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ESTABLISHING TECHNICAL AND TACTICAL PERFORMANCE GOALS FOR ELITE MEN'S BEACH VOLLEYBALL PLAYERS

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ABSTRACT

The purpose of this paper was to establish the technical and tactical performance goals for elite men's beach volleyball players. The process for calculation and analysis was carried out in three stages: 1) establishing the criteria to analyze and monitor; 2) data collection (match observation) as well as descriptive (mean, standard deviation, baseline of won and lost sets, and percentiles) and inferential analyses (Chi-Square Test and likelihood ratio) of the data to compare won/lost sets; and 3) establishing performance goals. Eight performance goals for technical-tactical actions to control player's actions in training and in competition were established. The data obtained are applicable for peak performance men's beach volleyball (World Tour) or for a similar level of competition.

Keywords: performance match analysis, tactics, technique

INTRODUCTION

The goal of monitoring beach volleyball practices is to ensure that the work done in practice by athletes and teams is adequate. This control helps us assess the effect of the work done and the aspects that should be changed or modified in practice (Coleman, 2002). The use of goals in sport is common, and they can be established in different realms (physical, technical, tactical, psychological, etc.). It is common for coaches

to use performance goals to monitor players, and when a problem is detected, they review the process goals of the athletes' actions (Coleman, 2002). For example, strength and conditioning coaches establish goals involving number of repetitions, manner of execution, speed or power, etc. The fulfillment of these goals allows strength and conditioning coaches to monitor the workout, and the goals help athletes focus on the important aspects of their practice.

The recommended criteria to follow in the establishment of goals is the SMART principle (Bull, Albinson, & Shambrook, 1996; Rushall, 1995): specific, measurable, affirmative, realistic, time-based, evaluated, and recorded. One of the most difficult aspects of performance goal establishment is to have proper reference values that are challenging for athletes. It is easier to set goals for physical aspects than for technique and tactics (e.g. weight lifted in the bench press or jump reach vs. ratio of serve aces and errors). The lack of reference performance goals related to technical-tactical actions means that beach volleyball coaches use their subjective, previous experiences to evaluate their players in practice and competition. Further, most current beach volleyball coaches usually started playing and coaching in indoor volleyball. Reference values are needed to analyze players' actions and to establish what aspect of the games needs to be worked on or emphasized.

This paper attempts to provide reference values through the collaboration between researchers and coaches to be used as performance goals by volleyball coaches to monitor their athletes in practice and competition. As a part of the design and validation of the performance goals for elite beach volleyball players, an expert panel, match analysis, and review of the literature were done. The purpose of this paper was to establish the technical and tactical goals for peak performance male beach volleyball players.

METHOD

The processes of calculation and analysis were done to establish the reference values for the goals. This was done in three stages: 1) establishing the criteria to calculate and analyze the performance (involving

researchers and coaches); 2) data collection (match observation) as well as descriptive (mean, standard deviation, baseline of won and lost sets, and percentiles) and inferential analyses (Chi-Square Test and likelihood ratio) of the data to compare won/lost sets; and 3) review of the data by coaches and researchers to establish goals with the SMART principle (Bull et al., 1996; Rushall, 1995). The steps followed to establish performance goals from technical-tactical actions from match analysis were (Palao & López-Martínez, (2012): 1) establish the critical aspects of the sport at this level of competition; 2) establish the performance indicators and reference values for the sport; 3) establish the baseline performance indicators and characteristics of the players and teams, and 4) establish the training and competition goals. The study was approved by the Ethics Committee of the University of Murcia. Participation in the study was voluntary. All coaches who participated in the study were informed of the study's procedures and were required to sign an informed consent before the study began.

