

Peculiarities of physical activity regimen of 11-14-year-old children during curricular and extracurricular hours

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Abstract:

The goal of this research is to determine the structure and amount of physical activity for 11-14-year-old children during curricular and extracurricular hours. Research data: the research involves 252 fifth to ninth grade students ages 11-14 (122 boys and 130 girls) from general education schools in Chernivtsi, Ukraine. A technique developed by scientists from the Framingham State University (physical activity timing) is used to evaluate the level of physical activity. Findings: low-level physical activity has been found to prevail in children of all age groups of interest during curricular and extracurricular hours.

Key words: physical activity, schoolchildren, physical activity regimen of schoolchildren, adolescents.

Introduction

Intensification of training (including the use of technical aids), extended curricular hours, irrational educational process management, educational stress and reduced physical activity are the factors that characterize the current education and that result in increased morbidity, reduced level of health in youth, etc. The situation is becoming even more serious due to the increased popularity of absence of physical activity in the school environment (slot machines, computer games, etc.). Physical training classes compensate for only 10-13% of the amount of physical activity required by a child's organism. Increased training load and reduced physical activity have been consistently proven to reduce physical health of schoolchildren [2, 13, 15, 21, 23]. According to Shypulo, I. P. [25], the lack of physical activity during school hours results in degraded cardiovascular adaptation to standardized physical load of schoolchildren, reduced pulmonary capacity, reduced back strength, excess body weight due to fat deposition, as well as high blood cholesterol levels. The incidence rate in the presence of hypokinesia is 2 times higher in schoolchildren, which is due to the overall lowered nonspecific resistance. The problem of finding means and methods to increase the physical activity of schoolchildren is of immediate interest. Domestic and international practices show that approaches that enhance physical activity have the potential to improve public health. Multiple scientists dedicated their research to searching for means that are capable of enhancing physical activity of schoolchildren [3, 8, 10-11, 18-20]. The researchers emphasize that physical activity of children decreases with age. This is especially true of adolescents. Attention is paid to the fact that the amount of physical activity is practically the same during curricular and extracurricular hours. Children and adolescents should be encouraged to perform regular physical exercises to form the foundation for their active lifestyle in the future. Therefore, it is essential to study the physical activity regimen of adolescents.

Methods

To pursue the research objectives, the following research methods were used: theoretical analysis and consolidation of information contained in scientific and methodological literature and documentary materials, sociological research methods (questionnaires), methods of studying physical activity, and mathematical statistics methods.

Different types of daily physical activity were determined using the Framingham Heart Study methodology [14], which is based on the timing of different levels of physical activity in children throughout the day. The physical activity timing involves recording the time intervals during which the activity was carried out, in the order of its performance throughout the day. This methodology allows to measure the daily physical activity quantitatively and qualitative based on the timing by recording the intensity of each type of physical effort. The value of these measurements is shown as a digital value of the physical activity index.

The following types of activity can be discerned in terms of the performance intensity:

- Basic level: sleep, lying rest;

- Sedentary: eating, watching TV, doing homework, reading, drawing, board and computer games;
- Low level: hygienic procedures, standing with little mobility, movement using all modes of transport, classes at school (except for physical training);
- Medium level: outing, walking, doing chores, morning hygienic gymnastics, activity during breaks at school;
- High level: specially organized physical exercises, intense games, running, cycling, scooter riding, roller skating, etc.

The daily physical activity timing was performed by schoolchildren with parental assistance. All activities that lasted more than 5 minutes were recorded using a physical activity chart. The questionnaire was designed to obtain an insight into the lifestyle of adolescents and their daily regimen, as well as to identify common cultural interests. The data obtained via the questionnaire were processed using a statistical method to determine the relative fraction indexes. The method involves evaluation of the research findings to determine the percentage ratios between the parts and the whole.

Student's t-test was used to determine the statistical significance of the samples. Statistical processing of findings was performed using the Statistica 6.0 (StatSoft, USA) suite and Excel 2003 spreadsheets (Microsoft, USA), which are instrumental for evaluating the measurements and for calculating the base values. The abovementioned methods were performed on a PC using standard software (MS Excel-2003, Statistica-6).

Results

The study showed that each child was characterized by his/her own amount of physical activity, which was strictly individual. The amount of physical activity depends on age, sex, medical condition, level of fitness, education management, health and fitness process management, daily regimen, as well as other factors.

