Journal of Physical Education and Sport ® (JPES), 19(1), Art 101, pp. 703 - 709, 2019
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Health promotion program for the students with regard to the level of their physical activity, physical fitness and health

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Published online:March 31, 2019
(Accepted for publication March 02, 2019)
DOI:10.7752/jpes.2019.01101

Abstract:
Problem Statement. There is a high demand for mobile, creative specialists in the labor market and requirements to their health are high. Hence, student health standards have changed. **Approach.** This article contributes to global science with data on physical activity, physical fitness and health of university students. The article offers recommendations on the improvement of physical activity levels, physical fitness and health of students in the university setting. **Purpose**. The purpose of the research is to validate the improvement of physical activity levels, physical fitness and health of student teachers and medical students. **Results**. The article defines the physical activity and the physical activity levels of student teachers and medical students. The low level of physical activity among medical students is conditioned by the characteristics of their learning and professional activity. The health indexes were identified for students with different levels of physical activity. Moderately and lightly active students were found to be in poor health. **Conclusions**. The lowest speed, speed-strength and endurance were found among medical students. This article provides a health promotion program for students with regard to their levels of physical activity, physical fitness and health.
Kew words: Health, physical fitness, program, students.

Introduction

The research matter was chose on the following basis. First, now is the time when higher education of the Republic of Kazakhstan is being reformed. Nowadays, there is a high demand for the mobile and creative specialists. The State Compulsory Educational Standard of the Republic of Kazakhstan says that "… a graduate must be able to take cues from information flows and adapt to dynamically changing phenomena and processes in the global economy; be flexible and mobile; be able to make economic and organizational decisions in the context of uncertain and risk" (The State Compulsory Educational Standard, 2010). Second, an intensive mobilization causes the strengthening of requirements for the physical fitness and health of specialists. This leads to high morbidity rates among students, as evidenced by literature (Moskalenko, 2002). Third, socio-economic changes together with technological progress lead to changes in the physical fitness and health standards.

This article contributes to the global science with data on physical activity, physical fitness and health of students from various institutions of higher education. This article also offers recommendations on the improvement of physical activity levels among specialists who work in various universities.

Practical relevance: findings regarding the physical activity, physical fitness and health of students, as well as health promotion recommendations, can serve as a reference for physical culture teachers.

The purpose of the research is to validate the improvement of physical activity levels, physical fitness and health of student teachers and medical students. Research objectives are to (1) define physical activity of students; (2) measure health levels of students with various levels of physical activity; (3) find relationship between physical fitness and physical activity levels; (4) develop a health promotion program for students with regard to their levels of physical activity, physical fitness and health.

Literature review

Domestic literature regarding the physical fitness of students provides information on the following domains.

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The monitoring of physical fitness and physical development. According to the literature, the level of physical development does not significantly change during the first three years, whereas the physical fitness significantly decreases by the third year… (Murtazin, 2008). The level of physical development is measured with regard to medical data and physical outcomes (Mironova, 2004).

Physical culture and health promotion classes with students. These are 46-week micro-cycles with a prioritized use of the means of athletic gymnastics and simulators (Gubernatorov, 2006). The course program provides for organizational, psycho-pedagogical and socio-medical measures, means and techniques for health promotion in a university educational setting (Mysina, 2011).

Sorting of students by physical qualities. The key physical qualities of students are outlined in (Borisova, 2006). Students are divided into groups improve specific qualities, such as speed (through playing games), strength (through practicing martial arts), endurance and flexibility (through gymnastics) (Rakhmatov, 2010). The workload is distributed with regard to the dominating physical abilities of students (Vinokurov, 2004).

Morphofunctional dynamics. The cardiorespiratory fitness of was basketball players found to be higher compared to other sportsmen (Panov, 2008).

The adaptation potential, health, morbidity and physical activity of students. More than a half of the first-year students were found to be in low health. Moreover, their adaptation potential was also in the red (Ryzhkova, 2008). Other study revealed 61% of students with low strength and 28% of students with below-average strength (Yefremova and Volkova, 2015). Morbidity rates among medical students are reliably higher than among technical university students of technical university (Moskalenko, 2002). The average number of steps taken by students under the federal program is 3826, which is below the hygienic norm of 10000 steps (Ponomariov et al., 2008).

