

Original Article

Effect of physical development parameters and conditioning abilities on the level of motor coordination in female volleyball players in the phase of specialized basic training

ROMAN BOICHUK¹, SERGII IERMAKOV², VASYL KOVTSUN³, VIKTORIA PASICHNYK⁴, VALERYI MELNYK⁵, MYKOLA LAZARENKO⁶, MARIYA TROYANOVSKA⁷, VITALII KOVTSUN⁸

¹Department of Physical Education and Sports, Ivano-Frankivsk National Technical University of Oil and Gas, UKRAINE

²Department of Tourism and Recreation, Gdansk University of Physical Education and Sport, POLAND

^{3,4,5} Department of Sport and Recreational Games, Lviv State University of Physical Culture, UKRAINE

^{6,7} Faculty of Physical Education, National University "Chernihiv Collegium" named after T.G. Shevchenko, UKRAINE

⁸Department of Winter Sports, Lviv State University of Physical Culture, UKRAINE

Published online: October 31, 2018

(Accepted for publication September 29, 2018)

DOI:10.7752/jpes.2018.s4288

Abstract.

Purpose: The objective of the study was to identify the effect of physical education parameters and conditioning capabilities on the level of motor coordination manifestations in the female volleyball players at the stage of specialized basic training. **Material:** 20 female volleyball players aged 15 to 17 participated in the study. **Results:** certain range of problems aggravating efficient training process of young female volleyballers has been revealed. It has been proved that the improvement of female volleyball players' motor skills is of crucial significance for proper mastering and efficient application of volleyball technique elements during competitive activities. Correlation between physical development characteristics and coordination and conditioning skills has been revealed. Average rate of negative correlation between female athletes' body length parameters and their ability to maintain dynamic equilibrium has been identified. Low and average rate correlations have been registered between the capability of immediate manifestation of spatial orientation, rhythm and body weight index. Valid interdependence of average rate between the majority of coordination readiness characteristics of female volleyballers and their speed and strength qualities has been investigated. The combined effect method for simultaneous improvement of coordinating and conditioning preparedness in 15-17 year old female volleyball players was applied in accordance with the specific knowledge about quantitative correlation between the above mentioned, all in all inconsistent, characteristics of a human being. **Conclusions:** in order to master the efficient volleyball technique it is obviously essential for a volleyball player to possess corresponding physical qualities and skills. Definition of correlation between coordinating skills of volleyballers and other parameters of their motor activity could enable better control of female volleyballers' physical perfection. Major somatic characteristics have minor if any effect upon general level of coordinating readiness of female volleyball players in the phase of specialized basic training.

Key words: female volleyball players, training, development, coordination, skills, correlation.

Introduction.

Modern trends of volleyball development are characterized by players universalization and game dynamism. High maneuvering speed alongside with a large number of leaps demands flexibility, speed and strength readiness, high level of coordination and jumping endurance on behalf of an athlete. The whole range of volleyball technique elements are performed in an unsupported position, thus advancing high claims to vestibular apparatus activity (Zhelezniak, Portnov, & Savin, 2001; Beliaev, & Bulykina, 2007; Soltani, Hojati, & Hossini, 2016). In this connection sports training of athletes in preadult age, when players could better succeed in mastering volleyball basic technique and motor skills, is of special significance.

Zhelezniak, Portnov, and Savin (2001), Rycarev (2015), Boichuk, Iermakov, and Nosko (2017) denote certain problems that complicate efficient training process of young volleyball players. The first and the primary problem is caused by low level of motor and coordinating skills of the beginners. Liakh (2006) proves conclusively that young athletes possessing higher level of coordinating abilities distinguish themselves in excellent athletic skills. Another problem, that of early specialization, is tackled in the studies of the following volleyball experts: Zhelezniak et al. (2001); Kovalchuk (2017); Malikova, Doroshenko, Symonik, Tsarenko, & Veritov (2018). Close limits of technique elements in early specialization restrict possible growth of sports mastership at the subsequent stages of many years sports perfection. Yet another problem arising consists in orientating both educational and training process at scoring a victory at the competitions to the detriment of

1950

comprehensive training of young athletes (Boichuk, Iermakov, Nosko, Kovtsun, & Nosko, 2017; Akelaitis, & Malinauskas, 2018; Hnatchuk, Lynets, Khimenes, & Pityn, 2018). Consequently most preadult volleyball players possess considerable gaps in their general and special physical efficiency that in future might limit the improvement of their tactical and technical skills.