By comparing the daily physical activity of adolescents from Chernivtsi against the developed and recommended health standards demonstrated that hypokinesia was observed in 11-14-year-old children (both boys and girls) that have a lack of energy consumption of up to 400-500 kcal per day. The abovementioned figures indicate the inadequate role of physical education in increasing physical activity in the daily regimen of schoolchildren. Basic, sedentary and low levels of physical activity increase in volume, starting with 14-year-old children, and insignificant rates of increase in the medium and high levels of physical activity are not able to compensate for the lack of physical activity in schoolchildren.

To clarify the data on the types of activities that schoolchildren are engaged in throughout the day, a study involving fifth to ninth grade students from Chernivtsi was conducted using the Framingham Heart Study methodology. The study involved 122 boys and 130 girls. Timing was performed on weekdays that were free from any physical training classes and on days off (see Table 1).

Table 1. Physical activity of 11-14-year-old children throughout a school day

Physical Activity Levels	Number of Adolescents, %							
	11-year-old		12-year-old		13-year-old		14-year-old	
	Girls n=31	Boys n=34	Girls n=27	Boys n=25	Girls n=29	Boys n=26	Girls n=43	Boys n=37
High	2.97	3.69	7.81	5.55	6.15	5.21	6.75	6.47
Medium	15.62	17.88	18.23	15.65	13.38	13.24	22.91	19.18
Low	23.22	20.56	20.05	24.49	25.11	26.45	22.91	23.87
Sedentary	18.05	20.73	15.24	16.44	17.69	18.4	11.65	13.85
Basic	40.16	37.21	38.46	37.59	37.68	37.02	36.76	36.69

According to the research data, the high level of physical activity reaches a peak at the age of 14 (1.55 hours per day) in boys and at the age of 12 (1.87 hours per day) in girls. The medium level of physical activity (outing, walking, doing chores, morning hygienic gymnastics, and activity during breaks at school) ranges from 3.21 to 5.5 hours per day in girls and from 3.18 to 4.6 hours per day in boys. The low level of physical activity prevails in all subjects of interest. Modern adolescents spend most of the day at school and doing homework during extracurricular hours, namely: 11-year-old girls - 4.44 hours, 12-year-old girls - 3.66 hours, 13-year-old girls - 6.03 hours, 14-year-old girls - 5.49 hours; 11-year-old boys - 4.92 hours, 12-year-old boys - 5.88 hours, 13-year-old boys - 6.35 hours, 14-year-old boys - 5.73 hours. It was determined that rest during breaks is mainly passive, with walking time ranging from 1.1 to 2.25 hours per day for children of different ages. However, 38% to 50% of children spend only 0.5 hours per day in open air.

The analysis of findings reveals that secondary-school students spend a lot of time sitting at a computer in addition to doing homework, which disturbs the physical activity regimen of schoolchildren. The sedentary level of physical activity progresses in 11-year-old girls (4.33 hours per day) and boys (4.97 hours per day). We believe that this is due to the transfer from a primary school to a secondary school, increased school load, increased amount of homework, as well as adaptation to the new learning environment. The basic level of 11-14-year-old schoolchildren meets the statistically average standards. Specifically, sleep and lying rest are

predominant at nighttime and are strictly regulated by parents and the school regiment (beginning of classes, class times, etc.). This level of physical activity ranges from 8.88 to 9.64 hours per day for both girls and boys.

The 11-year-old boys have a slightly lower performance, no disturbances on school days, with only 5.5% of boys doing more homework on days off. For 11-year-olds, there is a significant difference between girls and boys in the time spent doing homework. This is probably because girls treat their studies more responsibly than boys do. Therefore, the following results were obtained for the subjects of interest: 25.81% and 29.03% of 11-year-old girls do homework overtime on school days and days off, respectively. No significant disturbances were identified in 12-year-old students. Only on days off, 11.11% of girls and 8.0% of boys spent their free time doing homework overtime. With regard to 13-14-year-old adolescents, 34.88% of girls and 21.26% of boys of 14 years of age spent more time doing homework on school days. However, 17.24% of 13-year-old girls and 24.32% of 14-year-old boys spent more time doing homework on days off (see Table 2).

