Realization of Anti Gravity fitness exercises in physical education practice of female students.

ALEKSANDER OSIPOV[1,2,3], MARGARITA TSELOVALNIKOVA[1], NATALYA KLIMAS[1], TATYANA ZHAVNER[1], ANNA VAPAEVA[1], TATYANA MOKROVA[1]

[1]Siberian Federal University,
[2]Krasnoyarsk State Medical University named after professor V.F. Voyno-Yasenetsky,
[3]Siberian Law Institute of the Ministry of Internal Affairs of the Russian Federation, Krasnoyarsk, RUSSIA
E-mail: ale44132272@yandex.ru

Abstract: The article is devoted to substantiating use effectiveness of Anti Gravity fitness exercises in PE practice for relatively healthy female students. The studies were attended by students (n=25) of age 19 years practicing fitness aerobics in PE classes at university. The study period was being conducted during 10 months. Moreover, girls from group №1 (n=13) continued fitness aerobics classes. Besides, girls from group №2 (n=12) practiced Anti Gravity fitness together with fitness aerobics classes. The battery tests were used assessing physical fitness indicators: BMI, dynamometry, step ergometry, Flamingo balance test, Unterberg test, Hirtz test and others. By the way, statistical reliability was calculated using the Mann–Whitney U-test. The results had revealed the presence of significant (P<0,05) superiority particulars of indices of the static body balance and muscle strength of the hands in favor of female students practicing Anti Gravity fitness. Also, significant (P<0,05) superiority of these students was found in terms of characterizing the development of body flexibility. However, complex use of Anti Gravity fitness had been substantiated together with other types of health and sports fitness in PE practice of female students without diseases.
Key words: Female students; physical activity; new types of fitness; fitness aerobics; Anti Gravity fitness; body balance; body flexibility.

Introduction

The data of specialists show the presence of negative deterioration dynamics of physical health and physical fitness of modern students starting from the beginning of their studies at universities (Kubieva, et al., 2019; Druz, et al., 2017). According to scientists, the main reason for the deterioration of health indicators is the lack of regular physical activity (PA) among modern students (Uher, & Bukova, 2018). A. De Lion points out that there is no general consensus about effective and quick solutions to this problem along with the unanimous opinion of specialists about the lack of PA among young people and students. Besides, the scientist proposes to involve professionals solving this problem successfully in the fitness industry (De Lion, Neville, & Armor, 2017). Also, experts also recommend paying their attention to the needs and requirements of modern young people who visit fitness centers and clubs regularly (Farakhutdinov, & Sheregova, 2018). In Russia, a fairly significant increase in the number of people including young people has been revealed who attend fitness clubs regularly (Volobaeva, & Gilazieva, 2013). The use of data analysis of students' requests and practical experience of fitness trainers will modernize the process of physical education (PE) at universities significantly. It should be noted that experts recommend PE process should be upgraded in higher education institutions by developing and putting into practice PE effective fitness techniques that include various types of fitness (Shuba, & Shuba, 2017; Ilnitskaya, et al., 2014). The aim of using various fitness programs in PE practice is to declare: fighting obesity increasing cardiorespiratory fitness (Osipov, et al., 2018) developing strength and flexibility of body joints (Vashchuk, et al., 2018).

Today, many scientists propose introducing various types of aerobic and mixed fitness training into PE practice actively: callanetics (Kolomiytseva, & Anatskyi, 2017), crossfit training (Kudryavtsev, et al., 2018), Kangoo-jumps (Mokrova, et al., 2018). Fortunately, scientists have found that an increase in cardiorespiratory fitness has a positive effect on both the level of physical health and academic performance of young people (Marques, et al., 2018) and urge the active use of aerobic fitness training in the practice of youth education (Symolik, et al., 2018). Moreover, fitness aerobic training is widely used in PE practice of students with various pathologies (Kriventsova, et al., 2017). The use effectiveness of advanced fitness techniques in PE practice of students with motor pathologies has been proven by experts (Cherepov, et al., 2018). Various types of fitness aerobics are also used increasing the level of special characteristics of professional athletes (Kozina, et al., 2019). Also, experts point out the significant effects use of recreational yoga in PE practice of modern youth (Cox, et al., 2017). Besides, experts point out that today, it is necessary using various types of health and sports fitness that are popular among young people increasing the efficiency level in PE practice of young people. It should be mentioned that one of the new and rather quickly gained popularity is Anti Gravity fitness in the world of fitness. This fitness and yoga fitness system was developed by American dancer C. Harrison (Christopher Harrison's Antigravity Fitness). However, this type of fitness is an acrobatic exercise and yoga using a specially created Anti Gravity hammock. The classes include elements from dances, Pilates, gymnastics and yoga which

