

**DETERMINING FACTORS AND WAYS TO IMPROVE
PHYSICAL EDUCATION FOR THE FIRST AND SECOND
YEAR FEMALE STUDENTS**

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Abstract: *This article determines factors and ways to improve the physical education of the first and second year female students. The data on the female students' health show the low body mass index, Erismann index, and other indicators of physical development. The research shows that the physical form of the female students does not meet the regulatory requirements. The authors offer a number of ways to improve physical education involving curriculum redesign, interactive methodology, motivation and self-training.*

Keywords: physical development, physical fitness, curriculum design, anthropometric measurements, pedagogical experiment.

The choice of the research topic is determined by the two following reasons. Firstly, experts lament a decline of health and level of students' physical preparedness during the past 10-15 years.¹ They observe the same trend during the period of students' study in high school.² Secondly, the current educational reforms place high demands on the professional training of future specialists, which requires an appropriate level of health and physical preparedness. Overall, the government pays special attention to the improvement of physical education in universities. In recent years, the Republic of Kazakhstan³

¹ V. B. Mandrikov, *Methodology of profiling students' physical education in medical universities*, Doctoral dissertation, Krasnodar, 2002, p. 98.

² S. A. Romanchenko, *Correction of the state of students' health in the process of physical training*, Author's abstract of doctoral dissertation, St. Petersburg, 2006, p. 20.

³ *The Concept for Development of Physical Culture and Sports of the Republic of Kazakhstan until 2025*, Approved by the Decree of the President of the Republic of Kazakhstan dated January 11, No. 168, Astana, 2016.

has adopted a new program of physical education for schools as part of the development plan for physical culture and sports.⁴

The relevance of the study is related to the expansion of the methodology of examining, evaluating and improving physical education for the first and second year female students. Secondly, it compares and contrasts the data of physical development and fitness of students of the mid-2000s to those of the late 1990s. Thirdly, it develops and experimentally tests methodical approaches to improve the educational process in physical education for the first and second year students.

The study is focused on the insufficient health condition of the university students. It offers solutions to solve the problem of insufficient physical development of the first and second year female students. It offers methodological approaches to improve their physical education. The purpose of the study is to theoretically and experimentally substantiate these methodological approaches. It also offers guidelines for improving the physical education of students following the determining factors.

The objectives of the study are (1) to identify the theoretical and practical foundation for improving the process of students' physical education, (2) to determine the initial level of physical development of the first and second year university students and compare it with the relevant data from the late 1990s, (3) to examine the planning of the educational process for the first and second year university students, and (4) to develop methodological approaches to improve the process of physical education and identify its determining factors.

The scientific and methodological literature devoted to the problem of physical education includes G. R. Avsaragov,⁵ O. O. Brilliantova,⁶ A. Yu. Anisimova,⁷ H. A. Muayed⁸ who offered the following ways to improve physical education in colleges:

⁴ *Physical culture. Typical training program for the discipline of „physical culture”*, Almaty, Al-Farabi KazNU, 2014, p.104.

⁵ G. R. Avsaragov, *Physical education of university students in different periods of the educational process*, Author's abstract of doctoral dissertation, Naberezhnye Chelny, 2010, p. 23.

⁶ O. O. Brilliantova, *Normalization of load volumes in academic classes in physical education for university students in different seasons of the year*, Author's abstract of doctoral dissertation, Krasnodar, 2009, p. 24.

⁷ A. Yu. Anisimova, *Organization and planning of students' physical training on the basis of indicators of the urgent and delayed training effect*, Author's abstract of doctoral dissertation, Izhevsk, 2009, p. 24.

⁸ H. A. Muayed, *Use of the means of aerobic orientation in increasing the effectiveness of athletics training: Based on the example of the female contingent of the faculty of physical education of the University of Libya*, Author's abstract of doctoral dissertation, St. Petersburg, 2000, p. 24.

a) to add cycling, aerobic exercises, stretching with props, exercises with weight; for senior students, it is recommended to conduct intense training classes before the session;⁹

b) to offer a balanced physical activity depending on the season: in the fall-general and strength endurance, power and speed-strength training; in winter-speed-strength, speed and coordination training; in spring-speed endurance, speed-strength and coordination training;¹⁰

c) to add motor and coordination exercises during the first or second classes, while physical strength exercises-at the end of the student's day;¹¹

d) physical education program should start with endurance training (running for medium and long distances) and proceed to speed-strength exercises (running for short distances, jumping, throwing).¹²

Methods for assessing students' physical development were discussed in the works of N. M. Yudina,¹³ V. V. Feofilaktov,¹⁴ and V. A. Klimenko,¹⁵ who noted:

a) the „profile” method should be used to evaluate students' physical condition;¹⁶

b) the individual evaluation method makes it possible to evaluate the individual's physical fitness without tests on the basis of anthropometric and pulsometric traditional indicators of physical fitness;¹⁷

c) tests „test yourself” and computer program „jump” should be used for the evaluation of students' physical qualities;¹⁸

As O. G. Zhigaryova,¹⁹ D. E. Egorov,²⁰ E. A. Shunyaeva²¹ suggest, the goal of evaluation is to offer ways to improve students' physical fitness:

⁹ G. R. Avsaragov, *Physical education of university students*, p. 15.