The issue of general characteristics and age-related peculiarities of motor skills in young athletes is regarded as one of the most interesting and complicated problems in the theory and methodology of sports training and sports metrology. According to Tkachuk and Vikhrov (2009) the complexity of the issue could be ascribed to the variety and quantity of motor skills. Contemporary sports scientists differentiate as much as 18 types of endurance (Tumanian, 2007; Gainullin, Isaev, Zalyapin, & Korablyova, 2017; Linets, Chichkan, & Himenez, 2017). Special coordinating skills, amounting to two dozens, reveal themselves in specific motor activities (cyclic, noncyclic, ballistic, play etc.). There are a dozen more the so called coordinating skills inherent to individuals, manifesting themselves in a specific way. They are as follows: equilibrium, response, rhythm, spatial orientation, ability to differentiate spatial, time and power parameters of movements etc. (Bernshtejn, 1996, Bykova et al., 2017; Dana, 2017). This list might be extended to include all possible types of flexibility, strength and speed qualities. Though scientists of many nations and generations spare no effort in order to elaborate unified, generally accepted classification of motor skills, the issue is still far from being solved. Systematization of motor skills into two large classes is the most commonly used approach to their classification: conditioning skills to a considerable degree depend on morphological factors, on biomechanical and histological structural changes in the muscles and the body integrally. Coordinating skills are conditional mostly on CNS (psychophysiological mechanisms of control and regulation) (Liakh, 2006; Tkachuk et al., 2009; Pasichnyk, Melnyk, Levkiv, & Kovtsun, 2015).

According to Bal'sevich (2009) and Matveev (2010) differentiation should be made between absolute and relative characteristics of motor skills. Absolute parameters characterize the level of development of certain motor skills leaving out of account their influence against each other. Relative characteristics make it possible to consider the manifestations of motor skills taking into account their interaction.

Liakh (2006), mentions that, on terms of certain conditionality, it is plausible to differentiate between elementary and complex motor skills. Coordinating skills, like running, maintaining static equilibrium, speed response under simple circumstances, flexibility of separate joints etc. Coordinating skills manifested in combat sports or ball games, speed response or orientation under complicated conditions should be considered as complex motor skills.

Zimmerman (1988), Liakh and Vitkovskij (2010) suggest that motor skills should be divided into special, specific and general ones. Special motor skills belong to homogenous groups of integral motor activities. For instance, motions of this type manifest themselves in running, gymnastic or acrobatic exercises, or ball games. Tkachuk and Vikhrov (2009), suggest these specific manifestations of motor skills should be regarded as the components of their internal structure. The researchers note, in particular, that the structure of each major motor skills is not homogenous, being heterogeneous instead.

According to Liakh (2006) and Platonov (2015), major components of coordinating skills include orientability, equilibrium, responding, rhythm maintaining, reshuffling and rearrangement of motor actions, vestibular stability, involuntary muscles relaxation. Zaciorskij (2007) and Linets, et al. (2017) refer the speed of reaction and the speed of each singular movement to major structure components. Maximum movements frequency and the speed manifested in integral motor actions are also regarded as the components of speed skills structure (Matveev, 2010). Zaciorskij (2007) and Platonov (2015) believe that speed skills should be classified as static (isometric) and dynamic (isotonic) ones, i.e. of explosive and deprecation types. The structure of endurance seems to be most complicated. Aerobic endurance for its manifestation demands a lot of energy splitting oxygen resources. Anaerobic endurance to manifest itself needs glycolytic, creatine phosphate energy source, i.e. it needs no oxygen (Matveev, 2010; Platonov, 2015). Tumanian (2007) and Zaciorskij (2007) single out the endurance of various muscle groups in static positions (static endurance) and endurance manifested in dynamic exercises (dynamic endurance), which are performed at a speed of 50 to 90 percent from the maximum rate. Manifestations of flexibility, taking active and passive forms, are considered less complicated (Volkov, 2002).

Proper conditioning efficiency serves as a foundation for high work rate and a determining factor for all-round good health of young athletes (Kozina et al., 2016; Nagovitsyn, Volkov, & Miroshnichenko, 2017; Popel' et al., 2017). High level of coordinating skills is indispensable for mastering new motor actions, as well as for effective adaptation to competitive activity (Kozina et al., 2016; Baginska, 2017; Boichuk, Iermakov, Nosko, & Kovtsun, 2017).