In the first stage, work sessions between researchers and coaches were carried out. The goal of these sessions was to establish the criteria for analyzing the players' performance. The criteria described by Anguera (2003) to design observational instruments were followed. The expert group was composed of two beach volleyball coaches and three sport analytics researchers. The two coaches had more than six years of coaching experience each in volleyball or beach volleyball, had the highest Spanish volleyball coaching certificate, and had undergraduate degrees in Sport Science. One of the coaches was the Spanish national beach volleyball coach. Of the three researchers that participated in this stage, two had more than seven years of experience in coaching

volleyball or beach volleyball, there research area was sport team analytics, and all three were university professors who had their doctorate in Sport Science. The observational instrument for technical and tactical actions in beach volleyball, which was validated by Palao, Manzanares, and Ortega (2015), was used as a reference to commence the first session's discussion. The principal researcher acted as the facilitator of the sessions. Two work sessions were held. In the first meeting, there was an introduction, a brainstorming session, and an organizing session for the tasks to be done (prepare a list of actions to analyze and the criteria and aspects to analyze). In the second of the meetings, the proposed list of variables was reviewed by the group of coaches and researchers. At the end of this process, the actions, criteria, and manner of analysis were established by consensus.

In the second stage, the data collection (through match observation) and data analysis were done. A sample of 179 sets from 84 matches (5,132 rallies) from the 2008 World Tour season was analyzed. Matches from 26 of the first 30 teams in the 2008 World Tour were included in the sample (86.6% of the sample). Sample selection was done according to the following criteria:

a) Three levels of teams were established (those classified 1st-10th, 11th-20th, and 21st-30th). An equal number of matches from the six possible combinations of confrontations between these three levels were included (14 matches from each type of confrontation: 1st-10th vs 1st-10th, 1st-10th vs 11th-20th, 1st-10th vs 21st-30th, 11th-20th vs 11th-20th, 11th-20th vs 21st-30th, 21st-30th vs 21st-30th); and

b) A maximum of four matches or twelve sets per team was included in the sample. The video recordings of the matches were obtained

from the researchers' own records, from Eurosport and Eurosport 2 channels, and from the matches recorded by the Spanish national coach.

The recordings allowed us to watch all the ball contacts made by the players. The variables included the efficacy of the various actions (serve, reception, set, attack, block, and dig), the complex or game phase (side-out or defense), and the result of the set. Efficacy was measured in relation to an action's success and the options that action gave to the attack of the analyzed team and the opponent. The FIVB statistical system (Coleman et al., 1969) was adapted and used (Palao & Manzanares, 2009; Palao, Manzanares & Ortega, 2015). Terminal actions (serve, spike, and block) were evaluated on a 5-point scale (error, all opponent attack options, limited opponent attack options, no opponent attack options, and point). Actions of continuity were evaluated on a 4-point scale (error, no attack options, limited attack options, and all attack options). Data were expressed as occurrence, percentage of occurrence, efficacy coefficient (average efficacy score of an action (scale of 0 to 4 for terminal actions, or 0 to 3 for continual actions), efficacy (perfect action percentage minus error action percentage), or point-error ratio.

Four trained observers recorded the data. The observers had a degree in sport science, had the highest volleyball coaching certifications in Spain (level III), were former volleyball or beach volleyball players, and had experience as observers (research and sport scouting). The observers did inter- and intra-reliability testing with one of the researchers (Cohen's Kappa), and the values that were found were greater than 0.80 and 0.98, respectively. For quality control, all observers observed a match.

All matches were reviewed by the referent observer to correct differences in the criteria observed in the match trial.

Data were exported to a spreadsheet. From the raw data, statistical values that were proposed in stage one were calculated. With this data matrix, descriptive (mean, standard deviation, baseline of won and lost sets, and percentiles) and inferential (Chi-Square Test and likelihood ratio) analyses of the data to compare won/lost sets were done with the SPSS 15.0 software. Statistical significance was set at 0.05.

In the third stage, a comparison of the results obtained with data from previous studies in the literature (normal values and win/loss studies) was presented to the panel of experts from the first stage. A review of the studies found (in Web of Knowledge, Sportdiscus, Sponet, and Google Scholar) that analyze the actions studied and the differences between winning and losing was done. Only studies or data from male players in international competitions were included. The review and establishment of reference values was done by the same coaches and researchers as in phase one. Coaches and researchers established SMART goals (Specific, Measurable, Achievable, Realistic, Trackable) (Bull et al., 1996; Rushall, 1995). Consensus determined the criteria to follow to establish the reference values; at least five of the six participants had to agree on the criteria. If consensus was not achieved, the differences were discussed by the participants in order to arrive at an agreement.