Table 2. Number of adolescents doing homework overtime

Days	Number of Adolescents, %							
	11-year-old (n=65)		12-year-old (n=52)		13-year-old (n=55)		14-year-old (n=80)	
	Girls n=31	Boys n=34	Girls n=27	Boys n=25	Girls n=29	Boys n=26	Girls n=43	Boys n=37
Training	25.81	2.94	7.41	4.0	6.89	7.69	34.88	21.62
Days Off	29.03	26.47	11.11	8.0	17.24	15.38	9.3	24.32

Current socio-economic conditions and state policy have a bearing on living conditions of a family, affect the mental state of children, determine the area of their interests and indirectly reflect the degree of influence of various factors. We undertook a sociological study to determine the common cultural interests of subjects of interest (see Table 3). In their answers, they did not confine themselves to emphasizing only one particular area of interest; rather, they mentioned several areas of interest, as evidenced by the total percentage that exceeded 100. Therefore, the priority motives of schoolchildren are health improvement, body shape improvement, outdoor activities, entertainment, communication with friends, leisure activities, and emotional release. However, motivation due to age-related changes is also clearly discernible. The effect of socio-economic conditions can be traced by observing the structure of the common cultural interests of modern adolescents.

Listening to music or radio, walking, computer games; computer games and walking while shopping; hobbies and walking; visiting relatives, friends, and walking were of the greatest interest for 11, 12, 13 and 14-year-old girls, respectively.

Table 3. Common cultural interests in subjects of interest, % (n=252)

Types of Activity	Number of Adolescents, %							
	11-year-old		12-year-old		13-year-old		14-year-old	
	Girls n=31	Boys n=34	Girls n=27	Boys n=25	Girls n=29	Boys n=26	Girls n=43	Boys n=37
Reading	48.38	35.29	29.63	16.0	51.72	11.54	27.91	8.11
Walking	90.32	82.35	74.07	44.0	72.41	50.0	79.07	32.43
Doing sports	2.58	35.29	29.63	40.0	51.72	53.86	39.53	29.73
Biking, roller skating, dancing	48.38	88.23	51.85	32.0	41.38	38.46	23.26	35.14
Computer games	93.55	79.94	96.29	36.0	70.37	61.54	37.21	78.38
Meeting with friends	48.38	52.94	51.85	48.0	34.48	46.15	79.07	43.24
Watching TV, video	32.25	55.88	41.15	24.0	20.69	46.15	34.88	18.92
Listening to music, radio	80.64	17.64	70.37	28.0	27.59	34.62	51.16	16.22
Passive rest	6.45	8.82	14.81	20.0	10.34	-	6.97	5.14
Visiting relatives, friends	51.61	67.65	66.67	48.0	41.38	15.38	51.16	24.32
Moviegoing	19.35	41.12	14.81	20.0	20.69	7.69	25.58	21.62
Hobby	58.06	41.12	66.67	36.0	82.76	65.38	30.23	43.24
Parental-assisted household chores	38.71	50.0	14.81	36.0	17.24	11.54	27.91	27.03
Walking while shopping	25.81	20.59	81.48	20.0	37.93	7.69	30.23	2.7
Amateur performances	19.35	5.88	18.51	8.0	10.34	7.69	23.26	2.7
Technical study groups	12.9	8.82	11.11	32.0	-	69.23	-	13.51
Learning a foreign language	41.94	32.35	33.33	28.0	48.28	23.08	34.88	16.21
Other	-	5.88	-	4.0	3.45	-	2.32	-

In 11-year-old boys, the most significant common cultural interests are active movement, cycling, roller skating, dancing, walking, visiting relatives and friends, computer games; hobbies, computer games, technical study groups; computer games and listening to music are the most significant common cultural interests of 12, 13, and 14-year-old boys, respectively. A noticeably decreased interest is observed for reading books, with an increasing interest in watching TV programs, computer work and computer games, as well as outing with friends. Technical study groups, amateur performances and interest in music classes recede into the background,

which is probably due not so much to the low-level of interest in these types of activities as the lack of capacity to meet them.

During the school age, the main objective, which is interest in classes, is manifested not so much in attaining a health-improving effect as in deriving pleasure from physical exercises to meet a wide range of needs that are aimed at self-expression, spending free time, well-being, changing activities, positive emotions, participation in games and learning activities. The research findings show that the underlying motives for adolescents to pursue recreational and health-related activities are as follows: outdoor activities, entertainment (16.4%), communication with friends (12.6%), self-improvement and self-expression (10.38%), body shape improvement (12.4%), recovery after training sessions (3.1%), deriving of pleasure, positive emotions (9.8%), health improvement (14.0%), increase of physical activity (10.2%), self-testing in extreme conditions (5.2%), emotional release (4.8%), and leisure management (1.3%). Therefore, during adolescence, attention should be given primarily to recreational activities, teaching adolescents to perform physical exercises by themselves, and to the increase of the physical activity level. Our experiments showed that 56.7% of the subjects of interest performed regular physical exercises by themselves at home, 5.9% of the subjects of interest never performed any physical exercises, and 37.2% of the subjects of interest occasionally performed physical exercises.