allow improving physical fitness and general health. Today, Anti Gravity fitness is promoted by many health and fitness clubs around the world (Anti Gravity Fitness Australia P/L). It can be assumed that there is a possibility of increasing the general level of physical and functional fitness of female students due to the use in practice of PE of girls of a new fitness direction - Anti Gravity fitness.

At the same time, scientists point out the lack problem of accurate quantitative data in studies devoted to analyzing the effectiveness of using moderate and quite energetic PA in PE practice for young people studying in colleges and universities (Zhou, & Wang, 2019). It is known that high-quality scientific support and availability of detailed guidelines is necessary for the effective use of new types of health fitness in PE practice of students. In PE practice, there is a constant data lack about fitness at all levels of education (Keating, et al., 2009). Therefore, the mandatory testing of modern fitness systems is required in order to justify their use effectiveness in the process of teaching students in PE practice for students. In this regard, the aim of the research of the authors was the practical justification for the possibility of effective use of Anti Gravity fitness in PE practice for relatively healthy female students.

Material & methods

Participants: young (19 years old) female students of Siberian Federal University (SFU) (n=25) of 2 year full-time courses. All the girls gave their informed consent participating in the studies and had no medical contraindications for PE and fitness training. At the time of the research, all the girls showed approximately the same development level of basic physical qualities and motor abilities. All the girls had practical experience in doing fitness (fitness aerobics) as part of PE at university for at least one year. As classes of Anti Gravity fitness are recommended for persons with a developed vestibular apparatus and those who do not have injuries and diseases of musculoskeletal system, girls with experience in fitness aerobics and good health were selected for research. The average body weight of female students was 55,36±0,10 and height – 167,02±1,13 cm. BMI was calculated using Quetelet index – 19,7 (norm).

Organization of research: Studies were conducted on the basis of Siberian Federal University (SFU), Krasnoyarsk, Russian Federation. The research period was being conducted during 10 months (September-June 2017-2018 year). For the study, the girls were divided into 2 approximately equal groups: group №1 (n=13) and group №2 (n=12). Both girls groups attended fitness aerobics classes. Classes were held 2 times a week and the duration of each training lesson is 90 minutes. By the way, classes consisted of warm-ups (10-15 minutes); the main part (50-60 minutes) including: dance movements with musical accompaniment performed on step platforms (30-40 minutes), strength and functional training (15-20 minutes) using bodybuilders and dumbbells of various weights (0,5-5 kg); a set of exercises aimed at improving the indicators of flexibility and body mobility (10-15 minutes). Also, students from group №1 continued fitness aerobics classes under the current program of classes. For female students from group №2 the training format was changed and the time for basic training was reduced to 40-45 minutes (step aerobics – 20-25 minutes, strength training – 15-20 minutes), the time of the exercise complex was increased improving balance and flexibility to 25-30 minutes The complex included Anti Gravity fitness exercises performed in special fitness hammocks which are made from silk fabric. These hammocks are attached to the ceiling on special ropes and are structurally designed for practicing Anti Gravity fitness (designed for seated body poses).

Some exercises of Anti Gravity fitness are presented in figures below:

Fig. 1. Layback

Fig. 2. Bent forward

Fig. 3. Decompression fall over

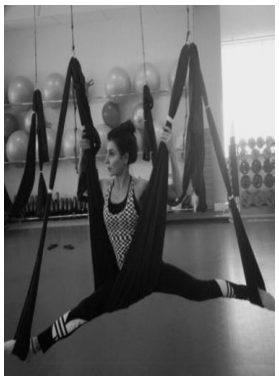

Fig. 4. Splitting legs apart

It should be emphasized that Anti Gravity fitness classes should be conducted under the guidance of experienced instructors who have been specially trained. In our studies, the course of classes with students in AG Fitness: AG Suspension Fitness and AG Aerial Yoga programs was being conducted by an experienced instructor with a certificate and practical teaching experience of more than 3 years. The classes consisted of

performing various movements: turning the body, bending in different directions, holding certain body poses and hanging upside down (decompression fall over). Today, Anti Gravity fitness has more than 3000 different body poses in its arsenal. The program of Anti Gravity fitness classes included a warm-up in hammocks (5-7 minutes), performance and retention of various poses in hammocks (15 minutes) – no more than 3-4 postures of the body during 1 training lesson, a set of exercises for flexibility development and mobility of body joints (5-10 minutes).

