Sport Mont 14 (2016) 2: 39–43
Original scientific paper
UDC 796.322:796.012-055.2

Level of Transformation of Motor Skills in Female Volleyball Players Influenced by Training Operators

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A B S T R A C T

The aim of this paper is to determine the level of improvement of motor skills of female volleyball players influenced by kinesiology operators in a period of 6 months. Research was conducted on sample subject of 130 female volleyball players aged from 13±0.6 (mean±SD). Sample variables are divided in two groups: 9 variables of assessment of basic motor skills and 5 variables of assessment of situational motor skills. Analysing difference of arithmetic means between of initial and final measures of treated variables it is determined that there is statistically significant difference on the level Sig=0.001, except for variables of Jelka test which determinates speed duration of female volleyball players. Analysis of quantity changes of basic motor skills, shows that the most important projections on selected discriminative function of basic motor skills have the following variables: body lifting in 30 sec; dynamometry of a hand, hand tapping; pull-up; throwing a 1 kg ball from lying position; side defence movement; push-up on bars and situational motor skill are the variables: precision of tactic serving; consecutive bumping; wall-spikes. Comprehensive development of female volleyball players and diversity in the level of volleyball specialization of the development will depend on systematic work on treated motor skills. This program appeared to be efficient. However, it is necessary to gradually increase the demands for the female volleyball players and to put the accent on performance of acquired situational motor skills in future work.

Key words: *volleyball, motor skills, female volleyball players, transformational processes, training operators*

Introduction

The psychometric skills are the dominant part of volleyball as a sport (Kim, Penney, Cho, & Choi, 2006; Macfadyen & Bailey, 2002). Due to its development volleyball became an Olympic sport with high levels demands for technique, physical condition and tactics aspects grow rapidly. The applied program was intended to establish motor skills i.e. fast performance of motor skills or techniques. Fast performance is on higher level in terms of ballistic movements, which basic characteristic is the absence of control of feedback. Volleyball is part of technique of external motor stereotype which means that continuous control and correction of movements is necessary. This control is presented through series of motor characteristics: direction of movements, speed of movements, tonus of movements, force of movements, amplitude of movements, and levels of coordination performance (Cosma, Rusu, & Paunescu, 2013; Katić, Grgantov, & Jurko, 2006). Plan and program of volleyball training is important activity of trainer and the whole expert team. (Milanović, Jukić, Čustonja, & Šimek, 2006; Mouron, 2014; Živković & Nešić, 2013). It reduces coincidences to minimum and achieves optimal sport results which answers the needs and demands of the volleyball players and the conditions of the training process. Specification of movements when playing volleyball demands great engagement of the whole body. Determination of dimensions which define the influence of transformational processes of anthropometric forms, motor skills and situational motor skills is very complex and multidimensional subject. Since the good structure of anthropological characteristics is a precondition for efficient performance or acquiring the technical and tactical elements in volleyball game also the monitoring of mentioned three anthropological areas is relevant.

The aim of this research is to establish the level of improvement of motor skills of female volleyball players influenced by kinesiological operators in a period of 6 months. The aim of the research includes complete research procedure and initial and final measurements. Also the aim of the research is to determine the effects of program on controlled anthropological characteristics of female volleyball players.

Methods

Sample subjects

Research was conducted on sample of 120 female volleyball players at the age of 13±0.6 years. Research included healthy female players which, apart from their volleyball training, attend the regular classes of physical education. All participants signed written contest for participation in study regulated according to the Declaration of Helsinki. Study was approved by Ethical Committee of Faculty of Sport and Physical Education at University of Sarajevo.

Sample variables

Sample variables are divided in two groups:

1. Variables for assessment of basic motor skills: hand tapping (MBFTAP); Bent to the front over a bench (MFLPRK); stick handling (MFISK); pull-ups (MRCZGV); push-ups on bars (MSAVIS); body lifting in 30 sec (MRCPRE); dynamometry of a hand (MRADSA); hand tapping, (MBFTAP); pull-ups (MRCZGV); throwing a 1 kg ball from lying position (MFEBML); side defence movement (MAGKBO).
2. Variables for assessment of situational motor skills: pre-

Received for publication May 10, 2016

cision of tactic serving (SMPTS); consecutive passes (SMUOČ); wall-spikes (SMSLZ); Japan test (SMJAT); Jelka test (SMJET).