Low level of physical activity has an adverse effect on the child's organism. The variety of reasons for the lack of movement, the degree of its manifestation and duration create greater opportunities for body changes: from adaptive-physiological to pathological.

Various abnormalities in the physical development and medical condition of school-aged children are caused, among other things, by the lack of physical activity, the amount of which decreases every year. The child's physical need for movement begins to drop noticeably in the middle school, with upper graders demonstrating an increasing reluctance towards physical exercises. Therefore, it is essential to timely develop a habit in children for independent performance of physical exercises.

Discussion

A systematic analysis of scientific literature, domestic and foreign practices made it possible to determine that numerous researchers from different countries raised and addressed a number of issues concerning various aspects of physical activity and lifestyle of students. According to many researchers, optimal regular physical activity is a major factor of a healthy lifestyle. Currently, many countries conduct fundamental and applied research on this topic, which states that the role of physical activity in health improvement and disease prevention is increasing. In recent decades, multiple studies have been undertaken to support the role and importance of physical activity for the human body. The study of physical well-being of children in conjunction with physical activity is an extremely important and indispensable component in terms of preserving and promoting health in the younger generation. The interrelation between physical activity and physical well-being in students has been the subject matter of interest for many researchers, including Arefiev, V. [4], Skidan, A.A., Sevdalev, S.V. & Vrublewski, E.P. [26], Yarmak, O., Galan, Y., Nakonechnyi, I., Hakman, A., Filak, Y. & Blahii, O. [29]. The findings of scientific research have shown that physical activity, daily physical activity and human health are interdependent [5, 17, 22, 29]. There is a considerable amount of factual materials on this topic of interest in the scientific literature [6, 9, 12, 28]. Scientists have determined that there is a significant reduction in children's physical activity immediately after commencement of regular school sessions and, as a result, a decrease in their physical well-being and increase in incidence rates. The results of the studies supplement future considerations [1, 7] about the substantial increase in the duration of static and information loads, which affect the quality of mastering the material and the day regimen and serve as potential risk factors for reducing adaptive-reserve capabilities, development of chronic fatigue, musculoskeletal disorders, sight impairment, and occurrence of chronic diseases.

Our studies support the data concerning the insufficient amount of physical activity in school-aged children during schooling. Physical training classes compensate for only 10-13% of the amount of physical activity that is necessary for the child's organism, which requires regular physical and health-improving work during extracurricular hours. The obtained research findings supplement the data [4, 8, 24] that an insignificant number of adolescents with chronic diseases systematically use physical activity in everyday life. This is consistent with the data of Bar-Or, Rowland [5]. Our studies support the data [16, 25] on the significant interest of secondary school-aged children in innovative forms of physical activity, in particular, fitness and recreation. The issue of preserving health of schoolchildren and of increasing the level of their physical activity based on their common cultural interests is urgent in other countries and is widely discussed at European and world forums. However, the developed recommendations are based on optimizing physical activity of students during curricular hours. The issues of methodological support of adequate physical activity of students during extracurricular hours have not been sufficiently addressed by the authors. The necessity of addressing discrepancies as well as inadequate theoretical and practical insight into the topic of interest account for the relevance of the research in this direction.

Conclusion

The paper analyzed the daily physical activity of 11-14-year-old schoolchildren. Physical activity of adolescents both during curricular and extracurricular hours is inconsistent with the physiological standards.

According to the evaluation results of physical activity using the Framingham Heart Study methodology, low and sedentary levels of physical activity prevail. The analysis determined that the following factors can reduce physical activity of students during schooling: high level of training load, low level of managed forms of physical activity during extracurricular hours, management and content of physical training classes in traditional educational institutions, and average school age. Complicated curricula increase time of doing homework by 2.79-4.98 hours. There is a significant increase in the duration of out-of-school activities, which do not provide a significant increase in the level of physical activity. Therefore, during adolescence, attention should be given primarily to recreational activities, teaching adolescents to perform physical exercises by themselves, and to increasing the level of physical activity. Our experiment showed that 56.7% of subjects of interest performed regular physical exercises by themselves at home, 5.9% have never performed any exercises, and 37.2% performed occasional physical exercises.

