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Original Article

Fitness – aerobic training of 15 – 17 years´ age girl students, who have significant risk of deviations in backbone functional state

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ABSTRACT

Purpose: to work out complex of health related aerobic exercises with fit-ball for girl students, who have significant risk of backbone pathologies. Material: in the research 1st-3rd year girl students (n=50, age – 15-17 years) participated. Questionnaire for assessment of self feeling was used. For diagnostic of backbone mobility we used criterion of functional disorders and trainings effectiveness assessment. The diagnostic included eight tests for every girl student of risk group - Cervical spine mobility, Otta's test, Chest excursion, Shober's test, Tomayer's test, Pavelky's (left) test, Pavelky's (right) test and Backbone index. The main research method was pedagogic experiment. Results: it was found that 50% of 1st year girl students have pain in back. Average level of backbone mobility (backbone index) in the tested group was 86.9% from approximate norm at the end of the research. Conclusions: we found that it is possible to prevent from deviations in backbone functional state and preservation of its functional level in fit-ball aerobic trainings. Fit-ball aerobic trainings resulted in confident improvement of indicators of backbone mobility. **Key words:** LYCEUM, BACKBONE, HEALTH, AEROBIC, FIT-BALL, FUNCTIONAL.

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INTRODUCTION

Functional state of backbone plays important role in human health during all life. It was found that 45.3% of Ukrainian students of vocational lyceums have disharmonious condition. Only 6-10% of adolescents are considered to be practically healthy. 50% of boys and 65% of girls have lower than average adaptation potentials reserves (Apanasenko, 2010). In Kyrgyzstan 62% of gymnasium girls (15-18 years' age) have deviations in physical condition (Atambaeva, Isakova, Aman kyzy, Zhumakeeva & Sokubasheva, 2014). Analysis of Russian youth's physical and psychological condition showed that 75% of students constantly or from time to time are in unhealthy state (Romanovskij, 2015). Researches of life quality in some regions of Australia prove that up to 20% of students have unsatisfactory health (Jacob, Raymond, Jones, Jacob, Drysdale & Isaacs, 2016).

Scientists determined that only 15.2% of students have correct posture. Great number of posture disorders is registered in frontal plane (Dudko, 2015). Diagnostic of torso showed that 63% of schoolchildren have disorders. It witnesses about early symptoms of posture abnormalities (Kupreenko, 2015; Nosko, Razumeyko, Iermakov & Yermakova, 2016; Razumeiko, 2015).

The main reason of possible disorders in backbone functional state is restricted motor functioning. It occurs as a result of irrational organization of day regime, replacement of active work by passive, especially in organization of youth's modern leisure (Kriventsova & Il'nic'kij, 2015). Among prophylaxis measures in respect to this problem certain place is taken by physical exercises (Bartík & Bolach, 2015; Kopeikina, Drogomeretsky, Kondakov, Kovaleva, & Iermakov, 2016).

Among such measures we can mark out aerobic and its kinds. Actually aerobic is one of forms of youth's social and professional integration in modern society (Ciomag & Dinciu, 2013; Podrigalo, Iermakov, Alekseev, & Rovnaya, 2016). Aerobic can also positively influence on image of students' bodies, their feeling of dignity; their awareness of physical exercises' importance for their health (Majeed, 2015).

Among aerobic kinds special place is taken by exercises with special balls (exercise ball, Swiss ball). Influence of such trainings on students' health was shown in researches of different orientation. Among them there are exercises for muscular corset formation and pain in backbone segments reduction. These authors found that exercises with such balls reduce pain in lumbar spine (Scott, Vaughan & Hall, 2015; Yan, Hung, Gau & Lin, 2014), improve perception of physical and psychic welfare (Corrêa & Bérzin, 2008; Marshall & Murphy 2006).

By results of other researches (Pashkevych & Kriventsova, 2015) it was found that among girl students the most wide spread are diseases of skeletal muscular apparatus. Besides, it was determined that the main reason of possible disorders of backbone functional state motor functioning restriction can be (Kriventsova & Il'nic'kij, 2015).

It was noted that in organization of such students' trainings their individual features shall be considered (Klimenchenko, Kriventsova, Gorban & Makhonin, 2014; Korobeynikov, Korobeynikova, Iermakov & Nosko, 2016). It permits to correct deviations in different aspects of students' health (Kuzmin, Kopylov, Kudryavtsev, Galimov & Iermakov, 2015; Pryimakov, Iermakov, Kolenkov, Samokish & Juchno, 2016) and weaken environmental negative factors' influence (Bendikova & Bartik, 2015; Kudryavtsev, Kramida, Kuzmin, Iermakov, Cieslicka & Stankiewicz, 2016). It was also noted that implementation of early diagnostic is one of

important elements of different posture defects' prophylaxis and treatment (Mrozkowiak, Posłuszny, Żukowska, Iermakov & Szark-Eckardt, 2014).

