

# COMPARISON BETWEEN STATISTICAL PARAMETERS OF ATTACK AND DEFENCE IN HIGH VOLLEYBALL PERFORMANCE (*CSM VOLEI ALBA BLAJ* IN THE CEV CHAMPIONS LEAGUE FINAL FOUR 2018)

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**Abstract:** *The research focused on analysing the parameters of attack and defence at high-level volleyball game in the Final Four Women CEV Champions League. The methods for analysing the results were Student t, Mann-Whitney and Wilcoxon Test. The results of the investigation showed that significant statistical differences were found between the total numbers of attacks from the two games. Conclusions of the research showed that analysing all the compartments of the volleyball game can objectively discover the strong points and weaknesses of our game and improve future results.*

**Key words:** *statistical analyse in volleyball game, attack and defence in volleyball, training, sports performance.*

## 1. Introduction

Volleyball game is considered an intermittent sport with effort and rest [20]. The actions during the match are of short duration (rally of 1 to 10 seconds) and with longer rest duration (11 to 30 seconds) [25], [34]. The explosive resistance strength and the reactive strength are the strength most used during a volleyball match [21]. Therefore, this content the specificity principle is important to organizing the session [22].

Volleyball is an indoor team sport, which requires high performance. The time of a volleyball match is indefinite and players will rotate positions during a match having limited contact with the ball [17], [39]. Due to the limited contact, volleyball is considered a safe sport compared to other contact team sports (i.e. football, handball and basketball) [9].

In terms of performance volleyball is classified as a technical team sport, belonging to a group of strength and speed sports [33].

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Specifically, volleyball performance requires intermittent bouts of high intensity exercise, followed by periods of low-intensity activity (i.e. walking or standing) [3], [10].

Volleyball is highly specialized sports discipline where each player has determined functions according to their playing position [6] and a sport that alternates between highly athletic intensity and relatively less strenuous moments during the play [12].

Mathematical models have proved to be useful in the study of technical properties in several sports, allowing for the generation of new game and training strategies. In particular, Markovian models have been used to describe the statistical properties of several sports, including volleyball, tennis and racquetball [4], [11–14], [24], [35].

An instrument that can be applied by coach to measure or assess performance in volleyball sports is Volleyball Information System (VIS), developed by FIVB in 2005. The instrument is a program completing a match which involves statistics of each player and team. The main purpose of VIS is to inform national and international media of statistics results of team and individual matches [32]. Besides, the result of a research and development done by Yudiana, Hidayat, Slamet & Hambali, was an assessment instrument of performance which was a modification of the VIS FIVB instrument [37]. The instrument was expected to be able to apply for assessing the athlete's ability when playing volleyball during the practicing process or during competition [38]. Video analysis in team sports has been proven a valuable tool for the analysis and assessment of technical tactical skills [27].

If we are to deal with the concept of multimedia, which has an increasingly important role in the game of volleyball, we can define it as “the handling capacity (obtaining, processing, storage, transfer, presentation), in an integrated numerical form of the information, represented by several means (English ‘media’), of which at least one is continuous (periodically, time-dependent) and one is discrete (asynchronous, independent of time)” [30].

At the basis of this concept are the possibilities offered by the computing technique to store and process information of different types simultaneously, including video images, in increasing quantities and in real time. In this context, multimedia defines the possibility of the computing technique to use two information paths (media = path) in parallel: static or dynamic images + sound + textual explanations + graphical analysis [23] or “a set of software and hardware, capable of using, at the same time, media sources, such as film, video, music, combined with text and numbers, simulations and electronic communications” [15].

## **2. Material and Methods**

The methods of research used in our research were the statistical and mathematical, we used the T-student test, the Mann-Whitney Test and Wilcoxon Test in analyzing the statistical significance of differences between parameters of attack and defense in the two matches analyzed.

### **2.1. Objectives**

The objective of the research was to analyze the important parameters of volleyball game of defense and attack, and

statistically analyze if there are significant difference between the two matches played by the *CSM Volei Alba Blaj* in CEV Women Final Four.

## 2.2. Study hypothesis

The research started from the assumption that analyzing the main parameters of the volleyball game (attack and defense) we can obtain an objective picture of the evolution of our team and adjust and improve parameters so as to get positive results in further games.

## 2.3. Sample of the research

As a sample of the research, we had the statistics of the two volleyball matches

played by the *CSM Volei Alba Blaj* in the CEV Women Volleyball Final Four.