Sadovskij (2003) and Liakh (2006) claim that identification of correlation between coordinating skills on the one part and athletes' physical development, conditioning skills (speed, force, endurance, flexibility) on the other part, are of great importance. The theoretical aspect of this correlation exhibits itself in the establishment of interrelation among various manifestations characterizing different levels of human biological identity, which are defined as psychomotor system and constitutional peculiarities (physique). The practical aspect of the issue would imply more efficient control over the development of different coordinating skills in

young athletes in accordance with their comprehensive knowledge of quantitative interrelation extent among human personality characteristics.

A contradictory situation arises between the necessity to study the coordinating skills characteristics and other manifestations of motor functions of female volleyball players in the phase of specialized basic training on the one hand and, on the other hand, - inadequate scientific development of methodological support of the pedagogical task. This specific contradiction stipulates practical and scientific topicality of the study.

Hypothesis. It is presupposed, that determination of the level of impact physical development characteristics and conditioning skills produce upon manifestations of motor coordination in 15-17 year old female volleyball players, might afford an opportunity to control the process of young female volleyballers coordinating skills in a more efficient way; to apply efficiently the method of combined coordinating and conditioning skills development, enhancing the training process and competitive activity effectiveness in the phase of long-term sports perfection.

Objective of the study was to determine the level of impact physical development characteristics and conditioning skills produce upon manifestations of motor coordination in female volleyball players at the stage of specialized basic training.

Material and methods.

Participants. Volleyball players (n=20, aged 15-17), who are at the stage of specialized basic training participated in the experiment. *Organization of the research.* To evaluate general coordinating skills characteristics of equilibrium, rhythm, reaction, kinesthetic differentiation, spatial orientation, coherence of motor actions and reorganization of motor actions different by origin, were used. Corresponding tests were applied for the assessment of general coordinating skills of volleyball players (Boichuk, Iermakov, Nosko, & Kovtsun, 2017).

To assess female volleyballers physical development, anthropometric measurements of athletes body weight and length were used. Body length was measured by auxanometer (in *cm*) and body weight – by person-weighing machine (in *kg*) (Sergiienko, 2001).

Assessment tests of conditioning skills development

Test 1: the assessment of female volleyballers speed endurance was held by means of “91.6 m running with the change of the direction of movement” test. The player was moving from the center of the bye-line of a volleyball court (point 7) to each of the six other points in succession. The points were marked with stuffed balls situated on bye-lines of one of the volleyball court sides at a distance of 3m from each other. Touching stuffed balls with her hand, the examinee returns to the starting position. Point 7 was regarded both as a starting and finishing position. Time was fixed by a stop-watch. This particular test is known in special literature as “herring-bone running”.

Assessment of female volleyballers high-speed skills (test 2-4).

Test 2: “9-3-6-3-9 running”. Volleyball player started from the bye-line of a volleyball court. Moving to the center of the court, the testee player had to touch with her hand the central line, then – the attack line on the home side of the court. Afterwards, the player moved to the attack line of the enemy side and then – to the central line. Finally, the testee player had to move with maximum speed to the bye-line opposite to the starting point. Time of travelling was registered in seconds.

Test 3: “3x10 m shuttle running around the stuffed balls”. The equipment necessary for the test is as follows: a track 10 meters in length, limited by two parallel lines; behind each line there are two semicircles with a radius of 50 cm centered on the line; 2 stuffed balls 2 kg each; stopwatch. After the command “On your mark!” the testee took her standing start position behind the starting line on either side of the stuffed ball. After the command “Forward!” the testee player runs the first 10 m, then, from the convenient for her side, she runs around the ball, placed in the semicircle. Afterwards the testee returns back, then again runs around the ball placed in the other semicircle. Covering the 10 m distance for the third time she finishes. The best result from two attempts with accuracy of 0.1 sec. was taken into account.

Test 4: 30 m running. After the command “On your mark!” the testee player took her standing start position behind the starting line. After the command “Forward!” the testee had to cover 30 m distance with the maximum speed. The time was clocked on with accuracy of 0.1 sec.

For identification of the level of speed-and-strength skills Tests 5 to 7 were held.

