

# Determination of first year students' physical condition and physical fitness level

Fotyntyuk V.G.

National Aviation University, Ukraine

## Abstract

- Purpose:** to study and find out first year students' physical condition and physical fitness levels.
- Material:** in the research first year students (n=86) participated. The age of the participants was 16 – 19 years. They passed the following tests for physical fitness: 100 meters' run; run during 12 minutes; long jump from the spot; chin ups; torso rising from lying to sitting position during 1 minute; forward torso bending from sitting position, cm.
- Results:** it was found that 41% of students have low and below average levels of physical condition and 76.35% - the same physical fitness level (unsatisfactory). So we came to conclusion that it was necessary to review the existing approaches to physical education system. It is recommended to increase the volume of compulsory classes of students' motor functioning at the cost of the following: usage of optional classes; physical exercises' practicing in free time; everyday motor activity in the form of morning exercises and sport games.
- Conclusions:** the main reasons of students' physical condition and physical fitness weakening during their studying are: restricted quantity of academic physical education classes; absence of students' demand in systemic physical exercises' practicing; students' low motivation for physical education; absence of interest in physical exercises' practicing in free time; students' health worsening before entering higher educational establishment; imperfectness of school physical education.
- Keywords:** students, testing, level, physical condition, physical fitness.

## Introduction

Students' physical condition depends on their physical fitness. Physical fitness is a complex of different physical qualities (strength, quickness, endurance, dexterity and flexibility) and it is gradually worsening. The reasons of it are: irrational distribution of time for study and rest; immobile life style.

The problem of pupils' and students' physical condition is rather relevant [10, 22, 23, 29]. It is elucidated in many scientific works. In assessment of senior pupils' physical fitness level it was found that pupils' physical condition is out of norm: 35.6% – by body length indicators; 65% – by body mass [19]. The author notes that with age physical condition level drops [28]. In other works it was found that the following boys' indicators reduce: long jump from the spot (by 1.62%); 1000 m run (by 0.95%); Rouffier's test (by 6.61%) [1, 2, 24]. Besides, it was found that the Quetelet index corresponded to normosthenic body composition. Rouffier's index corresponded to satisfactory workability. Heat beats rate in orthostatic test was within standard [15]. In other researches reduction of the following students' factors was noted: "quickness" – 33.9%; "speed-power abilities" – 24.8%; "endurance" – 13.4%; "flexibility" – 7.6%; "dexterity" – 6.7% [3].

Many authors state that the temps of students' physical fitness increment are noticeably reduced [5, 8, 12, 16]. It was found that more than 84.8% of boys and 81.1% of girls have average physical fitness level (satisfactory) [25, 26].

Analysis of scientific works shows that there is deficit of students' motor functioning. It results in students' physical condition and physical fitness problems [4, 6, 14, 17]. This fact permits to say that selection of physical loads' means and its regulation at trainings shall be realized in compliance with levels of students' physical condition and fitness [13, 20, 21].

*The purpose of the research* was to study and find out first year students' physical condition and physical fitness levels.

## Material and methods

**Participants:** In the research first year students (n=86) participated. The age of the participants was 16 – 19 years. By results of medical examination all students were related to main health group (no health deviations).

**Organization of the research:** we offered special individual chart of physical potentials for assessments of first year students' physical condition and physical fitness. This chart consisted of two parts. First part included physiological test exercises from physical education program: *the Quetelet index*. Mass-height the Quetelet index (QI) shall be calculated by formula:

$$QI = BM/L$$

where *BM* is body mass (grams);

*L* – body length in standing position (cm).

Correlation of body mass and length is: low  $\geq 400$ ; below average – 375.1 – 400.0; average – 350.1 – 375.0; above average – 325.1 – 350.0; high  $\leq 325.0$ . Norm of the Quetelet index for boys is 370-400 g/cm [9, 11].

**Heart beats rate (HBR, b.p.m.).** HBR is measured after 5 minutes rest. HBR in rest is the following:  $\geq 100$  – low; 90 – below average; 71-89 – average; 61-70 – above average;  $\leq 60$  – high [9, 11].

