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Analysis on the Increase of Efficiency at the Reception, Using the Data Volley Statistical Analysis Software

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Abstract: *The aim of the present research is to increase the serve reception efficiency for the players in the C. S. Arcada Galaţi team, by means of the statistical software program called "Data Volley". As the coaches of this team, we had the opportunity to use such a tool by means of which we collected the necessary data for the study.*
We studied all the 12 teams during 36 official plays selected from the initial part of the Masculine National Volleyball Championships where the analysis focused on the serve reception of 48 players, so that we could get a clear image of the play efficiency of this technical procedure at a national level.
The research methods used in the present article were the study of bibliographical material, the statistical-mathematical method, the video analysis and the graphical representation.
As a result of the statistical analysis and video analysis, we found that the efficiency at a national level is 56%, as compared to the 52 % efficiency in the Arcada Galaţi team. The ample analysis of each player at serve reception evinced the reception deficiencies, where we noticed a 30% efficiency for the perfect reception (#) as compared to 33% at national level, and 22% for a positive reception (+) as compared to 23 % at a national level.
The final results showed that the use of such a software during the entire sports training led to a noticeable increase of the serve reception efficiency, i.e. 32% for the perfect reception (#) and 27% for positive reception (+) at a total efficiency of 59%, which means a 7% increase as compared to the original analysis.

Keywords: *statistics, analysis, serve reception, software, Data Volley.*

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1. Introduction

Technology is ever more present in the sporting disciplines under various forms, such as statistical analysis, sophisticated sensors, many programs that may provide precise data and objective to the coaches and teachers in the field (Mocanu et al., 2021). In modern volleyball the assessment of performance is the analysis used by a coach to improve the performance of his/her team (González-Silva et al., 2020; Ungurean & Puni, 2019). Consequently, coaches use such methods consistently during training sessions, official and friendly games, obtaining objective data on their own players in a shorter amount of time (Laporta et al., 2018; Palao & Ortega, 2015). In this respect, in order to perform such an analysis, Data Project, a company providing technological tools to volleyball clubs all over the world, introduced the Data Volley software.

The Data Volley software is meant for volleyball, and its use relies on its capacity to record in a very short time the technico-tactical actions of the players during a game, for both teams, which eases the coaches' workload, supporting them in a fast and objective analysis of all the game stages (Cheng et al., 2022; Data Volley, f.a.; Patsiaouras et al., 2011).

The use of this program consists in the fact that the data may be viewed and analysed quickly, provides an objective assessment, and is very cost-effective (Harabagiu, 2020; Stankovic et al., 2019; Szabo et al., 2020). As a result, we performed a study based on the organization of training sessions and competitions by means of the Data Volley statistical analysis software, to the purpose of increasing the serve reception efficiency, as it is crucial as a technical procedure in volleyball.

The serve reception has been studied by several authors lately, but at the level of high performance it has not received too much attention. In the selected bibliography we analysed the serve reception and its impact on play efficiency (Paulo et al., 2016, 2018); another article deals with the connection between the serve and the serve reception, and their influence on the efficiency of the setter's passes (González-Silva et al., 2020), while another piece of research treats the importance of tactics and its benefits on the serve and the serve reception (Stamm et al., 2016), as well as the serve reception efficiency according to the team rotation and the zone where the reception occurs (Lopez et al., 2022).

2. Problem statement

According to the specialists in the field, the volleyball game has evolved a lot in the past few years, and the play actions of the players can no longer be followed without latest generation technological tools (Chen & Chu, 2021; Costa et al., 2017; Valhondo et al., 2018).

In order to find a quick solution to all these issues related to the players' game efficiency, in connection to data processing during play or training sessions, coaches use statistical analysis software to record the game actions of each player, so that they can operatively process them and provide technico-tactical solutions in the shortest time possible in view of improving play as a whole (Papadopoulou et al., 2020; Paulo et al., 2016; Silva et al., 2014).

