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## Does Effectiveness of Skill in Complex I Predict Win in Men's Olympic Volleyball Games?

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# Does Effectiveness of Skill in Complex I Predict Win in Men's Olympic Volleyball Games?

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## Abstract

The aim of the present study was to present the playing characteristics of the teams in complex I and to attempt to determine which of these characteristics led to victory and to the final ranking of the teams. The subjects were 38 Olympic Volleyball men's games. In every game, teams were characterized according to the result of the game (win or lose). The games were video-recorded and analyzed with the "Data Volleyball Project Sport Software" program. It recorded every skill of the complex I of the game, for each player of each team. There was a five level scale protocol according to the effectiveness of the skill (Eom & Schutz, 1992; Eom, 1989). Discriminant analysis was conducted to select which subset of the measured variables significantly contributed to the prediction of winning or losing in Olympic Volleyball teams. Among the five variables of service-reception: two variables "best reception, 1st set attack" and "Good reception, high set attack" were entered into the final model yielding, standardized coefficient 1.22 and .78 respectively. Among the five "attack from reception" categories, only one variable, "ace-point" was selected to enter into the final model. These results conclude that the "best" and "good reception" and the "ace-point" in the attack remain powerful aggressive tools for high level teams and were predictors to win.

**KEYWORDS:** volleyball, team performance, statistical analysis, complex I

## Introduction

The evaluation of individual and team performance by means of statistical analysis of the game is a very important factor that has helped considerably in the development of the sport of volleyball. The information provided to the coach by the statistical analysis when his team is being recorded assists in determining the advantage or disadvantage of a player or the team, in providing feedback to the players after the game regarding their performance, in encouraging the players to set personal targets, in assuring the players during time-outs and between games on whether they played well or not, in providing tangible data to the coaches' feel of the game, in designing future training sessions, in developing personal and team performance following each game, mid-season or at the end of the season and in providing the field for positive comments in press announcements (Byra & Scott, 1982). The game analysis is a significant source of information for the mass media as well as for informing the public of the players' and teams' performances.

Every coach envisaging his team as being amongst the top teams of the highest level in the world must implement this high level in detail. It is necessary for him to measure and compare the performance of his team against the performance of top teams in every detail, which should be estimated in an objective way. The evaluation of a player or the team must be attributed in simple mathematics and the data that the coach will collect must be transformable into numbers that will portray the performance in comparable parameters.

It is well known that videotaping matches are more benefited than taking notes simply because video can be reproduced. This gives the ability to the researchers to analyze the matches part by part taking different elements/criteria each time. Using video for recording matches is a wide spread method of statistical analysis and evaluation of players' performance. The use of video in combination with P.C. is an effective method to evaluate actions and movements of athletes by direct observation in team or individual sports (Sfingos, 1998).

Another main purpose of match analysis in coaching contexts is to provide augmented feedback to players. Computer-based systems combine quantitative performance data with video images. These systems can be fit for use with any sport using performance indicators of interest to the coaches and players. Video sequences can be provided in two ways; interactively through the match analysis system or as a stand alone edited movie. The statistical information provided by the systems can identify areas that require attention such as possessions losses, but observation of the relevant sequences allows the coaches to identify exactly why possessions are being lost and then this can be properly addressed in practice with the players (O'Donoghue, 2006).

There are different methods of recording and analyzing the game, some of which are considered as correct while others as incorrect (Franks & Miller, 1986; Miller, 1988). Many years before there was the notational analysis through live observations, but now the most popular method is the observation and evaluation, based on the subjective estimation of games, through video recordings and statistical analysis. Every method of video recording and analysis could be considered as appropriate if the way of recording being dependent on the aim of the analysis.

When a large number of data from playing actions is available, one can estimate the parameters of personal and team performance by using mathematical statistics. In general, the outcome of an action can be easily observed and evaluated. Normally, the sum of a player's actions constitutes his performance while the sums of the actions of all players constitute the performance of the team (Baacke, 1982). In order to simplify the analysis of the game, only the actions involving the ball are recorded since in Volleyball these actions influence the score to a much wider extent than actions not involving the ball.

Subjective observation, evaluation and measurement of performance in team sports is a very difficult task because the performance of the players or teams is characterized by a large number and variety of different playing actions by the complexity of playing actions, by the double nature of playing actions being both personal and team actions, and by the relation between playing performance and the opponents' performance. Therefore, the scientific measurement of the playing performance in Volleyball games by means of a direct mathematical method is not feasible. Only part of the performance can be examined objectively and the coach will try to find the appropriate method, which provides him with the values and data that approximate the performance of the team and his players (Baacke, 1982).