The physical development and physical fitness of men and women. The average result in 100 meters running among the students equals 14.3 seconds (C grade) (Dzhamalov et al., 2012). The body length is positively related to the body mass index (BMI), but the correlation with the body fat mass is negative (Tretiakova, 2005). Unlike women-weight lifters, women-light athletes have higher BMI, body length, chest circumference, width of pelvis, smaller shoulders, smaller muscles, more fat and weaker wrists (Sibley and Bergman, 2016).

Foreign literature provides information regarding other matters.

Factors influencing the physical activity of students. Arias-Palencia explores issues regarding health management and provides physical activity forecasts (Arias-Palencia et al., 2015). Men and women both were found to have low levels of physical activity. Only 28.1% of students followed recommendations regarding the daily step count of 10 000 steps (Al Sudani and Erdmann, 2017).

Morphological parameters and motor abilities. The fourth-year students have a significantly higher body mass and BMI value than the first-year students (Keska, 2018). This improvement was conditioned by the acknowledgment of high health risks (Caia et al., 2016). The improvements were influenced by the body fat mass, sex, body weight and leg length (Toselli and Spiga, 2017).

The relationship between physical activity and physical development. There is a positive relationship between sports, physical culture and body perception (Lotrean et al., 2018). A diversified diet protects from overweight and positively correlates with the everyday physical activity (Morassut et al., 2017). Students expose themselves to a greater stress when going for a bachelor degree due to the increased learning load. The stress causes the gain in weight and weight loss (Lee et al., 2017). An intensive 10-days program of health promotion that combines diet and physical activity with body characteristics of young people significantly decreased the body weight, body mass index, triglyceride, total cholesterol, low-density lipoprotein cholesterol, and blood glucose (Spittle and Spittle, 2016).

The motivations for participating in physical culture classes. The social opinion was regarded less important than the development of movement, sanitary education, the opportunity to play games, motor development and physical education (Apanasenko and Popova, 2000).

Methods

The research was conducted in three stages. The first (exploratory) stage was the analysis of domestic and foreign literature on the research problem (September-November, 2017). The methods of the analysis of the scientific-methodical literature and content-analysis were used. The second (formative) stage was an attempt to reach the first three objectives of the study (September 2017-April 2018). The initial data was gathered on physical activity levels, physical fitness and health of students from various universities. The research was conducted in the K. Zhubanov Aktobe Regional State University and the West Kazakhstan Marat Ospanov State Medical University.

To determine physical activity levels of students, steps in a week walk were counted using a OMRON HJ-005 pedometer. Aside from that, we recorded the types of physical activity on a daily basis. The pedometer was attached to the participant's belt during a week while they were awake. The results were registered in the protocol. The participants were 25 students from each university. The health level was measured on a somatic

health scale with regard to energy potential according to G.L. Apanasenko (Yakhontov and Lasukova, 2007). The calculation was carried out with due regard to the following initial parameters: height, body mass, lung capacity (LC), heartbeat rate (HBR), wrist muscle strength (WMS), systolic blood pressure, heartbeat recovery time after a Martinet test (20 squats per 30 seconds). The somatic health levels (low, below average, average, above average, high) was represented in a point value (from -2 to +7 in each category).

Parameters to measure:

a) body mass, measured using VEM-150 scales "Mass (A1)";

b) height, measured using RM-1 "Diakom" meter. These two parameters are used to calculate the Quetelet weight-height index (body mass index);

c) lung capacity, measured using a dry portable lung-tester SSP. The participants put the mouthpiece on the inlet pipe of the lung-tester. The mouthpiece was cleaned with cotton cloth soaked in alcohol. By turning the cover of the lung-tester, the dial was adjusted so that the needle points to zero marking. The test was carried out in standing position. The participant made 2-3 deep breathes in and out. Then, he made the deepest breath in and breathed out maximum air through the mouthpiece, tensing all the respiratory muscles, including abdominal tension. Breathing out lasted nearly 4-8 seconds. During testing, the participant held the lung-tester in such a way that the air could freely go out of the device. The value of the lung capacity was defined in liters on the scale of the lung-tester. There were three measurements of lung capacity. The arithmetic mean of values was calculated. The life index (ml/kg) was obtained through dividing the lung capacity value by body mass (Physical culture, 2014).

d) wrist muscle strength test was carried out using the hand-held dynamometer DRP-90. The finger of the device was put on zero marking by turning the button on its back. Then, the participant took the dynamometer in his hand, with his fingers on the handle grip, and squeezed the device with might. The hand was put aside on the shoulder level. The result was registered. After that, the finger of the device was returned to zero marking. Both the right and left hands were tested two times. The strength index was calculated by the following formula: wrist muscle strength /body mass x 100 (Physical culture, 2014).

e) systolic blood pressure (top number), measured using a professional classic tonometer AND IA 200 604 2019. The participant put his hand on a table, the blood pressure cuff was fixated 2.5 cm higher than the crook of his arm. With the help of a punching bag, the pressure in phonendoscope was increased up to 200. When releasing the tension by twisting off the wheel, the first pulse sound was taken as the systolic pressure, whereas the last sound pointed to the diastolic pressure.