Tests and measurements: It should be noted that special tests were used assessing the level of physical development of girls. The development of general power characteristics was assessed by the number of performed flexion-extension of the arms in the supine-lying position. Furthermore, a DC-50-e dynamometer (manufactured in Russia) was used determining the strength level of flexor muscles of the fingers. The level of torso muscle strength was assessed using a DC-200 stanometer (manufactured in Russia). These measuring devices are certified and recommended for objective measurement of power indicators. The development of flexibility was assessed by the results of test – tilting forward and downward while standing on the bollard with palms touching the bollard. By the way, body static balance scores were evaluated using the Flamingo balance test. The Unterberg test and Hirtz test (number of turns on a gym bench is 10 cm wide for 20 seconds) were used assessing the dynamic balance of the girls' bodies. Moreover, endurance indicators were determined by the results of overcoming the distance – 2000 m. The development level of speed-power abilities was assessed by the results of the girls overcoming the distance – 100 m. Also, the test is the participants' performance of climbing the steps of different heights. In our tests, the height of step-platform was 33 cm. The ascent rate was set by an audible signal focused on performing 120 ascents per minute. The test time is 3 minutes. After the test, the girls determined the time period for the recovery of the cardiovascular system using the pulsometry method. Pulse readings were determined immediately before the test, immediately after the end of the load and at each minute of the recovery period.

Statistical analysis: Analysis of the obtained results was carried out using the SPSS20 program. The reliability and statistical significance of the results was determined using the Mann–Whitney U-test. This test is recommended for use in determining the confidence level of different values in small samples by the number of tested participants.

Results

At the time of research start, the test results for girls from the studied groups were approximately the same. At the end of the study, significant differences ($P<0,05$) in the test which determines the level of muscle strength of the hands were identified in favor of students from group №2. At the same time, there were no significant differences in the performance of students from both groups in the development of general strength abilities (test - flexion-extension of arms in the rest position and testing of the strength of body muscles).

Meanwhile, indicators of static body balance (Flamingo balance test) significantly ($P<0,05$) increased among female students from both groups. At the same time, more significant 1,03±0,38 seconds, differences in the test results were found indicating a higher ability level maintaining the body's static balance of female students from group №2. Fortunately, Unterberg test data showed no significant differences of the results of female students. Also, Hirtz test showed a significant ($P<0,05$) advantage in the number of turns performed in favor of female students from group №1 where an average is 1 turn.

Then, the results from both girls' groups turned out to be approximately the same in tests that determine the development level of speed-strength abilities (100 m run) and general endurance (2000 m run). However, some positive dynamics of improving the girls' results is quite insignificant.

By the way, a significant ($P<0,05$) increase in test values from both girls' groups was revealed in the development indicators of the flexibility of female students. At the same time, a significant difference ($P<0,05$) was found in test results in favor of girls from group №2. On average, over the study period, students from group №1 improved the result by 1,88±0,06 cm and students from group №2 improved the result by 2,55±0,09 cm.

In the definition of the functional state (step ergometry), the test indicators for girls from both groups turned out to be approximately equal. However, some advantage was found in the level of functional fitness of girls from group number №1 but a slight one.

At the beginning of the study, the average values of body weight of girls from both groups were not significantly different. On average, the body mass indicators of female students were 55,36±0,21 kg. At the end, the average body weight values of female students from both groups significantly ($P<0,05$) increased by about 0,9 kg. On average, at the end of the study, the body weight of female students was 56,20±0,33 kg. However, a BMI calculation based on Quetelet index showed that fluctuations in the body weight of female students do not exceed the norm established for persons of this gender and age – 20,1.

The main results of conducted tests of girls are presented in Table 1.

Table 1. Test results of female students.

