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Transformational Success of the Course Content of Basic Volleyball Techniques and Skills on Motoric Dimensions of the Secondary School Female Students*

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Abstract

The aim of this research was to determine the success of transformational content volleyball game through teaching physical and health education,on selected variables for assessing motor dimensions of the secondary school female students.Kinesiology activities are implemented through two-hour, double gym classes during one school year.The experimental group of the high school female students, through a planned program of 70 lessons,have learned and practiced the elements and techniques of volleball game with the use of different methodical organization of work through all parts of each lesson.With the congruence method of initial and final measurement,intention was to determine wheter there has been a structural change in the observed motor area,under the influence of the content apllied.Although there was a total of eighteen (18) variables apllied, only five (5) were isolated in both measurement as those that could explain,in percentage,the area of the total variance of the system.

From the aspect of creating and programming the structure and content to teaching physical and health education, the results can serve as a recommendation. They can also point out the shortcomings which are present in the implementation of the certain sports and kinesiological activities in teaching.

Key Words: kinesiological content, volleball game, transformational success, motorical dimensions, female students, teaching physical and health education

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1. Introduction

Teaching physical and health education is aimed at raising health and fitness development of the students, developing their motorical skills and knowledge, as well as development of cognitive abilities. Such goals are difficult to attain without appropriate operators, proper content of the teaching units within annual programe. Such a programe should respond to student`s abillities in accordance with their gender, age, and on the other hand,satisfy and achieve the goals and tasks of the physical and health education programms. Different researches that have been dealing with population of primary and secundary students, have shown that the interest of the students increases if one of sports games is pursued in the continuity, which is not covered by the current school curiculum [7]. In adition, the same author recognizes ineficiency in the allocation of time after certain activity has been discontinued (processing techniques of the basic elements of one sport etc.).In such case, for the sake of successful continuation more time must be spent on repetition of already dealth with, but insufficiently adopted elements. According to Najšteter [9] the goal of teching physical and health education is in creation of a habit of everyday application of values that provides specifically-sports activity.Every student involved actively in teaching process has its bioritam growth and development, its possibilities, the interest and the ability which have to be supported.Usually,it is the very purpose of teching physical and health education [9].The planned treatment of the experimental group consists of 70 lessons. The content of the experimental program was concentrated on the tests,teaching units check, processing, excercies, repetition elements of the volleyball techniques. During the educational school year, the female students from the experimental group were excercising and rehearsing different elements, techniques and tactics such as settings,passing,serving,attacking techniques as well as the mechanism of blocking.Also, teaching units contained specific training exercises for development of motorical skills as well as tactics in the volleyball games, which were implemented through different methodical and organization elements such as the frontal forms of work, group work (work in a couple, three and more group memebers) alternating from class work, work in stations and ring work.

2. Methodology

The aim of the research is to determine the changes of the treated motoric dimensions of the female high school students conditioned by the teaching content of the volleyball games during one academic school year .

The sample

Testing was conducted on a sample group of 72 girls in high school, ages 14-16. The research process included students who are healthy and who regularly attend physical education.

The sample and choice of variables

The selection of variables was based on previous studies and on the basis of suitability of, performance techniques and the complexity of performance, age and gender of the sample.

Motoric dimensions assesment variables

The following variables were used for assesment of specific motoric dimensions:

*hand tapping, foot tapping, 20m run, coordination test with bat, slalom with three balls, polygon backwards, slalom with two balls, dribble hand, single leg balance test with eyes open, single leg balance test with eyes closed, both legs balance test with eyes open ,both legs balance test with eyes closed,lying-medicine ball throw,30 seconds sit-ups test, long jump from place test, sit and reach test,shoulder flex test and lateral string.

3. Results

Using the method of congruence of initial and final measurements - stacking factor scores, we wanted to determine whether there has been a structural change in the motorical abilities, under the influence of applied programs of the volleyball games within the teaching physical and health education classes.

In scientific research, very frequently efforts are made to present interconectedness of a large number of interrelated, phenomena which hinders a deeper and clearer insight into the legality of the structure of the same. Due to such conditions and traditional research, the principle of parsimony (savings) was set, which requires that a larger number of phenomena is explained what a smaller number of basic factors. As a goal of this factor analysis is the condensation of a large number of related manifest variables and their reduction of the relatively small number of independent latent variables that explain the connections and relationships together manifested. Such separated latent variables are considered to be the causes or sources of variation between the manifested variables. With our analysis, information can be obtained about the number of latent variables, their structure and interconnectedness.

