

# Analysis of anthropometric characteristics and jumping ability in junior top level volleyball athletes. Comparison by role



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## Introduction

- ◆ The volleyball is a situational sport classified among activities laying on alternative aerobic and anaerobic processes, with an important participation of the muscular mass and a marked prevalence of the alactacid anaerobic process.
- ◆ Today, physical qualities associated with volleyball achievement seem to be explosive dynamic force, spring and speed in short distance displacements (Ciccarone et al., 2000).
- ◆ In evaluation and talent detection perspectives, it is essential to have reference data coming from the most performing athletes.
- ◆ As in other team sports, the comparison of morphological and physical characteristics according to the role on the field should contribute to improve talent detection and the training planning (Doutreloux et al., 2002; Srhoj et al., 2002).
- ◆ This kind of data is not yet available in volleyball.
- ◆ Moreover, it seems that there is a lack of information about the correlations between athletes characteristics.

- ◆ The goals of the present study were :
  - To compare several anthropometrical and functional variables according to the role of the player during the game in young top volleyball athletes.
  - To determine the correlations between the variables to identify the most interesting ones.

## Methods

- ◆ Data were collected from 42 volleyball players who trained with the Italian national junior team. Players were divided into four groups:
  - Outside hitters (n = 14; age = 18.5 ± 1.4 y.);
  - Middle blockers (n = 15; age 18.1 ± 1.1 y.);
  - Setters (n = 7; age = 18.4 ± 1.3 y.);
  - Non-specific spikers (n = 6; age = 17.5 ± .8 y.).
- ◆ Three kind of data were collected:
  - Morphological data (height, weight, indirect ratio of body fat determined by the formula of Katch or %BF, reach with one hand or R1 and reach with two hands or R2)
  - Ability to jump measured (1) with the method of Bosco et al. (1983): squat jump (SJ), counter movement jump (CMJ), CMJ with arms (CMJa) and repeated jumps during 15 seconds (R15) and (2) with the Vertec test in two conditions: spike (Vertec attack, Va) and block (Vertec block, Vb).
  - Combined data as jumping performance determined through the difference between Va and R1 (running spring, RS) and Va and R2 (standing spring, SS) and the difference between RS and SS indicating the aptitude of the player to use running (DS).
- ◆ The comparison of the anthropometric data and the jumping capacities according to the role on the field was carried out by analysis of the variance while the coefficient of correlation of Pearson was used for assessing the relations between variables. Results were considered to be significant at p<0.05.

## Results

- ◆ Significant differences between groups were found for height (p<.006), R1 (p<.02) and R2 (p<.02). The three anthropological variables were significantly higher for middle blockers (MB) than for setters (S) (Table 1).
- ◆ Comparing players' performance at the Bosco tests, no significant differences appeared between groups (Table 1).
- ◆ Results of Vertec tests showed significant differences in Va (p<.001) where group MB performed better than groups S and U (non-specific spikers), and in Vb (p<.05) where group C achieved significantly better than setters.
- ◆ Analysis of the correlation matrix showed that height and weight were strongly correlated, as well as with R1 and R2 (Table 2).
- ◆ Performances at Bosco tests and at Vertec tests were with each other correlated but no correlation was observed between results of Bosco and Vertec tests (Table 2).
- ◆ While Bosco tests gathered information provides an assessment of the jumping ability without connection to the specific skills, Vertec tests give more specific information about the athlete's ability to use spring in specific conditions.
- ◆ High correlations were identified between anthropometrical variables and the results of the Vertec tests (Table 2).
- ◆ As confirmed by a multiple regression analysis all groups of variables were with each other correlated, except %BF which is only (inversely) correlated to Vertec performances.

Table 1 – Comparison of variables according to role on the field

Variable	Outside hitters (n=14)	Middle blockers (n=15)	Setters (n=7)	Unspecific spikers (n=6)	F	p
Morphological data						
Height (cm)	194.4±4.1	198.2±4.1	191.1±3.8	195.8±5.4	4.75	.006
Weight (kg)	83.9±6.3	84.3±4.9	78.7±5.5	82.5±8.3	1.54	0.22
%BF	11.0±1.0	10.5±2.0	12.2±2.3	10.4±1.7	1.71	0.18
R1 (cm)	256.1±6.5	260.7±7.2	251.0±5.5	256.7±6.0	3.6	0.02
R2 (cm)	253.1±6.4	257.3±7.2	247.6±4.8	253.2±6.2	3.66	0.02
Bosco tests						
SJ (cm)	38.1±3.9	38.7±2.6	37.4±5.1	35.5±4.6	1.03	0.39
CMJ (cm)	42.7±3.9	43.3±1.9	41.9±6.1	40.7±4.8	0.72	0.55
CMJas (cm)	50.5±4.6	50.7±2.9	49.1±6.7	47.5±7.5	0.70	0.56
Vertec tests						
Va (cm)	330.9±6.6	336.7±6.4	325.6±8.7	324.7±2.1	7.29	.001
Vb (cm)	307.1±8.7	313.1±7.3	301.4±8.3	306.5±5.1	3.95	.015
Combined data						
RS (cm)	74.4±4.9	75.8±6.2	74.9±4.0	68.5±6.0	2.67	.061
SS (cm)	63.8±6.0	65.5±6.9	63.9±5.9	62.5±2.2	0.44	0.73
DS (cm)	20.6±4.6	20.3±5.4	21.0±3.7	16.0±6.5	1.41	0.25

Table 2 – Correlation matrix between all variables (r values; n= 42 volleyball players)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.Age	1															
2.Height	.02	1														
3.Weight	.17	-.628	1													
4.%BF	.23	.293	.058	1												
5.R1	.13	.860	.690	-.248	1											
6.R2	.11	.873	.674	-.256	.990	1										
7.SJ	.08	-.342	-.356	-.19	-.298	-.502	1									
8.CMJ	.16	-.294	-.282	-.188	-.198	-.234	.933	1								
9.CMJ-SJ	.22	.114	.186	-.035	.269	.242	-.131	.234	1							
10.CMJas	.16	-.274	-.239	-.165	-.25	-.296	.737	.813	.246	1						
11.R15	.35	-.135	-.15	-.156	-.118	-.139	.708	.638	-.158	.550	1					
12.Va	.18	.586	.392	-.334	.703	.690	.198	.264	.19	.210	.310	1				
13.Vb	.29	.640	.442	-.131	.730	.707	-.109	-.245	.375	.107	.222	.837	1			
14.RS	.05	-.284	-.348	-.152	-.287	-.310	.830	.598	-.056	.595	.547	.468	.205	1		
15.SS	.31	-.098	-.142	.125	-.114	-.153	.469	.579	.246	.451	.479	.374	.578	.612	1	
16.DS	.3	-.207	-.226	-.314	-.192	-.173	.135	.007	-.346	.15	.065	.097	-.433	.421	-.459	1

## Discussion and conclusion

- ◆ The study has pointed out that, in junior top level volleyball players, the anthropometrical profile is directly related to specific variables which can be used to select talented athletes and to plan training in connection with specific role of the player in the game.
- ◆ Because of the reduced duration of the game episodes and to the increasing intensity of the game rhythm, modern volleyball involves increasingly the alactacid anaerobic component.
- ◆ Thus, top level volleyball requires always more muscular powerful athletes who are also characterized by quickness and high jumping abilities.
- ◆ It follows that assessment, training and follow up of the jumping abilities major determinant aspects of the player's effectiveness. Our study underlined the interest of the use of specific tests to identify the jumping ability of volleyball athletes.
- ◆ Finally, the protocol developed in this study can provide determining information during the first phase of athletes' selection.