For determination *Rouffier's index* [9, 11] heart beats rate values (HBR): pulse in different moments of recreation after physical loads. It is necessary during 15 second to count pulse after 5 minutes' rest, in sitting position (P1). Then the tested fulfills 30 squats during 45 seconds. Pulse shall be measured in first minute of recreation period: during first 15 seconds (P2) and in the last 15 seconds (P3). Results are calculated by the following formula:

$$\text{Rouffier's index} = [4 \cdot (P1 + P2 + P3) - 200] / 10.$$

We also analyzed the results of Shtange's test. This test with pause after inhale shall be fulfilled in the following way: Student fulfills three breaths at  $\frac{3}{4}$  of full breath. The breath is stopped after full inhale. Nose is closed with a clip or fingers. Pause time is registered by stopwatch. Shtange's test is assessed by the following indicators: low – 40 sec; below average – 50 sec.; average – 55 sec.; above average – 65 sec. and high – 75 sec. [9, 11].

Other part consisted of control tests of physical education academic program. Physical fitness was found with the help of the following exercises: for quickness (100 meters' run); for endurance (12 minutes' run); strength (chin ups and torso rising from lying position to sitting); speed-power (long jump from the spot); for flexibility (forward torso bending in sitting position (see table 1) [7, 11]. Students practiced physical education only at curriculum classes, twice a week, 90 minutes every lesson. All control exercises (tests) for motor abilities were conducted in main part of physical culture lessons.

*Statistical analysis:* the results were processed with the help of non parametric statistic's methods. Student's t-test was used for evaluation of statistical significance of the received results. *Null hypothesis* was tested.

## Results

The fulfilled study of *weight-height Quetelet index (QI)* permitted to state that by anthropological indicators students did not differ noticeably. By QI indicators students were distributed into the following levels: low level– 14%; below average level - 26%, average level - 38% and higher than average - 16%. 6% of boys had high level.

Analysis of results showed that 14% of students had body mass deficit or excessive mass. Low body mass

index is accompanied by risk of cardio-vascular diseases or diabetes [18].

The received results showed that students had confidently higher mean HBR in rest ( $p < 0.01$ , 61%). We registered the following: below average values in 15% of students; 7% of students had low level. HBR less than 60 b.p.m. are called bradycardia. HBR higher than 80 b.p.m. are called tachycardia. They often are the symptoms of many pathological states.

First level (excellent) has index  $< 3.0$ , characterized by high level of physical fitness. No students with such level were found. The second level (good) has index 4-6, with physical fitness level above average. Percentage of it was 10%. The third level (satisfactory) had index 7-10, which corresponds to average level of physical fitness. As per our study 28% of students belong to this category. The fourth level (bad) had index 10-14. It corresponds to level below average (weakened level of functional systems). This level dominates (48%). The fifth level (very bad) has index  $> 15$ . It corresponds to very low physical fitness level (sharp reduction of functional systems' potentials). In 14% of boys we found low levels of workability and cardio-vascular system's state.

By Shtange's test high endurance was registered in 8% of students. This indicator was the least, comparing with other. Indicator "above average" was found in 21% and average level – in 32% of students. Tests for breath pause showed that 26% of students had level below average. 13% had low indicator. It witnesses about unsatisfactory respiratory system's state. The results of students' physical fitness assessment are given in table 2.

Physical fitness (PF) is one of the most important directions of students' physical education. Physical fitness testing showed confidently significant indicators of students (see table 3).

Analysis of the received results showed the highest

**Table 1.** Criteria for first year students' physical fitness assessment

Control exercises	Normative, points				
	5	4-	3-	2	1
100 meters' run, sec.	13.2	13.6	13.8	14.2	14.8
12 minutes' run	2600	2500	2400	2300	2100
Long jump from the spot, cm	250	240	225	210	190
Chin ups, quantity of times	12	10	8	6	4
Forward torso bending in sitting position, cm	19	16	13	10	7
Torso rising from lying position in sitting during 1 minute, quantity of times	52	48	44	40	35