Analysis was conducted in program SPSS 22.0. The analysis of changes was conducted in order to determine the level of possible improvement of motor skills i.e. in period of 6 months training program. Univariate t-test for dependent samples was used to determine significance between arithmetic means of applied variables before and after training program. Canonical discriminative analysis was applied in order to determinate global quantitative changes. Determination of statistical significance of each discriminative variable is based on Bartlett's Hi-Square test. A discriminative analysis was conducted in order to explain percentage of total explained variance.

Results

Analysing the difference between initial and final measurements (Table 1), hand tapping (MBFTAP) is statistically significant. Since the difference between two arithmetic means was -1.17 in favour of final measurement, t-test result was -7.47, of 119 was statistically significant on the level p=0.001. Bent to the front over a bench (MFLPRK) in examining the differences between arithmetic means of initial and final condition was 13.1 in favour of final measurement which shows that it is statistically significant t–test is 5.2 with of 119 df statistically significant on the level of the significance (p=0.001). Stick handling test (MFISKI) which examined flexibility of shoulders, based on determined differences between initial and final measurements it can be concluded that this program of this experimental research improved flexibility of shoulders of female volleyball players. The difference was 16 and t means of AS initial and final result was 4.9 with 119 df is also statistically significant on level p=0.001. AS difference of arithmetic means between initial and final results; pull-ups (MRCZGV) was -1.5 in favour of the second measurement t-test was -4.86 with 119 df is statistically significant on level of significance p=0.001.

Table 1. Testing the differences of arithmetic means of variables for assessment basic motor skills

	Paired Differences	Mean	SD	t	df	p
Pair 1	MFEBMLI – MFEBMLF	-257.75	389.11	-7.26	119	p<0.001
Pair 2	MBFTAPI – MBFTAPF	-1.175	1.72	-7.47	119	p<0.001
Pair 3	MFISKI – MFISKF	16	35.18	4.98	119	p<0.001
Pair 4	MFLPRKI – MFLPRKF	13.17	27.25	5.29	119	p<0.001
Pair 5	MAGKBOI – MAGKBOF	30.18	88.81	3.72	119	p<0.001
Pair 6	MRCZGVI – MRCZGVF	-1.52	3.42	-4.87	119	p<0.001
Pair 7	MRADSAI – MRADSAF	-21.1	19.62	-11.78	119	p<0.001
Pair 8	MRCPREI – MRCPREF	-2.57	1.89	-14.91	119	p<0.001
Pair 9	MSAVISI – MSAVISF	-237.11	281.38	-9.23	119	p<0.001

Push-up on bar test (MSAVIS) showed the difference between AS initial and final measurements and the arithmetic means of treated variables is AS=-237.1 in favour of final measurement, t-test was -9.2 with of 119 df is statistically significant on level p=0.001. Variables of body lifting in 30 sec. (MRCPRE) show the difference of arithmetic means between initial and final results and the arithmetic mean was AS=-2.5, t-test=-14.9 which is with 119 df is statistically significant on level p<0.001. Throwing a ball of 1kg test MFEBML), shows the differences between these two measurements and the result is AS -257.7; t-test =–7.26 which is significant on the level p=0.001. Side defence movement test (MAGKBO) shows AS difference between initial and final measurements which was 30.1; t-test=3.7 with of 119 df statistically significant on level of significance p=0.001. Dynamometry of a hand test (MRADSA) shows AS difference between initial and final measurements and the results was AS= -21.1 in favour of the second measurement where results of are t-test = -11.7 with of 119 df, statistically significant on level of significance.

