QUALITATIVE CHANGES OF BASIC AND SITUATIONAL-MOTOR ABILITIES IN STUDENTS UNDER THE INFLUENCE OF PROGRAMMED PRACTICE INVOLVED IN EXTRACURRICULAR ACTIVITIES

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Abstract

This study was conducted on a sample of seventy-three students in the 7th and 8th grade from the Primary School ''Tojšići'', who underwent an accurately defined and implemented program of volleyball as part of extracurricular activities. Within this study, 15 variables were used to assess the motor skills and 5 variables to assess the situational-motor skills. The basic aim of this study was to determine the global quantitative changes of basic motor and situational-motor abilities produced by programme of volleyball as part of extracurricular activities. The congruence model of the factor analysis was applied to determine possible quantitative changes between the initial and final measurements of motor and situational-motor abilities. On the basis of obtained values it has been established that significant quantitative changes in the field of basic and situational motor abilities developed as a result of three months volleyball programme among students age of 13 to 14, who attended extracurricular activities in the field of volleyball games in the Primary School ''Tojšići''.

Key words: *extracurricular activities, volleyball, motor abilities, factor analysis*

Introduction

Volleyball is a sport which in its structural features belongs to a group of poly structural acyclic sports. The dynamics in which volleyball actions are performed, particularly in present-day modern top sport, is extremely emphasized, with almost impossible individual moves which are sometimes performed literally in a split second.

The features of volleyball are multiple and multidimensional, with some features which simply have to be above average, if top sport results are to be achieved (Janković & Marelić, 1995). For the realization of volleyball requirements of top sport for seniors, three prerequisites which have to be accomplished are necessary, in order for this range to be achieved, and which are articulated as sport models (Bonacin, Bilić & Bonacin, Da., 2008). A – First prerequisite is the knowledge of volleyball models, namely properties of game which is being realized and players' features which are a part of such realization, B – Second prerequisite is the knowledge of transformation process which guides the beginners of say 7,8 years of age to top results. And finally, if one knows this, C- third prerequisite is identification of potentially particularly talented children for volleyball, in accordance with their features (Bonacin & Smajlović, 2005).

Selection is, therefore, one of key steps in such a sequence, and one which cannot be approached laconic and without any insight into the future of the sport itself, as well as a child who commits to such sport for 10, 15 or more years, all the time trying to achieve top result (Bonacin, 2006; Bonacin et al., 2008).

Methods

Sample of respondents

Sample of respondents is composed of students in the seventh and eighth grade of Primary school "Tojšići", of male sex between 13 and 14 years of age. Those are students which regularly attend physical education class in their school. The students are not active sportsmen.

Sample of variables

Basic motor control abilities are presented with 15 variables, and their selection was conducted in accordance with the structure of volleyball game, as well as the analysis of reliability and factor validity of tests, which provides them with good metric characteristics. Tests for explosive power: MESSUD – Long jump, MESSUV – High jump, MESTIM – Triple jump, MESBML – Throwing of medicine ball from lying position. Tests for coordination: MKOUZR – Agility in the air, MKKOVT – Envelope test, MKOSAS – Eight of bending. Tests for movement frequency (segmental velocity): MSBTRU – Hand taping, MSBTNO – Leg taping, MSBTNZ – Leg taping against the wall. Tests for repetitive power: MRSPTR – Upper body boost, MRSZTK – Relaxing of upper body on the bench. Tests for flexibility: MFPNAK – Bending of upper body on the bench, MFISPA – Side movement with a bat, MFBŠPA – Side line. The aspect of situational motor skills has been covered with five variables which have been selected in accordance with the analysis of the volleyball structure, on which depends efficacy of technical-tactical requirements of the game: SMJAPT – Japan test, SMTESJ – Sitting test, SMPRSE – Serving precision, SOPKNZ – Ball bounce in the circle on the wall, SOPPOZ – Ball bounce onto the wall with forearms.

