were provided for each coach at the end of each game. In addition, all the reports were included in a book which was given to the coaches at the end of the Championship. The data analyses for the current investigation were conducted based on this volume of statistical data. This analysis was conducted only on the variables that were included in the indexes of efficiency. The rest of the variables were used to study correlational relationships among the technical variables of the game of basketball.

### Data Analyses

The data collected in this study reflected the technical ability of all players, and consequently the general playing ability of each team. Means and standard deviations were calculated for each technical variable of each team. Only 2 variables (i.e., turnovers and steals) among the technical variables collected in the study didn't have a normal distribution. However, all technical variables were correlated using Pearson product-moment correlations (Vincent, 1999). Based on these data, two indexes of efficiency were developed. These indexes reflected the concept of studying basketball performances of elite teams presented in Furukawa's (1974) study. The indexes used in this study are as follows:

(1) Index of playing ability = (C)

$$C = A \times B,$$

where

$$A = \frac{\text{number of successful shots}}{(\text{rate of supply}) - (\text{turnovers} + \text{violations})}$$

$$B = \frac{\text{rate of supply}}{(\text{rate of supply}) - (\text{turnovers} + \text{violations})}$$

where

$$\text{rate of supply} = \text{defensive} + \text{offensive rebounds}$$

(2) Index of shooting ability = (D)

$$D = \frac{\text{number of successful shots}}{(\text{num. of success. shots}) + (\text{num. of unsuccess. shots})}$$

The C index reflects the ratio between the positive and negative elements of the game of basketball. Positive elements are considered to be those which assist the team to gain advantage over the opposing team, such as successful shots, and defensive and offensive rebounds (i.e., total rebounds). Negative elements are game situations in which the team loses the ball or the advantage, such as unsuccessful shots, turnovers, and violations (i.e., 3-second and 10-second violations). The more positive elements the team achieved during the game, the higher the value of the index; the greater the gap between the positive and negative elements of the game (favouring the positive elements), the higher the value which reflects the general ability of the team.

The D index reflects the shooting ability of a team. Although this index is part of the C index, it is important to look separately at the shooting ability of the team. According to the leading coaches and instructors (e.g., Bird, 1986; Wissel, 1994; Wooden, 1980), shooting is considered as a central ability of playing the game. Ask someone what the main characteristic of playing basketball is, and the answer will probably be: "to put the ball in the basket". The D index is the ratio between the successful shots made by the team and the combined value of the successful shots and the unsuccessful shots made by the team. The lower the value obtained for the variable of unsuccessful shots, the higher the index of shooting ability.

By calculating the C and D indexes as well as other indexes, coaches are able to examine the contribution of different aspects of the game to the final success of the team. These indexes provide the coach with a general view of the actions which were taken by the players during the game.

The C and D indexes were calculated for each team. These indexes were correlated with three variables: (1) the final placing of the team, (2) the average height of each team, and (3) the technical components to be collected

Table 1: Summary of achievements of technical components for each team.

Team Variable	Final placing	Height	Total points	Total rebounds	Steals	Assists	Blocks	Turn- overs	Free throw %	2-points %	3-points %
Lithuania	1	1.96	587	279	28	44	23	13.29	71	50	39
Croatia	2	2.00	562	254	37	73	13	12.71	67	51	38
Spain	3	1.97	557	295	41	63	8	15.86	60	50	31
Italy	4	1.94	485	243	25	37	6	12.00	69	51	37
France	5	1.96	549	276	63	43	28	15.86	68	45	28
Greece	6	2.00	589	283	25	50	27	14.86	71	44	30
Slovenia	7	1.95	527	244	28	72	16	13.14	65	42	31
Russia	8	1.98	517	275	33	47	17	13.71	68	50	28
Turkey	9	1.97	465	267	33	41	7	14.71	58	44	31
Israel	10	1.94	452	234	58	53	14	13.29	60	41	28
Ukraine	11	1.96	533	283	47	45	13	14.29	69	41	29
Germany	12	1.99	443	228	34	39	11	18.86	66	42	31

during the 9-day championship. In addition, all other technical variables for each team, including the average height of the team, were correlated. The Spearman rank-order correlations were used to study the relationships between the final placing of the teams, the indexes of efficiency, and the technical variables. The Pearson product-moment correlations were used in order to examine the relationships among the technical variables collected during this tournament.