Test 5: Standing leap upwards. The equipment necessary for the test was as follows: marking on the wall, magnesia or chalk. The testee coated her finger tips with magnesia or chalk, and stood sideways to the wall with marking. The legs were placed on the shoulder width; the arms were put down. After the command “Allowed!” the testee raised her hand up touching the marking area with her chalked fingertips and puts her hand down. Then, slightly crouching, the testee made an abrupt movement upwards with her bent arms, pushed off upwards on her legs and leaped upright, trying to touch the marking area with her fingertips at the highest point possible. The best result out of two attempts was scored.

Test 6: Standing leap upwards without moving hands. This particular kind of a leap was performed in much the same way as the Test 5 leap, however this time only one arm of a testee was raised up, the other being

kept down and both arms performed no movements. The result was assessed by the height of the jump within the accuracy of 0.01 cm.

Test 7: Stuffed ball throw. The equipment necessary: a stuffed ball weighing 2 kg; a drawn line from which the range of the ball throws is measured; measuring tape. The ball was thrown with both hands from behind the neck, both in sitting and standing starting positions. In the sitting position the testee was sitting on a gymnastic mat, her legs astride, heels placed in the direction of the line. The range of the ball throw was measured in cm.

The assessment of flexibility development (tests 8-9).

Test 8: Vertebral column flexibility assessment. The equipment necessary was as follows: a platform or a chair; a marking bar or a rigid ruler (with markings from 0 to 50 cm up and down). The testee stood on the platform, feet together, the toes placed close to the platform edge. Without bending her knees the testee leaned forward, trying to touch with her fingers as low as possible. The position of a maximum bend was kept for 2 sec. The position relative to the upper edge of the platform was measured in cm indicating the trunk bending down. If the testee fingers did not go down lower than the platform level the results were registered as negative. In case she managed to bend lower the result was considered as positive. While going through the test it was necessary for a testee to keep her toes and heels together. It should also be seen to it, that the big toes are at the level of the front edge of the platform, knees straightened.

Test 9: In order to determine the shoulder joints flexibility the "Twisting the arms with the help of a broomstick" test was applied. Starting position: the broomstick is gripped with both hands placed at both ends of the stick. The task is to carry the stick over the head behind the dorsum and down, moving the arms in an arc-like way from the bottom upwards. Elbow joints should be straight. At first the test is performed with a wide grip, gradually becoming narrower to the minimum possible point. The level of shoulder joints flexibility is assessed by the distance between the thumbs of the left and right hand in a grip. The less the distance between both hands in a grip is registered, the higher is the flexibility level of shoulder joints is, and vice versa.

Statistical analysis. The findings were processed by means of SPSS 17.0 computer program. Multiple correlation analysis was carried out.

Results.

The analysis of correlations showed the average level of interrelationship (from $r=0.45$ to $r=0.66$, $p<0.05$) between the body weight of the athletes and their ability to spatial orientation and sense of rhythm (Table 1).

Table 1. Correlation of coordination readiness, physical development, flexibility and speed endurance characteristics in female volleyball players.

Coordination readiness parameters	Characteristics of physical development, flexibility and speed endurance				
	Weight	Height	Trunk bend	Stick twist	Herring-bone running
Throwing the ball at the target standing with one's back to it (differentiation of the movements parameters), number of hits home	-,251	-,229	-,080	,224	-,417
Stepping over the broomstick (coordination of movements), sec.	,347	-,143	-,470	,090	,385
"Ten Eights" test (coordination of movements), sec.	-,236	-,315	-,113	,452	,496
Running to the enumerated balls (orientation) sec.	,513	,254	-,442	-,030	,674
Time difference between running to the enumerated balls and shuttle running 5×3 m (orientation) sec.	,197	,210	-,189	-,143	-,006
Stand on one leg with eyes closed (static equilibrium) sec.	-,204	-,275	,608	-,353	-,280
Turns on the gymnastic bench (dynamic equilibrium), number of turns	-,247	-,610	-,065	,302	-,091
Running 3×10 m with one's back to the direction of movement (rearrangement of movements), sec.	,133	,139	,170	-,440	,494
Time ratio of running 3×10 m with one's face and with one's back to the direction of	-,066	,070	,426	-,659	,140

movement (rearrangement of movements), sec.					
Running 30 m along the hoops, sec.	,454	,319	-,400	-,095	,792
Time difference between 30 m running and 30 m running along the hoops, sec.	,663	,182	-,591	-,214	,791
SVMR, msec.	-,110	-,644	-,273	,241	,114
RCh 1-3, msec.	-,096	,165	,151	,258	-,461
RCh 2-3, msec.	-,092	,092	,096	-,110	,017

Note: SVMR – simple visually quick reaction, RCh1-3 – choice reaction of one signal from three, RCh2-3 – choice reaction of two signals from three.

