

SITUATIONAL EFFICACY OF TOP CROATIAN SENIOR BEACH VOLLEYBALL PLAYERS**Marko Šimac, Zoran Grgantov and Mirjana Milić***Faculty of Kinesiology, University of Split, Croatia**Original scientific paper***Abstract**

The aim of this study was to determine the significance of differences between successful and less successful beach volleyball players in the quality of performance in 6 basic technical and tactical elements, i.e., phases of the game: service, serve reception, setting for the spike, spike, block and field defense. To collect data, 35 matches played in two tournaments of senior men's Croatian Club Championship in beach volleyball were analysed from video recordings. The quality of performance of technical and tactical elements was estimated on a scale from 1 (a mistake in performance) to 4 (ideal performance). Based on the collected data, coefficients of efficacy were calculated for the analysed phases of the game. The lowest coefficient values were found in efficacy of the service (2.21) and block (2.62) phases, and the highest in the phases of the setting for the spike (3.49) and serve reception (3.28). Situational efficacy of volleyball players was estimated based on team placement in competition and the status of players within a team. By the criterion of situational efficacy, players were divided into two groups: less successful and successful players. By analysis of variance, it was found that successful beach volleyball players had significantly higher coefficients of efficacy in comparison to the less successful players in all 6 analysed phases of the game. The most pronounced differences were found in the phase of setting for the spike, serve reception and spike. The obtained results point to the importance of quality performance of all phases of the game in beach volleyball, and especially those that are performed in the attack complex.

Key words: *Croatian Club Championship, coefficients of efficacy, successful and less successful players, analysis of variance.*

Introduction

Beach volleyball is a sport played by two teams of 2 players, without any substitutions, on a 16 x 8 m court. At the 1992 Olympic Games in Barcelona it was played as a demonstration sport, and only 4 years later in Atlanta it was included in the official programme of the Olympic Games. The teams are separated by a net – 243 cm high for men, and 224 cm high for women – and the playing surface is purified and levelled sand 30-50 cm deep. The winner in beach volleyball is the team which is first to win 2 sets, which are played to 21 points, or in the case of a tie score, until one team achieves a 2-point lead. A possible third deciding set is played to 15 points. Beach volleyball consists of 6 basic phases of the game: serve reception, setting for the spike (in attack and counterattack), spike (in attack and counterattack), service, block and field defense. These phases are repeated in certain rhythm during the game. To win in beach volleyball, it is necessary to successfully perform all technical-tactical elements in separate phases of the game in attack and counterattack (Grgantov, Katić & Marelić, 2005). Monitoring players' performance efficacy in those phases during the game (alive or via video recording) is called notational analysis (Hughes & Franks, 2004). Today, notational analysis is an accepted technology of monitoring sports efficacy and it is widely applied in professional sport, including indoor volleyball (Cox, 1974; Eom & Schutz, 1992; Zhang, 2000; Marelić, Rešetar & Janković, 2004; Costa, Ferreira, Junqueira, Afonso & Mesquita,

2011; Rodriguez-Ruiz et al., 2011; Inkinen, Häyrinen & Linnamo, 2013; Penna, Rodríguez-Guerra & Serra, 2013). When gathering data in volleyball, different scales are used in which the quality of performance is evaluated at 3-5 levels. Marcelino et al. (2008) and Drikos, Kountouris, Laios & Laios (2009) proved that coefficients of efficacy as composite variables are better predictors of situational efficacy, as compared to using each level of efficacy in different phase of the game as separate variables. Other studies on indoor volleyball (Marelić et al., 2004; Zdražnik, Marelić & Rešetar, 2009) have confirmed the quality of this approach. However, there have not been many investigations in beach volleyball in which coefficients of efficacy were used in separate phases of the game to determine the differences between successful and less successful players. Giatsis & Thesis (2003) used indices of efficacy but only in phases of complex 1 (serve reception, setting for the spike in attack and spike in attack). In contrast, Grgantov et al. (2005) and Michalopoulou, Papadimitriou, Lignos, Taxildaris & Antoniou (2005) analysed the differences between the winning and the defeated teams in all phases of the game. However, all these studies were conducted just after the new rules in beach volleyball had come to effect in 2001, when the court was made smaller and the scoring system was changed. Further studies are necessary to determine whether some sort of players' adjustment to the new rules has led to changes in

the importance of performance quality of separate phases of the game for competitive success in beach volleyball. Thus, the aim of this study was to determine the significance of differences between successful and less successful beach volleyball players in the quality of performance of 6 basic phases of the game: service, serve reception, setting for the spike, spike, block and field defense.