3. Research questions/Aims of the research

The present study has as a main objective the analysis of the serve reception actions for the second players and the libero, the identification of problems as a result of processing the data provided by the Data Volley software, and the efficiency increase of this technical procedure by means of a specific training program of the players performing this action.

The serve reception is a highly important technical procedure in volleyball (the linking point to the other technical elements). Without a precise serve reception in the setter's zone, the game can no longer be optimally organized, and building the attack will undergo difficulties, leading to a low efficiency of the entire team (Coaching Manual, 2018; Liang et al., 2019; Stamm et al., 2016).

4. Research methods

Statistical data were collected by means of the Data Volley software, while the video analysis was performed by means of the Data Video system, integrated into the software. The video analysis also made use of a digital camera placed at the back of the volleyball court, so that to provide the best visibility on the play. This program was also successfully applied in the National Masculine Volleyball Championships, senior level, where it proved to be a real support in recording the technico-tactical actions, both individually and at team level (Data Volley, f.a.; Patsiaouras et al., 2011).

The research methods used in the present article were the study of bibliographical material, the statistical-mathematical method, the video analysis and the graphical representation.

The software used in the present research may provide details for all the play actions of the team, for each player in part, or for each play action taken individually. According to the assessment that the coach wants to perform, detailed analyses may be performed for a certain technical element, a certain rotation or several rotations, during the game or the analysis of one or more sets.

The table below provides an instance of analysis for one technical element for each rotation, which may help the coach to identify very quickly the rotation where the team was less than efficient.

Fig. 1.1. Model of statistical analysis per technical element
Source: Authors' own conception

Analysis selection
CS Arcada Galati | Player detail | Skill detail | Rotation detail

Skill	Type	Player	S	Set	Ind	*E%	Tot	=	%	BP	pS	/	%	BP	pS	-	%	!	%	+	%	#	%	BP	pS
Serve		Team	1		4	62%	8	1	12%	·	1	·	·	·	·	2	25%	1	12%	4	50%	·	·	·	·
			6		5	73%	11	2	18%	·	2	·	·	·	·	1	9%	1	9%	7	64%	·	·	·	·
			5		4	45%	11	2	18%	·	2	·	·	·	·	4	36%	1	9%	3	27%	1	9%	1	·
			4		2	33%	9	4	44%	·	4	·	·	·	·	2	22%	1	11%	2	22%	·	·	·	·
			3		4	71%	14	2	14%	·	2	·	·	·	·	2	14%	3	21%	6	43%	1	7%	1	·
			2		5	78%	9	1	11%	·	1	1	11%	·	·	1	11%	1	11%	5	56%	·	·	·	·

The analysis may be performed for 7 play actions, which are defined by 6 different symbols, so that to obtain a detailed analysis of the technical procedure undergoing assessment. The following shows a model of statistical analysis for the serve reception.

Table 1. Model of statistical analysis for the serve reception

Serve reception	
=	Error- direct point for the opponent
/	Low- the ball goes to the other half of the court- half point scored by the other team.
-	Negative- a single attack option.
!	Ball taken over after the 3 metre line - low number of attack options
+	Positive- the ball taken over reaches the 3 metre line zone, the setter has more attack options, but cannot use all the combinations.
#	Perfect reception- the setter may use all the attack options

Source: Data Volley Handbook

The first part of the experiment was aimed at analysing the reception efficiency of the 12 teams participating in the National Masculine Volleyball Championships, A1 division, within which we focused on 36 official games.

More precisely, 3 official games were selected from the first part of the championships for each of the 12 participating teams, assessing the play efficiency for 48 players performing a reception. The efficiency of the 12 teams and their average is shown below in table 2.