The body length index of female volleyball players turned to be interconnected at an average level with the dynamic equilibrium ability characteristics ($r=-0.61$, $p<0.05$), and simple visual-motor response parameters ($r=-0.64$, $p<0.05$). A low level of correlation was observed between mobility of the hip joints and the ability to movements coordination, spatial orientation and rhythm (from $r=0.40$ to $r=0.47$, $p<0.05$). Average correlation between mobility of the hip joints and ability to static equilibrium was registered ($r=0.61$, $p<0.05$). Low and average correlations were observed between shoulder joints flexibility parameters and the ability to movements coordination ($r=0.45$, $p<0.05$) as well as the ability to motor actions rearrangement ($r=-0.65$, $p<0.05$). Sufficiently high correlation was registered between speed endurance characteristics of volleyballers and their ability of spatial orientation ($r=0.67$, $p<0.05$) and sense of rhythm ($r=0.79$, $p<0.05$). Lower level of correlations was observed between the skills of kinaesthetic differentiations, consistency and rearrangement of movements, and speed endurance of the athletes (from $r=0.41$ to $r=0.50$, $p<0.05$).

More close correlations were observed between speed characteristics, speed-and-strength skills and those parameters, which characterize the level of coordination readiness of female volleyball players in the phase of specialized basic training (Table 2). In particular, the “9-3-6-3-9 m running” test exposed average correlations (from $r=0.45$ to $r=0.53$, $p<0.05$) among the abilities to kinesthetic differentiations, movements rearrangement, responses. High level of correlated interactions was found between this parameter and spatial orientation and rhythm characteristics (from $r=0.70$ to $r=0.81$, $p<0.05$). Test results revealed average and high correlations (from $r=0.48$ to $r=0.88$, $p<0.05$) between 30 m straightaway running and 3x10 m running with a change of the direction of movement on the one hand and with the abilities to coordinate and reorganize movements, spatial orientation, response on the other.

Table 2. Correlation between coordination readiness, speed and speed-and-strength skills in female volleyball players

Coordination readiness parameters	Speed, speed-and-strength skills characteristics						
	9-3-6-3-9 m running	30 m running	3610 m running	Standing leap upwards	Standing leap upwards without moving hands	Stuffed ball throw sitting	Stuffed ball throw standing
Throwing the ball at the target standing with one's back to it (differentiation of movements parameters), number of hits home	-,451	-,003	-,216	,245	,429	,128	,394
Stepping over the broomstick (coordination of movements), sec.	,378	,481	,336	-,256	-,509	-,241	-,401
“Ten Eights” test (coordination of movements), sec.	,329	,463	,487	-,552	-,488	-,046	-,125
Running to the enumerated balls (orientation) sec.	,700	,419	,702	-,350	-,536	-,341	-,664
Time difference between running to the enumerated balls and shuttle running 5x3 m (orientation) sec.	,092	-,246	,043	,246	,208	-,230	-175
Stand on one leg with eyes closed (static equilibrium) sec.	-,122	-,048	-,011	,011	,385	,702	,470
Turns on the gymnastic bench (dynamic)	-,163	-,046	-,128	,033	,306	,146	,599

equilibrium), number of turns							
Running 3×10 m with one's back to the direction of movement (rearrangement of movements), sec.	,528	,515	,770	-,582	-,425	,237	,290
Time ratio of running 3×10 m with one's face and with one's back to the direction of movement (rearrangement of movements), sec.	,184	,117	,385	-,284	-,093	,380	-,062
Running 30 m along the hoops, sec.	,740	,876	,874	-,675	-,815	-,192	-,627
Time difference between 30 m running and 30 m running along the hoops, sec.	,814	631	599	-,567	-,747	-,241	-,552
SVMR, msec.	,221	-,142	-,196	-,076	-,007	-,343	,282
RCh 1-3, msec.	-,530	-,483	-,539	,572	,355	-,348	,109
RCh 2-3, msec.	-,104	-,312	-,256	,278	-,083	-,097	-,416

