

Science, Movement and Health, Vol. XIX, ISSUE 2, 2019
June 2019, 19 (2): 146- 151
Original article

METHODOLOGY OF BINARY PHYSICAL EDUCATION OF MEDICAL FACULTY STUDENTS

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Abstract

Objectives. This article addresses the issue of the theoretical research and experimental argumentation of the binary physical education methodology, which focuses on the interconnection of teaching-learning physical education as an academic discipline and specific extracurricular activities in relation to the psychological, physical and professional needs of the students.

Methods. In order to determine the methodological bases of the physical education of the medical faculty students, as well as the elaboration of the binary methodology for the realization of this process, which will ensure the physical and somato-functional development of the future medical students, the following *research methods* were used: specialized bibliography study method, pedagogical observation; measurement and test methods; pedagogical experiment; statistical and mathematical methods.

Results. There is a clear tendency of improvement of students' outcomes from the experimental groups (boys and girls) compared to those in the control group due to the methodology implemented by us, by analyzing the evolution of the physical development and training indices at the end of the pedagogical experiment. The best results were recorded in the indices that determine the functional status of the sample of subjects included in the research, such as the Ștanghe(s), Ghenci(s), vital lung volume (ml) and vital signs (ml) which the results of the experimental groups were significantly higher than those in the control groups ($P < 0.01$).

Conclusions. The obtained results make it possible for the proposed binary methodology to be successfully implemented by teachers teaching physical education in higher education institutions, having a positive impact on the health indexes and on the development and professional training of the young students.

Key words: binary physical education, students, medical faculties, theoretical and methodological bases, physical development, physical training, somatic and functional indices.

Introduction

Physical education of students is a component part of higher education, a result of complex pedagogical action on the personality of the future specialist in the training process of physical education competencies, the quality of which depends directly on the individual level of the physical culture of each student, his / her spiritual values and the degree of development of specific professional skills.

Studying theoretical bases of the physical education of diligent youth (V. Ceban, 2002; T. Krutevich, 2003; J. Cholodov, V. Kuznetsov, 2011; M.Ia. Vilenski, 2013) let us to mention that the years of study are a basic stage in training the personality of the future specialist in different fields of activity. Students' age specifics represent an important period in forming the basic qualities of their personality. Adaptation to the new conditions of socialization in life, formation of the conception about the world directly contributes to the manifestation of the individual characteristics of the modern man character. In this context, we consider that physical education becomes the main means of social establishment of students / future specialists in various fields of professional activity.

The professional orientation of the physical education process in higher medical education institutions has an essential theoretical and practical importance for society as it represents one of the direct factors for improving the professional training of future physicians, reducing the term of acquiring the professional skills and abilities, to increase the security of employees in the conditions of complex contemporary technique, to increase labour productivity, etc. In this respect, physical education in higher education institutions serves as one of the important factors determining the psychomotor and functional competencies of the students [B.I. Ильинич, 1978; E. Drăgănescu, 2000; L. Ion, 2003; S. Danail, V. Ceban, 2004; A.Stoicoviciu, 2009].

The special forms of using the means of physical education with application to the specifics of the existing professions at the national and international level, as a result of the accumulation of the practical positive experience and based on the research data, the scientific-methodological principles of some applicative forms of physical education, as gymnastics in production and special forms of professional-applicative physical training have been developed.

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Received 16.03.2019 / Accepted 5.05. 2019

[†] the abstract was published in the 19th I.S.C. "Perspectives in Physical Education and Sport" - Ovidius University of Constanta, May 16-18, 2019, Romania

The teaching process in higher medical education institutions puts first the professional training of the students, with consequences regarding the physical and intellectual capacity, the health condition and the work capacity of the future physicians. In addition to strictly health aspects, physical education and sport also contribute to social integration as part of the informal learning process.