Table 2. Statistical analysis for the teams of the National Volleyball Championships

Reception	Total	Errors	%	/	%	-	%	!	%	+	%	#	%	*E%
Zalau	168	12	7%	6	4%	26	15%	12	7%	46	27%	66	39%	67%
Piatra	275	15	5%	9	3%	40	15%	29	11%	64	23%	118	43%	66%
Steaua	197	8	4%	9	5%	47	24%	13	7%	57	29%	63	32%	61%
Ploiesti	246	20	8%	16	7%	47	19%	38	15%	56	23%	69	28%	51%
Dej	248	21	8%	6	2%	54	22%	20	8%	61	25%	86	35%	59%
Arcada	252	14	6%	10	4%	72	29%	26	10%	55	22%	75	30%	52%
Csm	186	18	10%	15	8%	36	19%	22	12%	46	25%	49	26%	51%
Craiova	180	11	6%	8	4%	52	29%	20	11%	33	18%	56	31%	49%
Cluj	222	16	7%	11	5%	46	21%	27	12%	58	26%	64	29%	55%
Bacau	203	15	7%	15	7%	58	29%	20	10%	39	19%	56	28%	47%
Baia mare	211	15	7%	4	2%	30	14%	32	15%	51	24%	79	37%	62%
Caransebes	190	7	4%	7	4%	40	21%	30	16%	37	19%	69	36%	56%
Team average	2578	172	7%	116	5%	548	21%	289	11%	603	23%	850	33%	56%

Source: Authors' own conception

To analyse the play efficiency of the technical elements, the program uses a pre-established calculation formula, used by most teams at international level, and which we used ourselves to find the players' serve reception efficiency. For example, to find the reception efficiency we calculate the sum of the percentage of positive actions and the perfect actions (Table 3).

Table 3. Calculation formula for gameplay actions efficiency

Basic elements	Efficiency calculation
Serve	(%#)+ (%/)+ (%+)+ (%!)
Serve reception	(%#)+ (%+)
Attack hit	(%#)- (%/)- (%=)
Block	(%#+ (%+)- (%/)- (%=)
Defence	(%#)+ (%/)+ (%+)
Pass	(%#)+ (%+)- (%/)- (%=)
Easy ball	(%#)+ (%+)- (%/)- (%=)

Source: Data Volley

As it may also be seen in the efficiency calculation formula, where (#)- is the perfect reception, and (+)- is the positive reception, and the sum of the two shows the play efficiency of the players. These two characters show the reception quality, and they are interpreted during the game by the team statistician, according to the requirements of the coach. As shown in Table 1, the perfect reception occurs when the setter may use all the combinations, and the positive reception occurs when the ball is at a distance of 2-3 metres from the net, it has a high trajectory, and the setter's options are reduced.

As a result of the detailed analysis we performed, it was seen that at a national level the serve reception accounts for 56% out of which 23% is positive reception (+) and 33% perfect reception (#), on the other hand the percentage for the 4 players analyzed is 52%, with a positive reception (+) of 22% and a perfect reception (#) of 30%. We proceeded to an ampler analysis of the players in Arcada team, for whom we analyzed the statistical data of the reception actions of each player (Table 4).

Table 4. Analysis of the serve reception of the players in Arcada Galați team in the first part of the Championships

Skill	Player	Tot	=	%	/	%	-	%	!	%	+	%	#	%	*E%
Reception	Receiver 1	52	3	6%	1	2%	20	38%	3	6%	6	12%	16	31%	42%
	Receiver 2	55	1	2%	1	2%	18	33%	6	11%	11	20%	18	33%	53%
	Receiver 3	109	8	7%	6	6%	27	25%	13	12%	26	24%	31	28%	52%
	Libero	36	2	6%	2	6%	7	19%	4	11%	12	33%	10	28%	61%
	Average	252	14	6%	10	4%	72	29%	26	10%	55	22%	75	30%	52%

Source: Authors' own conception

Upon analyzing the data collected, it may be stated that the 3 receivers players had a lower average efficiency rate for the positive than the perfect reception. Thus there is an average of 12% for the positive reception, and 31% for the perfect reception in the case of the first receiver, 20% in comparison to 33% for a perfect reception, and an average of 24% in comparison to 28% for a perfect reception. The libero had a much higher efficiency for the positive reception, i.e. 33%, and a lower efficiency for the perfect reception, i.e. 28%. The statistical data collected for each player specifically pointed out their weak points, which is helpful in devising an adequate training plan specifically tailored to the players' needs.

