

DIFFERENCES BETWEEN WINNING AND LOSING TEAMS IN MEN'S EUROPEAN TOP-LEVEL VOLLEYBALL

M. Häyrinen¹, T. Hoivala² & M. Blomqvist¹

¹ KIHU - Research Institute for Olympic Sports, Jyväskylä, Finland;

² Finnish Volleyball Association

INTRODUCTION

Top-level volleyball matches are often very even. Usually matches finish 3-2 or 3-1 and the sets are very tight. The result of the match depends on the team's and individual player's ability to perform various volleyball skills.

A model for the volleyball skills in progress of a single rally is introduced in Figure 1. Volleyball skills can be divided to attacking and defending skills. The attacking skills are serving, attacking and setting and the defending skills are blocking, defending and receiving. A team can score points in four different ways: by serving, blocking, attacking or from opponent's mistakes. The three skills that support scoring are receiving, setting and defending.

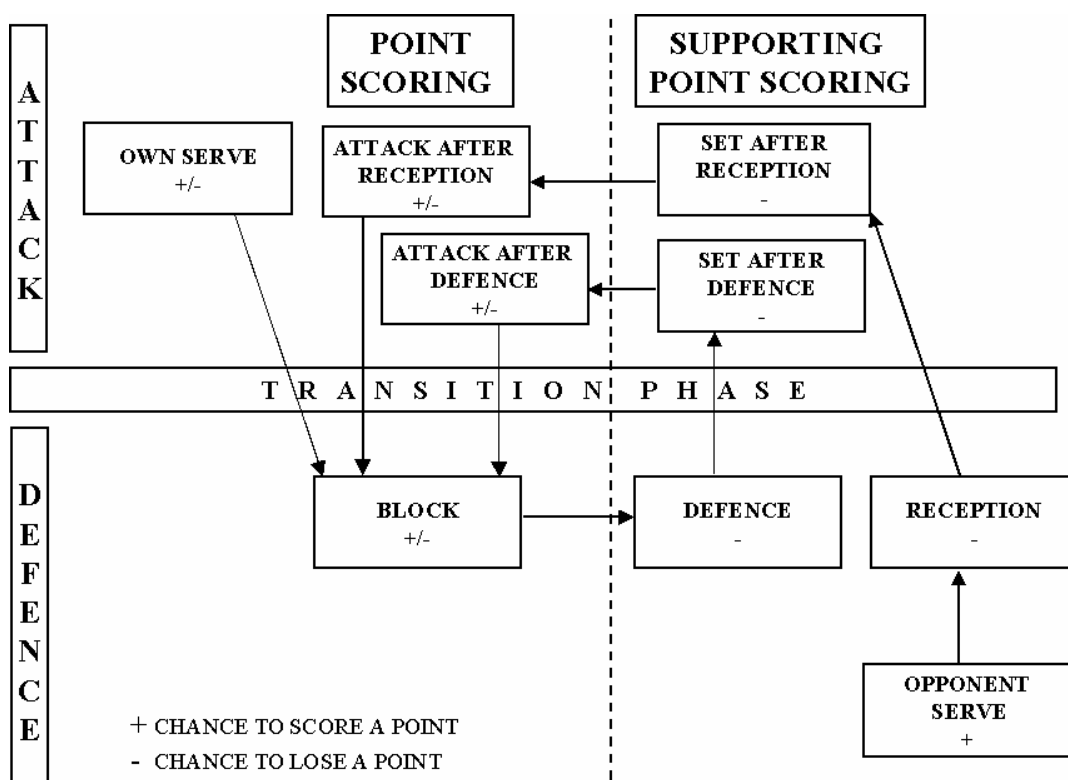


Figure 1. A model for the progress of a single volleyball rally (Häyrinen et al 2000).

Game analysis is widely used in ball games and it provides a lot of useful information for developing effective practices thus enhancing team performance. According to Hughes (1998) game analysis can be applied to five different areas: tactical evaluation, technical evaluation, analysis of movement, development of a database and modeling and educational use for both coaches and players. Game analysis can be used to analyze both the performance of the own team as well as the opponent. Today game analysis is usually made by using computer softwares which provide a

possibility for on-line analysis during the matches. For volleyball there are many different software available for game and video analysis. (Teel et al. 1986; Hughes 1988; Franks & Nagelkerke 1988; Fröhner 1995; Stamm et al. 2001; <http://www.dataproject.com/>.)