Given the attendance of training sessions and the amount of physical activity for low and sedentary levels, the physical activity related to sedentary work conditions requires 4 to 6 hours a day and accounts for 50.0% of the daytime. It is noted that in adolescents the physical activity regimen on days off and during holidays is unessentially different from school days in volume and structure and does not provide an adequate physical and psychoemotional recovery of schoolchildren.

References

1. Andreeva O. V. & Hakman A.V. (2011). Procedure for Developing Health-Improving and Recreational Programs at the Summer Recreation Camp. *Slobozhansky Scientific and Sports Journal* (4 (27)), 216-220.
2. Andreeva O. V. (2002) Programming Sports and Recreational Activities of Girls 12-13 Years: Dis. ... Cand. Sciences on Physical. Playback. and Sports: 24.00.02 / Olena Andreeva, 190.
3. Andrieieva, O., Galan, Y., Hakman, A., & Holovach, I. (2017). Application of Ecological Tourism in Physical Education of Primary School Age Children. *Journal of Physical Education and Sport*, 17 (1), 7-15. DOI:10.7752/jpes.2017.s1002
4. Arefiev, V.G. (2014). Modeling of Differentiated Physical Fitness in School Children. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 1, 3–8. doi:10.6084/m9.figshare.894383
5. Bar-or, O. & Rowland, T. (2009). Children's Health and Physical Activity: from Physiological Bases to Practical Application. *K.: Olymp. L-re*, 528.
6. Blagiy, O. O. & Andreeva, O. V. (2011). Physical Activity as a Factor that Shapes a Healthy Lifestyle of Students. In *Topical Issues of Physical Education, Rehabilitation, Sports and Tourism. Zaporizhya: Proceedings of III Inter. Sc. and Prac. Conf. KPU* (pp. 27-28).
7. Hakman, A.V. (2011). Physical Activity in Adolescent as a Cornerstone of an All-Round Personality. *Scientific Journal of the Chernivtsi National University: Collection of Studies. Rev. 572. Pedagogy and Psychology*. P. 18-23.
8. Iedynak, G., Galamandjuk, L., Dutchak, M., Balatska, L., Herasymchuk, A. & Mazur, V. (2017). Effectiveness of Different Options when Teaching Children Basic Movements due to Certain Handedness. *Journal of Physical Education and Sport*, 17(2), 582-589. doi:10.7752/jpes.2017.02088
9. Iedynak, G., Galamandjuk, L., Ivashchenko, V., Stasjuk, I., Guska, M., Prozar, M., Mazur, V., Sliusarchuk, V. (2017). Psychosocial Aspects of Improving Physical Activity of Children with Chronic Diseases. *Journal of Physical Education and Sport*, 17(3), 1186-1891. DOI:10.7752/jpes.2017.03183
10. Iedynak, G., Galamandjuk, L., Mysiv, V., M., Mazur, Kljus, O., Balatska, L., Yurchyshyn, Y. (2017). Peculiarities of the Success Achievement Motivation Display of Elite Athletes with Cerebral Palsy when Preparing for Basic Competitions. *Journal of Physical Education and Sport*, 17(3), 2019-2023. DOI:10.7752/jpes.2017.03202
11. Ivashchenko, O., Khudolii, O., Iermakov, S., Lochbaum, M.R., Cieslicka, M., Zukow, W., Nosko, M. & Yermakova, T. (2016). Intra-group Factorial Model as the Basis of Pedagogical Control over Motor and Functional Fitness Dynamic of 14--16 Years Old Girls. *Journal of Physical Education and Sport*, 16(4), 1190 – 1201. doi:10.7752/jpes.2016.04190
12. Ivashchenko, O., Khudolii, O., Yermakova, T., Iermakov, S., Nosko, M. & Nosko, Y. (2016). Factorial and Discriminant Analysis as Methodological Basis of Pedagogic Control over Motor and Functional Fitness of 14-16 Year Old Girls. *Journal of Physical Education and Sport*, 16(2), 442-451. doi:10.7752/jpes.2016.02068
13. Ivashchenko, O.V., Khudolii, O.M., Yermakova, T.S., Wiesława, P., Radosław, M. & Błażej, S. (2015). Simulation as Method of Classification of 7-9th Form Boy Pupils' Motor Fitness. *Journal of Physical Education and Sport*, 15(1), 142–147. doi:10.7752/jpes.2015.01023

