EXAMINATION OF EFFECTS OF RHYTHMIC GYMNASTICS TEACHING OF PHYSICAL EDUCATION ON FUNCTIONALL ABILITIES OF 3rd & 4th GRADE PUPILS OF ELEMENTARY SCHOOLS

(Original scientific paper)

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Abstract
In this work, the subject of the research is only one segment of the anthropological area, which refers to the appearance of appropriate morphological characteristic. The research involved a total sample of 99 girls from the 3th and 4th grade of elementary school. The subjects were classified in experimental and control groups. The experimental group was made of 51 students and they were practicing according to planning instruction where the rhythmic gymnastics had the primary part. The control group of 48 students was practicing according to official instructional plan and program for P.E. of the Republic of Serbia. The battery for the evaluation of functional abilities consists of the following tests: vital capacity by spirometer, Lorenc’s test and heart puls in peace. Research data was processed using SPSS standard statistics procedure. There were calculated: Basic statistics parameters (mean, standard deviation, Min/Max numeric score, interval of confidence, coefficient of variation), Descriptive statistic parameters, Kolmogorov-Smirnov test for the evaluation of normality of test result distribution of applied variables. The multi-variant procedures were used in this research ant those were: the multi-variant analysis of the variable (MANOVA) and the discriminative analysis. Also, the mono-variant procedures were used and those were: the variable analysis (ANOVA) and the interval of entrust. After the experimental treatment, i.e. at the final testing, significant differences were found with female pupils in experimental and control groups concerning the two of four tests for the evaluation of functional abilities.

Keywords: elementary school, teaching effects, vital capacity by spirometer, Lorenc’s test, heart puls in peace, physical education, physical activities, pedagogical experiment, multivariate analysis of covariance, discriminative analysis

INTRODUCTION
By the insight into researches which are available to us (Jorga et al., 1983, taken from Popović, 1998), it is determined that, by certain processes of exercise, it can exist a significant influence on different characteristics of a human body, their abilities and motor knowledge, and only then if the content of work is maximally adapted to the needs and interests of an individual, i.e. a student, if we speak about the teaching process (Mraković, Findak, 1997). In this case, the process of exercise should enable emotional engagement - exercise which would, above all, be accepted as pleasure, because, without pleasure, there is no success or expected changes, nor acquiring habits about the necessity for exercise.

This principle is also applied to the choice of determining the burden and forms of work, which also must be in function of maximal satisfaction of all the actual possibilities and interests of all students.

In this work, the subject of research is only one segment of anthropological space which refers to the expression of certain functional abilities. We can evaluate the working ability of a human being according to the functioning and respond of certain organic systems to the given workload (Zaciorski, 1975). The most accessible for monitoring and evaluation of a body’s reaction with physical workloads in the physical education teaching, training and recreative activities are the respiratory and cardiovascular systems. The monitoring of these systems is conducted by monitoring of resting heart rate during the workload and during the recovery.

The frequency of heart rate represents one of the basic functional parameters of cardiovascular system.
Certain information, during different kinds of exercise, given by the respiratory system can be gained by monitoring the frequency of breathing while resting, during the exercise and after the physical workload. Also, by monitoring the movement of vital capacity, we can make conclusions about the effect of physical activities during the physical education teaching, and the training and recreative physical activities to the vital lung capacity (Popović, 1998).

The subject of this research is studying the effects of the proposed experimental program of the physical education teaching which lasts for one school year, in which the elements of rhythmic gymnastics as the means of the physical education have primary role, for the transformation of one of the segments of the anthropological space which refers to the expression of certain functional abilities of female students of younger elementary school age in Nis.

Looking for adequate contents for the physical education teaching which would enable better efficacy of the physical education in schools, i.e. optimization of work on this educational area is the basic problem of this research.

METHODS

Population from which a sample of examinees for the research is taken is defined as the population of younger school age female students, from 9-10 years of age.

According to the goal of the research, a sample of minimally 99 examinees is suggested, and they are divided into two sub samples (experimental and control group) which is relatively optimal for the planned research to be accepted.

The research was conducted with the third and the fourth grade female students of the elementary schools in Nis, „Bubanjski heroji“ and „Vođ Karadjordje“. The examinees, which compose the sample, must satisfy the following condition:

- to regularly attend the physical education lessons.
- There is a great number of tests for examining some or, in the same time, more functions.

The generalized definition of tests involves a procedure or experiment that we use for measuring a certain ability. In the tests of physical, i.e. functional abilities that is a human body’s resistance of the influence of the physical effort and external environment in which that effort is done (Djuraskovic, 2001). The basic and the most important rule which must be followed by physical education pedagogues, trainers and recreators is that they can apply the tests of physical workload only in people who were found healthy and capable for attending the lessons of the physical education, training and recreation by a doctor.

The change in the function of the respiratory system was gained by measuring:

- of vital capacity (by Spiro meter) and, for the research of the efficacy of cardiovascular system:
  - Lorenzo’s recovery test, and
  - the measuring of resting heart rate were applied.