RESULTS

The result of the actions, criteria, and manners of analysis from the first stage is shown in table 1. The list was composed of six skills that were analyzed in two phases (team

in side-out and team on defense). Effectiveness was measured in relation to the action's success and the options that this action gave the analyzed team and the opponent. The FIVB statistical system (Coleman et al., 1969) was adapted and used to measure efficacy. The criteria followed in the analysis is described in Palao and Manzanares (2009). The manners of analysis that were established were: occurrence, percentage, coefficient, ratio, and efficiency (Palao, 2008; Schleuder, 1998).

In the second stage, after the data collection and the data analysis, significant differences were found in the following variables (table 2).

In the third stage, a comparison of the results obtained with data from previous studies in the literature (normal values and win/loss studies) was carried out (Table 3). The data from the literature were obtained after reviewing the studies found in the literature (Giatsis & Tzetzis, 2003); López-Martinez & Palao, 2009; López-Martinez & Palao, 2010; Tilp, Koch, Stifter, & George, 2005; Yiannis, 2008).

After the review of the data by the coaches and researchers, the reference value list to be used as performance goals was established (Table 4). For two skills, the analysis by phase only was considered. In the end, only three manners of analysis were selected (occurrence, percentage, and efficacy). The list was reduced to eight goals. Coaches' criteria were that in order for performance goals to be applicable for monitoring players in practices and competitions, the number of goals should be minimal. The serve was the only action with two criteria that were analyzed. The spike was analyzed in two phases (side-out and counter-attack).

Table 1. List of actions, criteria, and manners of analysis established after stage one.

Serve	Reception	Set	Spike	Block	Dig
Occurrence	Occurrence	Occurrence	Occurrence	Occurrence	Occurrence
Percentage	Percentage	Percentage	Percentage	Percentage	Percentage
Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Point-to-error ratio	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency
Efficiency					
Technique	Serve type	Technique	Technique	Technique	Technique
Zone	Technique	Zone	Zone	Zone	Zone
Tempo	Zone	Tempo	Tempo	Tempo	Tempo
Complex	Tempo	Complex	Complex	Complex	Complex
Player role	Complex	Player role	Player role	Player role	Player role
	Player role	Recep/dig efficacy	Recep/dig efficacy	Recep/dig efficacy	

Table 2. Differences between variables analyzed between won and lost sets.

	Won set		Lost set		Sig.
	M	SD	M	SD	
Serve					
Coefficient	1.43	0.22	1.34	0.25	.002*
Point-to-error ratio	1 : 1.73	1.29	1 : 2.13	1.83	.126
Efficacy	-3.96	9.36	-8.14	11.17	.000*
Reception					
Coefficient	2.39	0.26	2.46	0.24	.018*
Efficacy	86.32	15.68	90.75	12.65	.007*
Set					
Coefficient	2.56	0.22	2.64	0.19	.002*
Efficacy	95.20	7.00	97.22	5.55	.006*
Spike					
Coefficient	2.72	0.41	3.00	0.42	.001*
Efficacy	34.95	30.58	48.70	32.30	.002*
Block					
Coefficient	1.82	0.71	1.76	0.86	.529
Efficacy	0.42	34.75	-2.38	42.87	.541
Dig					
Coefficient	0.97	0.41	0.90	0.41	.140
Efficacy	-11.90	36.30	-19.11	36.23	.091
Set (counter-attack)					
Coefficient	2.27	0.33	2.22	0.40	.195
Efficacy	89.67	15.58	85.89	24.46	.120
Spike (counter-attack)					
Coefficient	2.62	0.69	2.48	0.77	.107
Efficacy	37.26	32.32	30.71	39.10	.123

Legend: * = $p \leq .05$ (Student t test for independent samples). Coefficient: average efficacy score of an action (scale 0 to 4 for terminal actions, and 0 to 3 for continual actions). Efficacy (perfect action percentage minus error action percentage).

Table 3. Reference values of the efficacy in beach volleyball in the reviewed literature.

Serve	Reception	Set	Spike	Block	Dig
35% ²	35% ¹	43-52% ⁴	41% ² - 46% ¹	4.9% ⁵	-

Legend: ¹ Giatsis & Tzetzis (2003); ² López-Martinez & Palao (2009); ³ López-Martinez & Palao (2010); ⁴ Tilp, Koch, Stifter, & George (2005); ⁵ Yiannis (2008).