**Table 2.** Distribution of first year students by physical condition indicators

Assessment blocks	Functional level				
	High (%)	Above average (%)	Average (%)	Below average (%)	Low (%)
Quetelet index	6%	16%	38%	26%	14%
HBR, b.p.m.	3%	14%	61%	15%	7%
Rouffier's index	0%	10%	28%	48%	14%
Shtange's test	8%	21%	32%	26%	13%

**Table 3.** Distribution of first year students' distribution by physical fitness

Levels	High (%)	Above average (%)	Average (%)	Below average (%)	Low (%)	
Mark	5	4	3	2	1	0
Exercise	5%	4%	12%	18%	40%	21%
100 m run, sec.	6%	4%	15%	20%	39%	16,00%
12 minutes' run	4%	6%	20%	32%	26%	12%
Long jump from the spot, cm	8%	5%	12%	18%	28%	29%
Chin ups, quantity of times	5%	3%	21%	26%	31%	14%
Forward torso bending in sitting position, cm	0%	2%	9%	18%	40%	31%
Torso rising from lying position in sitting during 1 minute, quantity of times						

results in power exercises in 8% of students (chin ups more than 12 times). In other exercises (for quickness, endurance, strength and flexibility) we registered low indicators.

Analysis of table 3 indicators in 100 meters' run showed the following levels: 5% high level; 4% - above average; 12% - average; 18% - below average and low level - 61%.

In exercise for endurance (12 minutes' run) the levels were as follows: 6% - high; 4% - above average; 15% - average; 20% - below average and low level - 55%.

In speed-power exercise (long jump from the spot) high level belonged to 4%; above average – 6%; average - 20%, below– 32%; low level– 38%.

In exercise for strength (chin ups on high horizontal bar) shows the following: 8% - high level; 5% - above average; 12% average level; 18% - below average and 57% low level.

Exercise (torso rising from lying position in sitting during 1 minute) demonstrated: 5% - high level; 3% - above average; 21% average level; 26% below average level and 45% - low level.

In exercise for flexibility (forward bending in sitting position) the results were as follows: 2% level above average; 9% - average level; 18% - below average level and 71% - low level. The main reason of low efficiency is absence of special physical qualities in students.

We found that for 4 months of academic year a number of vitally important physical condition's functional indicators reduced: Rouffier's test – 62%, Shtange's test – 39%. Besides, the tendency to reduction of indicators was detected in the following: 100 m run (79% had below average and low levels) 12 minutes run – (75% had below average and low levels); long jump from the spot 70% had below average and low levels; chin ups 75% - below average and low levels; torso rising in sitting position from lying – 71% - below average and low levels; forward torso bending in sitting position – 89% had below average and low levels.

Thus, control testing showed negative dynamic of students' physical fitness (those, who trained once in two weeks by traditional program).

### Discussion

Results of our studies prove and supplement the data of different authors about dynamic of students' physical condition and physical fitness weakening [5, 16]. We found low levels of long jump from the spot (38%) and Rouffier's test (14%) indicators. It is a proof of other researches' results about reduction of these indicators [1, 2]. Our research also proves the data of authors [15, 19], about Quetelet index's correspondence to normosthenic body composition. Besides, there are cases of body mass deficit or excessive body mass. We agree with the author that students' physical qualities reduce [3]. In our work we also found low indicators: "quickness" – 61%; "endurance" – 55%; "speed-power qualities" – 38% and "flexibility" - 71%.

Our data supplement information of authors [5, 8, 12, 16] about low dynamic of students' physical condition and fitness during all period of study. We found that students' physical condition (41%) and physical fitness (76.35%) were at low and below average levels. Thus we confirm the data of other research about satisfactory levels [25].

The received by us data prove the following: acuteness of problem of students' motor deficit [4, 6, 14, 17]; search of methods of students' physical condition and fitness improvement [13, 21, 27].

In our opinion the main reasons of students' weak physical condition and fitness during their study are the following: limited quantity of curriculum physical culture lessons; absence of students' demand in systemic physical exercises' practicing; students' low motivation for physical education; absence of interest in physical culture in free time; health worsening before entering university; imperfectness of school physical education process.