The research is of longitudinal character and it is conducted during the period of time of 36 weeks (one school year) within which the exercise of 45 minutes was conducted twice a week. Actually, two thirds of planned lecture hours for conducting the physical education teaching according to the current curriculum for elementary school education which is enriched by implementation of the elements of rhythmic gymnastics, so that those lessons resembled a sports training.

The first, i.e. experimental group consisted of the female students from the elementary school “Vođa Karadjordje” in Nis, with the experimental program in the physical education teaching with the implemented elements of rhythmic gymnastics (group 1).

The second group which consisted of the female students from the elementary school “Bubanjski heroji” in Nis, represented the control group, i.e. they did not have the experimental treatment but did the regular physical education lessons according to the program of the Republic of Serbia (group 2).

Before the beginning of the experiment, the initial measuring of functional abilities which were monitored during the experiment was conducted in all the subjects of the experimental and control group. The final measuring of the relevant functional abilities was conducted at the end of a school year, after the experimental treatment.

In the experimental group, the exercise of specific physical preparation characteristic for rhythmic gymnastics, which are adapted to the age and level of knowledge of the students would be applied, and they were classified by the units:

1. walking and running with the right posture, fast and slow, walking on toes, external instep, walking to the side, crossed step, steps with half squat, soft running, with throwing lower leg back, with high raising of the knee, running backwards, curvilinear (sinuous) running, running with different tempo, fast running from high start, road start and lying start of the limited length. One-leg hop and two-foot hop in one place, forward and backwards, jumping obstacles, one-leg and two-foot skipping a short rope in one place and in movement, skipping a long rope, „children“ hop, „cat“ hop, far-high jump, „scissors“ jump, long jump, high jump and deep jump.

2. long throwing a ball and into the goal with both hands, high throwing a ball and catching with both and one hand, leading and passing a ball in couples in one place and in movement, ball rebounding with hands (volleyball) in couples and groups.

3. simple and wavy arm movement (frontal, side and horizontal arcs and circles, eights, body wave, arm and leg positions), the development of the right feeling of tension, straining and loosing muscles, mastering the right transfer of body weight in frontal and side plane, mastering the stylized steps with drawing near, crossed steps with body and hand work, gallop hop to the side,
forward and backwards, „waltz“ three steps, „polka“ step, short wholes with the combination of the mastered elements.

4. a skipping rope - turning around and two foot skipping with mid-hop and without mid-hop, running and skipping the open skipping rope (forward, backwards, turning the skipping rope forward and backwards), gallop and cat jump through the open skipping rope, arcs, swinging and circling with a skipping rope in all directions, eights.

5. a ball - throwing and catching, turning, high throwing and catching, throwing and catching from hand to hand forward, above the head, behind the body in one place and in movement, kicking, coasting over the ground and body, or body parts, eights.

For all the variables, which are the subject of the research, basic descriptive statistical parameters are determined:

- arithmetic mean (X),
- standard deviation (SD);
- coefficient of variation (KV) and interval of trust;
- limits of span between the values of the minimal (MIN) and maximal (MAX) results;
- Skjuniš, Kurtozis;
- and Kolmogorov-Smirnov test of normal distribution.

In this research, multivariant procedures MANOVA, MANCOVA, and discriminative analysis will be used, and analysis ANOVA, ANCOVA and the interval of trust on the difference of the adjusted mean as univariant procedures.

RESULTS

During the procedure of analyzing the initial state, and by the application of multivariant analysis of the variance (MANOVA) and discriminative analysis, it is determined that the analyzed groups of female students (experimental and control) statistically significantly differ from each other in their functional characteristics (Table 1) and that there is a clearly defined line between some groups of the examinees.

Already noticed difference between the students of the experimental and control group for each characteristic of motor space is given by the analysis of variance (ANOVA) (Table 2). It showed that there are differences in all the characteristics and they are:

1. Vital capacity (vtka) p=.000,
2. Frequency of resting heart rate (puls) p=.005,
3. Lorenzo’s recovery test initially (lori) p=.005,
4. Lorenzo’s recovery test finally (lorf) p=.017.

Table 3. The coefficient of discrimination between the groups of the examinees in relation to the evaluation of the condition of functional abilities – initial

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient of discrimination</th>
</tr>
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<tbody>
<tr>
<td>VTKA</td>
<td>.147</td>
</tr>
<tr>
<td>PPULSE</td>
<td>.100</td>
</tr>
<tr>
<td>ORI</td>
<td>.051</td>
</tr>
<tr>
<td>LORF</td>
<td>.041</td>
</tr>
</tbody>
</table>

The coefficient of discrimination (Table 3) shows the greatest contribution to discrimination between the different groups of the examinees in relation to the initial measuring the functional abilities (i.e. where the greatest difference is).

Taking into account that it is determined that there is a great homogeneity in functional space inside every group at the initial measuring, so the characteristics of the groups are identical, and the distance between the experimental group and the control group is moderately big, and that the analyses MANOVA, ANOVA and DISKRIMINATIVE showed the existence of statistically significant differences between the groups, the conclusion that they enter the experimental program with different functional characteristics is imposed.