At the same time with the analysis of statistical data we performed a video assessment of each player, examining in detail all the reception actions. In order to do so, we sampled video footage by means of the Data Video system, containing the actions performed by the players in all the three matches under examination. As a result, we watched the players' actions when receiving the ball according to the zone of the opponent's serve, ball displacement, execution technique, lateral hitting of the ball, reception quality according to the zone where it is performed.



Figure 1. Screenshot of video footage provided by the Data video system

5. Findings

Analyzing all the statistical video data provided by the Data Volley software, we identified several technical-tactical issues at reception, which aided us in devising an individualized training program for each player. The table below shows the deficiencies identified as a result of the analyses performed.

Table 5. Technico- tactical issue found

Issues found in serve reception	Root of the issues	Individualized solutions/training
The players have difficulty in hitting the ball laterally	Late placement of the forearms in the ideal position	Technical training- focus on forearm positioning and maintaining the outer shoulder up
The player moves or jumps during the execution	Late reaction- slow displacement - he is late to reach the hitting position	Reception training focusing on moving laterally, from left to right or in different directions
The arm contact with the ball is too close to the torso	The player starts towards the ball too early	Serve-reception training- focus on ball trajectory
The receiving player loses ball control when he is to perform the attack hit	The player starts the attack before finishing the reception	Training focusing on reception execution and post-attack performance
Issues when jump serving, the ball clears the net	The player cannot control the ball handled in force	Ball contact should be performed in front of the torso

Source: Authors' own conception

A final analysis of the players' efficiency at reception, performed in the second part of the championships, both in the official and the training matches, during a 2-month training period, by means of the Data Volley software, showed considerable improvement in each player's efficiency, and hence, the entire team's efficiency. Table 6 shows the statistical data recorded for the 4 players and their general average.

Table 6. Statistical analysis of the players after 2 months' training

Skill	Player	All	=	%	/	%	-	%	!	%	+	%	#	%	*E%
Reception	Receiver 1	59	7	12%	1	2%	10	17%	6	0,1	17	29%	18	31%	59%
	Receiver 2	112	10	9%	5	4%	25	22%	10	9%	28	25%	34	30%	55%
	Receiver 3	84	3	4%	3	4%	15	18%	15	18%	20	24%	28	33%	57%
	Libero	35	2	6%	2	6%	9	26%			10	29%	12	34%	63%
	Average	290	22	8%	11	4%	59	21%	31	12%	75	27%	92	32%	59%

Source: Authors' own conception

6. Discussions

Analysing the reception efficiency and drawing a parallel with the 56% national efficiency, the Arcada team registered a 7% efficiency increase, with an average of the Arcada Galaţi team of 59%. All the 4 players involved in the present study showed considerable improvement as compared to the initial analysis, as follows: the first receiver player had the most spectacular increase, from the initial 42 % to 59%, i.e. a 17% increase, mainly for the positive reception. The second receiver player increased his efficiency by 2%, from 53% at first to 55%, and the third receiver player from 52% in the first part of the championships to 63%, which is a quite important increase. The libero increased his efficiency by 2%, from 61% to 63% , visibly better than in the initial part of the present study. Therefore, it may well be stated that it is of utmost importance to use such software throughout the training period of a volleyball team, as it brings innumerable benefits to the coach during, before, after play or during the training sessions.

7. Conclusions

In conclusion, the actual results obtained prove that using a statistical analysis software throughout training helps devise specific training programs for individualized game positions. All these materialized under the form of efficiency increase for the 4 players under study, the entire team, thus reaching the high-performance objective.

As a result, it may be stated that one of the decisive factors in increasing the play level and consequently the players' game efficiency is the latest methods and programs used in elite volleyball.

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