## Results

The results are presented in three parts. Part A presents the means of the technical variables which were collected during the European Basketball Championship for teams under 19 years of age. Part B presents the C and D indexes of efficiency which were developed based on the technical information obtained during the championship. Part C presents the correlational analyses of all variables. The correlational analyses are presented in the following order: correlations related to the indexes of efficiency and the final placing of the teams; correlations related to the variable of height; and correlations related to the technical variables.

### Technical Achievements of Each Team

Means of all technical variables which were collected throughout the championship are presented in Table 1. In addition, the final

placing of each team and the means of height are provided. The data are presented according to the final placing of the teams, i.e., the first team to be presented is Lithuania which took the first place in the Championship, and the last team to be presented is Germany which ranked as last. Based on these data, the C and D indexes were developed.

### The C and D Indexes of Efficiency

The index of playing ability (C) and the index of shooting ability (D) are presented in Table 2. The indexes are presented according to the final placing of the teams, as was the case in Table 1.

Table 2: C and D indexes for each team.

Final placing	Team	C	D
1	Lithuania	.46	.43
2	Croatia	.46	.47
3	Spain	.44	.40
4	Italy	.40	.50
5	France	.39	.40
6	Greece	.43	.43
7	Slovenia	.44	.44
8	Russia	.39	.41
9	Turkey	.37	.41
10	Israel	.36	.43
11	Ukraine	.38	.40
12	Germany	.36	.42

### Correlational Analyses

The Spearman rank-order correlations and the Pearson product-moment coefficients of correlations are presented in Table 3. As can be seen in Table 3, 16 correlational relationships among the variables, e.g., the indexes of efficiency and technical variables, were reliable. The other 62 relationships between the variables (including the height variable) were not found to be significant.

**Indexes of Efficiency.** The correlation between the C index and the final placing of the teams was significant,  $r = -.85$ ,  $p < 0.001$ . The correlation between the D index and the final placing of the teams, as well as the correlation between C and D, were not significant.

**Height and Other Variables.** The variable of height was not found to be significant with any other index or technical variable.

**Technical Variables.** Among the 36 correlations calculated, 6 were found to be significant. Among the significant correlational relationships were: the number of total rebounds and the number of points scored by the team ( $r = .72$ ,  $p < 0.01$ ); the percentages of success of 2-point shots and the number of assists made by the team ( $r = .70$ ,  $p < 0.05$ ); and the number of points scored by the team and the number of blocks made by the team ( $r = .61$ ,  $p < 0.05$ ).

### Discussion

An attempt was made in this study to examine the relationship between indexes of efficiency and technical variables in the game of basketball and the final placing of a team participating in a tournament. The main assumption was that these indexes are highly correlated with the final placing of the team. In other words, the stronger the technical skill level of a team, the stronger the chances that the team will rank high in a tournament or a championship.

To study the correlational relationships, statistical information was collected during the European Basketball Championship for male players under 19 years of age. This information included the final placing of the teams, the height of the players, and the technical variables of the game. The indexes of efficiency reflected the main technical components of the game of basketball.

The correlation between the C index and the final placing of the team was reliable. The C index included technical variables such as the number of successful shots, unsuccessful shots, defensive and offensive rebounds, turnovers and violations. This index reflected the balance between the positive and negative elements of the game of basketball. Logically speaking, the greater the gap between the positive and the negative elements of the game, the greater the rate of success achieved by the team.

Table 3: Coefficient of correlations among all technical variables and indexes of efficiency.