## Conclusions

Worsening of students' physical condition and physical fitness witnesses that there is need in reviewing of the existing approaches to organization of physical education system. It is necessary to enlarge the volume of compulsory physical education classes. It can be

realized at the account of the following: optional classes; physical culture practicing in free time; everyday morning exercises, sport games.

## Conflict of interests

The author declares that there is no conflict of interests.

## References

- Belykh SI. Health, physical education and physical development of students in historically and personally developing paradigm. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013;5:7-12. doi:10.6084/m9.figshare.707091
- Belykh SI. Dynamics of physical and functional status of students in the experiment on approvals personality oriented physical education. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013;9:8-15. doi:10.6084/m9.figshare.749687
- Volkov VL. The ratio of different orientation in the process of development of physical abilities of the students of the 1st course. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2012;12:32-36.
- Golod N. Dinamika parametriv fizichnogo rozvitku i fizichnoi pidgotovlenosti studentok special'noi medichnoi grupi pid vplivom rehabilitacijnoi programi [Dynamic of physical condition and physical fitness parameters of special health group girl students under influence of rehabilitation program]. *Moloda sportivna nauka Ukraini*, 2015;19(3):45 - 52. (in Ukrainian)
- Gulaj VS. Fizichna pidgotovlenist' ta zdorov'ia studentiv NUDPS Ukraini [Physical fitness and health of students of NUSTS of Ukraine]. *Naukovo-pedagogichni problemi fizichnoi kul'turi*, 2014;15(10):36 - 40. (in Ukrainian)
- Gurieieva AM, Klopov RV. Factor structure of physical state of female students of higher education institution. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014;7:7-11. doi:10.6084/m9.figshare.1015378
- Zubalij MD. *Derzhavni testi i normativi ocinki fizichnoi pidgotovlenosti naselennia Ukraini* [State tests and normative for assessment of Ukrainian population's health], Kiev; 1997. (in Ukrainian)
- Drachuk A, Romanenko V, Gudima S. Porivnial'na kharakteristika pokaznikiv fizichnogo stanu studentiv 1-4 kursiv VNZ Ukraini [Comparative characteristic of 1<sup>st</sup>-4<sup>th</sup> years students' physical condition in HEEs of Ukraine]. *Fizichna kul'tura, sport ta zdorov'ia nacii*, 2014;18(1):76 - 83. (in Ukrainian)
- Ivashchenko LLa. *Programirovanie zaniatij ozdorovitel'nyh fitnesom* [Programming of health related fitness trainings], Kiev: Scientific World; 2008. (In Russian)
- Kruevich TIu. *Kontrol' u fizichnomu vikhovanni ditej, pidlitkiv i molodi* [Control in physical education of children, adolescents and youth], Kiev: Olympic Literature; 2011. (in Ukrainian)
- Zakharova OM. *Navchal'na programa disciplini "Fizichne vikhovannia u vishchikh navchal'nikh zakladakh"* [Training program on discipline "Physical education in higher educational establishments"]. Kiev: MAUP; 2006. (in Ukrainian)
- Olchovik AV. Physical development and physical preparedness of students of special medical group with the disease of vegetative-vascular dystonia of mixed type. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015;3:38-45. doi:10.15561/18189172.2015.0306
- Pavlos' R, Svitlik V, Borovik Iu, Bulatov O. Stan fizichnoi pidgotovlenosti studentiv VNZ iak indikator iakosti ikhn'ogo fizichnogo vikhovannia [Physical fitness of HEE students as indicator of their physical education quality]. *Naukovo-pedagogichni problemi fizichnoi kul'turi*, 2016;15(3P):96 - 99. (in Ukrainian)
- Pidluzhniak O, Kolos O, Chkhan' A. Osoblivosti fizichnogo stanu studentiv fakul'tetu informacijnikh tekhnologij ta komp'iuternoї inzhenerii Vinnic'kogo nacional'nogo tekhnichnogo universitetu [Specific features of physical condition of information technologies and computer engineering faculty students of Vinnitsa national technical university]. *Fizichna kul'tura, sport ta zdorov'ia nacii*, 2015;19(1):335 - 340. (in Ukrainian)
- Prusik Krzysztof, Prusik Katarzyna, Iermakov SS, Kozina ZhL. Indexes of physical development, physical preparedness and functional state of polish students. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2012;12:113-122.
- Sergiienko VM. Zdorov'ia ta fizichnij rozvitok studentiv'koi molodi [Health and physical condition of student]. *Fizichne vikhovannia, sport i kul'tura zdorov'ia u suchasnomu suspil'stvi*, 2009;2:79 - 82. (in Ukrainian)
- Fomenko OV. Comparative analysis of physical fitness and motor coordination abilities of students of the first and second courses of higher educational institutions engaged in aerobics. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014;3:75-78. doi:10.6084/m9.figshare.938184
- Alfrey L, Gard M. A crack where the light gets in: a study of Health and Physical Education teachers' perspectives on fitness testing as a context for learning about health. *Asia-Pacific Journal of Health, Sport and Physical Education*, 2014;5(1):3 - 18.
- Bodnar IR, Stefanyshyn MV, Petryshyn YV. Assessment of senior pupils' physical fitness considering physical condition indicators. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2016; 20(6): 9-17. doi:10.15561/18189172.2016.0602
- Druz VA, Iermakov SS, Artemyeva GP, Puhach YI, Muszkietia R. Individualization factors of students' physical education at modern stage of its realization. *Physical education of students*, 2017; 21(1): 10-16. doi:10.15561/20755279.2017.0102
- Hnyp IY. Assessment of functional status and quality of life of students after acute respiratory viral diseases. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015;3:10-14. doi:10.15561/18189172.2015.0302
- Iermakov SS, Podrigalo LV, Jagiello W. Hand-grip strength as an indicator for predicting the success in martial arts athletes. *Archives of Budo*. 2016;12:179-86.
- Kozina ZL, Iermakov SS, Kadutskaya LA, Sobyani FI, Krzeminski M, Sobko IN, Ryepko OA. Comparative characteristic of correlation between pulse subjective indicators of girl students' and school girls' reaction to