№	Indicators	Group №1 (n=13)	Group №2 (n=12)

		September	June	September	June
1	Power abilities	17,21±1,24	18,25±1,43	17,34±1,62	18,37±1,29
2	Dynamometer (hand)	31,34±0,47	32,42±0,29	31,18±0,26	33,67±0,41*
3	Dynamometer (back)	78,63±2,58	82,47±2,44	78,46±2,27	82,69±2,53
4	Flamingo balance test	42,37±1,16	44,49±1,25	42,42±1,03	45,53±1,64
5	Unterberg test	2,16±0,05	1,89±0,07	2,15±0,24	1,82±0,12
6	Hirtz test	6,64±0,39	7,71±0,18	6,82±0,21	6,89±0,13*
7	Speed	16,14±0,76	15,88±0,44	16,23±0,29	15,92±0,26
8	General endurance	11,09±0,87	10,57±0,46	11,12±0,43	11,01±0,25
9	Flexibility	20,09±0,34	22,03±0,28	20,14±0,47	22,77±0,39*
10	Step-ergometry	3,48±0,12	3,36±0,08	3,49±0,10	3,39±0,04
11	BMI (Quetelet index)	19,71±0,02	20,12±0,03	19,73±0,01	20,16±0,02

Note - reliability: * - P<0,05.

Discussion

At the beginning of this section, it should be noted that there is a lack of reliable scientific data on the possibility of practical use of Anti Gravity fitness in PE practice of students. Promoting the high efficiency of this type of fitness in promoting health and improving the physical condition of students, Anti Gravity fitness specialists and instructors conduct classes on a commercial basis in fitness clubs and almost never practice it in educational institutions. Thus, for comparison and analysis of the obtained data, we use the results of practical application of other types of fitness in PE practice of students.

Promoting Anti Gravity fitness, trainers and instructors claim that this type of fitness will help to improve the body balance of the involved people significantly. Our studies have revealed a significant advantage in terms of maintaining a static body balance (Flamingo balance test) in favor of female students from group №2 who practiced Anti Gravity fitness. At the same time, the results of testing the ability maintaining the dynamic of body balance show a significant (P<0,05) advantage in favor of female students from group №1 who practiced fitness aerobics (Hirtz test). It is possible that students from group №2 need more time exercising Anti Gravity fitness than it was foreseen in our research to improve the dynamic balance of the body. However, a more significant increase in training time for Anti Gravity fitness exercises will result in a decrease in the amount of time for strength and cardiorespiratory exercises which according to some experts' opinions is not entirely correct (Osipov, et al., 2016). Also, experts confirm that significant positive correlations between the level of physical fitness and PA of students manifest themselves only with sufficiently long physical activity and physical exercises with large energy expenditure (Lipošek, et al., 2019).

Unfortunately, implementation of Anti Gravity fitness did not lead to a significant development of high-speed motor skills of female students. At the same time, experts say that the development of directly high-speed motor abilities of students who do not practice high-speed sports is a rather difficult problem (Talaghir, et al., 2018). Thus, even a slight increase in the development of speed-strength characteristics can be considered successful.

In modern conditions, experts recommend implementing PE fitness programs starting at school age (Mehmeti, & Halilaj, 2018). The purpose of such fitness programs are: improving muscle tone developing strength abilities, body shaping and reducing the body mass growth rate of young people (Vashchuk, et al., 2018). It can be noted that the classes of Anti Gravity fitness allow young girls increasing the level of development of strength abilities significantly and contribute to slowing body weight growth. In the course of the research, no significant differences were found in BMI indices from the girls' groups practicing fitness aerobics and Anti Gravity fitness. It should be noted that a significant (P<0,05) advantage in the development of power abilities in favor of female students practicing Anti Gravity fitness was revealed only in test – hand dynamometry. In the remaining tests, the indicators of female students from both groups do not have significant differences.

Analyzing the test data, it can be recognized that realization of Anti Gravity fitness in PE practice of female students is consistent with the recommendations of specialists increasing PE programs that affect the strength growth and body flexibility indicators at universities (Alonso-Fernández, et al., 2012). We have not found a significant increase in cardiorespiratory fitness indices among girls practicing Anti Gravity fitness. However, these figures have improved somewhat over the study period. It can be assumed that the achievement of the optimal effect from PA classes is somewhat larger possibly with the complex use of Anti Gravity fitness with other types of fitness and sports fitness. The effectiveness of the integrated use of various types of fitness has been proved by researchers practicing PE students (Ilnitskaya, et al., 2014). It is also necessary to achieve an appropriate level of intensity and duration of the exercises as it was indicated by experts (Mustedanagić, et al., 2016).