		place	score	rebound	assists	blocks	turn-overs	2-point shot	3-point shot	free throw	C	D
place	r	1.00										
	p	.										
score	r	-.72	1.00									
	p	0.008	.									
rebounds	r	-.36	.72	1.00								
	p	0.249	0.008	.								
assists	r	-2.52	.37	.00	1.00							
	p	0.430	0.242	0.989	.							
blocks	r	-1.58	.61	.34	-0.2	1.00						
	p	0.625	0.036	0.276	0.947	.						
turn-overs	r	.35	-.22	.03	-.29	.06	1.00					
	p	0.258	0.493	0.938	0.346	0.856	.					
2-point shot	r	-.62	.30	-.11	.14	-.16	-.43	1.00				
	p	0.033	0.345	0.745	0.655	0.625	0.160	.				
3-point shot	r	-.83	.81	.35	.70	.29	-.29	.55	1.00			
	p	0.001	0.002	0.236	0.012	0.361	0.356	0.066	.			
free throw	r	-.34	.52	.16	-.22	.57	-.17	.30	.25	1.00		
	p	0.276	0.080	0.627	0.493	0.054	0.600	0.344	0.431	.		
C	r	-.88	.81	.36	.63	.25	-.39	.64	.99	.31	1.00	
	p	0.000	0.001	0.252	0.027	0.426	0.206	0.025	0.000	0.328	.	
D	r	-.30	-.01	-.49	.18	-.25	-.63	.70	.26	.29	.36	1.00
	p	0.324	0.970	0.108	0.569	0.432	0.028	0.011	0.406	0.363	0.246	.



From a practical point of view, the C index can provide the coach with a broad view on the playing ability of the team. Because of the fact that both defensive and offensive components of the game are included in this index, the coach can use this index as one that provides him/her with the relevant information on the activity which occurred on both sides of the court. If the value of C is high, that means that the team achieves a high level of proficiency in defensive as well as offensive plays.

In this study, the best teams in the championship, e.g., Lithuania (first place;  $C = .46$ ) and Croatia (second place;  $C = .46$ ) achieved the best C indexes of efficiency among the 12 teams. In contrast, Germany, which was ranked last in the championship, achieved the lowest index of playing ability ( $C = .36$ ). Looking at Table 2, the better teams scored high in the C index while the low-ranked teams scored low in this index.

The D index was not correlated with the final placing of the teams. This means that shooting alone cannot predict the success of the team, no matter how talented the players are in this skill. Although coaches (e.g., Bird, 1986; Wooden, 1980) tend to emphasise the importance of the shooting skills among players, they are also aware of the other valuable aspects of the game. A high level of shooting ability can make the difference between losing or winning a game, but only as long as the team maintains a high level of proficiency in other components of the game, as was observed in the analyses of the data. In order to be ranked high in a championship, a team has to demonstrate a high level in rebounding and passing as well as in shooting. There are no "shortcuts" to achieving a high place in a championship. The players are required to demonstrate a kind of "general playing ability" and not only a one-dimension ability such as shooting. Coaches who carefully plan a preparation programme for a particular championship may rely on the usage of the C index but not the D index. Also, the players should realise that their success in achieving a high rank in a championship is influenced by a variety of factors, and not by only one dominant aspect of the game.

In this respect it was found that the height variable was not correlated with the final placing of a team. It is true that one of the beliefs among coaches and players is that the

"taller the team, the more chance the team has to win." However, as was the case with the shooting ability of the players (D index), height alone cannot guarantee a certain advantage in basketball. The findings reported in Furukawa's (1974) study support this observation.

The C and the D indexes were calculated based on the data obtained in the championship. Not all the teams played against each other in this championship. Thus, both the C and the D indexes can be considered as relative indexes of efficiency. According to Jošt, Dežman, and Pustovrh (1992), the correlational relationships between the teams' efficiency and the final placing of the teams are stronger when all the teams play against each other. In addition, the correlational relationships are stronger when the number of games played by each team is higher. Because of the fact that in most of basketball championships as well as in other championships of ball-game activities not all the teams play each other, it is suggested to interpret carefully indexes of efficiency such as the C and the D. If all the teams play each other, then a more valid interpretation can be obtained.

The correlational analyses between the technical variables and the final placing of the teams, and among the technical variables of the game, did indicate some reliable relationships. These relationships can provide useful information both for the coaches and players, upon which the fundamentals of the game should be focused. There are too many technical fundamentals in basketball, and coaches may not be able to spend an equal amount of time on each one. Thus, if more time is spent on certain specific technical variables, the total playing ability of the player and the team could be improved.