## 3. Results of the Research

The research started with gathering the statistical information from both games played by the *CSM Volei Alba Blaj* in the CEV Women Volleyball Final Four, against Galatasaray Istanbul in semi-finals (with the result 3-0) and VakifBank in the final of the competition (with the results 0–3).

We analyzed the two categories of parameters that were considered fundamental in winning or losing a game: attack (total numbers of attack, attack errors, blocked attacks) and defence (receiving and errors of the reception).

Table 1

*Statistical analyses regarding the attack errors, total number of attacks and blocked attacks in both games (against Galatasaray and VakifBank Istanbul)*

ATTACK Err	Game 1	Game 2	ATTACK Tot	Game 1	Game 2	ATTACK Blk	Game 1	Game 2
Number of values	14	14	Number of values	14	14	Number of values	14	14
Minimum	0.0	0.0	Minimum	0.0	0.0	Minimum	0.0	0.0
25% Percentile	0.0	0.0	25% Percentile	0.0	0.0	25% Percentile	0.0	0.0
Median	0.0	0.0	Median	0.0	0.0	Median	0.5000	0.5000
75% Percentile	0.2500	0.0	75% Percentile	1.250	1.250	75% Percentile	6.000	4.000
Maximum	4.000	3.000	Maximum	6.000	7.000	Maximum	23.00	7.000
Mean	0.5714	0.2857	Mean	0.7857	0.9286	Mean	3.500	1.857
Std. Deviation	1.284	0.8254	Std. Deviation	1.672	1.900	Std. Deviation	6.273	2.349
Std. Error	0.3431	0.2206	Std. Error	0.4470	0.5078	Std. Error	1.676	0.6277
Lower 95% CI of mean	-0.170	-0.191	Lower 95% CI of mean	-0.180	-0.168	Lower 95% CI of mean	-0.1217	0.5010
Upper 95% CI of mean	1.313	0.7623	Upper 95% CI of mean	1.751	2.026	Upper 95% CI of mean	7.122	3.213
D'Agostino & Pearson normality test	Pearson	omnibus	D'Agostino & Pearson normality test	Pearson	omnibus	D'Agostino & Pearson normality test	Pearson	omnibus
Passed	No	No	Passed	No	No	Passed	No	Yes
normality test (alpha=0.05)?			normality test (alpha=0.05)?			normality test (alpha=0.05)?		
Sum	8.000	4.000	Sum	11.00	13.00	Sum	49.00	26.00

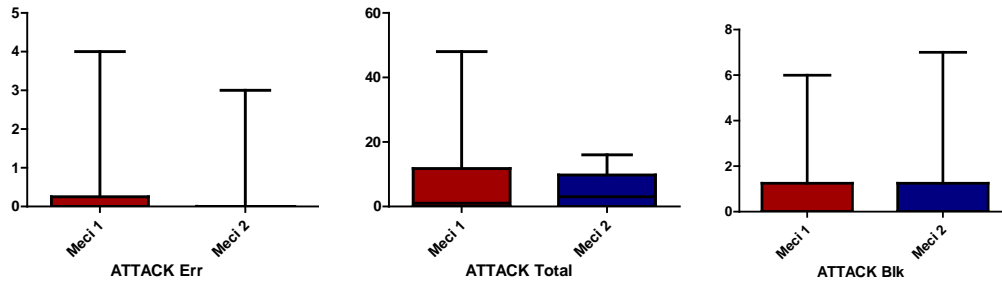


Fig. 1. Statistics regarding errors of the attack, total number of attacks and blocked attacks