¹⁰ O. O. Brilliantova, *Normalization of load volumes in academic classes*, p. 10.

¹¹ A. Yu. Anisimova, *Organization and planning of students' physical training*, p. 12.

¹² H. A. Muayed, *Use of the means of aerobic orientation*, p. 15.

¹³ N. M. Yudina, *Method for determining and assessing the physical potential of university students*, Author's abstract of doctoral dissertation, Volga, 2006, p.23.

¹⁴ V. V. Feofilaktov, *The comparative analysis of innovative technologies of physical training of humanitarian university students on the basis of physical development monitoring*, Author's abstract of doctoral dissertation, Moscow, 2005, p. 23.

¹⁵ V. A. Klimenko, *Motion-oriented approach to the organization of the process of physical education of university students*, Author's abstract of doctoral dissertation, Khabarovsk, 2004, p. 23.

¹⁶ N. M. Yudina, *Method for determining and assessing the physical potential*, p. 23.

¹⁷ V. V. Feofilaktov, *The comparative analysis of innovative technologies*, p. 11.

¹⁸ V. A. Klimenko, *Motion-oriented approach*, p. 13.

a) to increase physical activity for the university students and to develop their motivation for different kinds of sports;²²

b) to offer more cyclic kinds of sports activities (jogging and cross-country skiing) and exercises with weights;²³

c) to apply individual approaches to the physical training of the students with low endurance and offer them only 60% of speed-strength exercises.²⁴

As S. I. Izaak,²⁵ M. V. Kuznetsova,²⁶ V. M. Yavorskiy²⁷ and A. S. Sokolov²⁸ discuss approaches to physical development, physical fitness, motor activity, students' incidence and management of these processes, they:

a) note that the physical development of most students is below average;²⁹

b) identify the deceleration process in Orenburg young people aged 17-21, manifested in the reduced strength of all muscle groups, lower height, body weight, chest width in young males;³⁰

c) note that students' physical education depends on professionalism of the instructor, the optimal level of physical activity, self-reliance, self-control, motivation and desire to achieve the goals³¹;

¹⁹ O. G. Zhigaryova, *Pedagogical ways of increasing the effectiveness of physical training of humanitarian university students*, Author's abstract of doctoral dissertation, Moscow, 2006, p. 24.

²⁰ D. E. Egorov, *The technology of gradually increasing the level of physical preparation of humanitarian university students*, Author's abstract of doctoral dissertation, Khabarovsk, 2000, p. 24.

²¹ E. A. Shunyaeva, *Physical education of university students with a low level of development of speed-strength qualities and endurance by means of athletics*, Author's abstract of doctoral dissertation, Moscow, 2007, p. 24.

²² O. G. Zhigaryova, *Pedagogical ways*, p. 11.

²³ D. E. Egorov, *The technology of gradually increasing*, p. 12.

²⁴ E. A. Shunyaeva, *Physical education of university students*, p. 15.

²⁵ S. I. Izaak, *The state of physical development and physical preparation of the younger generation of Russia and their correction based on the population monitoring technology*, Author's abstract of doctoral dissertation, St. Petersburg, 2006, p. 45.

²⁶ M. V. Kuznetsova, *Peculiarities of the physical development of the student youth of the Orenburg region*, Author's abstract of doctoral dissertation, Orenburg, 2005, p. 24.

²⁷ V. M. Yavorskiy, *Management of the physical state of pedagogical university students*, Author's abstract of doctoral dissertation, Khabarovsk, 2009, p. 24.

²⁸ A. S. Sokolov, *Management of the physical preparation of students on the basis of the automated dynamic control system*, Author's abstract of doctoral dissertation, Krasnodar, 2008, p. 23.

²⁹ S. I. Izaak, *The state of physical development and physical preparation*, p. 40.

³⁰ M. V. Kuznetsova, *Peculiarities of the physical development*, p. 15.

³¹ V. M. Yavorskiy, *Management of the physical state of pedagogical university students*, p. 12.

d) reveal the deterioration of the morphological and functional health of applicants for the period of 1992-2000. It is observed that the applicants with lower height and insufficient weight have lower levels of physical development.³²

Foreign scientific and methodological literature on the topic include the works of A. Marinho et al,³³ J. Pereira et al,³⁴ V. Druz et al,³⁵ who studied the problem of physical competence as well as the methods of teaching and motivation for sports. They observed that:

a) students considered themselves more competent in such aspects of physical education as professional, ethical, theoretical,³⁶

b) exercises with high rates of repetitive movements are the most effective for training athletics; instructors should offer relevant alternative exercises for students with different levels of physical development;³⁷

c) individual approaches should be applied to the choice of sports depending on the physiology and adaptive behavior of the student,³⁸

Foreign researchers V. C. Filho et al,³⁹ D. Yaliz Solmaz and C. Bayrak,⁴⁰ A. Praxedes et al,⁴¹ E. Abildsnes et al,⁴² B. Hertz et al,⁴³ also

³² A. Praxedes, J. Sevil, A. Moreno, F. del Villar, L. Garcia-Gonzalez, „Levels of physical activity and Motivation in university students. Differences in terms of academic discipline linked to physical-sports practice”, in *Journal of Sport and Health Research*, no. 8 (3), 2016, pp. 191-204.