Table 1. KMO and Bartlett's Test of motorical dimensions of the experimental group(initial and final measurement)

KMO and Bartlett's Test			
		Initial measurement	Final measurement
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.787	.740
Bartlett's Test of Sphericity	Approx. Chi-Square	444.686	490.782
	Df	153	153
	Sig.	**.000**	**.000**

As a first step before factorization, a KMO test has been made, Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity of variables for the assessment of selected motorical abilities of the experimental groups in inicial and final measuring (Table 1.). Results indicate the adequacy and representation in both directions of the sample measurement. After that, the analysis of the isolated factors, derived from the matrix intercorelated motorical variables to assess skills in both measurement (initially and final measuring) and obtained correlations coefficients were already established, which refers

to representation ties at the relevance level 0.01 and 0.05 in both measurement. The following variables have the largest number of relevance corelationary ties, in initial measuring experimental groups:

- for assessment of body coordination (MKOKOP)
- for the assessment of frequency of the hand movement(MBRTAP)
- for the assessment of body coordination(MKOPOL)
- for assessment of the fast and „explosive“ hand strenght (MESBML)
- for the assessment of balance(MABAU2Z,MABAU1O)

The largest number of corelationary ties in the final measuring, have the following variables:

- for the assessment of „explosive“ strenght of legs (MSSDM)
- for assessment of flexibility of lower body parts (MFLBOS)
- for the assessment of body coordination (MKOVLR)
- for the assessment of body coordination (MKOKOP)
- for assessment of body balance (MABAU1O)
- for assessment of the body „repetitive „ strenght (MRSPTL)

This obtained results and analysis of intercorelationary matrix, initial and final measurements for experimental group, have already hinted the existence of isolated factors. Through analysis of all eighteen (18) variables, five (5) turned out to be isolated, which explain the total variances of the system (Table 2).

Table 2. The matrix of isolated latent variables for the assessment of motorical dimensions of the experimental group, in both measurement (initially and final measurement)

	Initial Eigenvalues			Extraction Sums of Squared Loadings			
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	5,694	31,636	31,636	5,694	31,636	31,636	INITIAL MEASUREMENT
2	1,611	8,953	40,588	1,611	8,953	40,588	
3	1,367	7,595	48,183	1,367	7,595	48,183	
4	1,265	7,029	55,213	1,265	7,029	55,213	
5	1,097	6,097	61,310	1,097	6,097	61,310	
1	5,822	32,343	32,343	5,822	32,343	32,343	FINAL MEASUREMENT
2	1,860	10,335	42,678	1,860	10,335	42,678	
3	1,341	7,450	50,128	1,341	7,450	50,128	
4	1,240	6,890	57,018	1,240	6,890	57,018	
5	1,128	6,268	63,287	1,128	6,268	63,287	

Table 3. The matrix assembly components isolated motor dimensions`s initial and final measurements of the experimental group

	Initial measurement					Final measurement				
	1	2	3	4	5	1	2	3	4	5
MBRTAR	,308	-,010	,140	,180	**,586**	**,725**	-,083	,118	-,106	-,011
MBRTAN	,007	,091	-,214	,010	**,739**	**,692**	-,037	-,242	-,221	,027
MBR20V	**-,756**	,278	-,079	,037	-,329	**-,890**	,131	,026	-,202	,033
MKOKOP	-,355	-,022	-,382	-,380	-,223	**-,542**	-,212	,266	-,203	,346
MKOS3M	-,345	**-,538**	,022	-,111	,108	-,231	,137	,379	,319	,226
MKOPOL	**-,621**	-,203	-,183	,035	-,200	-,405	-,242	,126	,399	-,119
MKOSN2L	-,201	**-,521**	**,535**	,196	-,198	,152	,034	,086	**,864**	,008
MKOVLR	-,740	-,099	,118	,025	,102	-,196	-,173	-,074	**,545**	,269
MABAU1O	-,021	**,692**	,134	,195	,053	,062	**,771**	,107	-,186	,001
MABAU2O	-,062	,163	**,669**	-,029	,048	,072	**,859**	-,113	,143	,069
MABAU1Z	-,066	**,732**	,153	,036	,103	,083	,125	**-,717**	-,182	,078
MABAU2Z	,418	,207	**,593**	-,211	-,096	-,242	**,837**	-,038	,003	-,140
MESBML	,394	,254	-,039	,307	,131	,291	,039	**,599**	-,412	-,036
MRSPTL	**,604**	,027	-,005	,200	,007	**,622**	,358	,239	-,007	,043
MESSDM	,400	-,152	,127	,088	**,558**	**,582**	,160	-,003	-,095	-,136
MFDS	-,078	-,059	,024	**,724**	,180	-,111	-,023	-,073	,050	**-,875**
MFLISK	-,084	-,194	,121	**-,804**	,193	-,117	-,049	-,260	,090	**,631**
MFLBOS	-,245	,426	,264	,004	**,583**	,152	,262	,006	-,296	-,319