Table 2. Testing differences of arithmetic means for assessment of situational motor skills

	Paired Differences	Mean	SD	t	df	p
Pair 1	SMUOPI - SMUOPF	-1.91	7.90	-2.65	119	0.009
Pair 2	SMUOČI - SMUOČF	-5.21	8.32	-6.86	119	p<0.001
Pair 3	SMPTSI - SMPTSF	-5.12	2.71	-20.70	119	p<0.001
Pair 4	SMSLZI - SMSLZF	-2.42	3.01	-8.79	119	p<0.001
Pair 5	SMJATI - SMJATF	34.40	170.26	2.21	119	0.029
Pair 6	SMJETI - SMJETF	43.61	283.99	1.68	119	0.095

In order to determine transformation of situational motor skills we used T-test for two dependent groups (Paired-Samples T-test), which show us differences between arithmetic means (Table 2). In Table 2 we can see that statistically significant differences are present on level p=0.001, except for variables of Jelka test (SMJET) which determinates speed endurance of female volleyball players. Variable of consecutive passes (SMUOP) tested differences of AS means SMOUP, and the results are AS=-1.9, t-test=-2.6 with of 119 statistically significant on level p=0.001.

Table 3. Significance of isolated discriminative function

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation	Motor skills
1	0.202	100	100	0.41	Basic motor skills
1	1.044	100	100	0.72	Situational motor skills

Variables of situational motor skills which includes elements of techniques: consecutive passes (SMUOČ), precision of tactic serving (SMPTS), wall-spikes (SMSLZ) show statistically significant differences on p=0.001. Variable of Japan test (SMJAT) and Abalak's test (SMABT) show statistically significant differences on level p=0.001.

Table 4. Significance of the discriminative function

Test of Function(s)	Wilks' Lambda	Chi-square	df	p	Motor skills
1	0.832	42.827	9	p<0.001	Basic motor skills
1	0.489	167.269	6	p<0.001	Situational motor skills

Analysis of differences of matrix of covariance between initial and final measurements of basic motor skills (p=0.014) and situational motor skills (p=0.001) showed statistically significant differences in covariance of analyzed matrix. Table 3 shows discriminative function of basic motor skills (r=0.41), which presents correlation of data which are the base of discriminative analysis and which prove that correlation exists. Means of situational motor skills show one discriminative function which displays relatively high means (r=0.72). Therefore we can conclude that there is relatively high correlation.

Table 4 shows statistically significant on level p=0.001. Wilks′s lambda test shows discriminative strength and it is 0.83. Table 5 shows strength of discriminative function was deducted from data of situational motor skills. It is determined that there is statistically significant difference since Wilks Lambda is 46 and statistically significant one level which p=0.001.

Table 5. Structure matrix of discriminative function

Basic motor skills	Function 1	Situational motor skills	Function 1
MRCPRE	0.687	SMPTS	0.902
MRADSA	0.570	SMUOČ	0.271
MBFTAP	0.432	SMSLZ	0.252
MRCZGV	0.324	SMJAT	-0.078
MFEBML	0.238	SMJET	-0.074
MAGKBO	-0.222	SMUOP	0.074
MSAVIS	0.222		
MFISK	-0.171		
MFLPRK	-0.145		

Analysis of means of basic motor skills (Table 5) shows that the most significant projections on isolated discriminative function have variables MRCPRE, MRADSA, MBFTAP, MRCZGV, MFEBML, MFEBML, MAGKBO, MSAVIS. Based on correlation of applied variables with the first discriminative function therefore with variables that differentiate first from the second test can be concluded that mentioned tests are the most responsible for deducted results.

Table 6. Centroids of examined groups

	Basic motor skills Function	Situational motor skills Function
GROUP	1	1
1.00	-.450	-1.022
2.00	.450	1.022

Discussion

In order to achieve the best results, female volleyball players need to go through certain transformational processes (Melrose, Spaniol, Bohling, & Bonnette, 2007). Comprehensive development of female volleyball players and diversity in the level of volleyball specialization of the development will depend on systematic work on coordination, and exposure to multiple exercises and skills during the childhood and adolescence (Drabik, 1996; Bompa, 2000.) During the volleyball training, increase of flexibility significantly reduces injuries of ligaments and muscles and improves stability of locomotors system (Janković, Janković, & Đurković, 2003; Lansdaal et al., 2016) especially for the age which was treated in this research. Applied exercises with medium intensity and exercises of cyclic and acyclic type include: coordination, endurance, speed and explosive strength during the six month period, show that exercises which develop endurance with changeable intensity and great strength and the exercises of coordination need to be included too (Marelić, Đurković, & Rešetar, 2008; Milanović, Šalaj, & Gregov, 2011).

