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The relationship between volleyball skills and final ranking in high level men's Volleyball.

1.   Introduction

Thorough analysis of athletic skills is a valuable resource for coaches in order to help teams' progress. Information obtained through statistical analysis, can be proved to be a priceless way to understand the strong and weak points of a team. By means of this information, coaches can, on one hand, give appropriate feedback to their athletes and, on the other, plan their strategic or tactical options more effectively, during the entire season (Byra & Scott, 1983). Moreover, it makes it possible to draw information about characteristics and trends of the playing model and, thus compare players and teams in a championship.   With regard to the Volleyball sport, in particular, data, derived through observation and evaluation of the sport skills is very important because the amount of ball touches in a match provides such a highly representative sample, that it allows both an individual and a team analysis, in terms of technical and tactical performance. According to Nishijima et al. (1987) volleyball consists from six basic technical skills (serve, pass, set, attack, block, dig) and two complexes (complex1 & complex 2). Out of these six basic technical skills only set and attack are to be found in both complexes. The performance of a team as far as these skills are concerned is very important for the achievement of its goals. Laios and Kountouris (2005) studied the differences between the Olympic Games of Sidney 2000 and Athens 2004 in the effectiveness of technical skills in men's volleyball, concluding that attack is the most important skill in volleyball. Lobietti et al. (2006) investigated the relationship between the volleyball skills and the final ranking of a team without individuating the attack performance in the two complexes. They concluded that attack and block are the most important skills of all, for the success of a men's volleyball team. In this study we examine attack separately in both complexes to find out in which one is more important.

The aim of this study is to determine the most important skill for the success of a volleyball team as it represents with the points gathered, in the final ranking of the regular season of a championship.

2. Methods

All the matches of the Greek professional men's League are recorded and analyzed through the software Data Volley (Data Project s.r.l., Bologna, Italy) by one scout man registering every touch of the ball during the game. This is the procedure we followed. We select one day of the championship at random, and record the data of the six games. A week after we re-record it, by an acceptable margin of 5% error allowance for each variable and the total number of touches for each skill. After having successfully completed this evaluation, we also analyzed the data in relationship to all games (132) of the entire A1men's regular season 2005-06 for each team (N=12). We took into consideration the effectiveness of the following twelve parameters: aces(S#), lost services(S=), ratio of lost services/ aces (SR), attack points after serve pass(AP#), attack errors after serve pass(AP=), attack stuffed after serve pass (AP/), attack points after defense(AD#), attack errors after defense(AD=), attacks stuffed after defense(AD/), direct blocks(B#), perfect passes(P#) and passes errors(P=).

A Pearson r correlation coefficient was computed between these variables and team points in the final ranking of the regular season (PFR), which was calculated according to the point system of the entire championship as following: 3 points for winning team 3-0 or 3-1, 2 points for winning team 3-2, 1 point for losing team 2-3 and no points for losing team 1-3 or 0-3. A multivariate regression analysis has been carried out to detect the relationship among the parameters and their decisive role in the success of a volleyball team in the entire championship.

3. Results

The descriptive statistics for the variables are previewed in table 1. Comparing the percentages for attack in two complexes, we can remark that in complex 1 attack is more effective than in complex 2.The percentage of Kill attacks after pass is higher than that of kill attacks after defence (52,7%±4,2% and 45,4%±5,5%). The percentage of attack errors is lower in complex 1 than in complex 2 (8,7%±1,2% and 9,9%±1,8%) and the same happens with the percentage of attack stuffed in block(9,9%±2,2% and 10,21±2,2% respectively). For serve we can maintain that more often teams losing direct points from it (17,4% ± 2,4%) than win direct points (6,7% ± 1,2%) and for every ace they have lost approximately 3 services(2,64 ± 0,49).

The correlation statistics between variables are previewed in table 2. The more correlated skills with the final ranking is AP#(r=, 866) and SR(r=-, 816). Also very high negative correlation with PFR have and the other variables which related with attack in complex 1, AP=(r=-, 635) and AP/(r=-, 810). We don't remark congener correlation for attack in complex 2. From the three variables related with attack during complex 2 only AD# has statistically significant correlation with PFR. From skills which executed during complex 2(serve, block, attack after defense) the more correlated with the final ranking is S#(r=, 665) and AD#(r=, 657). For direct block the correlation is not statistically significant whereas B# is more effectiveness than S# (7,06%±2,2% for direct block, 3,42%±1,1% for serve aces).