The program of work

The program of work included primary technical-tactical elements in volleyball, which were realized with the students of seventh and eights grades of Primary school "Tojšići" in the period from February 1, until May 31, 2010, as part of extracurricular activities. The program of work was conducted continuously twice a week and it included 30 classes in total (one class lasting for 60 minutes). In learning technical-tactical volleyball elements, combined method of synthetic and analytical learning was dominant. Exertion during the implementation of programmed volleyball classes was of submaximum intensity, with proportional resting intervals in relation to the activity during the implementation of the class. Measuring of all tests represented in the research has been conducted in two time points – in the beginning and in the end of realization of volleyball program (initial and final condition).

Processing methods

For the purposes of asserting qualitative changes between initial and final measurement of motor and situational-motor abilities, we used factor analysis, congruence model.

Results and discussion

Results of the analysis of qualitative changes of tests for the evaluation of basic motor control skills and situational-motor skills, on the sample of 73 respondents of male sex – students of 13-14 years of age from Tojšići, who attended extracurricular volleyball classes, have been derived by factor analysis – congruence method. First, through Bartlett's test we tested the possibility of subjecting this group of motor and situational-motor variables to any type of factorization. The results of Bartlett's test for the initial and final measuring have confirmed the fact that data can be subjected to factorization (Sig .000).

Table 1. Characteristic roots and explained part of mutual variance – initial measurement

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4,798	23,991	23,991	4,798	23,991	23,991	2,868
2	2,464	12,322	36,313	2,464	12,322	36,313	2,552
3	1,938	9,690	46,004	1,938	9,690	46,004	2,965
4	1,619	8,094	54,098	1,619	8,094	54,098	2,698
5	1,459	7,294	61,392	1,459	7,294	61,392	1,843
6	1,140	5,701	67,093	1,140	5,701	67,093	2,512
7	,855	4,273	71,366				
8	,843	4,216	75,582				
9	,707	3,536	79,118				
10	,669	3,344	82,462				
11	,579	2,897	85,359				
12	,550	2,748	88,107				
13	,447	2,237	90,344				
14	,397	1,984	92,328				
15	,381	1,905	94,232				
16	,298	1,491	95,724				
17	,264	1,321	97,045				
18	,230	1,151	98,196				
19	,193	,967	99,163				
20	,167	,837	100,000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Through factorization of intercorrelations of latent basic-motor variables and situational-motor variables and through the application of Guttman-Kaiser criterion, upon initial measurement (Table 1), we found six characteristic roots which explain total of 67,09% of mutual variance, and the individual contribution in explaining mutual variance is for the first latent variable 23,9%, for the second 12,3%, for the third latent variable 9,69%, for the fourth 8,09%, for the fifth latent variable 7,29%, and for the sixth 5,7%. Rotation has been conducted in direct-oblimin method.

Table 2. Characteristic roots and explained part of mutual variance – final measurement

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5,407	27,036	27,036	5,407	27,036	27,036	2,603
2	2,052	10,258	37,293	2,052	10,258	37,293	2,118
3	1,839	9,195	46,489	1,839	9,195	46,489	3,352
4	1,427	7,135	53,624	1,427	7,135	53,624	1,493
5	1,270	6,350	59,974	1,270	6,350	59,974	2,754
6	1,049	5,245	65,218	1,049	5,245	65,218	3,368
7	,903	4,514	69,732				
8	,858	4,288	74,020				
9	,797	3,983	78,003				
10	,673	3,364	81,367				
11	,582	2,912	84,279				
12	,550	2,749	87,028				
13	,528	2,639	89,666				
14	,478	2,390	92,056				
15	,376	1,878	93,934				
16	,332	1,661	95,595				
17	,304	1,520	97,115				
18	,238	1,189	98,304				
19	,177	,887	99,191				
20	,162	,809	100,000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 3. Structure matrix – initial measurement