Methods

The data for this study were collected in the summer of 2014, during two tournaments of the senior men's Croatian Club Championship in beach volleyball. Five clubs, i.e., 36 players played in these tournaments, playing the total of 91 sets in 40 matches. Each club at the championship played all others twice, i.e., two rounds. In each match-up the clubs played two matches to 2 won sets. If both couples of the same club won match-up, the club won two points, and if they won one match and lost one match, they won 1 point, and if they lost both matches, they won zero points. The points were summed and the winner was the team that won most points at the end of both tournaments. One person gathered the data. The data were gathered from video recordings of each match. The matches were recorded by high resolution cameras that were set up in positions suitable for recording without interference. Six technical-tactical elements in beach volleyball, each of which has four levels regarding the quality of performance, represented the set of independent variables (24 variables overall).

The technical-tactical elements are as follows: Service, Serve reception, Setting, Spike, Block, Field defense. Four levels regarding the quality of performance of technical-tactical elements were as follows: "Ideal performance" – results in the best possible situation for the team in the case of serve reception and field defense, i.e., directly winning a point in the case of spike, service or block; "Good performance" – does not result in directly winning the point, but it ensures an advantage for the team in relation to the opponent in further rally; "Inadequate performance" – the team that performed the action is in inferior position in relation to the opponent in further rally; "Mistake in performance" – results in losing a point. The data that were filled in during the matches in the forms that had been prepared beforehand, were imported into the "Statistica 10" software package in which the data analysis was performed. Data analysis was conducted by first calculating the coefficients of efficacy for the 6 phases of the game. The values of these coefficients were from one to four, and they were calculated by multiplying the ideal performance of each element by four, good performance by three, inadequate by two, and performances with mistakes by one. The obtained value was divided by the total number of performances of each element. Such data were transformed to the interval scale and were suitable for parametric procedures if their distribution did not deviate significantly from normal distribution.

Sensitivity was then tested on the coefficients of efficacy obtained in such manner, and then basic descriptive indicators of the analysed variables were calculated. The differences between successful and less successful beach volleyball players in coefficients of efficacy of the 6 phases of the game were analysed by analysis of variance. The dependent variable in this study represents players' competitive efficacy. Efficacy was defined based on 2 criteria (Table 1): *Team placement in competition* and *Players' status within a team*. All players who were assigned scores 6, 5 and 4 were categorized as successful, and the players who were assigned scores 3, 2 and 1 were categorized as less successful.

Results

The results of descriptive statistics: arithmetic mean (AM), median (M), minimum (Min) and maximum (Max) values, and standard deviations (SD) of coefficients of the six applied variables: *Service, Serve reception, Setting for the spike, Spike, Block, Field defense* are presented in Table 2. Sensitivity was tested by coefficients of asymmetry (Skew) and peakedness (Kurt) of distribution. The normality of distribution was tested by the Kolmogorov-Smirnov test with critical value of 0.12, representing maximal allowed value of maximal difference between cumulative observed and theoretical relative frequencies.

Table 1 Criteria for evaluation of situational efficacy of beach volleyball players.

| Team placement in competition | The best players | Other team members |
|-------------------------------|------------------|--------------------|
| 1st | 6 | 5 |
| 2nd | 5 | 4 |
| 3rd | 4 | 3 |
| 4th | 3 | 2 |
| 5th | 2 | 1 |

Table 2 Descriptive indicators and sensitivity of the applied coefficients of the overall sample (N=36).