All variables of basic motor skills which were presented in this experimental program had statistically significant transformational process. Coordination in volleyball is one of the most important elements in equation of specification of success in volleyball (Gabbett, Georgieff, & Domrow, 2007). During the growth and development characteristics of certain muscles can be equal and certain muscles can have different characteristics. Body force is ability of development of muscle strength. Force of hand is a reflection of development of a body. Good coordination includes muscles that are most adequate for certain tasks and they inhibit antagonists and regulate frequency of nerve impulses (Barbara & Clarac, 2011; Shah, 2012). Synchronization parts of regulation centres and peripheral locomotors mechanism is necessary for coordination (Metikoš, Milanović, Prot, Jukić, & Marković, 2003). Well-coordinated movements are more economical and faster that poor coordinated movements. Coordination is of, course, closely related to technique of volleyball. If a volleyball player wants to perform techniques effectively he needs to have developed coordination. Well-co-

ordinated player is able to acquire and perform new skill quickly. What's more important volleyball player who is well coordinated consumes less energy (Ilics, Bakk, & Suskovics, 2013; Rashad & El-Agamy, 2010). Coordination is influenced by several factors (Drabik, 1996): intelligence of an athlete (ability to solve complex and unpredictable motor tasks) systematic training (improves kinaesthetic senses and coordination, precision and the speed of movements): received motor knowledge (motor experience) and the level of development of other motor skills (low level of speed, strength, endurance, flexibility, and other motor skills influences badly on coordination). Since the program content was based on improvement of specific skills mostly isolated from the game, it was expected that certain variables of situational motor skills which are represents of technical skills of female volleyball players would have more significant changes in the final measurement in relation to the initial measurements. The fact that female volleyball players have managed to insert acquired elements into the game explains the effect of the program, but only as a segment which is a part of the game and not a segment which makes the game.

Today, volleyball presents the area of human action which includes developed technology in preparation of both, an athlete and the teams. It also includes engagements of experts and scientists in process of selection, guidance, training and management. These procedures are intended for efficient preparation of athletes and presentation of attractive performances of athletes on competitions. Volleyball is one of the most attractive and the most popular sports in the world. Volleyball is close to the audience due to its simplicity of the rules, small demands in equipment, space and audience's identification to the players. In order to achieve the best results, female volleyball players need to go through certain transformational processes. Specific motor skills i.e. game techniques (with and without a ball) are dominant part of volleyball as a sport. Technique is the main part of volleyball and it influences the result. Volleyball game during its development has improved its segments. Contemporary game demands acquirement of techniques (rational movements with the ball or without it in order to solve certain tasks). Together with appliance of elements of technique of the game it demands good acquirement of tactics individual and team as well. It is unthinkable for a top player not to be prepared for prefect performance of technical and tactical element. In order to achieve this it is necessary to perform adequate and optimal condition preparation of volleyball players as a fundament of all movement performances on a volleyball court. It has to be played maximum attention to the phase of learning, acquirement or perfect perfomance of the elements in order to make them faster, stronger and more precise. Therefore, any technical element of the volleyball game is not possible to perform without adequate conditional preparation (e.g. hitting the ball won't be efficient, if the female volleyball players are not on the optimal level of speed strength hand the spike demands explosive strength of legs etc.). Quality of the game and winning depends on that. Considering the facts from deducted results we can conclude that the accent needs to be put on application of the acquired situational skills and to choose the papers that will provide knowledge of the performance of these skills. If we choose this type of learning it is assumed that volleyball players will apply this technique on a more dynamic way with great number of repetition. Significant quantity improvements can be explained by the fact that the content of training process is conceptualized in that way the subjects during the training were faced with the situations that required stability and orientation during the activities whether they are static or dynamic. Therefore it's not surprising that variable which determinates static strength has the highest projection on discriminative function. This program appeared to be efficient. However, it is necessary to gradually increase the demands for the female volleyball players.