Average level of correlated interactions was registered between the standing leap upwards test results and certain coordination skills parameters of female volleyball players, in particular those of concordance and movements rearrangement, rhythm and response. Correlation values in these cases ranged from $r=0.55$ to $r=0.68$, $p<0.05$. Closer correlation was observed between the standing leap upwards without moving hands and coordination readiness of the volleyballers. The same test results revealed low and average correlation (from $r=0.42$ to $r=0.53$, $p<0.05$) with the abilities to kinesthetic differentiations, concordance, movements reorganization, and spatial orientation. High level of correlation (from $r=0.75$ to $r=0.82$, $p<0.05$) was registered between standing leap upwards without moving hands test results and sense of rhythm characteristics.

High correlated links were revealed between the "Stuffed ball throw in sitting position" test results and the parameters, which characterized the ability of the testees to static equilibrium ($r=0.70$, $p<0.05$). Considerably larger number of correlations was observed between the results of the "Stuffed ball throw in standing position" test and the parameters of movements coordination, spatial orientation, static and dynamic equilibrium, response and rhythm (from $r=0.40$ to $r=0.63$, $p<0.05$).

Discussion.

The study showed that coordination skills characteristics, that manifest themselves in various motor activities, approximately in 80 percent are not connected with physical efficiency parameters of 15-17 year old female volleyball players, which coincides with the research of other authors (Sadovskij, 2003; Liakh, 2006). Researchers, in particular, note that the characteristics of athletes' body length and weight exert more tangible effect upon coordination skills in cyclic and acyclic locomotions, acrobatic exercises, and throwing at range. Physical efficiency parameters, however, exercise almost no influence on coordination abilities in ballistic movements set on shooting accuracy and ball games motor activity (Zimmerman, 1988; Boychuk, 2015). A far closer correlation between coordination readiness and conditional skills parameters than between coordination abilities and morphological characteristics was observed. The parameters of certain conditional skills (speed, speed-and-strength, strength, endurance, flexibility) unequally related to either coordination skills. Of all the investigated parameters more reliable connections were observed between speed-and-strength and speed skills, especially with rhythm, movements' coordination and reshuffle, and spatial orientation. Significantly less reliable correlation was registered between volleyball players' coordinating skills and the results of flexibility tests. Positive correlation of low and average level was observed between the parameters of speed endurance and the abilities to spatial orientation, rhythm, movements' coordination and reorganization. Our findings support the conclusions of other authors (Liakh, 2006) concerning the expediency of optimal combination of coordination exercises with those ones meant for speed endurance development. This coalition seems highly effective in terms of improving both aforesaid kinds of motor skills, as well as physical performance in general (Hnatchuk et al., 2018).

The results of our research fully correlate with the results of other studies (Sadovskij, 2003; Liakh et al., 2010). They confirmed the idea that the complex of coordination skills is mainly stipulated by central nervous system influence (psychophysiological mechanisms of management and regulation), whereas the complex of the so called "energetic" or "conditioning" skills ("physical" in the traditional sense) depends to much greater extent on morphological factors, as well as on biological and histological changes occurring in muscles and the body as a whole. In our opinion the principle of the combined development of these motor

skills might be of great possibilities for correlation improvement between certain coordination and conditional skill in ball games. Sadovskij (2003) came to similar conclusion investigating coordination skills of athletes practicing martial arts. In particular, the researcher claims that, adjusting to this principle, the exercises included in training sessions should not be oriented at analytical development of separate such skills. They have to exert a simultaneous influence on the variety of their combinations. As a result, the level of both coordination abilities and conditional qualities increases. This hypothesis was confirmed at the training sessions with school-age children and adolescent athletes (Podrigalo, Iermakov, Rovnaya, Zukow, & Nosko, 2016; Bykova et al., 2017; Lazarenko et al., 2017). At the same time, the educational experiment aimed at the development of separate coordination skills showed no influence at the number of valid correlations between coordination abilities and physical development characteristics (Sadovskij, 2003). Apparently, the larger is the distance between the attributes of human individuality, such as somatotype, physical development, sensorimotor level, conditional and functional abilities, the less positive correlations could be observed among them.

Conclusions.

Efficacious sports training of volleyball players is of special significance in preadult age, when basic game technique and comprehensive development of motor skills could be easily acquired. Mastering efficient volleyball technique necessitates appropriate development of major physical qualities.