³³ A. Marinho, P. M. dos Santos, M. N. Manfro, J. P. Figueiredo, V. Z. Brasil, „Brazil Reflections about outdoor adventure sports and professional competencies of physical education students”, in *Journal of adventure education and outdoor learning*, no. 17 (1), 2017, pp. 38-54.

³⁴ J. Pereira, R. Araujo, C. Farias, C. Bessa, I. Mesquita, „Sport education and direct instruction Units: Comparison of student Knowledge Development in Athletics”, in *Journal of Sports Science & Medicine*, no. 15 (4), 2016, pp. 569-577.

³⁵ V. A. Druz, S. S. Iermakov, G. P. Artemyeva, Y. I. Puhach, R. Muszkieta, „Individualization factors of students' physical education at modern stage of its realization”, in *Physical Education of Students*, no. 21 (1), 2017, pp. 610-631.

³⁶ A. Marinho, P. M. dos Santos, M. N. Manfro, J. P. Figueiredo, V. Z. Brasil, „Brazil Reflections about outdoor adventure sports”, pp. 38-54.

³⁷ J. Pereira, R. Araujo, C. Farias, C. Bessa, I. Mesquita, „Sport education and direct instruction Units”, pp. 569-577.

³⁸ V. A. Druz, S. S. Iermakov, G. P. Artemyeva, Y. I. Puhach, R. Muszkieta, „Individualization factors of students' physical education”, pp. 610-631.

³⁹ V. C. Filho, K. S. da Silva, J. Mota, C. Beck, A. da Silva Lopes, „Physical activity Intervention for Brazilian students From Low Human Development Index Areas: A Cluster-Randomized Controlled Trial”, in *Journal of Physical Activity & Health*, no. 13 (11), 2016, pp. 1174-1182.

examined students' physical education and motivation and its determining factors. They advanced the research in the following ways:

a) studied the role of active exercises in the lifestyle of Brazilian students to notice increased participation in the sport clubs and gyms. The findings showed the growing popularity of active exercises;⁴⁴

b) investigated the impact of active games on the level of students' preparedness in physical education classes. Active sport games significantly improved students' physical development in the experimental group;⁴⁵

c) studied the significance of sports in free time of university students to find out that it became a priority for students as they often associate their professional success with a healthy lifestyle;⁴⁶

d) identified the differences in the amateur and professional sport groups of Norwegian students. Students who exercised for pleasure devote less time to physical activity per day and often have such unhealthy habits like excessive TV watching and irregular eating habits;⁴⁷

e) measured 24% moderate and 38.6% active physical activity of Appalachian students during the four-week study of sport activities.⁴⁸

⁴⁰ D. Yaliz Solmaz, C. Bayrak, „Affect on Character Development of Elementary Students of Physical Activity Games within Physical Education Lessons”, in *Hacettepe University Journal of Education*, no. 31 (4), 2016, pp. 644-656.

⁴¹ A. Praxedes, J. Sevil, A. Moreno, F. del Villar, L. Garcia-Gonzalez, „Levels of physical activity and Motivation in university students. Differences in terms of academic discipline linked to physical- sports practice”, in *Journal of Sport and Health Research*, no. 8 (3), 2016, pp. 191-204.

⁴² E. Abildsnes, G. Rohde, S. Berntsen, T. H. Stea, „Fun, influence and competence-a mixed methods study of prerequisites for high school students' participation in physical education”, in *BMC Public Health*, no. 17 (1), 2017, p. 241.

⁴³ B. Hartz, E. Winters, M. Grim, R. Linguak Petosa, „Prospective Relationship Between Social Cognitive Variables and Leisure Time Physical Activity”, in *American Journal of Health Education*, no. 48 (2), 2017, pp. 129-135.

⁴⁴ V. C. Filho, K. S. da Silva, J. Mota, C. Beck, A. da Silva Lopes, „Physical activity Intervention for Brazilian students”, pp. 1174-1182.

⁴⁵ D. Yaliz Solmaz, C. Bayrak, „Affect on Character Development of Elementary Students”, pp. 644-656.

⁴⁶ A. Praxedes, J. Sevil, A. Moreno, F. del Villar, L. Garcia-Gonzalez, „Levels of physical activity”, pp. 191-204.