The purpose of this study was to examine which of the previously presented volleyball skills have the biggest effects on winning in men's international top-level volleyball.

METHODS

For this study ten men's top-level volleyball matches were analyzed. Seven of these matches were from the Men's European Olympic Qualification Tournament which was played in January 2004 and three matches were from the Men's European Championships played in September 2003. The results of the matches are shown in table 1. Eight European top national teams: Russia, the Netherlands, France, Germany, Bulgaria, Spain, Poland and Finland played in these matches.

Table 1. The results of the analyzed matches.

MATCH	TOURNAMENT	RESULT	SET 1	SET 2	SET 3	SET 4	SET 5
ESP-GER	EC 2003	1-3	26-28	25-21	19-25	26-28	
NED-ESP	EC 2003	3-2	21-25	25-23	22-25	25-22	18-16
POL-NED	EC 2003	2-3	27-29	25-21	21-25	26-24	9-15
ESP-FRA	OQ 2004	1-3	21-25	37-35	16-25	19-25	
BUL-GER	OQ 2004	0-3	19-25	19-25	18-25		
NED-FIN	OQ 2004	3-0	25-22	25-23	25-19		
BUL-RUS	OQ 2004	0-3	20-25	20-25	19-25		
FIN-ESP	OQ 2004	2-3	19-25	25-22	25-15	23-25	10-15
GER-POL	OQ 2004	2-3	25-22	16-25	27-25	24-26	13-15
FRA-FIN	OQ 2004	3-0	25-20	26-24	25-21		

Data Volley 2.1.2 Professional -game analysis software is widely used in top teams all over the world. Therefore it was also used in this study for on-line game analysis. It provides a lot of information concerning the team's and player's actions.

Serve, reception, attack and block were coded using different categories. Serves and attacks were analyzed into six categories and reception into five. Kill blocks were also analyzed separately. The codes for serving were error, half point, negative, good, positive and winning, for reception error, half error, negative, positive and perfect and for attacking error, blocked, negative, neutral, positive and kill.

Based on the coding different variables were calculated for each team in every match and set. For serving three variables was calculated. The proportion of the successful serves (Serve +%) was calculated from the half point, positive and winning serves. The proportion of the error serves (Serve -%) was calculated from the error serves. The efficiency of the serve (Serve eff.) was calculated as successful serves minus error serves.

For receiving two variables were calculated. The proportion of the successful receptions (Reception +%) was calculated from the positive and perfect receptions. The proportion of the error receptions (Reception -%) was calculated from half error and error receptions. Also for attacking two variables were calculated. The proportion of the successful attacks (Attack +%) was calculated from the

killed attacks. The proportion of the error attacks (Attack -%) was calculated from error and blocked attacks. In addition the team attacks were divided to two categories: attacks after reception and attacks after dig and the percentages were calculated as for total attacks.

For blocking the number of kill blocks was calculated. On the match level the number of kill blocks was equalized as the number of kill blocks in one set. Also the number of opponent team's errors, where the scoring team didn't have an effect to the result was calculated. Attacks to the net or out of court, net, serve and technical faults belong to this group.

The t-test for independent samples was used to compare the means and standard deviations of the winning and losing teams in every match and set. Results of t-test are denoted $*=p<0.05$, $**=p<0.01$, $***=p<0.001$.

RESULTS

When analyzing the results based on the whole match, the winning teams were significantly better in overall attacking (success% 55.3 % vs. 49.6 %*, error% 15.4 % vs. 19.8 %*), attacking after reception (success% 58.7 % vs. 51.8 %*, error% 13.6 % vs. 18.3 %*) and blocking (2.9 kill blocks per set vs. 2.0 kill blocks per set*). The success and error percentages for serve (success% 26.8 % vs. 26.7 %, error% 17.4 % vs. 17.7 %), reception (success% 67.5 % vs. 67.6 %; error% 8.7 % vs. 9.9 %) and the number of opponent's errors (6.8 errors per set vs. 5.9 errors per set) did not differ significantly (Figure 2).