REFERENCES

Barbara, J. G., & Clarac, F. (2011). Historical concepts on the relations between nerves and muscles. *Brain research, 1409*, 3-22.

Bompa, T. O. (2000). *Total training for young champions*: Human Kinetics.

Cosma, G., Rusu, L., & Păunescu, M. (2013). Study on some characteristics of motor intelligence. Volleyball vs. Fencing. *Discobolul*, *45*.

Drabik, J. (1996). *Children and sports training*. Island Pond VT: Stadion Publishing.

Enghauser, R. (2003). Motor learning and the dance technique class: science, tradition, and pedagogy. *Journal of Dance Education, 3*(3), 87-95.

Gabbett, T., Georgieff, B., & Domrow, N. (2007). The use of physiological, anthropometric, and skill data to predict selection in a talent-identified junior volleyball squad. *Journal of Sports Sciences, 25*(12), 1337-1344.

Ilics, K. B., Bakk, A. B., & Suskovics, C. (2013). Researching the aptitude of young volleyball players (children and adolescents). *7th INSHS International Christmas Sport Scientific Conference (61-71)*, Szombathely, Hungary.

Janković, V., Janković, G., & Đurković, T. (2003). Specific physical preparation of top volleyball players. Collection of papaers *International scientific conference" condition preparation of athletes* , 442-450.

Katić, R., Grgantov, Z., & Jurko, D. (2006). Motor structures in female volleyball players aged 14–17 according to technique quality and performance. *Collegium antropologicum, 30*(1), 103-112.

Kim, J., Penney, D., Cho, M., & Choi, H. (2006). 'Not business as usual': Sport Education pedagogy in practice. *European Physical Education Review, 12*(3), 361-379.

Lansdaal, J. R., Van den Bekerom, M. P., Cools, A. M., Jones, V., Lefevre, N., & Servien, E. (2016). Specific Aspects of Throwing Sports in Recreational and Competitive Sport *Prevention of Injuries and Overuse in Sports* (101-115), Springer.

Marelić, N., Đurković, T., & Rešetar, T. (2008). Differences in fitness level and morphological characteristics between female volleyball players of different team status. *Croatian Sport and Medicine magazine, 23*(1), 30-34.

Melrose, D. R., Spaniol, F. J., Bohling, M. E., & Bonnette, R. A. (2007). Physiological and performance characteristics of adolescent club volleyball players. *The Journal of Strength & Conditioning Research, 21*(2), 481-486.

Metikoš, D., Milanović, D., Prot, F., Jukić, I., & Marković, G. (2003). Theoretical and methodical basics of development of coordiantion *U: D. Milanović, I. Jukić (Ur.): Collection of papers of interantional science conference condition preparation of athletes (264-270)*. Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu, Zagrebački športski savez.

Milanović, D., Jukić, I., Čustonja, Z., & Šimek, S. (2006). Quality work in sport, *U, 15*, 35-47.

Milanović, D., Šalaj, S., & Gregov, C. (2011). New technologies in diagnostics of preparation of athletes. *Collection of papers, 20*, 37-50.

Milanović, D., Šalaj, S., & Gregov, C. (2012). Basic Physical Conditioning in Athlete's Health Protection. *Arhiv za higijenu rada i toksikologiju, 63*(3), 103-118.

Mouron, B. (2014). Differences of body dimensions in female volleyball players (cadets) in relation to volleyball playing position. *The Sport Journal*.

Rashad, A. K., & El-Agamy, M. I. (2010). Comparing two different methods of stretching on improvement range of motion and muscular strength rates. *World, 3*(4), 309-315.

Shah, S. (2012). Plyometric exercises. *International journal of health sciences and research, 2*(1), 115-126.

Živković, M., & Nešić, G. (2013). The annual plan and program in volleyball for the girls 8 to 10 years old. *Fizička kultura, 67*(2), 167-175.

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