

Somatic Health and Physical Fitness of 18-20 Year-Old Female Students from Different Fitness Groups

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Abstract – This article provides a methodology for examination and assessment of physical health and physical fitness of 18–20 year-old female students of Samara state agrarian university from different fitness groups. Female students included to the specialized medical group due to the health reasons showed higher anthropometric indicators of physical development than their peers did from the main fitness group. At the same time, 18–20 year-old female students from the main fitness group have higher physiometric indicators of physical development, higher indicators of physical efficiency, and somatic health in general. Moreover, female students from the main fitness group show a higher level of physical fitness, which is consistent with the higher level of physical efficiency and somatic health. Some recommendations were provided on optimization of the level of physical fitness, physical efficiency and physical health of female students from the specialized medical group in general, which include a balanced mode of physical activity with mainly an aerobic type of physical exercises.

Key Words – somatic health, fitness group, female students, physical fitness

I. INTRODUCTION

The level of the functional state of the cardiorespiratory system plays a key role in comprehensive assessment of the young students' health condition. Numerous studies have proven that physical activity has a positive impact on the change of physical development indicators, functional state of the cardiorespiratory system, physical condition and somatic health in general [2–4, 6–8, 10]. At the same time, some studies has started to appear recently showing a low level of young students' somatic health and the level of physical fitness connected to it [5, 8]. This indicates that the problem of protecting and promoting Russian youth's health is relevant since health is a key factor of human capital development. Additionally, study results show that in our country, on average, the number of students with limited health capacities, who should attend physical education classes for specialized

medical groups (SMG), is at least 30 %, and, as practice shows, the number of students in SMG keeps rising during the period of study. Thus, the results of clinical examination carried out among the students of Samara state agrarian university have shown that 32.8 % of the students have been included into SMG due to the health reasons. At the same time, it is necessary to monitor physical health and physical fitness of students from the main fitness group (MFG) in order to prevent negative dynamics of mentioned indicators and subsequent transition of such students to SMG. Teaching of such disciplines as "Physical culture and sport" and "Elective courses on physical culture and sport", included in the list of obligatory humanitarian disciplines, helps to solve the problem of protecting and promoting students' health.

In the modern context, teachers of the above-mentioned disciplines can create conditions for positive developments in physical fitness and somatic health of students by implementing the student-centered, activity approach to their practice. Such approach is the best for the students included to SMG, because a wide variety of diseases, numerous health disorders, a low level of motivation, and the need for physical activity require an individual approach.

In order to solve the problem of optimizing the level of students' health, the assessment program and the program of longitudinal studies of somatic health and physical fitness are needed with the following correction program and performance analysis of the means used, especially those related to physical activity.

The purpose of this research is to examine the level of physical health and physical fitness of 18-20 year-old female students from Samara state agrarian university, included to SMG and MFG due to the health reasons.

Research tasks are as follows. 1. To carry out examination of indicators of the physical development, cardiorespiratory system, physical efficiency, and physical fitness of 18–20 year-old female students from Samara

agrarian university. 2. To assess the level of somatic health and physical fitness, to compare the indicators of somatic health and physical fitness of females students from the specialized medical group and main fitness group. 3. To offer a program for correction of physical health of students from the specialized medical group by means of the balanced mode of physical activity.

II. MATERIALS AND METHODS

18–20 year-old female students from Samara agrarian university, both from SMG (n=38) and MFG (n=47), took part in our research. The systolic (SBP), diastolic (DBP) blood pressure and heart rate (HR) have been registered by means of an electronic blood pressure monitor. The double product (DP) has been calculated.

Anthropometric and physiometric indicators of physical development have been examined by means of a standard set of tools (height meter, electronic floor scales, spirometer, and manual dynamometer).

The breath-holding test has been carried out after three deep inhalations and exhalations with breath-holding after inhalation (Stange’s test) and after exhalation (Gench’s test) with the 6–7 min interval between the tests.

The standard exercise tolerance test included 20 squats in 30 seconds. The test subject’s heart rate was measured before doing squats. Then the student did 20 squats in 30 seconds. Upon completion of squats, the test subject’s heart rate was measured during 10 seconds and then the heart rate was measured at the 2nd and 3rd minute.