⁴⁷ E. Abildsnes, G. Rohde, S. Berntsen, T. H. Stea, „Fun, influence and competence”, p. 241.

⁴⁸ B. Hartz, E. Winters, M. Grim, R. Linguak Petosa, „Prospective Relationship Between Social Cognitive Variables”, pp. 129-135.

D. Curtis et al,⁴⁹ B. Vadasova et al,⁵⁰ D. Kenny and R. Adams⁵¹ studied the problem of students' physical development and the determining factors, in particular:

a) the impact of racial and other socio-economic factors on the body mass index of students. Afro-American students had a better body mass index than European students. However, they also observed that the body mass index is often marked by early life's socio-economic challenges for Afro-Americans rather than for Europeans;⁵²

b) the body mass index as a risk factor in overweight students of Slovakia. A direct relationship between the body mass index and selected body indicators has been revealed. The most accurate indicator of overweight condition and obesity in youth is waist circumference;⁵³

c) the relationship between eating attitudes, body mass index, age, and gender in Australian students. The body mass index was lower in females with the most distinctive profiles being BMI=16-17 (body mass indexes). These students suffered from a lack of appetite and dissatisfaction with their body. The research suggests that sociocultural components have etiological significance in determining the relationship between food intake and the body mass index.⁵⁴

Material and methods

The study was conducted on the basis of K. Zhubanov Aktobe Regional State University (K. Zhubanov ARSU) with the first and second year female students during 2015-2016, 2016-2017 academic years in three stages. The first stage took place in September-October

⁴⁹ D. S. Curtis, T. E. Fuller-Rowell, S. N. Doan, A. E. Zgierska, C. D. Ryff, „Racial and socioeconomic disparities in body mass index among college students: understanding the role of early life adversity”, in *Journal of Behavioral Medicine*, no. 39 (5), 2016, pp. 866-875.

⁵⁰ B. Vadasova, P. Cech, V. Smerecka, J. Junger, M. Zvonar, P. Ruzbarsky, „Overweight and obesity in Slovak high school students and body composition indicators: a non-randomized cross-sectional study”, in *BMC Public Health*, no. 16, 2016, p. 808.

⁵¹ D. Kenny, R. Adams, „The relationship between eating attitudes, body-mass index, age, and gender in Australian university- students”, in *Australian Psychologist*, no. 29 (2), 1994, pp. 128-134.

⁵² D. S. Curtis, T. E. Fuller-Rowell, S. N. Doan, A. E. Zgierska, C. D. Ryff, „Racial and socioeconomic disparities”, pp. 866-875.

⁵³ B. Vadasova, P. Cech, V. Smerecka, J. Junger, M. Zvonar, P. Ruzbarsky, „Overweight and obesity in Slovak high school students”, p. 808.

⁵⁴ D. Kenny, R. Adams, „The relationship between eating attitudes, body-mass index, age, and gender”, pp. 128-134.

2015 and was devoted to the study of scientific and methodical literature based on the analytical method.

The second state took place in November 2015-May 2016 to address the objectives of the study. The following indicators were used: the vital capacity of the lungs, the timed respiratory capacity, the circumference of the chest (pause, inhalation and exhalation), carpal dynamometry, blood pressure, heart rate, body length, body weight to determine the level of physical development.

The timed respiratory capacity was tested according to the following method. The subject held the breath after deep inhale after three breaths depth of full capacity. A clamp was placed on the nose or the subject clamped his nose with his fingers. The stopwatch was used to record the time. Immediately after the resumption of breathing, the pulse was taken. The test could be taken twice with intervals of 3-5 minutes. The test of the timed respiratory capacity with holding breath after exhaling. Breath was held after a full exhale, which was done after three breathes at 3/4 full breath.⁵⁵

Body weight was taken by an electronic weight BET-150 „Weight-to (A1)”. Body height was measured by a height meter RM-1 „Diakoms”. Weight to height Kettle index (BMI) was calculated by $\text{weight/height index} = \text{body weight}/P^2$.⁵⁶

We measured the circumference of the chest with a centimeter tape during measuring pause, inhale and exhale. The chest proportion index (Erismann index): $\text{chest in pause (cm)} - (\text{height (cm)})/2$.⁵⁷

The heart rate was measured by taking pulse for 10 seconds and multiplying it by 6.⁵⁸

To determine the level of physical preparedness, the following tests were used: running 100 m (sec), running-walking, 6 min (meters), standing long jump (cm), upper body lifts from the laying on the back position for 1 min (the number of times), forward bend (cm).⁵⁹

The second stage of the study covered 370 first year female students and 350 second year female students of K. Zhubanov ARSU.

⁵⁵ B. Kh. Landa, *The method of the complex assessment of physical development and physical preparation*, Moscow, Sovetskiy Sport, 2006, p. 208.

⁵⁶ *Ibidem*.

⁵⁷ *Ibidem*.