To determine the heartbeat rate, the number of beats per 30 seconds was counted. The result was multiplied by 2 (Physical culture, 2014).

Basing on these two parameters, the double product was calculated

$$\frac{\text{HBRxBP (syst)}}{100}$$

e) Ruffier index is the time of heartbeat rate recovery after 20 squats in 30 seconds (Physical culture, 2014).

The following tests were used to measure physical fitness: 100 meters running (sec.), 2000 meters running (min.), standing long jump (cm) (Zhelezniak and Petrov).

The data were processed through mathematical statistics. The following indicators were calculated: arithmetic mean, mean-square deviation, standard mean error, Student's t-test, error probability.

The third stage of the study was aimed at developing a health promotion program for students with regard to their level of physical activity, health and physical fitness (May-June, 2018). The results were put in a form suitable for analysis.

Results

Table 1 shows data on physical activity of students.

Table 1. The initial level of physical activity (daily step count).

Physical activity levels	Student teachers			Medical students			Growth	t	p
	X	S	m	X	S	m			
high	14301.2	585.5	119.7	13101.1	458.0	93.6	9.1	7.9	<0.01
moderate	9803.4	246.8	50.5	8760.4	218.1	44.7	11.9	4.89	<0.01
low	5874.2	146.6	29.9	5201.1	137.5	28.1	12.9	16.4	<0.01

Table 1 shows that unlike medical students, student teachers are more physically active (high level of physical activity: 14301.2 steps a day vs 13101.1 steps a day; moderate level: 9803.4 steps a day vs 8760.4 steps a day; low level: 5874.2 steps a day vs 5201.1 steps a day). The lag in high level was 1200.1 steps (9.1%), 1043 steps (11.9%) in average level and 673.1 steps (12.9%) in low level (in all cases, statistically significant differences between the indicators were found, p<0,01). We can see it from the Table 2 as well: it shows a higher percentage of moderately active students (64% and 56%). Physical activities performed by highly active students

involved the attendance of sport sections, weekend-day events, physical culture classes (4 hours per week) in the university, independent physical exercises and sport competitions. Additionally to the everyday locomotion, moderately active students were engaged in physical culture classes (4 hours per week).

Physical activities performed by students with low levels of physical activity are associated their everyday routine, which do not involve meaningful physical exercises.

We associate lower levels of physical activity with educational requirements. Unlike student teachers, medical students have to spend more time engaged in medical practice.

Table 2. Students sorted by the level of physical activity, in %.

Student teachers			Medical students		
Physical activity levels			Physical activity levels		
High, n=3, %	Moderate, n=16 %	Low, n=6 %	High n=2, %	Moderate, n=14 %	Low, n=7 %
12	64	24	8	56	28

Table 3 shows the health levels of student teachers and medical students.

Table 3. Health status of student teachers and medical students.

Indicator	Student teachers					Medical students				
	Health levels									
	Low	Below average	Average	Above average	High	Low	Below average	Average	Above average	High
Body mass index	0	28.7	71.2	-	-	-	31.3	68.7	-	-
Life index	7.16	8.14	26.2	32.1	26.4	9.9	14.6	24.1	30.2	21.2
Strength index	62.4	29.8	2.0	2.0	3.8	64.1	30.3	1.8	1.7	2.1
Double product	3.4	13.4	34.6	37.8	10.8	5.1	14.8	33.8	36.4	9.9
Ruffier index	5.4	22.6	56.2	15.8	-	5.7	26.1	54.1	14.1	-

Table 3 reveals the following regularities. Student teachers demonstrated better results than medical students did. By BMI, 28.7% of students were in below average health, whereas 71.3% of students were in average health (relatively to 31.3% and 68.7% among medical students). A relatively better trend is observed in the life index values: 26.2% of student teachers with average life index vs 24.1% of the medical students, whereas 78.5% and 52.4% of students had “below average” and “high” indices.