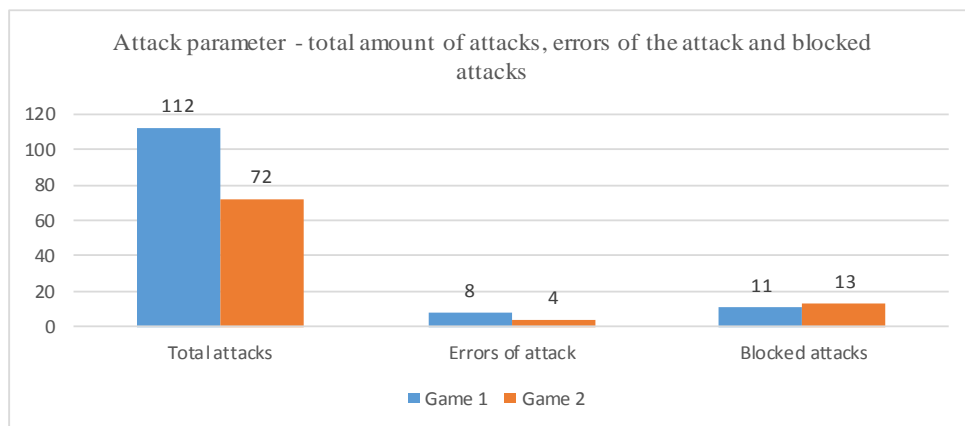


Fig. 2. Attack parameters, total number of attacks, attack errors, blocked attacks.

Table 2

*Statistical analyses of parameters of receiving and total errors of receiving*

RECEPTION Total	Game 1	Game 2	RECEPTION Err	Game 1	Game 2
Number of values	14	14	Number of values	14	14
Minimum	0.0	0.0	Minimum	0.0	0.0
25% Percentile	0.0	0.0	25% Percentile	0.0	0.0
Median	0.0	0.500	Median	0.0	0.0
75% Percentile	7.250	6.500	75% Percentile	1.250	1.000
Maximum	35.00	38.00	Maximum	6.000	2.000
Mean	5.143	4.786	Mean	0.785	0.500
Std. Deviation	10.04	10.19	Std. Deviation	1.672	0.769
Std. Error	2.683	2.724	Std. Error	0.447	0.203
Lower 95% CI of mean	-0.65	-1.10	Lower 95% CI of mean	-0.18	0.061
Upper 95% CI of mean	10.94	10.67	Upper 95% CI of mean	1.751	0.939
D'Agostino & Pearson omnibus normality test			D'Agostino & Pearson omnibus normality test		
Passed normality test (alpha=0.05)?	No	No	Passed normality test (alpha=0.05)?	No	Yes
Sum	72.00	67.00	Sum	11.00	7.000

Using the Wilcoxon test,  $p > 0.05$ , we observed that there is no statistically significant difference between the median ATTACK Err values (attack errors) at the 2 matches.

Also with the Wilcoxon test,  $p > 0.05$ , we noticed that there is no statistically significant difference between the median

ATTACK Blocked values (blocked attacks) in the 2 matches.

The Wilcoxon test,  $p > 0.05$ , was also applied for the parameter number of total attacks, with which we observe that there is a statistically significant difference between the medians of the total ATTACK values (total attacks) in the 2 matches.

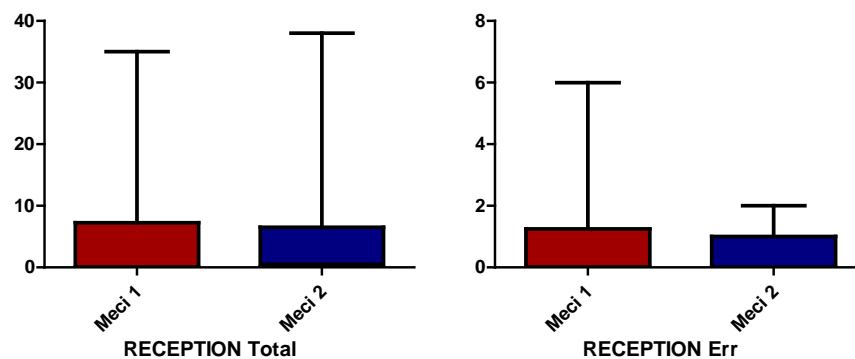


Fig. 3. Statistics regarding total number of receiving and errors of the receiving