| Variables | AM | M | Min | Max | SD | MaxD | Skew | Kurt |
|-----------------|------|------|------|------|------|------|-------|--------|
| Service | 2.21 | 2.21 | 1.78 | 2.59 | 0.18 | 0.05 | -0.11 | -0.44 |
| Serve reception | 3.28 | 3.25 | 2.20 | 4.00 | 0.28 | 0.07 | -0.21 | 0.6099 |
| Setting | 3.49 | 3.56 | 2.78 | 3.94 | 0.27 | 0.12 | -0.78 | -0.13 |
| Spike | 2.98 | 2.98 | 2.20 | 3.59 | 0.29 | 0.09 | -0.13 | -0.31 |
| Block | 2.62 | 2.59 | 1.00 | 3.50 | 0.50 | 0.12 | -0.34 | -0.25 |
| Field defense | 3.04 | 3.14 | 1.89 | 4.00 | 0.54 | 0.12 | -0.35 | -1.04 |
| KS test = 0.12 | | | | | | | | |

Legend: AM - arithmetic mean, M - median, Min - minimum result, Max - maximum result, SD - standard deviation, KS - Kolmogorov-Smirnov test, Skew - coefficient of distribution asymmetry, Kurt - coefficient of distribution peakedness.

The analysis of distributional indicators of the overall sample shows that there are no significant deviations from normal distribution in any of the variables, which means that all variables are suitable for further multivariate parametric statistical analysis.

Somewhat lower distributional characteristics, however within the limits of statistical tolerance, were manifested only by the coefficients *Setting for the spike*, *Block* and *Field defense*. The results of univariate analysis of variance (ANOVA) of the applied coefficients of variables according to the efficacy criteria on the overall sample, N=36, are presented in Table 3.

Table 3 Analysis of differences of the applied coefficients according to the efficacy criterion of the overall sample (N=36).

| Variables | Less successful N=18 | Successful N=18 | F | p |
|---------------|-------------------------|--------------------|------|------|
| | AM±SD | AM±SD | | |
| Service | 2.16±0.18 | 2.26±0.1 | 11.1 | 0.00 |
| Serve | 3.16±0.23 | 3.40±0.2 | 31.9 | 0.00 |
| Setting | 3.34±0.26 | 3.64±0.1 | 61.3 | 0.00 |
| Spike | 2.87±0.26 | 3.09±0.2 | 21.3 | 0.00 |
| Block | 2.53±0.46 | 2.71±0.5 | 5.07 | 0.02 |
| Field defense | 2.90±0.52 | 3.18±0.5 | 10.0 | 0.00 |

Legend: AM - arithmetic mean, SD - standard deviation, F - Fisher's coefficient of differences, p - level of significance.

By analysing Table 3, it is evident that significant difference exists in all the observed coefficients between less successful and successful beach volleyball players. Successful players had higher mean values of the coefficients in all the variables. The highest value of the Fisher's coefficient of differences can be seen in the *Setting for the spike* variable, and the lowest value in the *Block* variable. The *Setting for the spike* variable had the most pronounced negative asymmetry of result distribution, whereas the *Field defense* variable and its coefficients of distribution peakedness indicate the lowest sensitivity of the test.

Discussion and conclusion

The aim of this study was to determine the significance of differences between successful and less successful beach volleyball players. It is the first time that a combination of 2 criteria: team placement in competition and players' status within a team was applied in beach volleyball to assess competitive efficacy. This type of evaluation of efficacy has been applied in investigations in indoor volleyball (Grgantov, Katić, & Janković, 2006; Katić, Grgantov, & Jurko, 2006). In most previous studies in beach volleyball (Michalopoulou, Papadimitriou, Lignos, Taxildaris, & Antoniou, 2005; Grgantov et al., 2005; Palao & Ortega, 2015; Medeiros, et al., 2017) researchers have analysed the difference between the teams that won or were defeated in a set or a match. In this study, the authors analysed a club competition in which 4-6 players who competed for each club did not contribute equally to team placement in the competition, and therefore both team placement in the competition and individual contribution to that placement were considered. By analysing the descriptive indicators of coefficients of efficacy of each phase of the game (Table 2), it can be

concluded that Croatian beach volleyball players show most room for improvement in service performance. Quality service enables to either directly win points or makes it difficult for the opponent team to perform setting for the spike or spike in attack, which increases the chances for the serving team to win points. Therefore, in some studies (Michalopoulou et al., 2005; Palao & Ortega, 2015), the service has been singled out as one of the most important phases of the game to win a set or a match. It is therefore evident that players must be ready to assume greater risk in service, which implies also better psychological and technical-tactical preparation.