Identification of correlations between female volleyball players coordinating skills and other characteristics of motor function might considerably improve the process of athletes' physical perfection control. It could also contribute to more efficient application of combine effect method and choice of rational means of training effects on female athletes.

Principal somatic features exert practically no effect upon general level of coordinating readiness of female volleyball players at the stage of specialized basic training. Body length index correlates with the ability to dynamic equilibrium on an average level, negatively affecting this parameter. Occasional correlations were registered on low and average levels between the ability to rapid manifestation of spatial orientation and rhythm on the one hand and body weight index on the other.

Coordinating skills correlate considerably closer with conditioning abilities of athletes as compared with their morphological characteristics. Significantly closer correlations were observed between coordinating abilities and speed-and-strength qualities in comparison with endurance and flexibility skills.

Abilities to coordinated movements, their reorganization, rhythm, spatial orientation expose closer correlations with conditioning skills, especially those of speed and strength ones, than with other manifestations of motor coordination.

Conflict of interests

The authors declare that there is no conflict of interests.

References

- Akelaitis, A.V., & Malinauskas, R.K. (2018). The expression of emotional skills among individual and team sports male athletes. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 22(2), 62-67. doi:10.15561/18189172.2018.0201
- Baginska, O.V. (2017). Correlation of factorial weights of separate motor coordination structure indicators, which characterize motor function level of different age groups' schoolchildren. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 21(3), 100–104. doi:10.15561/18189172.2017.0301
- Bal'sevich, V. K. (2009). *Essays on age kinesiology of man*. Moscow: Soviet sport. (in Russian)
- Beliaev, A.B., & Bulykina L.V. (2007). *Volleyball: theories and principles of training*. Moscow: Physical Culture and sport. (in Russian)
- Bernshtejn, N.A. (1996). *Notes on physiology of movements and physiology of activity*. Moscow: Medicine. (in Russian)
- Boichuk, R., Iermakov, S., & Nosko, M. (2017). Pedagogical conditions of motor training of junior volleyball players during the initial stage. *Journal of Physical Education and Sport*, 17(1), 327–334. doi:10.7752/jpes.2017.01048
- Boichuk, R., Iermakov, S., Nosko, M., Kovtsun, V., & Nosko, Y. (2017). Influence of motor coordination indicators on efficiency of game activity of volleyball players at the stage of specialized basic training. *Journal of Physical Education and Sport*, 17(4), 2632–2637. doi: 10.7752/jpes.2017.04301
- Boichuk, R., Iermakov, S., Nosko, M., & Kovtsun, V. (2017). Special aspects of female volleyball players' coordination training at the stage of specialized preparation. *Journal of Physical Education and Sport*, 17(2), 884–891. doi:10.7752/jpes.2017.02135
- Boychuk, R.I. (2015). Theoretical substantiation of programs of targeted development of coordination abilities of pupils in lessons of physical training with elements of sports games. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 19(1), 7–12. doi:10.15561/18189172.2015.0102
- Bykova, O., Druz, V., Pomeshchikova, I., Strelnikova, E., Strelnikov, G., Melnyk, A., & Shyriaieva I. (2017). Changes in technical preparedness of 13-14-year-old handball players under the influence of coordination