Swimming trainings are also positive direction of this problem's solution (Rovnaya, Podrigalo, Iermakov, Prusik & Cieślicka, 2014), as well as calisthenics (Adashevskiy, Iermakov, Logvinenko, Cieślicka, Stankiewicz & Pilewska, 2014; Bliznevsky et. al., 2016) and organization of proper pedagogic control (Ivashchenko et.al., 2016a; Ivashchenko et.al., 2016b; Khudolii, Iermakov & Ananchenko, 2015, Khudolii, Iermakov & Prusik, 2015). Professional support during training is also important (Adamčá, Bartík & Nemec, 2014; Pomeshchikova et.al., 2016a; Pomeshchikova et.al., 2016b), as well as students' adaptation ability for tasks' fulfillment (Pupiš, Sližik & Bartík, 2013) and level of their activity (Bartík, 2012; Kozina et.al., 2016; Skurikhina, Kudryavtsev, Kuzmin & Iermakov, 2016).

The purpose of the work is to work out complex of health related aerobic exercises with fit-ball for vocational lyceum girl students, who have significant risk of backbone pathologies.

MATERIAL AND METHODS

Participants

In the first stage of the research 1st – 3rd year girl students of vocational lyceum (n=50, age 15-17 years) participated. In the second stage 20 2nd-3rd years girl students, who had risk of deviation in backbone functional state, were involved (by questioning data – more than 100 points). Randomly the girl students were distributed into control (n=10) and experimental (n=10) groups.

The girl students' parents gave written consent for their children's participation in the research.

Study design

The research took one academic year. 50 girl students were questioned for complaints, connected with backbone pathologies. For analysis we used complex assessment by points. Indicators of each girl student were assessed in points (Questionnaire for assessment of self-feeling, 2016). On the base of questioning we found the group of risk, which included girl students with moderate and expressed disorders. For diagnostic of backbone mobility we used criterion of functional disorders and assessment of trainings effectiveness. The diagnostic included eight tests for every girl student of risk group - Cervical spine mobility, Otta's test, Chest excursion, Shober's test, Tomayer's test, Pavelky's (left) test, Pavelky's (right) test and Backbone index (Ionov, Gontmakher & Shevchenko, 2003).

During six months, twice a week we realized pedagogic experiment - additional trainings were conducted with girl students of both groups (45 minutes each training). The girls of experimental group were trained to health related fit-ball aerobic by the worked out by us program. Control group girl students were trained by official lyceum physical culture program.

Statistical analyses

Statistical analysis included: calculation of initial statistical indicators; determination of differences between groups by statistical data. Statistical processing of the received results was fulfilled with STATISTIKA 6.1 licensed programs. (Khalafian, 2007).

RESULTS

Analysis of medical documents in respect to distribution into health groups for physical culture classes showed that majority of girl students (54.2 ± 7.0 %) had health problems. Only 9.3 ± 4.1% can be considered practically healthy.

Results of questionnaires' processing showed insignificant quantity of 1st year girl students' complaints (42.0±1.2 points). 2nd year girl students' complaints were more expressed (71.0±1.2 points). Third year girl students had even more complaints of backbone problems (90.0±1.6 points). Basing on health examinations and girl students' self-assessment we found the group of backbone pathologies' risk. This group (60.0 ± 6.9%) was trained health related aerobic. It was determined that the most vulnerable were 2nd and third year girl students. The received data witnesses that every of the tested girls from the mentioned group of risk (i.e. those, having subjective complaints) had not proper backbone functional activity (see table 1).

Table 1. Changes of backbone mobility in control and experimental groups under influence of aerobic trainings.

N/N	Indicators	Approximate normative	M ± m			
			Control group, n=10		Experimental group, n=10	
			Beginning of the research	End of the research	Beginning of the research	End of the research
1	Cervical spine mobility, cm	3	1.08±0.11	1.10 ± 0.08	0.94±0.10	1.21 ± 0.09*
2	Otta's test, cm	4	3.85±0.34	4.10 ± 0.22	3.31±0.60	4.46 ± 0.22*
3	Chest excursion, cm	6	4.10±0.31	4.25 ± 0.32	3.50±0.40	4.55 ± 0.32*
4	Shober's test, cm	4	4.10±0.31	4.15 ± 0.25	3.65±0.40	4.37 ± 0.22*
5	Tomayer's test, cm	0	0.30±0.11	0.25 ± 0.08	0.60±0.20	0.12 ± 0.06*#
6	Pavelky's (left) test, cm	8	4.60±0.21	4.70 ± 0.23	4.10±0.50	5.20 ± 0.28*
7	Pavelky's (right) test, cm	8	4.20±0.33	4.30 ± 0.28	4.10±0.50	5.00 ± 0.33*
8	Backbone index, conv.un.	27.0-30.0	19.93±0.90	20.35 ± 0.69	18.80±0.80	23.47±0.41**#

*Notes: * - confident difference between indicators of experimental group (p<0.05);*
*** - confident difference between indicators of experimental group (p<0.01);*
 # - confident difference between indicators of control group at the end of research (p<0.05).