These assessments confirm the attempts of some teachers to streamline the physical education process of the students of the higher education institutions through a unilateral approach, which does not allow to solve the complex issue with a health insurance orientation, the differentiated development of the qualities and professional applicative motor capacities, removing the unfavourable influence of the training process on the students.

All the problems mentioned in the organization of the physical education of the young students create certain difficulties in the context of developing an integrated concept that would allow concurrently and harmoniously to solve the training, educational and developmental objectives related to the training of the students - future physicians.

The same opinion are [D. Filipescu, 1999; G. Vanvu, 2013; С.М. Футорный, 2014; G. Cozmei, I. Carp, 2017; Г. Nikitushkin, 2018], which investigated the problem we have approached, which allows us to demonstrate that physical education for medical specialists is in contradiction with relatively inactive students' involvement in the continuous improvement of skills in the field of physical education.

These contradictions have led us to identify **the research problem** that resides in the necessity of the theoretical determination of the physical education process of medical students and the experimental validation of the binary methodology of realizing this process from the curricular and extracurricular systemic perspective, in result will improve the students' development indices and physical training, the development of the utilitarian motor and professional-applicative skills needed by the medical workers.

The objectives of this study is to analyze the concepts, approaches, visions in the field of physical education in higher education, elaboration of the binary methodology of the physical education of medical faculty students, experimental validation of the binary methodology of the physical education of the students - future physicians.

Methodology of research

The theoretical analysis of the essence, structure and content of the professional activity of

the students of the medical institutions as well as the possibilities of combining the curricular and extra-curricular forms of training included by us in the physical education process allowed to elaborate the functional structure of the binary methodology of physical education that had a beneficial influence on the motor, functional and health indices of medical faculty students.

The basic researches were carried out within the physical education process of the medical faculty of the University of Medicine and Pharmacy "G. Popa" in Iasi with a good material base allowing the application of experimental research at the higher level of education, under appropriate conditions, according to the contents of the specially developed curriculum.

Analyzing the answers obtained by the students from the sociological conducted survey, the point of view of the subjects on the time for the weekly course of physical education was highlighted, 77% of the respondents mentioned that it does not meet the daily need for movement, allowing the 46 % respondents to opt for involvement in 2-3 extracurricular activities.

Taking into account the non-specific profile of physical activity of medical students, one can appreciate the increased interest of students in the activity of physical education in general and extracurricular activities in particular, the need to practice exercises characteristic of a particular discipline in leisure time 39 % of respondents opted for fitness and gymnastics activities, 32% for mini football, etc. with expectations in awareness and achievement of objectives related to the improvement of the health indicators, of the physical and functional training.

Following the analysis of the experiment results obtained by the subjects in the preparatory phase 2012-2013 regarding the initial level of development and physical training, a low motor content was observed in most tests (as extension and value level) close to most of the cases with values of the minimum rating scale. Thus, in the case of boys in pull-ups tests with an average of 5.9 repetitions, compared to the minimum of 10 repetitions model, lying push-ups with an average of 21.9 repetitions compared to 28 repetitions-model min, speed running with an average result of 14.83 seconds - model min 14.2 sec as well as in mobility. In the case of girls, low results, close to the min model, have been proved in most of the evaluated tests, which has allowed us to find that the level of student training at the initial experimental time is low and requires special intervention.

The formative pedagogical experiment was carried out during the period 2013-2015 within four semesters, with two compulsory weekly hours and

2-3 extracurricular activities according to the students' wish, attended by 52 subjects, 26 boys and 26 girls.

According to the elaborated program, the total number of hours assigned to the experimental group is 280 hours for two years of study, 140 hours of study per year and 70 hours for each semester, of which 28 are curricular and 42 are extracurricular.