The first component bears the largest variability and its distinctive square root amounts to 5,694 which carries a 31.64% total system variances. The second isolated component of the initial measurement has a distinctive square root of 1.61 which refers to 8.95% total system variances.

The third isolated, latent component explains 7.60% of the total system variance. It has a square root of 1.37.The fourth isolated component has a square root of 1.27 and explains 7.03% of the total variance. Finally, the fifth isolated, latent variable has a square root of 1.10 and explains 6.10% of the total variance. In general these five factors explain 61.31% of the total varience of the system.

In the final measuring of the experimental group, we have had a group of eighteen (18) variables to assess motorical dimension, and again, isolated are five statisticaly significant components that explain the total variance of 63,29 %. The first component holds the highest,has a distinctive square root stands of 5.82 and explains 32.34 %. of the variance. The second isolated component has a distinctive root of 1.86 and 10.34 per cent of the total variance. The third isolated latent variable explains 7.45% oft he total variance with square rooth of.34. The fourth izolated component accounts for 6.89% oft he total variance and has a square rooth of 1.24. Finaly, the fifth isolated component explain the remaining part of 6.27% of final measurement variance and has square rooth of 1.13.So, if we compare both

measurements, we can note the increase in percent and a square rooth, which explains total variance of respectively both measurements (initial 61.31% and final 63.29 %.) When interpreting the importance of five isolated factors, very importante is the matrix (table 3) of isolated components for the experimental group's motorical dimensions in initial and final measurements.

It is evident that in the initial measuremnt the largest part of variance is accounted for by the first main component followed by the other four (MBR20V,MKOPOL,MRSPTL) and this factor can be defined as mixed factor of speed,body coordination and repetitive strength of upper body .

In the final measurements the most influential element is MBRTAR, followed by MBRTAN and the MBR20V.The values, significant projections in this factor have variables for the assessment of body coordination (MKOKOP),repetitive strength of upper body (MRSPTL) and explosive power legs (MESSDM).This factor can be defined as clean, speed factor. A large part of variance factor explains the largest projections have variables to assess speed and it frequencies movement legs and hands and simple movement speed. In the following an initial measurement component, which explains a significant area of variance system,the largest projections of values have variables to assess balance open and closed-eye one foot (MABAU1ON,MABAU1Z) as well as variables for the assessment co-ordination legs (MKOSN2L) and hand (MCYS3M) .and this factor can be defined as combined factor of balance and co-ordination of legs and hands.In the final measuring, on the second isolated component, the largest projection have variables to assess balance MABAU1O, MABAU2O and MABAU2Z so that we can, and this factor defined as pure factor balance.

On the third component isolated initial measurement, most significant projection have variables to assess leg coordination(MKOSN2L) as well as variables to assess balance,open and closed eyes(MABAU2ON,MABAU2Z).This third isolated latent factor explains the remaining space of variance initial measurement experimental groups and we can define it as mixed factor of leg coordination and balance. At the final measuring, analyzing the matrix assembly components,the third in a row, isolated component also can be defined as mixed factor of balance and explosive hand strenght, with substantial projections variables to assess balance closed eyes (MABAU1Z) and explosive hand strenght (MESBML) .The fourth isolated component of the initial measurement, significant projections have variables to assess flexibility of upper body(MFDS) and shoulders (MFLISK).