Table 1: Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
PFR	12	54	6	60	33,00	4,925	17,061	291,091
% S#	12	,04	,05	,10	,0672	,00342	,01183	,000
% S=	12	,07	,14	,21	,1737	,00684	,02368	,001
% P#	12	,11	,55	,66	,6098	,01128	,03909	,002
% P=	12	,06	,06	,11	,0806	,00466	,01615	,06
% AP#	12	,14	,45	,59	,5267	,01204	,04172	,002
% AP=	12	,04	,07	,11	,0873	,00359	,01245	,000
% AP/	12	,08	,07	,15	,0991	,00656	,02272	,001
% AD#	12	,21	,35	,56	,4544	,01578	,05466	,003
% AD=	12	,06	,06	,12	,0994	,00520	,01801	,000
% AD/	12	,07	,06	,13	,1021	,00643	,02228	,000
%B#	12	,08	,20	,28	,2386	,00706	,02445	,001
SR	12	1,43	1,95	3,38	2,6398	,14031	,48605	,236

Table 2:Correlations between variables

	PFR	% S#	% S=	% P#	% P=	% AP#	% AP=	% AP/	%AD#	%AD=	% AD/	%B#	SR
PFR	1	,665(*)	-,379	,787(**)	-,509	,866(**)	-,635(*)	-,810(**)	,289	-,657(*)	-,546	,183	-,816(**)
% S#	,665(*)	1	,191	,542	-,296	,708(*)	-,556	-,481	-,224	-,825(**)	-,676(*)	-,150	-,685(*)
% S=	-,379	,191	1	-,052	-,068	-,133	-,184	,494	-,529	-,196	,351	-,689(*)	,576(*)

% P#	,787(**)	,542	-,052	1	-,760(**)	,888(**)	-,910(**)	-,703(*)	,088	-,508	-,253	-,087	-,487
% P=	-,509	-,296	-,068	-,760(**)	1	-,704(*)	,717(**)	,659(*)	-,168	,160	-,051	,012	,237
% AP#	,866(**)	,708(*)	-,133	,888(**)	-,704(*)	1	-,794(**)	-,862(**)	,271	-,596(*)	-,509	,033	-,690(*)
% AP=	-,635(*)	-,556	-,184	-,910(**)	,717(**)	-,794(**)	1	,476	,091	,500	,236	,245	,330
% AP/	-,810(**)	-,481	,494	-,703(*)	,659(*)	-,862(**)	,476	1	-,425	,296	,457	-,298	,777(**)
%AD#	,289	-,224	-,529	,088	-,168	,271	,091	-,425	1	,091	-,028	,509	-,237
%AD=	-,657(*)	-,825(**)	-,196	-,508	,160	-,596(*)	,500	,296	,091	1	,561	,135	,516
% AD/	-,546	-,676(*)	,351	-,253	-,051	-,509	,236	,457	-,028	,561	1	-,318	,802(**)
%B#	,183	-,150	-,689(*)	-,087	,012	,033	,245	-,298	,509	,135	-,318	1	-,422
SR	-,816(**)	-,685(*)	,576(*)	-,487	,237	-,690(*)	,330	,777(**)	-,237	,516	,802(**)	-,422	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 3:Multiple Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	,866(a)	,750	,725	8,946	,750	30,009	1	10	,000	
2	,917(b)	,841	,806	7,514	,091	5,176	1	9	,049	2,074

a Predictors: (Constant), AP#

b Predictors: (Constant), AP#, SR

c Dependent Variable: PFR

4.   Discussion

For our analysis, we selected the variable which determines the completion of the action and the assignation of the point.   We chose to take consideration the variables in terms of the percentage of the total execution of each skill, something that allows us to compare the teams' profile to one another and

derive information about the stability of their performance during the championship.

Only the variable R#, however, didn't determine the end of the action and the assignation of the point. We chose to consider R# closely because, from the point of view of many coaches, it is the most important variable for the determination of the final outcome of complex 1 in a volleyball game.

We individuate the skill of attack in the two complexes of the game so as to define the role of the importance if the attack both after pass (complex 1) and after a defense (complex 2) for the success of a team. All the variables for attack during complex 1 are important for team's success. Also the high correlation of P# with PFR(r=, 787) and with AP#(r=, 888) confirm the believe of many coaches that serve's pass is very important for the success of a men's team. So the performance of a team in complex 1 is may be considered as very important for its success in a championship. The same concluded from Marelic et al. (2004) in a case study of the performance of only one team. Due to the regulations of volleyball the winning team for a set must serve and play complex 2 at least two times more than its opponent. The ratio of the two variables related with serve (S# and S=) giving a very high correlation with the final ranking(r=-, 816) indicated that is not only important the number of wining or loosing points from serve. For the coach is important to take notice the ratio of lost serves to serve aces. For a multivariate regression analysis (table 3) the two independent variables (AP# and SR) with the higher correlation to PFR giving high coefficient of determination ($R^2 =$, 841) and also good adjusted coefficient of determination ($R_{adj}^2 =$, 806). Conclusively performance in complex 1 is very important for the success of a team. From the skills taking place in complex 2 is important to keep the ratio of lost serves to serves aces as lower as possible and avoid making attack errors.

Authors

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