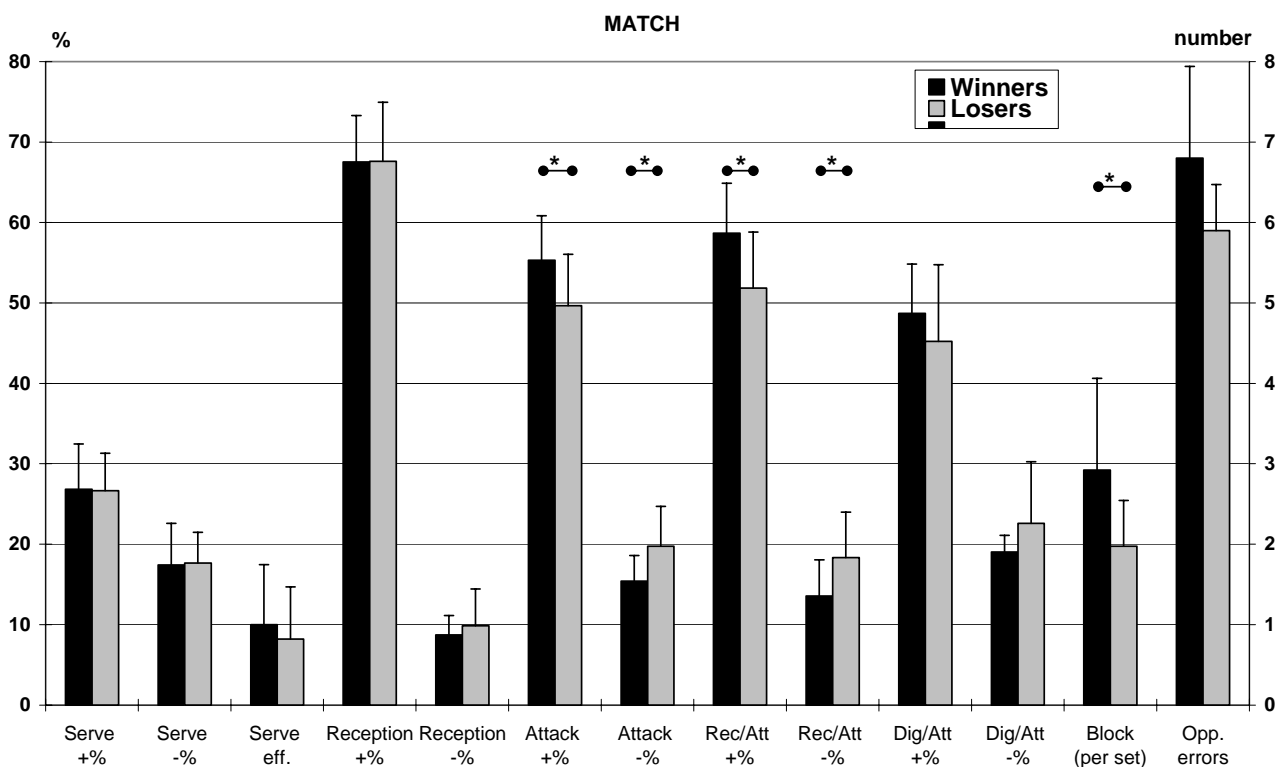


Figure 2. The success and error percentages of the match winners and losers in serving, receiving and attacking, the number of kill blocks and the number of opponent's errors ($*=p<0.05$).

In comparing the winning and losing teams based on the separate sets, the winners were found to be significantly better in serving efficacy (11,6 % vs. 5,7 %*), overall attacking (success% 56.0 % vs. 48.9 %**, error% 13.9 % vs. 21.2 %***), attacking after reception (success% 60,3 % vs. 50,5 %***, error% 11.9 % vs. 19.9 %***) and blocking (3.1 kill blocks per set vs. 1.8 kill blocks per set***). The set winners had a smaller error percentage in reception (7.6 % vs. 10.6 %*). Also the number of opponent's errors was significantly higher for winning teams (7.3 errors per set vs. 5.7 errors per set**). The success and error percentages for serve (success% 28.3 % vs. 24.9 %, error% 16.6 % vs. 18.6 %) and the success percentages for reception (success% 69.2 % vs. 66.0 %) did not differ significantly (Figure 3).