- physical load. *Physical Education of Students*. 2016;20(4):24-34. doi:10.15561/20755279.2016.0403
24. Kudryavtsev MD, Kramida IE, Iermakov SS, Osipov AY. Development dynamic of healthy life style personality component in relatively healthy students. *Physical Education of Students*. 2016;20(6):26-33. doi:10.15561/20755279.2016.0603
25. Korol SA. Assessment of physical health and physical fitness of students of technical specialties of I course. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014;11:23-29. doi:10.15561/18189172.2014.1105
26. Osipov AY, Kudryavtsev MD, Kramida IE, Iermakov SS, Kuzmin VA, Sidorov LK. Modern methodic of power cardio training in students' physical education. *Physical Education of Students*. 2016;20(6):34-9. doi:10.15561/20755279.2016.0604
27. Pang B, Soong H. Teachers' experiences in teaching Chinese Australian students in health and physical education. *Teaching and Teacher Education*. 2016 May;56:84-93.
28. Sandercock GRH, Ogunleye A, Voss C. Associations between showering behaviours following physical education, physical activity and fitness in English schoolchildren. *European Journal of Sport Science*, 2016;16(1):128-134.
29. Skead NK, Rogers SL. Running to well-being: A comparative study on the impact of exercise on the physical and mental health of law and psychology students. *International Journal of Law and Psychiatry*. 2016;49:66-74.
- 

**Information about the author:**

**Fotynyuk V.G.**; <http://orcid.org/0000-0002-5483-7039>; [biohazard6666@ukr.net](mailto:biohazard6666@ukr.net); National Aviation University; pr. Komarova 1, 03058, Kiev, Ukraine.

---

**Cite this article as:** Fotynyuk VG. Determination of first year students' physical condition and physical fitness level. *Physical education of students*, 2017;21(3):116-120. doi:10.15561/20755279.2017.0303

The electronic version of this article is the complete one and can be found online at: <http://www.sportedu.org.ua/index.php/PES/issue/archive>

---

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/4.0/deed.en>).

Received: 19.02.2017

Accepted: 01.03.2017; Published: 10.05.2017