Table 4. Technical and tactical performance goals for men's performance beach volleyball players (data from the first 30 teams in the men's 2008 FIVB ranking).

TECHNIQUE	CRITERIA	GOAL
Reception	Efficacy (Perfect - Error)	50%
Attack	Efficacy (Points - Error)	30%
Counter-attack	Efficacy (Points - Error)	25%
Serve	Percentage of error	10%
Serve	Percentage of points and actions that reduce the opponent attack options	30%
Set	Percentage of errors and sets that do not allow attack	<10%
Block	Percentage of points	5-10%
Dig	Digs that allow team to counter-attack	20%

DISCUSSION

The objective of this study was to determine reference values for establishing technical and tactical values that can be used as performance goals for peak performance male beach volleyball players. From a general perspective, three stages that were applied have contributed to developing a proposal of technical and tactical goals. The collaboration of coaches and researchers, with their different perspectives, has allowed this. The role of the Spanish national beach volleyball coach was critical in this process to set practical reference values that can be used as performance goals.

The first stage allowed for a wide perspective so as not to limit the analysis, and it considered new options. The aim mentioned in the meetings was the idea of innovating in match analysis and exploring new perspectives (e.g. data calculation). Coaches always insisted that the new proposals be adaptable to their current statistical system regarding knowledge and experience from coaches and athletes, software, and integration in practice and in competition. The basis for building the structure of the instrument was the statistical system used by the coaches as well as the studies regarding the characteristics of volleyball (Eom and Schutz, 1992a,b; Palao, 2004), especially in relation to game complex

or the order of actions (i.e. serve-reception, reception-attack, etc.). Books and articles about the methodology of statistics in sport were reviewed to establish the manners of analysis (Diaz, 1992; Ejem, 1980; Palao, 2004; Schleuder, 2004).

After establishing the criteria to do the analysis and observing the sample selected by the panel of experts (coaches and researchers), data obtained from matches gave specific values for the level of competition studied. From the data analysis, it was found that the defense actions were the actions that differentiate winning and losing teams (serve, block, dig, set, and counter-attack), and from the analysis of the descriptive data (average, standard deviation, and percentiles) the profile of winning and losing teams was set. The comparison of the data found with the results of research studies about this topic allowed us to contextualize the data. The available information was limited because most of the studies either use the match as the unit of analysis (occurrence and percentage) or they do not present the occurrence data.

Specifying the performance goals involved eliminating numerous aspects established or calculated in previous stages. The criteria of the coaches was to reduce the number of goals and in this way make the

reference values truly applicable to practice and competition. This was the aspect that was most mentioned by coaches in the last stage (to be realistic). When selecting the performance goals, the significant criteria to decide which one of the ways to analyze a skill that was going to be used was that it allowed us to give clear information to players and teams. The group of experts decided to include at least one aspect of each skill to have a broad perspective of the game and give every skill of the game the same importance. Beach volleyball coaches decided to set two goals for the serve and the spike, due the weight of these actions on the game. The unit used to express the performance goals was the percentage because according to the coaches this type of calculation was easier for them to monitor in practice. It was easiest to transfer to 10 repetitions which was the way that they usually monitored the actions in practice (e.g. one error out of 10 serves).

CONCLUSIONS

Eight performance goals for technical-tactical actions to monitor player's actions in training and in competition were established. The data obtained are applicable for peak performance men's beach volleyball (World Tour) or for a similar level of competition. It is necessary to complement this data with the level of the team in which the goals are to be implemented to be properly adjusted. It is important to be aware of the criteria used to calculate the goals because it affects the reference value. The process used in this study involves the combination of mathematical analysis, literature, and expert opinion. More studies that establish reference values for technical and tactical actions are needed in beach volleyball (by level, gender, type of competitions, etc.).

In order for sport protocols and/or data to really be used by coaches and athletes, either collaboration between coaches and researchers or a divulgation of the results through proper channels and language, etc., which is adapted to the target population is needed. The present paper is a proposal of protocol and data that can help to develop reference values that contribute to properly evaluating athletes and teams in practice and in competition.

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