In a study conducted by Grgantov et al. (2005), on a sample of Croatian beach volleyball players, the lowest coefficient of efficacy was also recorded in the performance of service. Therefore, it can be concluded that for a long time now Croatian beach volleyball players have not been paying enough attention to the perfection of this phase of the game. The volleyball players showed the highest values of the coefficients of efficacy in the setting for the spike and serve reception, which might partially be the consequence of these elements being perfected to a high level, but it is also partially conditioned by the previously explained opponents' service performance of insufficient quality.

It is much easier to organise the play on serve reception and setting for the spike well after an easier service from the opponents. Somewhat lower values of the coefficients of efficacy in the performance of block and field defense can be explained by the demanding nature of their performance, given that two players must cover a relatively large space (64 square meters) during block and field defense and defend it from quick and precise spikes from the opponents. Lower scores in these elements can also be conditioned by poorer service performance, as it is harder to defend opponents' attacks which are performed after precise serve reception and setting for the spike. By analysing the differences between successful and less successful beach volleyball players (Table 3), it was determined that successful volleyball players were significantly better in the performance of all volleyball phases of the game, in comparison to the less successful players.

This confirms the significance of universal technical-tactical preparation which should be aimed at good performance of all phases of the game at competition (Grgantov et al., 2005). However, as opposed to the study conducted by Michalopoulou et al. (2005), in which the most prominent differences between the winners and the defeated in a match were in the service and spike phases, and the study of Grgantov et al. (2005), in which the most prominent differences were found in spike and block, in the present study successful players differentiated most from less successful players in the variables serve reception, setting for the spike and spike.

In volleyball, quality of performance in one phase of the game depends on the quality of performance of the same or the opponent team in the previous phases. Therefore, one should not conclude, based on the obtained results, that isolated perfection of serve reception, setting for the spike and spike can guarantee success in a competition.

Further research is needed which would take into consideration the mutual dependence of separate phases of the game, i.e., which would analyse the causal correlation in the quality of performance between one phase of the game and the performance of other preceding or following phases.

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SITUACIJSKA USPJEŠNOST VRHUNSKIH HRVATSKIH ODBOJKAŠA NA PIJESKU**Sažetak**

Cilj ovog istraživanja bio je utvrditi značajnost razlika uspješnijih i manje uspješnih odbojkaša na pijesku u kvaliteti izvedbe 6 osnovnih tehničko-taktičkih elemenata tj. faza igre: servis, prijem servisa, dizanje za smeč, smeč, blok i obrana polja. S video zapisa analizirano je 35 utakmica odigranih tijekom 2 turnira seniorskog muškog ekipnog prvenstva Hrvatske u odbojci na pijesku. Kvaliteta izvedbe tehničko-taktičkih elemenata procijenjena je na skali od 1 (greška u izvedbu) do 4 (idealna izvedba). Temeljem prikupljenih podataka izračunati su koeficijenti uspješnosti izvedbe analiziranih faza igre. Najmanje vrijednosti koeficijenata uspješnosti utvrđene su u fazama servis (2,21) i blok (2,62), a najveće u fazama dizanje za smeč (3,49) i prijem servisa (3,28). Situacijska uspješnost odbojkaša procijenjena je temeljem plasmana ekipe na natjecanju i statusa igrača unutar ekipe. Po kriteriju situacijske uspješnosti igrači su podijeljeni u skupinu manje uspješnih i skupinu uspješnijih. Analizom varijance, utvrđeno je da uspješniji odbojkaši imaju značajno veće koeficijente uspješnosti od manje uspješnih u svih 6 analiziranih faza odbojkaške igre. Pri tome su najizraženije razlike utvrđene u fazama dizanje za smeč, prijem servisa i smeč. Dobiveni rezultati ukazuju na važnost kvalitetne izvedbe svih faza igre u odbojci na pijesku, a naročito onih koje se izvode u kompleksu napada.

Ključne riječi: Hrvatsko klupsko prvenstvo, koeficijenti uspješnosti, uspješni i manje uspješni igrači, analiza varijance.

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