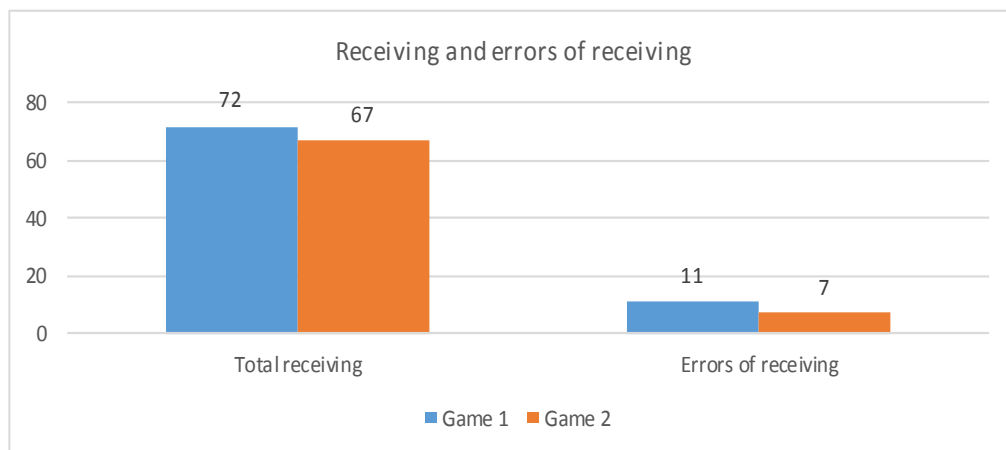


Fig. 4. Statistical representation of total receiving and errors of receiving

Wilcoxon test,  $p > 0.05$ , ( $p = 0.9324$ ), showed us that there was no statistically significant difference between the median RECEPTION Total values at the 2 matches.

The next step was to analyze the error parameter when receiving the service, we

applied the Wilcoxon test,  $p > 0.05$ , ( $p = 0.5862$ ), with which we observed that there is no statistically significant difference between the median RECEPTION Errors values for the 2 matches.

#### 4. Discussions

The research conducted on Final Four of the Women's Volleyball CEV competition revealed that the only decisive and statistically significant parameter was the total number of attacks, the other parameters analyzed (attack errors, total number of reception and errors of the reception) were statistically insignificant.

When examining the different skills performance on display in a volleyball match (serving, blocking, attacking, reception, setting, and defense), it seems reasonable that the team that makes the fewest errors should be the one that is most likely to succeed [31]. The results observed by Castro et al. [5] and Drikos et al. [7] revealed a significant influence of serve and attack efficacy (those that result in direct point) on the match outcome.

Statistical analysis is used in many directions in volleyball game, some scientists analyzed players regarding their nutrition and skin fold [28], or core stability and symmetry in obtaining performance [29].

Attacks, blocks, and serves, due to the possibility of scoring a direct point, are considered Scoring Skills [18]. On the other hand, the defense, setting, and reception procedures are termed Non-Scoring Skills [18] and therefore should, at first glance, contribute less to a win. Despite this classification it is important to acknowledge those skills that most discriminate in favor of victory. Moreover, these analyses have been mostly based on the relation between efficacy and success. However, in some studies [1] [2] it has been proven that in elite teams, error in some skills may indicate a higher level of risk taken rather than technical problems.

Some researchers found out in their studies that the main results of their study showed that the skills that discriminate in favor of victory are the serve point and surprisingly, blocking errors. On the other side, reception errors were the only variable that discriminated in favor of defeat.

Other researchers believe that teams that are at a disadvantage in the set take more risks while serving, probably because they have nothing to lose [16] [19]. By risking more strategically, these teams also end up failing more frequently, consequently increasing the percentage of errors made [19] [36]. On the other hand, if the serve is risky, opponent reception will be more difficult, increasing error probability. Our results discriminate reception error in defeat so the teams with low efficacy in this skill are more likely to lose the game. Some researchers concluded that successful blocking offers more chances to win. In addition, the block is the first terminal action that the opposition may take to the opponent's attack, and may result in a direct point [26]. Quantitative analysis, performance evaluation and statistical processing are becoming an increasingly important process for those involved in several sports and, in particular, in team sports [8].

#### 5. Conclusions

The conclusions of our investigation presented that the Europe top women volleyball teams continue to become more equilibrate and the difference is made by details, competition must be evaluated in terms of performance parameters. Few skills of the game are becoming vital for winning and are associated with success; while poor performance in others leads to

failure. Our conclusions show that in order to improve performance, teams, staff and coaches must prepare their teams, statistically evaluate the opponent previous performances and patterns, and focus on the skills that are probable to tilt the balance in favor of their own teams.

The results of our investigation highlight the importance of attack skills, and also improving the other attack parameters like errors of the attack and also the defensive skills like reception and blocking.

The results of our investigation of the Final Four of the Women's Volleyball CEV competition confirm that an effective attack is a parameter that may be used to predict success. Therefore, attacking skills training is a crucial value, and should be taken in consideration in different contexts and moments during the match, using several types of strategies and scenarios that may cause imbalances between teams at the same sports level.

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