Structure Matrix

	Component					
	1	2	3	4	5	6
MESSUD	,661	,442	-,156	-,311	-,488	-,293
MESSUV	-,007	,769	-,406	-,050	,014	-,052
MESTIM	,548	-,030	-,041	-,516	-,281	-,381
MESBML	,346	,797	-,134	-,077	-,236	-,096
MKOUZR	,038	-,077	,802	,179	-,005	,070
MKKOVT	-,067	-,255	,210	,762	-,136	,287
MKOSAS	-,161	,121	,036	,846	,109	,076
MSBTRU	,361	,278	-,686	-,098	-,267	-,343
MSBTNO	,479	,002	-,756	-,089	,013	-,249
MSBTNZ	,524	-,056	-,352	-,242	,330	-,327
MRSPTR	,837	,267	-,062	-,091	-,112	-,132
MRSZTK	,276	,438	-,340	-,306	-,024	,348
MFPNAK	,556	,214	-,362	,015	-,372	-,273
MFISPA	,103	,753	,183	,116	,171	,148
MFBSPA	,148	-,050	-,124	-,144	-,836	-,083
SMJAPT	-,097	,253	,391	,627	,319	,296
SMTESJ	,193	-,117	,551	,503	,039	-,023
SMPRSE	,269	-,006	-,325	-,277	,237	-,690
SOPKNZ	,267	,006	-,064	-,078	-,469	-,672
SOPPOZ	,189	,081	-,188	-,242	-,018	-,795

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Through factorization of intercorrelation matrix of latent basic-motor variables and situational-motor variables and through the application of Guttman-Kaiser criterion, upon final measurement (Table 2), we also found six characteristic roots which explain total of 65,21% of mutual variance, and the individual contribution in explaining mutual variance is for the first latent variable 27,03%, for the second 10,25%, for the third latent variable 9,19%, for the fourth 7,13%, for the fifth latent variable 6,35%, and for the sixth 5,24%. Rotation has been conducted in direct-oblimin method. In the agreement of factor scores – congruence method – initial and final measurement we wanted to ascertain if there had been any structural changes in students of 13-14 years of age from Tojšić, who attended extracurricular volleyball classes, under the influence of training operators in the framework of applied program. In pursuance to characteristic roots of isolated main components it is noticeable that certain structural changes have occurred on the final measurement in relation to the initial measurement, namely, clearer structure of individual manifest variables' influence onto isolated main components on the final measurement was visible.

In the further procedure, we were able to establish what precisely has changed in the structure of isolated main components. By observing frame matrix on the initial and final measurement, it can be concluded that certain changes in the structure of isolated main components have occurred.

Table 4. Structure matrix – final measurement

Structure Matrix

	Component					
	1	2	3	4	5	6
MESSUD	,430	,102	-,449	,210	,385	-,760
MESSUV	,007	-,032	-,071	,213	,688	-,147
MESTIM	,550	,106	-,384	-,209	,079	-,664
MESBML	,322	,118	-,267	,229	,158	-,794
MKOUZR	-,039	-,131	,490	,226	-,634	,211
MKKOVT	-,394	-,026	,817	-,085	-,264	,231
MKOSAS	-,142	-,136	,839	-,025	-,116	,238
MSBTRU	,450	,191	-,101	,116	,600	-,277
MSBTNO	,548	,152	-,216	-,238	,584	-,226
MSBTNZ	,715	,263	-,433	,077	,307	-,286
MRSPTR	,422	,191	-,259	,518	,374	-,354
MRSZTK	-,008	-,139	-,251	,177	,687	-,146
MFPNAK	-,022	,244	-,005	-,036	,216	-,701
MFISPA	-,094	-,121	,058	,878	,100	,142
MFBSPA	,104	,117	-,020	-,173	,119	-,708
SMJAPT	-,484	-,144	,628	,220	-,188	,183
SMTESJ	,104	-,301	,693	,053	-,256	-,064
SMPRSE	,136	,831	-,234	-,027	,102	-,069
SOPKNZ	,579	,556	-,017	,092	-,159	-,202
SOPPOZ	,154	,814	-,078	-,099	-,049	-,300