Conclusions

By results of our study, we can affirm that modern conditions of student learning are characterized by a significant decrease of physical health indicators of young people and an increase in the number of various diseases. Besides, experts say that the main reason is the low level of PA of young people including PE classes at universities. Moreover, experts in the field of health care and PE of youth recommend using the new modern types of health and sports fitness in the practice of teaching students more actively. By the way, scientists believe that the fitness types that are popular among young people will contribute to the growth of students' motivation to exercise regularly. The use of Anti Gravity fitness exercises in PE practice contributes to a significant increase in the static balance, body flexibility and muscle strength of young people's hands for relatively healthy female students. At the same time, further research is needed to find the possibilities for the most effective use of Anti Gravity fitness in PE practice of students. It is necessary to consider the possibility of the integrated use of this type of fitness with other fitness systems increasing the cardiorespiratory fitness indicators of young people.

Conflicts of interest - If the authors have any conflicts of interest to declare.

References.

Alonso-Fernández, D., Gutiérrez-Sánchez, Á., & Pino-Juste, M. (2012). Health-related physical condition variables in university students. *Journal of Human Sport and Exercise, 7*(1). 331-340. DOI:10.4100/jhse.2012.71.11

Anti Gravity Fitness Australia P/L. (Retrieved April 10, 2019). URL:https://fitness.org.au/directory/fitness-suppliers/anti-gravity-aerial-yoga-australia-pty-ltd/4/082319

Cox, A., Ulrich-French, S., Howe, H., & Kole, A. (2017). A pilot yoga physical education curriculum to promote positive body image. *Body Image, 23.* 1-8. DOI:10.1016/j.bodyim.2017.07.007

Cherepov, E., Epishev, V., & Terekhina, E. (2018). Effects of modern fitness technologies on physical qualities in students with locomotor disorders. *Minerva Ortopedica e Traumatologica, 69*(3). 43-48. DOI:10.23736/S0394-3410.18.03879-1

Christopher Harrison's Antigravity Fitness. (Retrieved April 12, 2019). URL:https://antigravityfitness.com

De Lion, A., Neville, R., & Armour, K. (2017). The role of fitness professionals in public health: A review of the literature. *Quest, 69*(3). 313-330. DOI:10.1080/00336297.2016.1224193

Druz, V., Iermakov, S., Nosko, M., Shesterova, L., & Novitskaya, N. (2017). The problems of students' physical training individualization. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, *21*(2). 51-59. DOI:10.15561/18189172.2017.0201

Farakhutdinov, Sh., & Sheregova, V. (2018). Typological model of fitness centers clients. *Teoriya i Praktika Fizicheskoy Kultury*, *2*. 39-40.

Ilnitskaya, A., Kozina, Z., Korobejnik, V., Ilnickiy, S., Cieślicka, M., Stankiewicz, B., et al. (2014). The method of application of health systems Bodyflex and Pilates in physical education of students. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, *18*(2). 25-32. DOI:10.6084/m9.figshare.923510

Keating, X., Harrison, L., Chen, L., Xiang, P., Lambdin, D., et al. (2009). An analysis of research on student health-related fitness knowledge in K–16 physical education programs. *Journal of Teaching in Physical Education, 28*(3). 333-349. DOI:10.1123/jtpe.28.3.333

Kolomiytseva, O., & Anatskyi, R. (2017). Fitness callanetics in physical education of girl students. *Physical Education of Students*, *21*(2). 66-71. DOI:10.15561/20755279.2017.0203

Kozina, Z., Sobko, I., Ulaeva, L., Safronov, D., Boichuk, Y., Polianskyi, A., & Protsevskiy, V. (2019). The impact of fitness aerobics on the special performance and recovery processes of boys and girls 16-17 years old engaged in volleyball. *International Journal of Applied Exercise Physiology*, *8*(1). 98-113. DOI:10.30472/ijaep.v8i1.306

Kriventsova, I., Pashkevych, S., Iermakov, S., Bartík, P., Michal, J., Nosko, M., & Yermakova, T. (2017). Fitness – aerobic training of 15 – 17 years´ age girl students, who have significant risk of deviations in backbone functional state. *Journal of Human Sport and Exercise, 12*(4). 1289-1297. DOI:10.14198/jhse.2017.124.15