- orientation exercises. *Journal of Physical Education and Sport*, 17(3), 1899 - 1905. doi:10.7752/jpes.2017.03185
- Dana, B. (2017). The educational impact of implementation the education through adventure discipline in physical education and sports academic curriculum. *Physical Education of Students*, 21(3), 108-115. doi:10.15561/20755279.2017.0302
- Gainullin, R., Isaev, A., Zalyapin, V., & Korablyova, Y. (2017). Statistical analysis of morphometric indicators and physical readiness variability of students. *Physical Education of Students*, 21(5), 205-212. <https://doi.org/10.15561/20755279.2017.0502>
- Hnatchuk Y., Lynets M., Khimenes Kh. & Pityn M. (2018). Improvement of physical preparedness of qualified volleyball players. *Journal of Physical Education and Sport*, 18(1), 239 - 245. doi: 10.7752/jpes.2018.01032
- Kovalchuk, V.Ya. (2017). Traumatism in training process of students - volleyball players. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 21(1), 31-35. doi:10.15561/18189172.2017.0105
- Kozina, Z., Sobko, I., Yermakova, T., Cieslicka, M., Zukow, W., Chia, M., . . . Korobeinik, V. (2016). Psychophysiological characteristics of female basketball players with hearing problems as the basis for the technical tactic training methodic in world level teams. *Journal of Physical Education and Sport*, 16(4), 1348–1359. doi:10.7752/jpes.2016.04213
- Lazarenko, M., Plisko, V., Troyanovska, M., Kozeruk, Y., Lysenko, L., Vaschenko, I., ... & Donec, I. (2017). Development of motor skills of students with the help of the training simulator "belts with rings". *Journal of Physical Education and Sport*, 17(3), 1147–1153. doi: 10.7752/jpes.2017.03176
- Liakh, V. I. (2006). *Coordination abilities*. Moscow, Division. (in Russian)
- Liakh, V., & Vitkovskij, Z. (2010). *Coordination training in football*. Moscow: Soviet sport. (in Russian)
- Linets, M.M., Chichkan, O.A., & Himenez, Kh.R. (2017). *Differentiation of physical training of athletes*. Lviv: LSUFK.
- Malikova, A.N., Doroshenko, E.Yu., Symonik, A.V., Tsarenko, E.V., & Veritov, A.I. (2018). The ways of improvement special physical training of high-qualified women volleyball players in competitive period of annual macrocycle. *Physical Education of Students*, 22(1): 38–44. doi:10.15561/20755279.2018.0106
- Matveev, L. P. (2010). *General sports theory and its applied aspects*. Moscow: Soviet sport. (in Russian)
- Nagovitsyn, R.S., Volkov, P.B., & Miroshnichenko, A.A. (2017). Planning of physical load of annual cycle of students', practicing cyclic kinds of sports, training. *Physical Education of Students*, 21(3), 126–133. doi:10.15561/20755279.2017.0305
- Pasichnyk, V., Melnyk, V., Levkiv, V., Kovtsyn, V. (2015). Effectiveness of integral-developmental balls use in complex development of physical and mental abilities of senior preschool age children. *Journal of Physical Education and Sport*. 15 (4), 775 – 780. doi:10.7752/jpes.2015.04118
- Platonov, V. N. (2015). *System of sportsmen's training in Olympic sports*. Kiev: Olympic Literature. (in Russian)
- Podrigalo, L., Iermakov, S., Rovnaya, O., Zukow, W., & Nosko, M. (2016). Peculiar features between the studied indicators of the dynamic and interconnections of mental workability of students. *Journal of Physical Education and Sport*, 16(4), 1211–1216. doi:10.7752/jpes.2016.04193
- Popel', S. L., Tsap, I.G., Yatciv, Ya. N., Lapkovsky, E. Yi., Synitsya, A.V., & Pyatnichuk, D.V. (2017). Special aspects of hemo-dynamic and reaction of erythrocytes in blood to standard physical load of different qualification female volleyball players. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 21(5), 251–259. doi:10.15561/18189172.2017.0508
- Rycarev, V.V. (2015). *Volleyball: theory and practice*. Moscow: Sport. (in Russian)
- Sadovskij, E. (2003). *Principles of coordination abilities' training in oriental martial arts*. Belaia Podliaska. (in Russian)
- Sergiienko, L. P. (2001). *Testing of schoolchildren's motor abilities*. Kiev: Olympic Literature. (in Ukrainian)
- Soltani, H., Hojati, Z., & Hossini, S. R. A. (2016). Comparative analysis of competitive state anxiety among team sport and individual sport athletes in Iran. *Physical Education of Students*, 20(5), 57-61. doi:10.15561/20755279.2016.0508
- Tkachuk V., & Vikhrov K. (2009). Age peculiarities of the motor abilities development periodization in schoolchildren. *Physical education at school*, 6, 36–39.
- Tumanian G.S. (2007). *Champion training strategy: coach's table-top book*. Moscow: Soviet sport. (in Russian)
- Volkov, L.V. (2002). *Theories and principles of children and youth sports*. Kiev: Olympic Literature. (in Russian)
- Zaciorskij, V.M. (2007). *Physical qualities of the athlete*. Moscow: Soviet sport. (in Russian)
- Zhelezniak, Iu.D., Portnov, Iu.M., & Savin, V.P. (2001). *Sport games. Technique, tactic, training*. Moscow: Academy. (in Russian)
- Zimmerman, K. (1988). *Coordination abilities in sport game. Theorie und Praxis der Körperkultur*, 4, 251 –253. (in German)