⁵⁸ S. V. Yakhontov, T. V. Lasukova, *Physiology. Methods for assessing the functional state of the cardiovascular system*, Tomsk, Tomsk State University, 2007, p. 38.

⁵⁹ *The Concept for Development of Physical Culture and Sports of the Republic of Kazakhstan*.

The syllabi, programs and class timetables were analyzed to study the planning of the Department of Physical Education. The authors also used the recommendations of experts.⁶⁰

The third stage of the study in the form of the experiment took place during 2016-2017 academic years at K. Zhubanov ARSU. Following the recommendations of Yu. D. Zheleznyak and P. K. Petrov,⁶¹ the pedagogical experiment was planned. The purpose of the formative experiment was to develop, examine and test methodological approaches to improve students' physical education and describe the determining factors. 20 second year female students participated in a consecutive experiment.

The following research methods were applied: analysis of scientific and methodological literature; analysis of documents; pedagogical observation, pedagogical experiment, statistics methods, anthropometric measurements, control tests. For statistical analysis of the data, we used the arithmetic mean, standard deviation, arithmetic mean error, t-criteria, and probability error.

Results

Table 1 and Figure 1 show the data of the physical development of the first and second year female students.

Table 1: Indicators of physical development of the first and second year female students

Indicators	1 year			2 year			Increase, %	t	P
	n =			n =					
	X	S	M	X	S	m			
Body length, cm	160.8	5.2	0.27	162.6	3.6	0.48	1.1	3.27	<0.01
Body weight, kg	53.1	8.08	0.42	58.4	7.77	0.40	9.9	9.13	<0.01
BMI kg / m ²	20.5	0.86	0.04	22.3	0.92	0.05	8.8	thirty	<0.01
Chest circumference (in pause), cm	82.2	2.33	0.12	84.6	3.33	0.17	2.9	11.4	<0.01
Chest circumference (inhale), cm	85.3	3.31	0.16	88.2	4.34	0.20	3.0	11.2	<0.01
Chest	79.1	3.34	0.17	81.2	4.40	0.21	2.7	7.8	<0.01

⁶⁰ G. A. Vasilkov, „Planning of the educational process, methodical equipment for its implementation”, in *Physical Culture in School*, no. 8, 1990, pp. 11-15.

⁶¹ Yu. D. Zheleznyak, P. K. Petrov, *Fundamentals of research and procedure development activities in physical culture and sports*, Moscow, Academia, 2002, p. 264.

circumference (exhale) cm									
Erismann index, cm	1.8	0.3	0.02	3.3	0.3	0.02	83.3	5.3	<0.01
Stange test on inhale, sec	44.3	1.3	0.2	47.8	1.0	0.18	7.9	13.4	<0.01
Genche test on exhale, sec	33.2	0.83	0,15	37.8	0.5	0.09	13.8	27th	<0.01
Heart rate, bpm	78.2	0.67	0.12	74.1	0.83	0,15	5.5	29.9	<0.01

Table 1 and Figure 1 demonstrate that all indexes of the physical development of the second year students were higher. In addition, the second year students were taller than the first year students by 1.8 cm (1.1%), their body weight was 5.3 kg (9.9%) more.

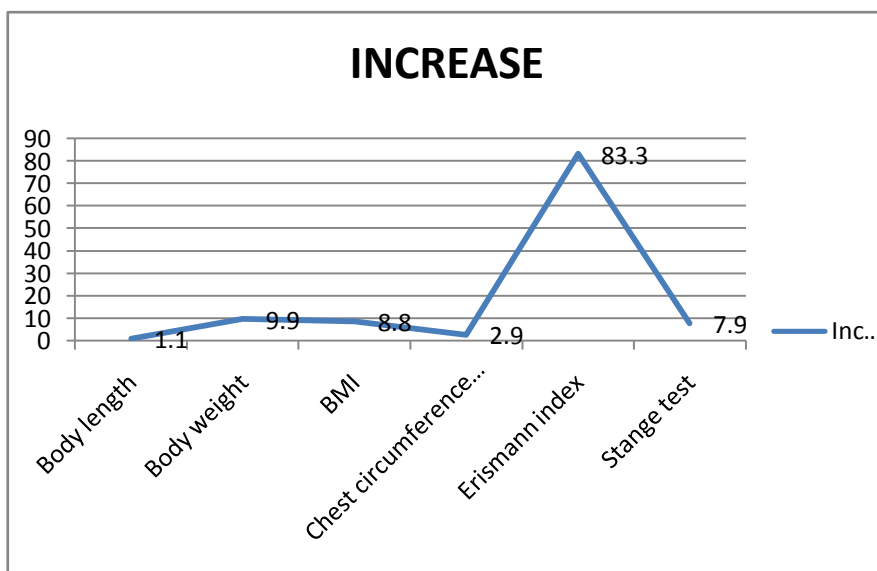


Figure 1: Indicators of the physical development of the first and second year students

The second year female students had BMI 1.8 kg/m² higher. However, it should also be noted that 8.6% of the first year female students (32 out of 371) had a body weight deficit below 18.4 kg/m². So the differences were statistically significant (P<0.01).