Three cases are discussed within the correlational analyses of the technical variables. First, the more rebounds (defensive and offensive) a team took, the more points a team scored. In order to score more points than the opponents, players have to gain the possession of ball. One of the ways to do this is to take rebounds on both sides of the court. The more rebounds the team makes, the more chances they have to set the offence (while taking the ball in a defence position), and to increase the chances of scoring (while taking the ball "under-the-basket" of the opponent's

zone). Based on this observation, coaches should spend a certain amount of time on rebounding skills, and should consider the rebound as one of the important keys for gaining advantage over the opponent.

Second, the more assists a team passes, the higher the number of successful 2-point shots. Many coaches try to emphasise a "teamwork" approach during practices. They consistently claim that it does not matter who is scoring; the most important thing is to assist the player who is taking the shot to be in the best shooting position. To be in the ideal position will enable the shooter to aim more effectively at the rim, thus increasing the chances of taking the shot. A team which emphasises orientation of team approach in offence increases the number of assists which are made in offensive plays, and presumably, the chances of scoring.

Third, the more blocks a team makes, the more points the team scores. Although there are many factors which can potentially influence the ability of the team to score, it seems that blocking has a significant psychological impact on both teams. The team of a player who blocks a shooting attempt made by one of the opponent players becomes aroused and psyched-up. The team which loses the ball is upset by giving up an easy chance to score. It is assumed that this unique temporary psychological situation is of benefit for the team which made the block and is in position to score.

There are other interesting correlational relationships in Table 3. For example, there is the reliable coefficient of correlation between the final placing of a team and the scoring variables, namely the 2- and 3-point shots. The better teams in the championship scored more points than the less talented teams. In addition, the better teams shot more accurately than the lower ranked teams. To maintain consistency during a championship that lasts a few days, a team has also to shoot well. However, as was argued before, shooting alone cannot guarantee success: teams should excel in other components of the game to achieve a high rank in a championship.

The correlational analyses conducted in this study can provide the coach with a picture of some of the technical contributions to the final success of the team. The C index appears to be the strong mathematical equation to assist coaches in evaluating the strengths and weaknesses of their teams. The C index can also be implemented to predict the final placing of the team. If the coaches add the other relevant technical variables of the game of basketball to the C index, e.g., total rebounds and scoring, they may increase their knowledge of what should be done during practices in order to achieve greater success in a championship, a tournament, or a single game. Moreover, coaches can use this information as part of any other evaluation system (e.g., Swalgin, 1998) that they usually use during practices and games.

For example, coaches may be aware of what is expected from their teams at the technical level of the game. Table 4 presents a team profile of the 9 investigated technical variables and the 2 indexes of efficiency; these values are the means of the variables observed in this study. In order to achieve a high level of proficiency in such a championship, a team should obtain these values for a single game.

However, there are other factors to be considered when attempting to predict a final success of a basketball team. These factors have nothing to do with the technical ability of the team. Michael Farber, a journalist in the famous American weekly magazine "Sports Illustrated", has claimed that "sports can be painted by numbers, but games are also a laboratory of human behaviour. Of courage. Of sacrifice. Of leadership" (1990, p. 80). In this respect, it is suggested that the "hidden" aspects of the game, e.g., mental, psychological, and emotional processes of the individuals within the team and of the team itself, can provide more in-depth information to the coach. These processes can assist the coach in predicting the final place of teams in ball-games activities in general, and in basketball in particular. A team can be tall, fast and have a high level of shooting ability, but these factors alone cannot guarantee success.

Table 4: Average performances of a basketball team for a single game.

heights	total points	total rebounds	steals	assists	blocks	turn-overs	free throws	2-point %	3-point %	C	D
1.97	74.60	37.63	5.38	7.23	2.18	2.05	66	46	32	.41	.43



Furthermore, coaches and players often argue that their teams do not have enough natural talent and skilled technical ability to win. The "spirit of the game" might enable them to fulfil their potential and even to reach a higher level of performance than predicted (Martin & Lumsden, 1987; Singer, 1986). Broad indexes of efficiency can provide useful guidance information for coaches. In addition to the technical evaluation of the team, understanding the psychological edge of the

team may enable them to predict the final placing of their team with greater confidence.

Researchers and practitioners who are interested in ball-game activities may put more effort in developing indexes of efficiency which include not only the technical but also the psychological variables. If a multi-face index could be developed, then prediction processes in ball games would be more frequently realised.

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