Table 4. The significance of the difference between the groups of the examinees in relation to the evaluation of functional abilities – final

<table>
<thead>
<tr>
<th>n</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANCOVA</td>
<td>4</td>
<td>3.408</td>
</tr>
<tr>
<td>DISKRIMINATIVE</td>
<td>4</td>
<td>4.294</td>
</tr>
</tbody>
</table>

Table 5. The significance of the difference between the groups of the examinees in relation to the evaluation of functional abilities – final
and by the application of multivariant analysis of the covariance (MANCOVA) and discriminative analysis, it is determined that the analyzed groups of female students (experimental and control) statistically significantly differ from each other in their functional abilities (Table 4) and that there is a clearly defined line between some groups of the examinees, which means that after the neutralization of the differences in the initial state, there is a significant difference between the analyzed groups in the final measuring, which practically means that there is also a significant difference in the contribution of the treatment.

Already noticed difference between the students of the experimental and control group for each characteristic of motor space of balance is given by the analysis of covariance (ANCOVA) (Table 5). It showed that there are differences in two of the characteristics and they are:

1. Lorenzo’s recovery test initially (lori) \( p=.000 \),
2. Lorenzo’s recovery test finally (lorf) \( p=.001 \).

The results from the Table 6 show who has the advantage of the difference after the conducted adjustment of the results of the final measuring. By the insight into the Table and comparison of the adjusted mean values of the results of the experimental and control group, we see that the difference appears in relation to the treatment to which the experimental groups were subjected.

In the experimental group, which was subjected to the treatment from the area of rhythmic gymnastics, the results of the interval of trust which were gained show that there is a difference in the advantage of the experimental group in two characteristics of the functional space and they are:

1. Lorenzo’s recovery test initially (lori) \( (957 \quad 5.277) \),
2. Lorenzo’s recovery test finally (lorf) \( (-8.249 \quad -1.070) \).

The coefficient of discrimination (Table 7) shows the biggest contribution to discrimination between the different groups of the examinees in relation to the final measurings of functional abilities (i.e. where the greatest difference is)

The gained results lead us to the conclusion that, for the significant changes of the functional status in the students from the experimental group, the experimental factor is primarily responsible.

- Of four monitored variables in the experimental group, in the two variables, Lorenzo’s recovery test initially and Lorenzo’s recovery test finally, we can say that the influence of the applied treatment had the primary role and that it produced a statistically significant difference between the experimental and control group of students, which is enough for us to derive the conclusion even when we speak about the completely monitored functional space. Taking into account the difference of the effects of the treatment, it can be said that the experimental program of rhythmic gymnastics with all its characteristics significantly contributed in all its segments to the improvement of the functional space.

**DISCUSSION AND CONCLUSION**

The gained results lead us to the conclusion that for the significant changes in the evaluation of the functional abilities in the students of the experimental group, the experimental factor is primarily responsible. Jorga and ass. (1983, taken from Popovic, 1998) came to this conclusion, and they determined that under the influence of the training process, it comes to the adaptation of cardiovascular system in terms of the increase of the functional abilities. The speed and scope of the increase of the functional capacity will depend on the intensity and scope of the training process. The first significant values at the level of reaching the new quality appear after the increase of the size of stimulation of the cardiovascular system (after1.5 years). The frequency of training over four times a week, with the classical content of the elements of training and duration of 1.5 hours per training has favorable effect on an organism in terms of size, speed and scope of adaptation. After the period of 4.5 years of time (group D), the subjects achieve the maximal values of the cardiovascular system such as: stroke and minute volume of the heart, arterial-venous difference in oxygen and oxygen pulse, with slight increase of the number of erythrocytes, the same value of hemoglobin and reduction of the heart rate.

Although our experimental treatment lasted for only one school year, it produced the improvement of certain functional abilities in the experimental group, which
leads to the justification of the requests that the existing plan and program of the physical education teaching should be modified. According to the gained results and by the insight into the development curves, Mraković and Findak (1997) concluded that significant oscillations in the development of all the analyzed characteristics are noticeable. It is obvious that those differences cannot be attributed to only one genetic limitation but to the lack of physical exercise also. As the best proof for this claim, the authors point out the indicators of strength and endurance which are less at the end of a school year or the same as at the beginning of a school year.

Beside the theoretical, this research could also have its practical applicability in the process of planning and programming the physical education teaching, because, according to the gained results, it is not difficult to conclude that it is necessary to change the existing concept of the teaching contents in the physical education in schools. Taking into account that the experimental programs of this research showed the great advantage in relation to the existing concept, we think that they could find its place in the future teaching plan and program for elementary schools.

Certainly that it implies the series of further researches about the effects of different organizational teaching methods on children of this and other ages. One of the questions for further researching projects would be what effect would the application of this experimental program have if it lasts for more that one year. Our research only indicated positive tendencies in this area of expertise.

REFERENCES


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