By strength, 62.4% of student teachers and 64.1% of medical students demonstrated low levels, whereas the average levels were found in 29.8% and 30.3% of students, respectively.

By the double product, student teachers demonstrated better results as well: average, below average and high levels of health were found in 34.6%, 37.8% and 10.8% of student teachers vs 33.8%, 36.4% and 9.9% of medical students. This indicates better cardiovascular fitness.

The student teachers also demonstrated better recovery: 56.2% of students with the average value of Ruffier index and 15.8% of students with the above average value vs 54.1% and 14.1% of medical students with the corresponding results.

Table 4 shows the correlation between the health levels of students and their levels of physical activity.

Table 4. Correlation between the health and levels of physical activity.

Health level	Student teachers			Medical students		
	high	moderate	low	high	moderate	low
	Point value/pct.	Point value/pct.	Point value/pct.	Point value/pct.	Point value/pct.	Point value/pct.
Low	-	-	2.9 28.1	-	-	2.5 29.6
Below average	5.9 23.4	5.8 39.8	4.1 48.2	5.6 24.6	5.4 42.2	3.9 51.2
Average	10.4 30.2	9.6 34.4	8.8 23.7	10.1 29.9	9.1 38.1	8.5 19.2
Above average	14.6 46.4	13.8 25.8	-	14.0 45.5	13.1 19.7	-
High	-	-	-	-	-	-

According to Table 4, moderately and highly active student teachers dominate the moderately and highly active medical students. The proportion of highly active students comprises more students with average

and above average levels of health (30.2% and 46.4% versus 29.9% and 45.5%). The proportion of moderately active students comprises more students with average and below average levels of health (34.4% and 39.8% versus 38.1% and 42.2%). Among the students with low level of physical activity, there were more students in below average and low health (48.2% and 28.1% versus 51.2% and 29.6%).

Table 5 shows physical fitness of student teachers and medical students with different levels of physical activity.

Table 5. Physical fitness of student teachers and medical students with different levels of physical activity

Indicator	Statistical parameters	Student teachers			Medical students		
		Physical activity levels					
		High	Moderate	Low	High	Moderate	Low
100 meters running, sec.	X	13.8	14.2	14.8	14.0	14.5	15.3
	S	0.15	0.13	0.12	0.17	0.27	0.48
	m	0.03	0.02	0.02	0.03	0.05	0.09
	Growth, %	1-2 2.8	2-3 4.2	1-3 7.2	1-2 3.5	2-3 3.4	1-3 8.0
	t	1-2 10	2-3 10	1-3 20	1-2 8.0	2-3 3.0	1-3 7.78
	p	1-2 <0.01	2-3 <0.01	1-3 <0.01	1-2 <0.01	2-3 <0.01	1-3 <0.01
2000 meters running, min.	X	9.40	9.50	10.05	9.45	10.0	10.20
	S	5.5	5.6	5.7	1.89	2.1	2.5
	m	1.12	1.14	1.16	0.39	0.40	0.51
	Growth, %	1-2 1.7	2-3 2.5	1-3 4.3	1-2 2.5	2-3 3.3	1-3 5.9
	t	1-2 6.28	2-3 9.25	1-3 15.6	1-2 6.4	2-3 23.4	1-3 25.0
	p	1-2 <0.01	2-3 <0.01	1-3 <0.01	1-2 <0.01	2-3 <0.01	1-3 <0.01
Standing long jump, cm	X	235.1	225.2	210.2	230.2	215.1	195.2
	S	7.8	13.2	15.1	8.5	14.1	16.8
	m	1.59	2.69	3.08	1.73	2.88	3.43
	Growth, %	1-2 4.3	2-3 9.5	1-3 11.8	1-2 7.0	2-3 10.2	1-3 17.9
	t	1-2 2.6	2-3 3.7	1-3 3.46	1-2 4.5	2-3 7.4	1-3 14.9
	p	1-2 <0.05	2-3 <0.01	1-3 <0.01	1-2 <001	2-3 <0.01	1-3 <0.01