Kubieva, S., Botagariev, T., Konisbaeva, S., Mambetov, N., Aralbayev, A., et al. (2019). Health promotion program for the students with regard to the level of their physical activity, physical fitness and health. *Journal of Physical Education and Sport, 19*(1). 703-709. DOI:10.7752/jpes.2019.01101

Kudryavtsev, M., Osipov, A., Kokova, E., Kopylov, Y., Iermakov, S., Zhavner, T., et al. (2018). The possibility of increasing cadets' physical fitness level of the educational organizations of the Ministry of Internal Affairs of Russia with the help of optimal training effects via crossfit. *Journal of Physical Education and Sport, 18*(Supplement issue 5). 2022-2028. DOI:10.7752/jpes.2018.s5300

Lipošek, S., Planinšec, J., Leskošek, B., & Pajtler, A. (2019). Physical activity of university students and its relation to physical fitness and academic success. *Annales Kinesiologiae, 9*(2). 89-104.

Marques, A., Santos, D., Hillman, C., & Sardinha, L. (2018). How does academic achievement relate to cardiorespiratory fitness, self-reported physical activity and objectively reported physical activity: a systematic review in children and adolescents aged 6-18 years. *British Journal of Sports Medicine, 52*(16). 1039. DOI:10.1136/bjsports-2016-097361

Mehmeti, I., & Halilaj, B. (2018). How to increase motivation for physical activity among youth. *Sport Mont, 16*(1). 29-32. DOI:10.26773/smj.180206

Mokrova, T., Bryukhanova, N., Osipov, A., Zhavner, T., Lobineva, E., Nikolaeva, A., et al. (2018). Possible effective use of Kangoo Jump complexes during the physical education of young students. *Journal of Physical Education and Sport, 18*(Supplement issue 1). 342-348. DOI:10.7752/jpes.2018.s5300

Mustedanagić, J., Bratić, M., Milanović, Z., & Pantelić, S. (2016). The effect of aerobic exercise program on the cardiorespiratory fitness and body composition of female college students. *Facta Universitatis. Series: Physical Education and Sport, 14*(2). 145-158.

Osipov, A., Iermakov, S., Gruzinky, V., Kudryavtsev, M., Bliznevsky, A., et al. (2018). Analysis of the parameter changes of students' physical development (at the age of 18–20) to identify the threat of increased body weight and obesity. *Journal of Physical Education and Sport, 18*(2). 800-809. DOI:10.7752/jpes.2018.02118

Osipov, A., Kudryavtsev, M., Kramida, I., Iermakov, S., Kuzmin, V., & Sidorov, L. (2016). Modern methodic of power cardio training in students' physical education. *Physical Education of Students, 20*(6). 34-39. DOI: 10.15561/20755279.2016.0604

Shuba, L., & Shuba, V. (2017). Modernization of physical education of student youth. *Physical Education of Students, 21*(6). 310-316. DOI:10.15561/20755279.2017.0608

Symonik, A., Chernenko, O., Chernenko, A., Serdyuk, D., Kokarev, B., Bulakh, S., et al. (2018). Application of fitball aerobics means in the system of physical education of female students of non-sporting specialties. *Physical Education of Students, 22*(3). 159-166. DOI:10.15561/20755279.2018.0308

Talaghir, L., Mocanu, G., Iconomescu, T., & Mindrescu, V. (2018). Development of speed manifestation forms during physical education classes at university. *Human, Sport, Medicine, 18*(4). 95-102. DOI:10.14529/hsm180414

Uher, I., & Bukova, A. (2018). Interrelationship between exercise and diseases in young people: Review study. *Physical Activity Review, 6*. 203-212. DOI:10.16926/par.2018.06.25

Vashchuk, L., Dedeliuk, N., Roda, O., Kalytka, S., Demianchuk, O., Matskevych, N., et al. (2018). The realization of the individual fitness programs in the physical education of high schoolgirls. *Physical Activity Review, 6*. 144-150. DOI:10.16926/par.2018.06.19

Volobaeva, L., & Gilazieva, S. (2013). Fitness training in the system of physical education of students. *Teoriya i Praktika Fizicheskoy Kultury, 7*. 16-19.

Zhou, Y., & Wang, L. (2019). Correlates of physical activity of students in secondary school physical Education: A systematic review of literature. *BioMed Research International,* Article ID 4563484. DOI:10.1155/2019/4563484