The volume of the thematic hours is divided into sections as follows: 8 hours course, athletics - 18 hours, sports games - 32 hours, gymnastics - 12 hours, fitness activities - 44 hours, evaluation 8 hours. Extracurricular activities have provided various forms of physical exercise aimed at general and special physical development, improvement of the somatic and functional indexes, as well as contributing to the formation of professional psychomotor skills of future physicians, capitalizing in this respect the valences and opportunities of the binary process of organizing

physical education. In consensus with our research strategy, we used elaborated pedagogical tools incorporating, in fact, the theoretical-applicative benchmarks determined and developed in the investigative process.

Results

The final testing was conducted in June 2015, checking the effectiveness of the binary methodology of physical education of medical students on the indices of physical development and training. On the basis of the results obtained by the subjects of the experimental group, theoretical and practical - methodical conclusions and recommendations were formulated.

The statistical data obtained from the samples of subjects included in the initial and final stage of the basic pedagogical experiment following the implementation of the binary methodology of physical education with the students of the medical faculty are presented in Tables 1 and 2.

Table 1. Comparative analysis of physical development and training indices of experimental and control subjects, initial-final (boys, n = 26)

| No. crit. | Measurements / tests | Statistical groups | Initial indices $\bar{X} \pm m$ | Final indices $\bar{X} \pm m$ | t | P |
|-----------|------------------------------|--------------------|---------------------------------|-------------------------------|------|--------|
| 1 | Height (cm) | C | 179,20±2,75 | 181,12±2,74 | 0,64 | > 0,05 |
| | | E | 178,93±2,80 | 181,54±2,73 | 0,86 | > 0,05 |
| | | T | 0,07 | 0,11 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 2 | Weight (kg) | C | 74,60±1,89 | 77,91±1,83 | 1,63 | > 0,05 |
| | | E | 75,00±1,91 | 76,26±1,80 | 0,62 | > 0,05 |
| | | T | 0,15 | 0,64 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 3 | Body Mass Index (BMI), units | C | 24,02±1,37 | 23,25±1,35 | 0,52 | > 0,05 |
| | | E | 23,85±1,38 | 23,80±1,36 | 0,03 | > 0,05 |
| | | T | 0,09 | 0,81 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 4 | Ştanghe (s) test | C | 48,32±1,74 | 49,78±1,72 | 0,77 | > 0,05 |
| | | E | 48,61±1,73 | 54,89±1,70 | 3,36 | < 0,01 |
| | | T | 0,12 | 2,11 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 5 | Ghenci (s) test | C | 21,39±1,22 | 22,91±1,20 | 1,15 | > 0,05 |
| | | E | 21,76±1,24 | 26,49±1,18 | 3,58 | < 0,01 |
| | | T | 0,21 | 2,13 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 6 | The vital lung volume (ml) | C | 3631,50±55,01 | 3723,90±54,88 | 1,54 | > 0,05 |
| | | E | 3687,10±55,22 | 3890,35±54,61 | 3,39 | < 0,01 |
| | | T | 0,71 | 2,15 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 7 | Vital index (ml) | C | 48,80±1,63 | 50,87±1,60 | 1,14 | > 0,05 |
| | | E | 49,40±1,64 | 55,62±1,57 | 3,55 | < 0,01 |
| | | T | 0,26 | 2,12 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 8 | Speed running (100 m) | C | 14,50±0,11 | 14,32±0,10 | 1,60 | > 0,05 |
| | | E | 14,42±0,12 | 14,03±0,09 | 3,25 | < 0,01 |
| | | T | 0,50 | 2,23 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 9 | Arm pull-ups (no. Reps.) | C | 8,00±0,20 | 8,30±0,18 | 1,41 | > 0,05 |
| | | E | 8,10±0,21 | 8,93±0,17 | 3,62 | < 0,01 |
| | | T | 0,34 | 2,24 | — | — |