This isolated major component can be defined as clean factor of flexibility. At the final measuring, should acknowledge the value projections, belongs to variables to assess legs cooridnation of (MKOSN2L) and hand coordination (MKOVLR) which define the fourth factor as factor of coordination. In the end, it is the fifth component that is isolated from residual vriability of all apllied variables for the assessment of the motorical ability. In initial measuring significant projections have variables to assess the leg and hand movement frequency (MBRTAN,MBRTAP), explosive leg strenght (MESSDM) and flexibility of lower body (MFLBOS) can be counted.We can define this component as a mixed factor of speed, strenght and flexibility.In the final measuring, largest projections on fifth isolated dimension have variables to assess upper body and hand flexibility (MFDS,MFLISK) and as such it can be defined as a flexibility factor.

4. Discussion

After so called condensation of corelated variables which influence motorical dimensions of the tested group, it apeared that five of the 18 factors are crucial in both initial and final measurements. Structure of the latent isolated variables can be shown in the following manner:

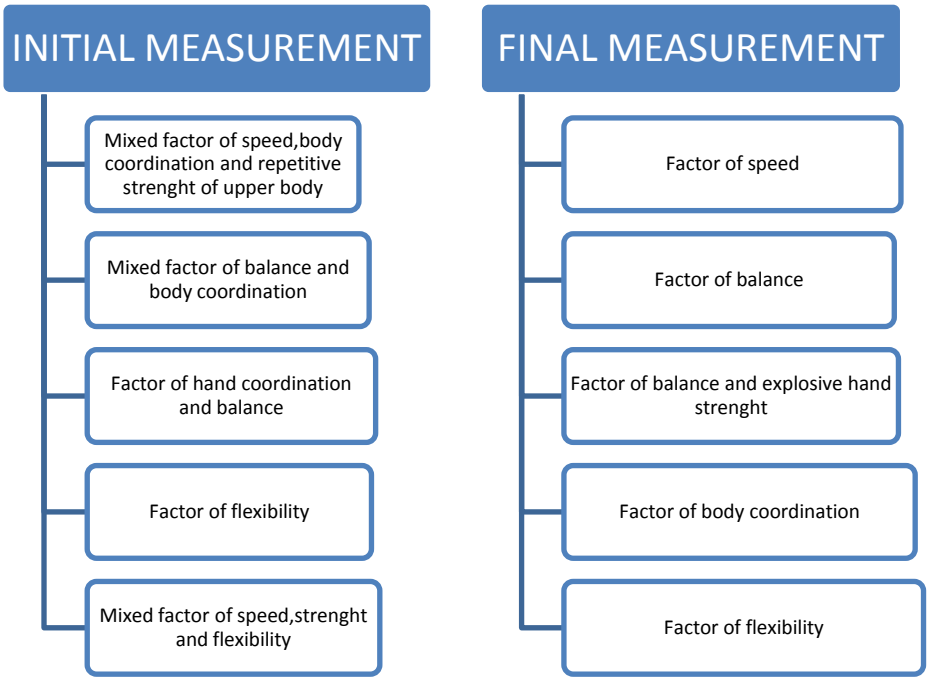

Figure 1. Structure of isolated variables for assessment of motorical dimensions in initial and final measurement

In initial measurement of motorical dimensions, some variables have been identified and that explains the structure of motorical abilities of the tested sample. For instance, the period of 14 to 16 years is very dynamic period for development of an individuald with strong differences in physical development of boys and girls. In this period, the body height and weight are changing as well as intensified development of bones and muscle structure. Developmental differences between girls and boys is expressive because relations percentages of muscle tissue and fat tissue in total body weight for boys is grater than it is for girls.

The development of muscles is the basis for the overall strenght and it is recommended that in this period they begin with systematic coaching disciplines in which the represented durability and strength continue to work in the space of body coordination, balance and flexibility with which need to be worked at the right time. Further characteristic during this period, there is the further development of respiratory system and intensive development cardiovascular system. In this period ends the process of shaping and specializations period begins when we are talking about the training [2].We have already mentioned height and weight which have a negative impact as limiting factors manifest certain motorical capabilities.

The body growth negatively affects the coordinating ability whose level is determined by the level and demonstrating other motoric skills [2]. In addition to negative influences there are some positive as well such as increase of speed abilities that go along with increase in power,which again depends on the range of motion in the joint structures.And the range of motion in the joint strucutres influence the level of body balance [11].