The volleyball game can be characterized as an integrated playing action that consists of six elements: service, service reception, pass, attack, block, defense (Bertucci, 1979, Fraser, 1988). Quantitative analysis is not something new in the field of volleyball and numerous studies employed some type of catalogue or a check list in order to collect data regarding the elements of the game (Baacke, 1982, Byra and Scott, 1983, Ejem, 1980, Eom and Schutz, 1992, Sawula, 1977, Vojik, 1980). These studies used a numerical scale of five gradations in order to attribute the quality of each element. Later on the data were analyzed under different methods depending on the principal aim of their use, such as to represent the frequencies of appearance of certain elements or to compare performances between teams or to research the relationship between team performance and the success it accomplished in a tournament (Cox, 1974, Ejem and Horak, 1980, Nishijima and Matsuura, 1988).

There are many research articles in Volleyball based upon the video analysis (Zetou, Papadimitriou, Paschali, & Gourgoulis, 2004; Hughes & Daniel, 2003; Lee & Chin, 2004; Afonso, Mesquita & Palao, 2005). Laios & Kountouris, (2005) using video analysis, compare the effectiveness of the five principal skills in men's Volleyball (serve, reception, attack, block and dig) between the Sydney and the Athens Olympic Games and examine how the observed changes are connected with the implementation of the new rules in Volleyball. The findings revealed a universal tendency of the elite men's volleyball teams to enhance their defence by reducing their block and dig faults. On the contrary there was an increase of the reception faults as a result of the improvement of the service effectiveness. The above changes reflect the teams' shift of tactics to win more points from their own serve. This tactical development became more imperative after the introduction of the rally-point system, which reduced the number of points played per set, and hence the teams' opportunities of gaining the minimum two-point advantage in order to win the set. Nonetheless, the Athens gold-medalist team of Brazil showed, remarkable reception effectiveness which led to an outstanding attack capability, thus reestablishing the attack as the most important skill in volleyball.

In order to facilitate the evaluation of a team performance, the elements that play a key role in the way each team's game is organized should be weighed in regard to complex I (serve reception, setting, attack) or complex II (serve, block/defense, counterattack) (Frohner and Zimmermann, 1996). According to complex I, the team is trying to gain a point by direct first attack. It is therefore, crucial for the team to play an offensive and effective game. During the series of actions, service-reception, set and attack, every action aims at exerting pressure to the opponents by using all available weapons in attack (winning the point), at gaining the advantage by winning a direct ball, or pressing the opponent defense to save the ball and creating as easy as possible counterattack. The aim of gaining the point is achieved by restricting the attacking possibilities of the opponent so as to enable the forming of a strong and effective block. Zetou, Tsigilis, Moustakidis & Komninakidou, (2006) through video analysis, present the playing characteristics of the teams in complex II and attempt to determine which of these characteristics led to victory and to the final ranking of the teams using discriminant analysis. The results conclude that "ace" in service and in counterattack remain powerful aggressive tools for high level teams and were predictors to win.

The aim of this study was to present the playing characteristics of the teams in complex I and to attempt to determine which of these characteristics led to victory and to the final ranking of men's Olympic Volleyball teams.

## Method

### *Subjects*

The subjects were 38 Olympic Volleyball men's games, (in 76 recordings because every team was recorded separately in every match). In every match, teams were characterized according to the result of the game (win or lose).

### *Instrument*

A video camera SONY was used and a laptop with the "Data Volleyball Project Sport Software".

### *Procedure*

The games were video-recorded and analyzed with the "Data Volleyball Project Sport Software" program. It recorded every skill of the complex I of the game, for each player of each team. It was chosen the service reception skill and the first attack. The only limitation of the study was that there was not recording of set, because it is difficult for the observer to be objective in evaluating the setter's set. There was a scale protocol according to the effectiveness of the skill (Table 1). The video camera was placed 10 m behind the final line of the court. In table 1 are presented the gradations for every skill.

**Table 1:** Recording protocol

<i>Skill</i>	<i>Effectiveness</i>
<i>Reception of service</i>	Lost = 0 Bad reception, directing to opponent court=1 Not so good reception, away from setter, or high set from other player=2 Good reception, high set attack= 2 Best reception, 1 <sup>st</sup> set attack = 4
<i>Attack from reception (first attack)</i>	Lost = 0 Block in = 1 Counter attack from opponent= 2 The opponent only pass the ball = 3 Ace-point = 4

The protocol was created by the main author of this study who had volleyball as a major and a high level volleyball coach who also trained the observer. After the protocol creation, the reliability of the classification procedure was examined. Inter observer reliability was evaluated by two observers under stable conditions, in four games which were randomly selected. A significant

correlation (Spearman) between the two classification actions (Spearman's  $\rho = .86$ ) was found. Four other games were also randomly selected and analyzed a week later by the same observer, to examine temporal stability of the classification. The correlation (Spearman) between the two recordings of the observer was high (Spearman's  $\rho = .92$ ).