The second year students had a 2.4 cm (2.9%) larger chest circumference (in pause) compared to the freshmen. So the first year students had lower Erismann index indicated by the narrow chests.

The Stange test for inhale was 3.5 seconds (7.9%) longer for second year students. The results for students of both years correspond to the „satisfactory” level. The Genche test for exhale of the second year students also demonstrated higher results (4.6 sec-13.8%). The differences were statistically significant ($P < 0.01$). These results also correspond to the „satisfactory” level.

The heart rate of the second year students was 4.1 beats/min (5.5%) lower compared to that of freshmen.

Table 2 and Figure 2 illustrate relatively higher results of the second year students

Table 2: Physical development of the first and second year female students

Indicators	1 year			2 year			Increase, %	t	P
	n =			n =					
	X	S	M	X	S	m			
Run 100 m, s	18.89	1.83	0.09	17.18	1.32	0.06	9.9	15.5	<0.01
Run-walk, 6 min, m	940.1	28.5	1.48	1070.4	38.3	1.99	13.9	52.5	<0.01
Standing long jump cm	164.9	15.0	0.78	172.4	12.4	0.64	4.5	7.5	<0.01
Bend forward cm	6.2	0.71	0.04	10.8	0.95	0.05	74.1	76.6	<0.01
Upper body lifts	23.5	5.0	0.26	36.2	3.6	0.19	54.0	39.6	<0.01

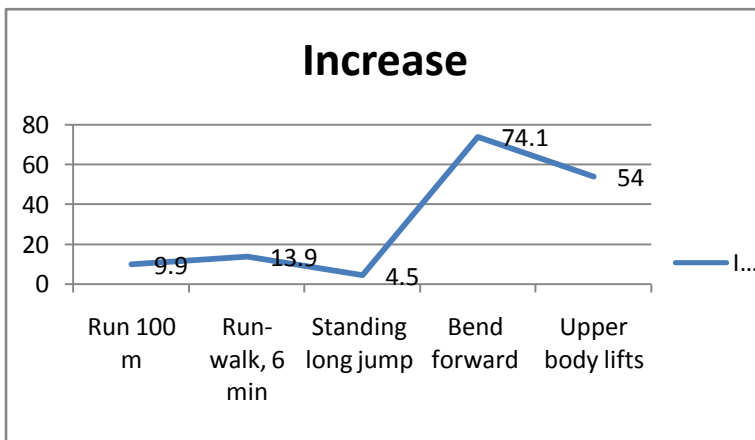


Figure 2: Increase in the results of physical fitness of the first and second year students

Compared to the first year students, the second year students showed 1.71 sec (9.9%) ($P < 0.01$) better result in 100-m run (speed quality). In the 6 min run-walk (endurance) the second year students performed 130.3 m (13.9%) longer distance in the specified time limit ($P < 0.01$). The results are consistent with the "satisfactory" level in both tests.

The results of standing long jump (speed-strength) were more positive. Thus, the second year students jumped 7.5 cm (4.5%) ahead of freshmen and showed the „good” level while freshmen performed at the „satisfactory” level ($P < 0.01$).

The bend forward test showed that the difference between the first and second year students was 4.6 cm (74.1%). The results were at the „satisfactory” level ($P < 0.01$).

The second year students tested 12.7 better (54%) than the first year students in the body lifts at the „satisfactory” level ($P < 0.01$).

Some students showed the „unsatisfactory” level: 26.9% failed a standing long jump, 26.9%-100 m run, 43.3%-a running jump, and 25.3% failed upper body lifts.

We have compared the test results for the students of 2015 and 1998 (Table 3).

Table 3: Indicators of physical development of the first year female students in 1998 and 2015 at K. Zhubanov ARSU

No. p / p	Indicators	Year				Increase, %
		1998		2015		
		n =	n =	n =	n =	
		X	S	X	S	
1	Run 100 m, s	17.1	1.76	18.89	1.83	10.5
2	Standing long jump	165.4	11.2	164.9	15.0	0.3
3	Upper body lifts for 1 min, times	30.3	8.0	23.5	5.0	28.9

Table 3 shows that the results of 2015 are higher than those of 1998. The 100 m run time was higher by 1.79 seconds (10.5%). However, standing long jump result was 0.5 cm longer in 1998 (0.3%). There is a significant difference in lifts results (6.8 times-28.9%).

We have analyzed the annual schedule, implemented by teachers of physical training at K. Zhubanov ARSU. Based on the frequency and content of physical education classes we can assume that the curricula

emphasized certain physical exercises. At the beginning of semesters 1-3 (H1) students are engaged in the athletics component to develop speed and speed-strength. The gym exercises develop students' strength. The throw test as well as middle and long distance runs within the athletics section must develop students' speed-strength and endurance. Such sports games like football, volleyball, and basketball develop agility, speed, speed-strength, special endurance and peripheral vision. Various gymnastic exercises (tumbling, parallel bars, horizontal bar, jumping over a stand) develop such physical qualities as flexibility, coordination, strength, and endurance.