The level of the physical fitness was measured with the test battery including shuttle run of 3x10 meters, 1000 m run (for MFG) and 1000 m walking (for SMG), standing long jump, push-ups, sit-ups, arms behind the head, leaning forward from a standing-on-a bench position. These motion tests enabled to evaluate the level of coordination abilities, endurance, speed/strength abilities, strength abilities and flexibility.

III. RESULTS AND DISCUSSION

In terms of anthropometric indicators of physical development, results of our research have shown that the female students of Samara agrarian university from the specialized medical group have a reliably (p<0,05) higher body weight indicator (6.18 kg higher) and a chest circumference indicator (5.52 cm higher) in comparison with the female students from MFG. At the same time, it was established that, according to Pignet’s index, the students from SMG have a stronger constitution than the students from MFG do. This fact indicates that the girls from SMG have a tendency to having a muscular-digestive type of the constitution while most of the girls from MFG show the tendency towards having an astheno-thoracal type of the constitution. Pignet’s index, which is 10.32 relative units higher for the female students from SMG, also proves a stronger constitution. Analysis of the results of the research into physiometric indicators of physical development has shown no valid variations between the girls from SMG and

MFG with the exception of a vital index, which is reliably (p<0,05) higher for the girls from MFG (6.17 relative units higher than for the girls from SMG) (table 1).

Based on such indicators of central hemodynamics as systolic blood pressure (SBP), diastolic blood pressure (DBP) and the heart rate (HR), no valid variations between SMG and MFG groups have been identified in terms of tested indicators. It should be noted that SBP, DBP, and HR indicators are within the age and gender limits for test subjects from both groups.

TABLE I. INDICATORS OF MORPHOFUNCTIONAL DEVELOPMENT, PHYSICAL EFFICIENCY, AND SOMATIC HEALTH OF FEMALE STUDENTS FROM DIFFERENT FITNESS GROUPS

Indicators	Fitness group		Significance of differences SMG-MFG
	SMG	MFG	
Height, cm	166,54±1,16	165,1±0,88	–
Body weight, kg	64,15±5,19	57,97±1,18	**
Chest circumference, cm	80,77±3,69	74,25±0,85	*
Body mass index, relative units	385,2±7,15	351,0±5,67	**
Level	–1	0	
Pignet’s index, relative units	21,56±0,55	31,88±0,45	**
Right-hand grip strength, kg	31,0±0,87	31,34±0,55	–
Strength index of a right hand, relative units	48,3±5,2	54,0±3,0	–
Level	1	2	
Left-hand grip strength, kg	28,36±0,98	29,42±0,52	–
Strength index of a left hand, relative units	44,1±3,1	51,0±2,2	*
Vital capacity, cc	3735,7±167,4	3733,3±74,25	–
Vital index, relative units	58,23±1,93	64,4±1,51	*
Level	5	5	
SBP, mm of mercury	110,28±2,9	113,54±1,32	–
DBP, mm of mercury	73,64±1,95	74,59±0,98	–
HR (sitting position), mm of mercury	81,7±3,4	82,19±1,6	–
Double product, relative units	90,1±2,1	93,31±1,93	–
Level	2	2	
Stange’s test, sec	41,5±5,1	41,05±2,04	–
Gench’s test, sec	26,0±2,4	25,72±1,41	–
Recovery time after 20 squats in 30 seconds	141,5±20,05	102,19±6,76	**
Level	1	3	
Level of somatic health (acc. to G.L. Apanasenko), points	8	12	
Level of somatic health	Below average	Average	

^a. Notes: * – valid at p<0,05; ** – valid at p<0,01

What concerns such an important indicator as a double product, we have also identified no valid variations between the test subjects from SMG and MFG. It should be noted that absolute values of central hemodynamics indicators are a little bit lower in SMG as compared with MFG, which indicates some advantage of SMG in such an important indicator as a double product, which characterizes the function of the cardiovascular system (table 1).

Indices of Stange’s and Gench’s tests, which characterize vital lung capacity and oxygen capacity of blood, show that no valid variations between the two tested groups have been identified.