In this case, the following tendencies were identified. First, student teachers demonstrated better results. Secondly, there results corresponded to B's, C's and D's under the standard program. For example, in 100 meters running test, student teachers sprinted at the speed higher by 0.4 sec. (absolute speed increase by 2.8 %) and 0.6 sec. (relative speed increase by 4.2%). For comparison, medical students sprinted at the speed higher by is 0.5 sec. (3.4%) and 0.8 sec. (8%), respectively. In 2000 meters running test, student teachers sprinted at the speed higher by 10 sec. (absolute speed increase by 1.7 %) and 15 sec. and (relative speed increase by 2.5%), whereas sprinted at the speed higher by 15 sec. (2.5%) and 20 sec. (3.3%), respectively. In standing long jump test, student teachers had a jump longer by 9.9 cm (2.6%) and 15 cm (3.7%), whereas the medical students had a jump longer by 15.1 cm (7.0%) and 19.9 cm (10.2%). The sharpest absolute and relative improvements were associated with jumping. These findings allowed us to create a health promotion program. We drew this program upon the revealed inconsistencies:

- medical students are less active than student teachers;
- students with moderate and low levels of physical activities had less competitions, did not attend sport sections, and did less physical exercises outside the university;
- lower physical activity among medical students was associated with the characteristics of their educational setting (they spend more time engaged in medical practice);
- some students demonstrated a below average BMI and low strength;
- moderately active students were in poor health (under 9 points according to Apanasenko);
- student teachers and medical students with moderate and low levels of physical activity demonstrated relatively lower speed (100 meters running test), endurance (2000 meters running test) and speed-strength (standing long jump test). The aim of the health promotion program is to improve the levels of physical activity, health and physical fitness of students. The program consists of 3 blocks: diagnostic, organizational and control.

Within the diagnostic block, we determined the physical activity levels of students (step count tracking), measured their health (Apanasenko's method) and physical fitness (100 meters running, 2000 meters running,

and standing long jump). Within the organizational block, students were engaged in specific physical training (exercises and sports) to improve insufficient physical qualities. For example, to reach higher speed, students were engaged in face- and back starts running of a 5-10 m sprint, in 30-40 m running with high hips, in fast-starts running with ball passing from hand to hand, in two-feet jumping (30-40 m) with speeding up. To reach higher endurance, students performed two-ball drills in pairs (shuttling).
Within the control block, physical activity, health and physical fitness were re-measured.

Discussion

Findings show that student teachers are more physically active compared to medical students (high level of physical activity: 14301.2 steps a day vs 13101.1 steps a day; moderate level: 9803.4 steps a day vs 8760.4 steps a day; low level: 5874.2 steps a day vs 5201.1 steps a day). In other studies, students take 3 826 steps during the normal class, which is below the hygienic norm of 10 000 steps (Lotrean et al., 2018). Our study, however, address the full daily walk. Similar studies were conducted by N.M. Arias-Palencia, M. Solera-Martinez, L. Gracia-Marco Silva P., V. Martinez-Vizcaino, J. Canete-Garcia-Prieto, M. Sanchez-Lopez. They noted that only 28.1% of students followed recommendations regarding the daily step count of 10 000 steps (Physical culture, 2014). Our data on highly active students correlate with these recommendations.

By strength, 62.4% of student teachers and 64.1% of medical students demonstrated low levels, whereas the average levels were found in 29.8% and 30.3% of students, respectively. In earlier studies, low strength was peculiar to 61% of students and 28% of students had below-average strength (Caia et al., 2016). Our findings prove the effectiveness of our program – the students demonstrated strength higher than that in the study by Caia. Students with high, moderate and low levels of physical activity demonstrated results corresponding to B's, C's and D's under the standard program. For example, in 100 meters running test, student teachers sprinted at the absolute speed of 13.8 sec., 14.2 sec. and 14.8 sec., respectively. Similar studies revealed that the average result in 100 meters running among the students equals 14.3 seconds (C grade) (Morassut et al., 2017). The present study specifies that medical student perform at the lower level compared to student teachers.
The health promotion program for students is created with due regard to their level of physical activity, physical fitness and health. It comprises diagnostic, organizational and control blocks. G.A. Mysina developed a similar program that provided for organizational, psycho-pedagogical and socio-medical measures, means and techniques for health promotion in a university educational setting (Vinokurov, 2004). Our program stands out with the involvement of specific exercises and sports based on sports training principles.

Conclusions

Student teachers are in better shape compared to medical students due to the specific characteristics of their educational setting. Students had problems with BMI and strength regardless of their levels of physical activity. Moderately and lightly active student teachers and medical students had speed, endurance and speed-strength issues. The three -eared health promotion program allows using differentiated means, forms and methods of physical education. Recommendations for health improvement are the following: a) determine the student's level of physical activity; choose physical activities that a student lacks in his/her daily routine; b) set the target values for each physical quality and keep an eye on the; c) do not make students do sports which they do not like.

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