In the second half of the year (2.4 semesters), the first section of physical education curriculum is devoted to ski training to develop endurance. It also includes target shooting to develop visual acuity and accuracy.

Analysis of all the physical exercises in the curricula indicates that it often matches the requirements in the professional training of students. How is curricula implemented? What is the realistic state of implementation of the planned material? To answer the questions we needed to „*identify the means and methods of students' physical training*” and for this purpose we conducted observation in the physical education class for the first and second year students enrolled in biology to find out that classes did not match the curricular in the following ways.

The middle and long distance runs were rescheduled from 17 to 24 class of the athletics section due to the rainy weather. Classes were moved from the stadium to the gym. Instead of running, the students did warm-up exercises and played volleyball. Thus, the experiment lacks the data to solve the problem of the development level of aerobic and anaerobic endurance because, as the observation shows, the curricula are not strictly followed.

The instructors did not employ interactive teaching methods. Since the gym is usually overcrowded, they often used the demonstration method of teaching rather than team, module and other innovative methods.

The above-mentioned factors (bad weather, the lack of funds, inadequate teaching methods) do not allow students to vary physical exercises and fully develop their physical skills. As a result of such drawbacks, students' physical development, in our opinion, is substandard leaving much to be desired.

Analyzing the results of the study of students' physical development and physical fitness, we have proposed the following

methodological ways to improve their physical education and physical development:

1. to adjust the curricula for physical education and to include relevant activities in case of bad weather conditions;
2. to add aerobics to the „general physical preparation” because aerobic exercises strengthen the muscles and no special equipment is needed;
3. to include Strelnikova breathing exercises⁶² (to develop the chest muscles and cardio system);
4. to motivate students by using personal cards and to follow personal progress;
5. to arrange physical activities as circular training aimed at the development of endurance and strength;
6. to add self-training hours to the curriculum as a required component of the credit system. The students can perform a set of exercises for the development of high-speed, speed-strength, endurance, and flexibility. They also can study such topic as the assessment of physical development and management of physical activity.

Table 4 shows the dynamics of students’ physical development during the experiment. As shown in Table 4, after the experiment, all students’ indicators had positive change. Thus, the body to height ratio increased by 1.65%, the body to weight ratio-9.2%, and the body mass index-4.8%.

Table 4: Dynamics of indicators of students’ physical development in the pedagogical experiment

Indicators	Prior to the experiment			After the experiment			Increase, %	t	P
	n =			n =					
	X	S	m	X	S	m			
Body height, cm	162.8	3.0	0.69	165.5	2.4	0.55	1.65	3.01	<0.01
Body weight, kg	54.2	1.35	0.31	59.2	1.62	0.38	9.2	10.2	<0.01
BMI kg / m ²	20.7	0.32	0.07	21.7	0.59	0.13	4.8	2.43	<0.05
Chest circumference (in pause), cm	83.8	1	0.23	85.9	0.75	0.17	2.5	7.24	<0.01
Erismann index, cm	2.4	0.24	0.06	3.15	0.22	0.05	31.2	9.3	<0.01
Stange test on the inhale, cm	45.8	0.7	0.16	51.2	0.62	0.14	11.7	25.7	<0.01

⁶² A. N. Strelnikova, „Inhalation treatment”, in *Inventor and innovator*, no. 18, 1975, pp. 21-22.

Genche test on the exhale, cm	35.3	2.11	0.49	46.2	1.11	0.26	30.8	19.8	<0.01
Heart rate, bpm	77.6	1.05	0.24	72.2	0.65	0.15	7.4	19.2	<0.01

The body mass index change was statistically significant at $P < 0.05$, and in other cases-at $P < 0.01$. The data of BMI corresponded to normal weight before the experiment. The Erismann index increased by 31.2%. Prior to the experiment the results were low and substandard ($P < 0.01$).

In the Stange tests (inhale) and Genche tests (exhale) of the respiratory capacity, the volume increased by 11.7% and 30.8%. The positive change of the heart rate was 7.4% ($P < 0.01$).

Table 5 shows the dynamic of changes in the female students' physical form during the experiment. As seen in Table 5, after the experiment, the female students also had good progress. Thus, 100 m run results improved by 6% ($P < 0.01$). Prior to the experiment the results were „satisfactory” and after the experiment-„good”. In 6-minute run-walk an increase was 12.2%. The „satisfactory” level improved to „excellent”.

