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Relationships between somatic traits and physical efficiency of female volleyball players

by
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Professional sport, requires the enhancement of theoretical and practical foundations of women's sports training. Todays system of sports training is consistently being enriched by information delivered through studies on functional abilities of female athletes. Enhancements in practice of women's sports training are further justified by the fact that in many countries of the world, participation of women in sport is still uncommon. The latter allows for making expectations, that in coming years, female sport will be full of landmark developments and new records. This study aimed at recognition of functional and structural characteristics of female athletes and presents an attempt to built theoretical and methodological foundations of women's sports training in volleyball. Volleyball belongs to sport activities in which morphological conditions of its participants influence the level of sport performance. Recent changes in rules according to which volleyball matches are played resulted in even more obvious influence of somatic traits on final success in this sport. Thirty of the top Polish 14 – 15 year old female volleyball players were studied Correlative interdependency between somatic traits and chosen elements of physical efficiency at the introductory stages of training.

Keywords: *volleyball, sports training, female athlete, functional and morphological characteristics*

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Introduction

Volleyball belongs to sport activities in which morphological conditions of its participants influence the level of sport performance. Recent changes in rules according to which volleyball matches are to be played resulted in even more obvious influence of somatic traits on final success in this sport. While taking into account the present level of development of this sport, it is evident that one most characteristic feature of both male and female top volleyball players is their exceptional height. The average body height of top male volleyball players representing club and/or national teams equals 200 cm, and female volleyball players – 185 cm.

Although exceptional body height seems to be an indispensable condition for success in volleyball, by no means is it the only one.

Far more important are the conditions in which the specific body posture fully matches the elements of volleyball physical fitness which have a direct influence upon the effectiveness of match activities.

Body height, being the most characteristic trait of volleyball players is significantly conditioned genetically (Milicerowa 1973). External factors including training and starting loads, do not influence this variable (Zatsiorski 1995; Zaporozanow and Sozanski 1997). Somatic conditions, necessary to attain top sports level, have to be brought about in a long and time-consuming process of selection, whereas the harmony of somatic traits and other elements specific for volleyball is developed during many years of training. (Socha 2001). Practical experience as well as theoretical knowledge indicate that the process of selection potential volleyball players should not to be based on somatic criteria exclusively. (Laska-Mierzejewska 1980). It seems equally important to include criteria that evaluate functional abilities necessary for successes in this sport discipline.

The current level of development of both, theory and methods of volleyball training offers primarily a set of somatic criteria, which are far better developed than the functional ones. (Sobolewa 1999; Socha 2002). This is why selection of future volleyball players is limited to somatic criteria. Fitness predispositions are usually discovered when successive stages of training are implemented. While observing practical sport training techniques of female volleyball players one can discover that specific body traits do not help in development of specific fitness. It seems that girls of average height reach a high level of specific fitness with much less physical effort (Laska-Mierzejewska 1978).

This is why a number of sport coaches for whom sport priorities are short-termed, while choosing possible candidates for volleyball, clearly value these selection criteria, at the same time neglecting the somatic ones, which, by the way, clearly seem to be career-promoting.

The contemporary system of volleyball training, oriented, particularly in case of professional sport, onto a long list of specific requirements, has to take into account, beginning from the early stages of selection and matching, a complete set of both somatic and fitness elements which influence top sport achievements. These methods of selection and matching which are primarily oriented on short-term goals are not justified (Laska-Mierzejewska 1979).

Material and methods

The presented above theoretical considerations were verified on 30 female players aged 14 and 15 who took part in the final volleyball tournament of 8 macro-regions in 1996 (tab. 1). In order to evaluate somatic predispositions, 11 somatic traits as well as 6 fitness tests were administered to the selected group.

The primary aim of the research was to find out the degree to which somatic traits match body functions at this level of sports development. In order to discover possible interdependencies an attempt to estimate the level of correlation between the chosen somatic traits and results of the administered fitness tests were calculated.

Discussion of the results

The obtained results suggest that at this sport correlations between somatic traits and results of fitness tests are weak. The only element that moderately correlates is the circumference of the thighs and shanks with the results of fitness tests.

Most characteristic element at this stage of training is the complete lack of correlations between body height as well as the two remaining longitudinal variables, and the results of fitness tests. This suggests that body height does not favour specific fitness important in volleyball. This is why some volleyball coaches aiming at early successes prefer to set teams of not too tall, but well shaped and agile players. However, what has been very well evidenced, this type of body posture does not guarantee positive perspectives in further stages of volleyball training.

As it has already been stated, the selection of such volleyball players as described above cannot be explained either from a sport-like, or an economic point of view.