14. Ivashchenko, O.V., Yermakova, T. S., Cieslicka, M. & Muszkieta, R. (2015). Discriminant Analysis as Method of Pedagogic Control of 9–11 Forms Girls' Functional and Motor Fitness. *Journal of Physical Education and Sport*, 15(3), 576–581. doi:10.7752/jpes.2015.03086
15. Ivashchenko, O.V., Yermakova, T.S., Cieślicka, M. & Śukowska, H. (2015). Discriminant Analysis in Classification of Motor Fitness of 9–11 Forms' Juniors. *Journal of Physical Education and Sport*, 15(2), 238–244. doi:10.7752/jpes.2015.02037
16. Kashuba, V.O., Goncharova, N.N. & Butenko, H.O. (2016). Effectiveness of Health Tourism Application as the Basis of Health Related Recreational Technology in Primary School Pupils' Physical Education. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 2, 19-25. doi:10.15561/18189172.2016.0203
17. Khudolii, O.M., Iermakov, S.S. & Ananchenko, K.V. (2015). Factorial Model of Motor Fitness of Junior Forms' Boys. *Journal of Physical Education and Sport*, 15(3), 585–591. doi:10.7752/jpes.2015.03088
18. Kibal'nik Oksana (2008). Application of Fitness Technique for Enhancing Physical Activity and Physical Fitness of Adolescents (Doctoral Dissertation, Kibal'nik Oksana Yakivna. Lviv: 2008, 22 p.).
19. Kozina, Z., Repko, O., Kozin, S., Kostyrko, A., Yermakova, T. & Goncharenko, V. (2016). Motor Skills Formation Technique in 6 to 7- Year -Old Children Based on Their Psychological and Physical Features (Rock Climbing as an Example). *Journal of Physical Education and Sport*, 16(3), 866-874. doi:10.7752/jpes.2016.03137
20. Lazareva O., Aravitska M., Andrieieva O., Galan Y. & Dotsyuk L. (2017). Dynamics of Physical Activity Status in Patients with Grade I-III Obesity in Response to a Physical Rehabilitation Program. *Journal of Physical Education and Sport*, 17(3). doi:10.7752/jpes.2017.03193
21. Nosko, M., Razumeyko, N., Iermakov, S. & Yermakova, T. (2016). Correction of 6 to 10 -Year- Old Schoolchildren Postures Using Muscular- Tonic Imbalance Indicators. *Journal of Physical Education and Sport*, 16(3), 988-999. doi:10.7752/jpes.2016.03156
22. Pavlova, Iu. (2013). Model for Evaluating Physical Activity of Schoolchildren. *Theory and Methodology of Physical Education*. No. 2. P. 13–18.
23. Pavlova, Iu. (2014). Evaluating the Impact of Physical Activity on Predicting the Living Standards of Youth. *Journal of the Chernihiv National Pedagogical University. Series: Pedagogical Sciences. Physical Education and Sport*. Rev. 118, V. 3. P. 222-225.
24. Pop, Cristiana Lucretia (2016). Physical and Health Education Facing the Technology Challenge. *Physical Education of Students*, 20(2), 45-49. doi:10.15561/20755279.2016.0207
25. Shypulo, I. P. (2015). Influence Employment by Improving Aerobics on Motor Readiness of Girls. *Physical Education of Students*, 1, 67-71. doi:10.15561/20755279.2015.0110
26. Skidan, A.A., Sevdalev, S.V. & Vrublewskiy, E.P., (2015). Content of Health Related Shaping Training Methodic for Girls in the Process of Physical Education. *Physical Education of Students*, 6, 56-62. doi:10.15561/20755279.2015.0608
27. Vaskan I. (2016). Research and Methodology Foundations for Enhancing the Physical Activity of Adolescents in Out-of-School Activities. *Physical Education, Sport and Health Culture in Modern Society: Collection of Studies* No. 2 (26)
28. Yarmak, O., Galan, Y., Hakman, A., Dotsyuk, L., Blagii, O. & Teslitskyi, Yu. (2017). The Use of Modern Means of Health Improving Fitness during the Process of Physical Education of Student Youth. *Journal of Physical Education and Sport*, 17 (3). 1935-1940. doi:10.7752/jpes.2017.03189
29. Yarmak, O., Galan, Y., Nakonechnyi, I., Hakman, A., Filak, Y. & Blahii, O. (2017). Screening System of the Physical Condition of Boys Aged 15-17 Years in the Process of Physical Education. *Journal of Physical Education and Sport*, 17 Supplement Issue 3, 1017-1023. doi:10.7752/jpes.2017.s3156