The standard exercise tolerance test with 20 squats in 30 seconds has shown that the recovery time after this exercise for the female students from MFG is reliably ($p<0,01$) shorter (39.31 second shorter) than for the female students from SMG, which indicates higher physical efficiency of the female students from MFG (table 1).

One of our research tasks was to calculate the level of physical health using the screening methodology of G.L. Apanasenko et al. [9]. It is a well-known fact that the higher the level of physical health is, the lower the risk of a chronic somatic pathology is. The methodology is based on the indicators of physical development (height, body weight, vital capacity (VC), handgrip test) and on the state of the cardiovascular system, specifically, on the following relative indices: body mass index, vital index, dynamometric index, double product and HR recovery time after the exercise tolerance test with 20 squats in 30 seconds.

The results of somatic health examination with the use of G.L. Apanasenko [9] methodology show that, based on the number of accumulated points (8 points), somatic health of female students from SMG is below the average level. At the same time, the level of somatic health of the female students from MFG is much higher – 12 points, which corresponds to the average level (table 1).

Thus, the analysis of examination of morphofunctional development and somatic health of the 18–20 year-old female students from SMG and MFG has shown that female students from MFG have an advantage over the female students from SMG in terms of physiometric indicators of physical development, physical efficiency, and physical health in general. At the same time, higher values of anthropometric indicators of physical development have been identified in the specialized medical group, which is, by itself, does not bring any significant advantages while establishing a level of somatic health.

This fact may suggest that, having a rather good inherited condition of the cardiovascular system, the girls from SMG have less intense physical activity compared with the girls from MFG, which leads to overweight and reduction of physical efficiency. In the meantime, the girls from SMG, just like the girls from MFG, need physical activity in order to optimize both physical efficiency and physical health in general.

An advantage of the female students from MFG in physiometric indicators of physical development, physical efficiency, and somatic health in general is consistent with the higher level of physical fitness (PF), which is proven by the higher level of coordination abilities, speed and strength qualities and, the most important, aerobic endurance (table 2). This is proven by reliably lower values in shuttle run of 3x10 meters (0,29 sec less) ($p<0,05$), in finishing a 1000 m distance (118.0 sec less) and better results in standing long jump (11.7 cm longer) ($p<0,01$). Another fact proving the higher level of physical fitness in MFG in comparison with SMG is that fewer test subjects with a low level of physical fitness (18.72 % less) have been identified among them; and vice versa, more girls with the above-average level of physical fitness have been identified (8.7 % more).

IV. FINDINGS

1. The girls from the specialized medical group have a higher level of anthropometric indicators of physical development. At the same time, the female students from the main fitness group have a higher level of physiometric indicators of physical development, higher level of physical efficiency, physical fitness and somatic health in general.

2. Due to the low level of physical fitness, the female students from SMG should have at least 8 hours of physical activity per week, including at least 5 hours of individual exercising, mainly of an aerobic type and of moderate intensity (walking, skiing, skating, cycling, swimming, step aerobics, corrective gymnastics etc.). In order to maintain the optimum level of physical fitness and prevent a transition of the female students from MFG to SMG due to the low level of physical fitness, they should also follow a similar pattern of physical activity.

3. In order to identify the dynamics of indicators of physical efficiency, physical fitness and somatic health in general, it is necessary to carry out comprehensive examinations of students from both fitness groups at the beginning and at the end of an academic year. To help students, a workbook for self-control at PE and sports classes has been designed.

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TABLE II. MOTION TESTS RESULTS OF 18–20 YEAR-OLD FEMALE STUDENTS FROM DIFFERENT FITNESS GROUPS

Motion tests	Fitness groups		Significance of differences SMG-MFG
	SMG	MFG	
Standing long jump, cm	161.3±7.0	173.0±2.97	**
Sit-ups, arms behind head, number of times	18.72±1.11	18.9±0.51	–
Push-ups, number of times	10.62±2.45	12.16±1.05	–
Leaning forward from a standing- on-a bench position, cm	11.17±1.45	13.2±1.0	–
Shuttle run of 3x10 meters, s	8.77±0.19	8.48±0.08	*
1000 m run (walking),sec	481.3±21.3	363.3±7.12	**

b. Notes: * – valid at $p<0,05$; ** – valid at $p<0,01$

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