Table 5: Changes in the female students' physical form in the pedagogical experiment

Indicators	Prior to the experiment			After the experiment			Increase, %	t	P
	n =			n =					
	X	S	m	X	S	M			
Run 100 m, s	17.24	0.43	0.1	16.2	0.40	0.09	6.0	8.0	<0.01
Run-walk, 6 min, m	1,064.2	16.2	3.76	1,194.2	11.1	2.58	12.2	28.2	<0.01
Standing long jump, cm	172.3	3.49	0.81	187.4	2.89	0.67	8.7	14.3	<0.01
Forward bends	11.4	0.73	0.17	16.5	0.59	0.14	44.7	23.2	<0.01
Upper body lifts, times	37.2	1.7	0.39	43.5	1.4	0.32	16.9	12.6	<0.01

The standing long jump results improved by 8.7% to correspond to the „excellent” level. The „bend forward” test produced the greatest gain-44.7% (the result of evaluation changed from „satisfactory” to „good”). Upper body lifts showed an increase of 16.9% (prior to the experiment, the results were „satisfactory”, after the experiment-„excellent”).

Discussion

All indicators of physical development of the second year students were higher. The second year female students had 1.8 kg/m² higher body mass index. It should be noted that 8.6% of the first year female students (32 out of 371) were underweight with the BMI being below 18.4 kg/m². On the basis of the data obtained in earlier studies, we agree with M.V. Kuznetsova's conclusion that „*in Orenburg region 25% of females aged 17-21 years have insufficient physical development due to the low weight in each of the age groups studied*”.⁶³

According to D. Kenny and R. Adams,⁶⁴ females had lower BMI. The most distinctive profiles have been identified by BMI=6-17. Our experimental data differed from M. V. Kuznetsova's findings in the lower than 18.4 kg/m² body mass index of the participants. In contrast to the data of the research of D. Kenny and R. Adams, the body mass index in the surveyed students was higher-20,5-22,3.

Students passed standard tests in all indicators of physical fitness with satisfactory grade. There were those who failed to pass: in the female 100 m run-26.9%, upper body lifts-25.3%. Analysis of the data allows us to agree with E. A. Shunyaeva's statement: „*50% of female participants failed in 100 m run, 56% – in standing long jumps, and 50%-in upper body lifts*”.⁶⁵ The results of our experiment are consistent with the above-mentioned research. Compared to E. A. Shunyaeva's study, our experiment produced little bit better results: 26.9% failed 100 m run, 43.3%-standing long jumps, and 25.3% – lifts.

The data demonstrate deterioration in test results of the first year female students of 2016 compared with those of 1998 in 100 m run, standing long jumps, and upper body lifts. Our experiment results are consistent with V. V. Feofilaktov's conclusion that „*many indicators (100 m run and others) are significantly lower in current students*”.⁶⁶

Urgent curriculum redesign is required to improve students' physical development. Similar conclusion was made by O. O. Brilliantova who notes „*the growth of the total index of students' physical development occurs mainly due to: in the fall-the power, speed and overall endurance training; speed and power exercises; flexibility exercises; in winter-coordination, speed*

⁶³ M. V. Kuznetsova, *Peculiarities of the physical development*, p. 15.

⁶⁴ D. Kenny, R. Adams, „The relationship between eating attitudes, body-mass index, age, and gender, pp. 128-134.

⁶⁵ E. A. Shunyaeva, *Physical education of university students*, p. 15.

⁶⁶ V. V. Feofilaktov, *The comparative analysis of innovative technologies*, p.16.

and power-speed exercises; flexibility exercises, in spring-speed, endurance training; speed, speed-strength and coordination exercises”.⁶⁷ Our experiment adds to O. O. Brilliantova’s observation that in winter skiing develops endurance.

The results are important because they identify the ways of curriculum redesign and teaching methods improvement aimed at optimizing the physical education of students.

The research is theoretically significant because it examines the aspects of physical development and physical preparedness as well as compares the data on the physical form of the first and second year students of ARSU. The research also offers practical advice on how to improve the physical education curricula and teaching methods.

Conclusions

The main scientific and theoretical premises for improving the process of physical education are as follows:

- the need for standardization of physical activity in different periods of the academic year; the efficient training routine;
- the application of physical development evaluation (individual profile, typological scale);
- a decrease in the level of physical development of modern students; the relationship between the body mass index and other components.

The study revealed an insufficient level of the first year female students’ physical development compared to the second year students, especially in the body mass index and the Erismann index. Most of the students have the „satisfactory” level of physical fitness. Some students performed at „unsatisfactory” level-in the range of 29.3% to 43.3%.

The study revealed contradictions between planned activities in the curriculum and implementation (due to the bad weather), the lack of interchangeable means and methods, the absence of active learning techniques such as circular training. It reduced the cumulative effect of the conducted studies.

Methodological ways of improving the physical form of students should include interchangeable methods of physical education, power aerobics for the females, breathing exercises, circuit training method, individual cards of student progress, self-training for students.

⁶⁷ O. O. Brilliantova, *Normalization of load volumes in academic classes*, p. 13.

The pedagogical experiment confirmed the effectiveness of the suggested approaches and resulted in the positive changes of students' physical development and physical preparedness.