#### *Statistical analysis*

Discriminant analysis was used to examine the contribution of volleyball playing actions to the game outcome (win – lose). Categories for each skill (element) of the complex I were entered into the analysis separately as independent variables (Zetou, Tsigilis, Moustakidis & Komninakidou (2006). Two separate discriminant analyses were performed, one for variables of the “service reception” and one for the “attack from reception” variables. The stepwise method of variable enter to the model was used. Estimation of the correct membership was based on “the leave-on-out classification” (or “jackknife”) procedure, which provides a more realistic prediction. According to that procedure each case is classified based on the functions derived from the remaining ( $n-1$ ) cases. Stevens (1992) argued that this classification procedure should be employed for small or moderate samples. All analyses were conducted using the SPSS ver.11. The “alpha” level was set to .05.

## **Results**

Application of the discriminant analysis using the five categories of the “service-reception” playing element revealed one significant function, Wilks'  $\Lambda = .862$ ,  $\chi^2 (2, N = 76) = 10.87$ ,  $p = .004$  (Box'  $M = .541$ ,  $p = .913$ ). Two variables “best reception, 1<sup>st</sup> set attack” and “Good reception, high set attack” were entered into the final model yielding, standardized coefficient 1.22 and .78 respectively. These variables were able to classify correctly 68.4% of the original groups' cases (52/76).

Predicting game outcome from the five “attack from reception” categories resulted in one significant function, Wilks'  $\Lambda = .823$ ,  $\chi^2 (1, N = 76) = 14.30$ ,  $p < .001$  (Box'  $M = .006$ ,  $p = .941$ ). One only variable, “ace-point” was selected to enter into the final model. Based on that variable 67.1% of the original groups cases were classified correctly (51/76).

## **Discussion-Conclusion**

This study examined the performance of Olympic Volleyball teams in complex I and tried to determine which elements led to the victory as well as the final teams' ranking. The results of the discriminant analysis identified there are three elements that were significantly discriminated for the game outcomes. For

service-reception skill, the best predictor was receiver to be able to make a best reception, so as setter could set a first tempo attack, or/and a good reception so as setter could set a high set in the outside hitter in zone 4 or 2.

As far as the other elements concerned the direct point from first attack, “ace-point” was the most determinant predictor for teams to win in complex I. The results concluded that a “best” and a “good” service reception remained the main condition for setter, in organizing a powerful attack and thus win the point. The same occurred in first attack where the more organized it was the more powerful and effective it become. Of course the base of a well organized attack was a good service reception which required well-practiced receivers, especially capable libero, but the attackers’ ability to attack all the balls effectively, were also remained a power weapon for the team.

Therefore coaches should spend most of the training time in practicing receivers and especially libero in service-reception, with many repetitions. Also, they should teach players the tactics of service reception in every line up and also the development of attack (offensive tactics with combinations).

Today, after the introduction of new rules, reception from above is a new technical component, which helps a larger reception sector to be covered. In floating serves, reception occurs principally in the two-man line-up, and in jump serves, mainly in three-man line-up with back court players. All reception players must be in the position to connect reception actions (of floating and jump serves) with subsequent attack actions primarily from the back court. Setters are leaders with good tactical and strategic capabilities. They have high quality and precision in setting high sets with different techniques (one-hand sets, delayed sets, sets with quick twists of their body, etc.). They also have large flexibility in the deployment of players (change of the variations and/or of the attackers) taking into account the effectiveness of the attackers. Setters many times use short sets for back court attacks in position 1 or in position 6.

As far as the first attack concerned, coaches should practice their players both individually and as a team so as to be able to accomplish strong and difficult attacks and also to use combination in order to avoid the opponent’s block. The attack in nowadays has become a complex and effective weapon so as the team to become more power. The choices of the setters’ set has increased; there are not only the three front zones but also could included the 1 or 6 zones. Individual performance capability should be increased through mastery of a wide repertoire (in approach, jumping and shots technique) with variables shots, completed also in the deep court. Strong attacks, with striking power and aggressiveness should alternate with soft, placed and deliberate shots. Attackers should always be ready and able to make an effective attack no matter the set or the tempo of the set is (tempo 1, semi-high sets or high sets). Outside attackers should also be able to play with the hands of blockers.

These results showed that one team action (service reception) and one individual's action (attack) are the main factors that predict whether the teams will win or lose in complex I. Therefore coaches should use a variety of individual and team complex drills to practice their players in as much representative and competitive situations as possible.

For future research we suggest to record and evaluate the setter's set, in order to correlate with effectiveness of the attack, so as to exact more useful results for coaches, because in the real game there is a direct relation with setter and attackers. Setters influence and play strategies and thus they are responsible for their implementation.

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