Experimental group girl students were offered the program of fit-ball aerobic additional trainings. This program considered orientation, intensity and scope of loads (in compliance with individual physical condition). Every training as conducted as per the following scheme (see table 2).

Under influence of fit-ball aerobic trainings we registered confident improvement of backbone mobility indicators in the whole and in comparison with control group (see table 1). It should be noted that by all, without exclusion, indicators of backbone mobility we registered positive changes in experimental group, comparing with initial level (p<0.05). The best dynamic of increment was demonstrated by Otta's test, breathing excursion and Pavelky's test.

Table 2. Scheme of health related aerobic training (45 minutes).

Part of training	Purpose	Description	Duration min	Methodic instructions
Introduction	Activation of attention, preparation to main work	Warm up. Breathing exercises, general exercises, flexibility, stretching, imitation of slow walk on fit-ball	5 min.	Slow temp; control of heart beats rate and breathing
Main	Formation of torso and neck muscular corset; backbone flexibility, joints' mobility; Training of vestibular apparatus. Formation of carriage. Improvement of cardio-vascular and respiratory systems.	Aerobics + floor work. Exercises on fit-ball; exercises on fit-ball with dumbbells; exercises with ball on mat.	30 min.	Slow and moderate temp; moderate and maximal movements' amplitude. Heart beats rate shall not exceed 120 -140 beats per minute.
Finalizing	Gradual weakening of load; transition to usual activity.	Cool down. Restoration of normal breathing; stretching of back muscles. Relaxation.	5 min.	Slow temp; control of heart beats rate and breathing
Topical talks	Prophylaxis work	Control of working posture in the process of work and learning; industrial gymnastic exercises.	5 min.	Correct selection of material

In control group, at the end of the research we registered confident changes by Tomayer's test ($p<0.05$) and backbone index. Other indicators had only tendency to positive changes. At the end of the research average level of backbone mobility (backbone index) in experimental group was 86.9% in respect to approximate norm. Insignificant improvement of backbone mobility in control group was at the account of Otta's test and chest excursion.

Thus, be the results of our experiment experimental group girl students have opportunity to prevent from problems with backbone functional state. The mentioned changes are the results of the offered program, which facilitated improvement of backbone mobility.

DISCUSSION

The received by us results coincide with the data of other authors (Apanasenko, 2010; Klapchuk, Dziak & Muravov, 1995). Depending on year of studying there is clear tendency to increasing complaints' quantity and variety, which can be connected with backbone problems. Results of other researches also show steady increase of back pains among adolescents recent years (Shahee & Zaky, 2014; Ståhl, El-Metwally & Rimpelä, 2014). It was proved in our researches.

In our researches we found that 50% of 1st year girl students have back pains. It coincided with results (Pravdiuk, 2007). But already 90% of 3rd year girl students (17-18 years' age) had the same symptoms. Mainly they were pains in thoracic and cervical spines. In our opinion it is conditioned by influence of negative risk factors, which have been exactly determined for adolescents' population.

The available experience (Bannikova, Andruskaia and Pogrebniak, 2014; Romanchuk and Klapchuk, 2015) witnesses, that opportunities for disordered functions' restoration are rather various in adolescents with dorsopathy. Application of fit-ball aerobic as a prophylaxis measure was substantiated for restoration of backbone functional state.

The results of it practically coincide with the tasks, defined by other scientists (Scott, Vaughan and Hall, 2015; Yan, Hung, Gau and Lin, 2014). Actually, all above mentioned corresponds to content of fit-ball aerobic (as a kind of fitness), which is rather popular among modern youth and especially among girls. Besides, there are practically no counter indications for such trainings.

Additional fit-ball aerobic trainings permitted to substantially improve backbone mobility of girl students that was proved by the results of functional tests. Duration of the research was not sufficient and accumulation of positive changes takes much time. It explains little difference between indicators of control and experimental groups' girl students. It permits to speak about efficiency of the worked fit-ball aerobic complex and compliance of this methodic with the tasks of the research.

CONCLUSIONS

Additional fit-ball aerobic trainings permitted to substantially improve backbone mobility of experimental girl students by all indicators, comparing with initial period. Temp of backbone index increment in control group was 2.0% for the period of the research. In experimental group it was 25.0% with confident difference between these indicators at the end of the research. It proves effectiveness of the worked out program.

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