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

By observing structure matrix on the initial and final measurement, it can be concluded that on the initial measurement (Table 3) the largest projections on the first main component had variables for evaluation of explosive power factor of lower extremities – horizontal component MESSUD – long jump and variable for evaluation of repetitive power MRSPTR – upper body boost. The largest projections on the second main component had variables for the evaluation of explosive power factor – vertical component MMESSUV – high jump and variables for the evaluation of flexibility MFISPA – side movement with a bat. The largest projections on the third main component had variables for evaluation of coordination factor MKOUZR – agility in the air. The largest projections on the fourth main component had variables for evaluation of coordination factor MKKOVT – envelope test, MKOSAS – eight of bending. None of the variables had extremely large projections on the fifth and sixth main component on the initial measurement (Table 3). On the final measurement (Table 4) the largest projections on the first main component had variables for evaluation of frequency of movement factor – segmental velocity, MSBTNZ –leg taping against the wall. The largest projections on the second main component had variables for the evaluation of situational-motor skills level, SMPRSE – serving precision, SOPKNZ – ball bounce in the circle on the wall, and SOPPOZ- ball bounce onto the wall with forearms. This means that this program had contributed development and improvement of situational-motor abilities in students of 13 and 14 years of age.

The largest projections on the third main component had variables for evaluation of coordination MKKOVT – envelope test, MKOSAS – eight of bending. The largest projections on the fourth main component had variables for evaluation of shoulders flexibility MFISPA –side movement with a bat. The largest projections on the fifth main component had variables for evaluation of flexibility MFPNAK - bending of upper body on the bench, and variable for evaluation of explosive power of lower extremities MESSUV – high jump. There were no extremely large projections of manifest variables on the sixth variable. It is important to note that significance coefficients of individual manifest variables on the isolated main components in the final state were higher in relation to the initial state. On the basis of presented results, it can be concluded that certain significant qualitative changes in basic motor abilities and situational motor abilities have occurred, under the influence of three-month volleyball program in students of 13-14 years of age from Primary school "Tojšići", who attended extracurricular volleyball classes. In analyzing intercorrelation matrix of isolated main components – latent dimensions on the initial and final measurement, it can be seen that isolated latent dimensions in the initial measurement are not in significant correlations, whereas on the final measurement correlation coefficient between isolated main components has been significantly enlarged.

Conclusion

The primary goal of this study was assertion of qualitative changes (differences) of the applied basic and situational-motor abilities of 13 do 14 years of age students, in Primary school "Tojšići", who have as a part of extracurricular classes realized specifically defined volleyball program lasting 30 classes (twice a week). In the study we applied 15 variables for the evaluation of basic motor abilities, and 5 variables for the evaluation of situational-motor abilities. We applied factor analysis for the ascertion of qualitative changes which have occurred under the influence of three-month volleyball program. Upon the results of factor analysis it can be concluded that under the influence of specifically defined volleyball program as a part of extracurricular classes, students showed statistically significant quantitative changes (differences) in the field of basic and situational-motor abilities. The obtained results can be useful to Physical Education professors in conceiving such and similar programs for the purposes of gaining intended transformation of anthropological status of students.

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KVALITATIVNE PROMJENE BAZIČNIH I SITUACIONO-MOTORIČKIH SPOSOBNOSTI POD UTJECAJEM PROGRAMIRANOG RADA S UČENICIMA UKLJUČENIM U DODATNU NASTAVU

Sažetak

Istraživanje je provedeno na uzorku od 73 učenika sedmih i osmih razreda osnovne škole „Tojšići“ koji su u sklopu dodatne nastave realizirali precizno definirani program iz odbojke. U istraživanju je primijenjen skup od petnaest motoričkih varijabli i pet situaciono-motoričkih varijabli. Osnovni cilj istraživanja bio je da se utvrde kvalitativne promjene u prostoru bazične i situacione motorike pod utjecajem programa odbojke u okviru dodatne nastave. Za analizu eventualnih kvalitativnih promjena između inicijalnog i finalnog mjerenja motoričkih i situaciono-motoričkih sposobnosti primijenjena je faktorska analiza, model kongruencije. Dobiveni rezultati ukazuju da je došlo do određenih značajnih kvalitativnih promjena bazičnih motoričkih sposobnosti i situaciono motoričkih sposobnosti pod utjecajem tromjesečnog programa odbojke kod učenika 13-14 godina starosti, iz JU OŠ ''Tojšići'', a koji su pohađali dodatnu nastavu iz područja odbojkaške igre.

Ključne riječi: *dodatna nastava, odbojka, motoričke sposobnosti, faktorska analiza*

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