When analyzing the isolated variables in the final measuring, we can note that due to change in the curiculum there are structural changes in the variables. Volleyball as a game belongs to group of sports activities which is characterised by complex displaying motorical capabilities in different level of their development. Research from different authors who are dealing with issues effecting women volleyball motorical skills that request, analyses have shown that the various phases of the game and elements techniques of the participants request a certain level motorical skills such as the explosive leg strenght, speed, flexibility and body coordination. It is often cite coordinating skills in the first place of importance for the successful response requirements after the volleyball game, and the explosive strenght as well. No less important factor are the basic elements of volleyball techniques such as the setting, digging, blocking, serving, which is carried out from jump, require level of explosive streght and durability in it. While players in the defense claim a good coordinating skills, agility, flexibility, balance and precision [1].

On the other hand, analysis of specific motorical skills, we can say the following:

- Ability to maintain body balance ,with the analysis of information on the position of the body that come through kinesthetic and visual receptors (in this case it is keeping balance with extensive and frequent , rapid changes in body position - leaps , turns , landing , short - running a requirement that sets volleyball as a game) is correlated with the coordination abilities , especially with such agility and speed and powerful properties of muscles to ensure the maintenance of balance(dynamic). Meaning that level may increase any form of balance, increased levels of agility , speed and strength of the muscular groups involved in maintaining the same (specific balance) .
- Flexibility as motor ability belongs to a group of motor skills that have a relatively low coefficient as an innate trait and can take a lot of influence on her development. Flexibility is the most developed in the earliest period of childhood and for girls is increased the risk of developing them (depends on the flexibility of the joint structure and elasticity of muscle tissue). All this is outlined in the earlier period of childhood.
- Induced enhancement in strength of certain muscle groups increase the speed of those muscle groups, except when creating a “speed barrier" excessive increase in the level, shortening the duration of the movement, distortion techniques and coordination [11]. Expression and development speed as well as the majority of motor skills, depends on the growth of body weight and level of conditioning of motor skills. People with elevated body mass have a problem with any manifestation of motor skills, therefore the speed. When talking about the level of acquired motor knowledge, people with a high level of technical knowledge of the motor knowledge have the option of expressing the maximum speed which in turn applies the other way around.
- The analysis of the degree , the inherent coefficient of motor skills , speed (.90 - .95) and explosive strenght (.80 - .85) , have a high coefficient of innate traits what limits but still leaves a space in which can cause an increase qualitative and quantitative levels .

- Repetitive power has the inherent lower coefficient (.50) and a larger effect on growth. Coordinaction capabilities, according to a hierarchical model of motor functioning and the structure of motor skills [12], belongs to the mechanism for the regulation of movement, its structuring and possesses a high coefficient of innateness (.90 -95). Due to the inherent factor, it is possible to partially affect the development of coordination skills and in time. Even the smallest progress in the coordination means a lot because it has a direct impact on all other motor skills and their manifestations [12]. Given that the general coordination is not possible impact upon the completion of growth and development, specific coordination can be changed. During the realization of the basic techniques of volleyball games such as digging, setting, spiking, you need a specific level of coordination, which in turn depends on the weight and structure of the required movements in volleyball.

5. Conclusion

The main objective of this study was to determine the success of transformational teaching content with volleyball games on motorical abilities of the high school students aged 14-16 years. For this purpose, data were collected from a sample of 72 female respondents using 18 tests of motorical abilities. In the course of solving the objective of this study preliminarily determined latent structure of motorical abilities in the initial and final measurements. The goal of factor analysis in this study was not only to determine the latent structure of the investigated area, but also to establish a presence primarily qualitative changes that have occurred due to programmed volleyball classes. Using the Method of congruence - stacking factor scores initial and final measurements, it was found that there were structural changes occurred as a product of the applied curriculum volleyball for a period of one regular school year. Factor analysis results provide a basis to conclude that the basic structure of motoric abilities after conducting the volleyball program, there was a significant qualitative change in the majority of the applied variables, and it obtained a better and more compact structure of the final measurement.

Knowing the impact of teaching content and operators to transform motoric skills, will facilitate quality educational programming process in the area of the subject 's physical and health education in secondary schools, and should in the future facilitate the discovery of nearly ideal facilities that will meet the required standards and implement the tasks and goals of cases of physical and health education. The results of this research could be used in defining the effects of programmed instruction in the case of volleyball, and other sports games. In terms of temporal structure of the teaching process, a small number of classes, the break between two classes a week, with no additional work, poses the question whether this is enough for any significant change in the level and structure of motoric abilities. Finally, the teacher, i.e. his creativity and knowledge, and selected operators and content of teaching, are also crucial for any transformation.

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