| | | | | | | |
|----|---|---|-------------|-------------|------|---------|
| 10 | Lying push-ups (no. Repts.) | P | > 0,05 | < 0,05 | — | — |
| | | C | 31,90±1,03 | 32,65±1,01 | 0,67 | > 0,05 |
| | | E | 31,54±1,04 | 35,62±0,98 | 3,71 | < 0,01 |
| | | T | 0,25 | 2,11 | — | — |
| 11 | Sit-ups/lying trunk lifting (no. reps 30 sec) | P | > 0,05 | < 0,05 | — | — |
| | | C | 24,80±0,77 | 26,03±0,75 | 1,48 | > 0,05 |
| | | E | 24,92±0,76 | 28,23±0,73 | 3,89 | < 0,001 |
| | | T | 0,11 | 2,09 | — | — |
| 12 | Standing long jumping (cm) | P | > 0,05 | < 0,05 | — | — |
| | | C | 224,80±2,24 | 227,37±2,24 | 1,05 | > 0,05 |
| | | E | 225,21±2,25 | 234,06±2,20 | 3,64 | < 0,01 |
| | | T | 0,13 | 2,13 | — | — |
| 13 | Resistance running 1000m (sec) | P | > 0,05 | < 0,05 | — | — |
| | | C | 300,00±3,75 | 292,30±3,60 | 0,67 | > 0,05 |
| | | E | 298,10±3,73 | 286,69±3,51 | 2,88 | < 0,01 |
| | | T | 0,36 | 2,11 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |

Table 2 Comparative analysis of physical development and training indices of experimental and control subjects, initial-final (girls, n=26)

| No. crit. | Measurements / tests | Groups | Initial indices $\bar{X} \pm m$ | Final Indices $\bar{X} \pm m$ | t | P |
|-----------|----------------------------|--------|---------------------------------|-------------------------------|------|---------|
| 1 | Height (cm) | C | 165,90±2,55 | 167,59 ±2,52 | 0,61 | > 0,05 |
| | | E | 165,81±2,56 | 168,16±2,53 | 0,84 | > 0,05 |
| | | t | 0,02 | 0,16 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 2 | Weight (kg) | C | 56,54±1,43 | 59,21±1,41 | 1,72 | > 0,05 |
| | | E | 57,22±1,43 | 58,21±1,42 | 0,64 | > 0,05 |
| | | t | 0,34 | 0,50 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 3 | Body Mass Index (BMI) | C | 22,77±1,67 | 21,37±1,66 | 0,57 | > 0,05 |
| | | E | 22,40±1,68 | 22,32±1,65 | 0,04 | > 0,05 |
| | | t | 0,16 | 0,25 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 4 | Ştanghe (s) test | C | 44,16±1,58 | 45,54±1,55 | 0,81 | > 0,05 |
| | | E | 44,25±1,57 | 50,01±1,40 | 3,53 | < 0,01 |
| | | t | 0,04 | 2,14 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 5 | Ghenci (s) test | C | 23,56±1,34 | 25,31±1,32 | 1,21 | > 0,05 |
| | | E | 24,36±1,35 | 29,19±1,30 | 3,33 | < 0,01 |
| | | t | 0,42 | 2,10 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 6 | The vital lung volume (ml) | C | 3203,10±53,38 | 3291,62±53,31 | 1,52 | > 0,05 |
| | | E | 3241,50±53,40 | 3450,63±53,27 | 3,59 | < 0,01 |
| | | t | 0,51 | 2,11 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 7 | Vital index (ml) | C | 56,65±1,89 | 59,11±1,86 | 1,20 | > 0,05 |
| | | E | 57,00±1,90 | 64,58±1,84 | 3,71 | < 0,01 |
| | | t | 0,13 | 2,09 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 8 | Speed running (60 m) | C | 9,49±0,10 | 9,30±0,10 | 1,72 | > 0,05 |
| | | E | 9,43±0,11 | 9,21±0,09 | 2,00 | > 0,05 |
| | | T | 0,40 | 0,69 | — | — |
| | | P | > 0,05 | > 0,05 | — | — |
| 9 | Lying push-ups(no. Repts.) | C | 14,60±0,48 | 15,42±0,46 | 1,52 | > 0,05 |
| | | E | 14,80±0,50 | 16,79±0,44 | 3,90 | < 0,001 |
| | | t | 0,29 | 2,14 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 10 | Standing long jumping (cm) | C | 167,20±2,08 | 170,43±2,06 | 1,43 | > 0,05 |
| | | E | 167,80±2,07 | 176,63±2,00 | 3,97 | < 0,001 |
| | | t | 0,20 | 2,16 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |

| | | | | | | |
|----|--------------------------------|----------|-------------|-------------|------|--------|
| 11 | Mobility vertebral column (cm) | C | 2,90±0,17 | 3,28±0,16 | 2,10 | < 0,05 |
| | | E | 3,08±0,18 | 3,73±0,15 | 3,61 | < 0,01 |
| | | t | 0,72 | 2,04 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |
| 12 | Resistance running 800m (sec) | C | 272,00±3,40 | 266,82±3,38 | 1,40 | > 0,05 |
| | | E | 268,10±3,42 | 256,63±3,33 | 3,12 | < 0,01 |
| | | t | 0,81 | 2,15 | — | — |
| | | P | > 0,05 | < 0,05 | — | — |

Note: n – 26 P - 0,05 0,01 0,001 r = 0,404

g = 25; t = 2,060 2,787 3,725

g = 50; t = 2,009 2,678 3,496

Discussion

The comparative analysis of the physical development indices at the end of the pedagogical experiment allows to distinguish a clear tendency to improve the results of the experimental groups (boys and girls) compared to those in the control group. The application in the pedagogical experiment of the structure and content of the binary physical education methodology with the students of the medical faculty led to the improvement of the indices that determine the functional condition of the sample of subjects included in the research such as: the Stanghe(s) test with 12.9% (P <0.01) in which the duration of inspirational breath-taking was increased in boys in EG versus CG in the mean group score of 5.11 sec, in the Ghenci test with 21.7% (P <0.01), in the vital lung volume with 5.5% (P <0.01) in boys and girls respectively - the Stanghe test with 13.1% (P <0.01), in the Ghenci test by 19.8% (P <0.01) , in the vital index test with 13.3% (P <0.01), which allows us to observe a significant improvement in the respiratory system activity, due to the influence of the physical aerobic efforts specific to extracurricular activities with fitness and sports games topics, the mean differences between the final tests were significantly higher than those in the control groups with (p <0, 01).

Regarding the dynamics and the comparative analysis of the physical training indices at the end of the pedagogical experiment one can notice an improvement of the results of the students from the experimental groups (boys and girls) compared to those in the control group due to the effective application of the binary methodology of approaching the physical education process with the students of the Ist and IInd years of study. Frequent involvement of the sample of subjects surveyed in extracurricular activities proposed by us has resulted in higher results in force tests such as: lying push-ups with 12.9% in boys and 13.44% in girls with significance thresholds P <0.001), arm pull-ups with 10.24% boys (P <0.01), lying trunk lifting by 13.28% (P <0.001) in boys, mobility of vertebral column girls with 21.10% due to their

interest in force exercises and fitness activities, where the results of the experimental groups were significantly higher than those in the control groups with (P <0.01).

In conclusion, we are firmly convinced that the positive results obtained by the subjects of the experimental group in the parameters proposed for the research prove the efficiency of the structure and content of the binary methodology of the physical education on the functional indices, on development indices and physical training of the students of the medical faculty during two years of training.

The results of the research become all the more valuable, as the students who have implemented the binary methodology of the physical education process based on the motivation formation and the necessity of their systematic involvement in extracurricular motor activities have managed to achieve the established objectives.

We believe that the future development of the physical education competencies of medical students at the level of educational standards by exploiting the results of our research can serve as a support for the teachers working in the higher education institutions.

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