Table 1 Correlation coefficients between somatic traits and the results of fitness tests for 14- and 15-year-old female volleyball players. (n=30)

	Variables	Vetical jump with run-up	Vertical jump/	Strength of lower limbs	Medicine ball throw	10 m run	„Zigzac" run
1	Body height	0,08	0,11	0,07	0,19	0,04	-0,26
2	Body height with raised arm	0,17	0,12	0,14	0,16	0,07	-0,24
3	Lenght of legs	0,13	0,11	-0,15	0,17	0,18	-0,23
4	Body mass	0,20	0,26	-0,04	**0,62**	**0,35**	-0,04
5	Chest circumference	0,24	0,28	0,13	**0,57**	0,29	**0,38**
6	Thigh circumference	**0,37**	**0,59**	**0,41**	**0,58**	**0,43**	0,29
7	Shank circumference	**0,31**	**0,47**	**0,29**	**0,61**	**0,40**	0,26
8	Arm circumference	0,19	0,21	0,16	**0,56**	**0,51**	0,24
8	Fat free mass (FFM) %	0,29	0,27	0,19	**0,59**	0,27	0,09
10	Fat content (FT) %	0,18	0,09	-0,07	**0,33**	-0,12	-0,27
11	Rohrer index	0,25	0,29	-0,09	**0,55**	**0,41**	-0,16

p = 0,50; r = 0,38

Similar research was carried out with a group of 16 female volleyball players, each of them two year older that those incorporated into the first examined group, that, subsequently, trained volleyball two years longer (tab. 2).

From this group the National Junior Female Volleyball team, consisting of 12 players, which placed 3rd in the World Volleyball Championships For 17-Year-Olds was completed.

This group of female volleyball players, on examination, allowed us to discover positive correlations between longitudinal traits and results of both jumping tests and medicine ball throw.

One could, however, notice the existence of negative correlations between longitudinal traits and „zig-zac" run, in this group of examined players.

Taking into account the specific form of account necessary in this exercise, i.e. numerous stops, starts and turns, as well as slightly longer speed-endurance efforts, such results of correlation are justified.

It should be stressed that this group of volleyball players was 3 cm taller than the previous group of 14- and 15-year-olds, and its average height was in-between 179-192 cm.

Table 2 Correlation coefficients between somatic traits and the results of fitness tests for 16- and 17-year-old female volleyball players. (n=16)

Variables		Vetical jump with run-up	Vertical jump/	Strength of lower limbs	Medicine ball throw	10 m run
1	Body height	**0,32**	**0,40**	0,19	**0,37**	**-0,52**
2	Body height with raised arm	0,27	**0,31**	0,17	0,26	**-0,39**
3	Lenght of legs	**0,39**	**0,32**	0,14	0,11	**-0,30**
4	Body mass	0,23	0,19	0,09	**0,46**	-0,27
5	Chest circumference	0,19	0,12	0,07	**0,51**	-0,19
6	Thigh circumference	**0,51**	**0,54**	**0,46**	**0,44**	0,21
7	Shank circumference	0,19	0,22	0,19	**0,31**	0,09
8	Arm circumference	0,26	0,19	0,11	**0,42**	0,17
9	Fat free mass (FFM) %	0,22	0,29	**0,30**	**0,49**	0,19
10	Fat content (FT) %	0,07	0,12	-0,09	**0,37**	-0,21
11	Rohrer index	0,19	0,23	0,07	**0,44**	**-0,34**

p = 0,50; r = 0,40

The group of the female representatives of Poland, that placed 5^{h} at the World Volleyball Championships for 18-19-year-olds, showed that the correlation's between longitudinal traits and fitness results are more significant (tab. 3). It seems, justified to claim that a further concord between body posture and fitness of the female volleyball players can be observed. The results obtained in this group revealed some new correlations, not found in two previous groups, these, namely, between fat content and the fitness tests' results.

Table 3 Correlation coefficients between somatic traits and the results of fitness tests for 18- and 19-year-old female volleyball players. (n=14)

	Traits	Vetical jump with run-up	Vertical jump/	Strength of lower limbs	Medicine ball throw	10 m run
1	Body height	**0,39**	**0,43**	0,09	**0,36**	0,03
2	Body height with raised arm	**0,40**	**0,36**	0,11	0,29	0,08
3	Lenght of legs	0,28	**0,31**	0,06	0,17	-0,16
4	Body mass	0,23	0,17	0,09	**0,52**	0,17
5	Chest circumference	0,15	0,21	0,16	**0,33**	0,21
6	Thigh circumference	**0,34**	**0,39**	0,23	**0,37**	0,19
7	Shank circumference	0,17	0,21	0,09	0,18	0,03
8	Arm circumference	0,21	0,16	0,03	**0,43**	-0,11
9	Fat free mass (FFM) %	0,22	0,19	0,12	**0,49**	0,03
10	Fat content (FT) %	**-0,53**	**-0,38**	0,07	0,17	**-0,47**
11	Rohrer index	-0,27	-0,24	0,04	**0,38**	0,02

p = 0,50; r = 0,40

The negative correlation shows that fat content at this sport level clearly hinders performance. This negative influence is particularly observed in activities based on agility. It seems logical to conclude that the level of fat content, which is embedded genetically to a small degree, definitely limits the level of play of female volleyball players. Fat content is mainly dependent on the type of diet and performed exercise. Individual training loads and diet can significantly influence it. The examined group revealed the highest fat content. This phenomena is a result of an irrational diet of teenagers and the specifics of female metabolism at this age.

Conclusions

1. The processes of matching fitness variables with somatic traits depend, in the analyzed groups of female volleyball players, upon the duration and the form of training programs.
2. The process of selection of future volleyball players should concern somatic traits, which play a decisive role from the initial stages of training.

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