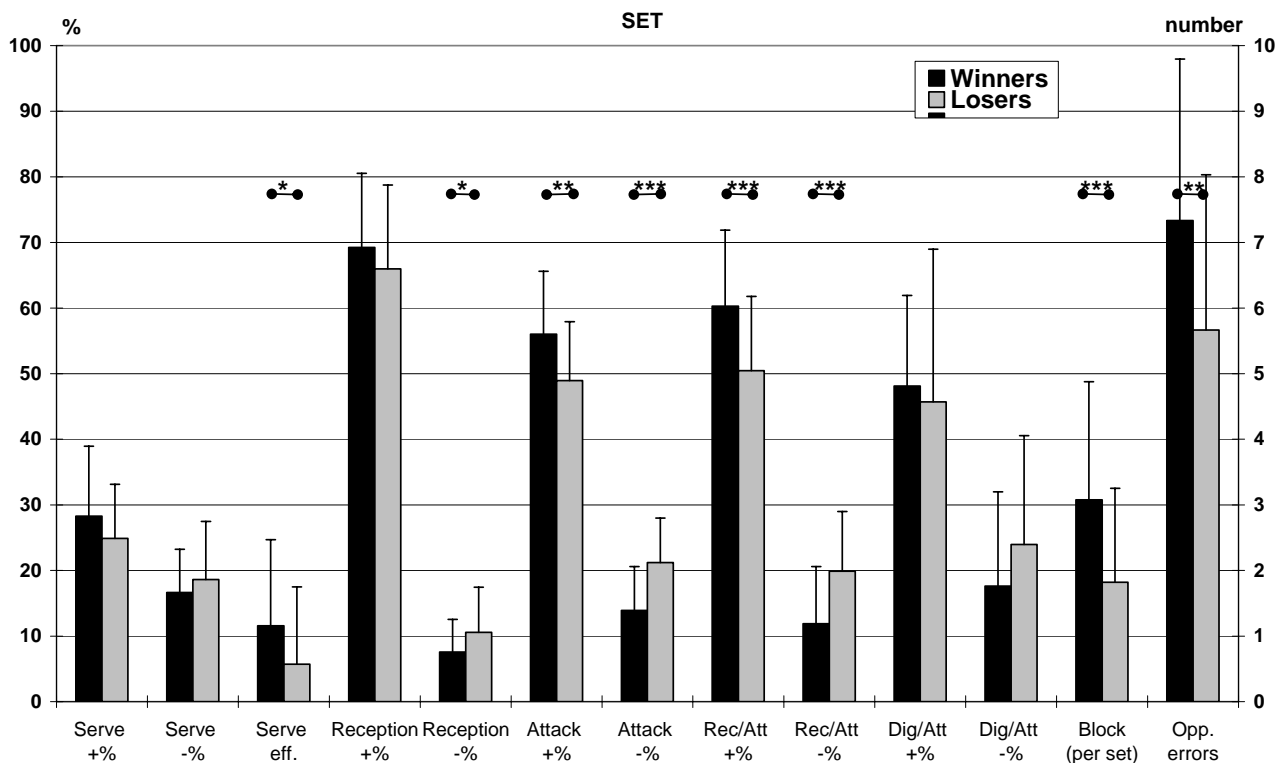


Figure 3. The success and error percentages of the set winners and losers in serving, receiving and attacking and the number of kill blocks and the number of opponent's errors (*= $p < 0.05$, **= $p < 0.01$, ***= $p < 0.001$).

DISCUSSION

International level matches in men's volleyball at the highest level are often very even, because the teams are very equal in skills, tactics and physical abilities. The results of this study suggest that the most important skills concerning winning a match or a set in top-level men's volleyball matches were attacking and blocking. The success in attacking after reception was found to be especially important. Serving efficiency and the number of opponent's errors had a significant effect on winning when the results were analyzed based on separate sets.

The results of this study are in line with previous studies, where attacking and blocking were also found to be the most important skills. The success percentage of serving was now found to be higher than before and on the other hand the success percentage of receiving was found to be lower than before. This suggests that the power of jump serving has developed and thereby made the successful receiving more difficult. (Fröhner & Zimmermann 1996; Häyrynen et al. 2000.)

These results suggest that the training of a men's volleyball team should focus on attacking and blocking. Especially attacking after receiving and thus also receiving should be trained exceedingly. In serve practicing the relation of successful hard serves and errors serves should always be remembered. Also the amount of own errors is a factor to be controlled during training and competing.

In the future it would be interesting to find out which players in different playing roles like opposite, libero, middle players or outside hitters, have the biggest effect on the result of a match or a set. Also a comparison between men's and women's matches, that would require a similar kind of analysis of women's matches, would be interesting and useful.

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