Application of Differentiated Physical Training Programs and Modern Technologies by Students of Medical Universities for Independent Physical Exercises

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Abstract: Purpose of the study. To base the effectiveness of the application of differentiated physical training programs and modern technologies for independent physical exercises by students of medical universities. Comparing the results of control tests in the control group (CG) and experimental group (EG), the growth rates in pull-ups on a crossbar, standing long jumps, sit-ups, a flexibility test, running 2000 m, 3000 m, 100 m are reliably significant ($P \leq 0.05$). When comparing control tests in CG at the beginning and end of the academic year as a result of statistical processing ($P \leq 0.05$), the growth rates were reliably significant in standing long jumps, running 2000 and 3000 m, for all other indicators – reliably insignificant ($P \leq 0.05$); in EG, the growth rates were reliably insignificant ($P \leq 0.05$) were found only in the flexibility test. In EG, the number of non-certified significantly decreased, unlike in CG. Conclusions. The use of differentiated physical training programs developed on the basis of modern technologies made it possible to form the needs of medical university students in the use of physical exercises in everyday life to increase the level of physical fitness and the possibility of participating in mass sports events.

1 INTRODUCTION

In the curriculum, classes in medical universities in the discipline "Applied physical culture and sports" are designed for 9 semesters in the amount of 328 academic hours. In each academic year, the schedule of training sessions on the subject of "Physical Culture" may change the interval of their conduct, and the frequency may also be different. The physical activity of students in physical culture is provided by one training session per week. The amount of workload stated by the curricula is completely insufficient. Moreover, the duration of training sessions is reduced due to remote locations of training bases, unfavorable environmental conditions, compliance with sanitary and hygienic requirements after classes, etc. The curriculum provides for the implementation of control standards and requirements. Many Russian and foreign experts have noted that a decrease in the number of hours of physical education in universities leads to a decrease in the level of physical fitness (Akishin, 2016; Gorelov, 2010; Davydova, 2022; Ivanov, 2017; Izaak, 2016; Listkova, 2014; Severina, 2022). The research conducted by Russian and foreign scientists (Levushkin, 2013; Garina, Lepeshkina, Voronova,

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Shulgin, 2019; Kleevich, Strankovic, Czkordziewcz, Trkula-Petrovic, Jovanovic, Plazibat, Orsholik, Kurich, Verish, 2022; Naylor, Nettlefold, Race, Hoy, Ashe, Wharf-Higginsa, McKay, 2020) suggests a low level of physical fitness of students. According to experts (Listkova, 2014; Severina, 2022), the introduction of additional physical education classes in the process of physical education of students will compensate for their lack of physical activity. According to experts (Blinkov, 2021; Gorelov, 2010; Sevast'yanov, 2020; Bobkov, Antonova, Titushina, Akimova, Garina, Alatyreva, 2022), the required amount of physical activity per week for students aged 17-25 is 8-10 hours for classes in sections and independent studies in their free time.

According to Listkova M.L. (Listkova, 2014), in the conditions of the university, the expansion of the network of health and sports sections will not bring the desired results in increasing motor activity for most students, since up to 15-25 students can attend one section, which significantly limits the capacity.

To compensate for the above disadvantages of educational and sectional classes, such an extracurricular form of motor activity as independent classes of students in physical culture can be. The organization of these classes will allow you to diversify physical exercises, choose a convenient time for them, use an individual approach in solving physical education problems (Listkova, 2019; Maletin, 2019). The most common means of self-training in Russian and foreign universities are walking and running, swimming, cycling, exercise equipment, hiking, sports and outdoor games (Shchegolev, 2017; Codina, Pestana, Stebbins, 2020; Gierczyk, 2019; Vuˇckovi´c, Krejaˇc, Kajtna, 2022).

Most countries of the world comply with the prescriptions of the All-Russian Health Organization, implement programs to combat non-communicable diseases, create bicycle and treadmills in parks, horizontal bars in courtyards for self-training, and also organize World Running Day, Student Sports Day (Egorychev, 2017).

The Strategy 2030 project was adopted in 2020 and sets the task for the society - to increase the number of students engaged in physical culture among students. The All-Russian Sports Complex "Ready for Labor and Defense" has been introduced in the country, the purpose of which is to widely attract young people to independent physical exercises (Akishin, 2016).

Mobile technologies have great potential to facilitate the introduction of innovative teaching methods. A wide range of applications, a large amount of computing equipment, wireless communication makes a mobile device an effective tool for self-exercise (Gordeeva, 2018; Kliment'ev, 2018).

2 STUDY METHODS

For comparison, we took two extracurricular forms of classes: sectional and independent. The training sessions of sports training (general and special physical training) on "computer sports" correspond to the total number of hours per year of the physical training program developed by us for independent physical exercises. And also, the programs of sectional and independent classes include: athletics exercises, swimming, weight-lifting exercises, etc.

The training sessions on "computer sports" include: general physical training, special physical training, technical training, tactical training, theoretical training, psychological training. The total number of hours per year for students who study for more than a year at the initial training stage is allocated from 312 to 416 hours. When implementing an additional educational program of sports training, 20-30% of the total number of hours per year is allocated for general physical training; 5% for special physical training.

Training sessions on "computer sports" at the stage of initial preparation of the second year of study were conducted by a computer sports coach at the Department of Physical Culture with 2nd-year students at the I.M. Sechenov First Moscow State Medical University on the basis of the sports and recreation complex "Burevestnik" from September 2021 to May 2022.

146 hours a year, 4.6 hours a week were allocated for general and special physical training, according to the approved schedule by the Department of Physical Culture.

The control group (CG) consisted of students (18 men and 12 women) belonging to the main medical group, of different levels of physical fitness, engaged in sports disciplines such as combat arena and competitive puzzles. The age of the subjects is 19-20 years.

To enroll and transfer to groups at the training stage in the sport "computer sport", as well as to receive the current credit in the discipline "Applied physical culture and sport", students of the CG performed control tests at the beginning and end of the academic year, approved by the Department of Physical Culture.

Control tests on general physical fitness included: flexion-extension of the arms from the lying position (number of times) – women, pull-ups on a high crossbar (number of times) - men, sit-ups in 1 minute (number of times), standing long jumps (cm), leaning forward from standing position on gym bench (cm); running 2000 m (min. / sec.) – women, running 3000 m (min. / sec.) – men, running 100 m (sec.).

The general physical training program for esports athletes included swimming, athletics exercises, sports games, weight-lifting exercises.

Students attending sports sections at Sechenov University are exempt from classes in the discipline "Applied Physical Culture and Sports".

In the experimental group (EG), the subjects trained independently three times a week for one hour according to the program developed by us (108 hours) and under our guidance from September 2021 to May 2022. An additional 40 hours were also allocated for cross-country training, ski training, swimming and cyclocross.

The EG was composed of 2nd year students (18 men and 12 women) belonging to the main medical group, of different levels of physical fitness. The age of the subjects is 19-20 years.

A chat was created on the VKontakte social network to post material, additional information and feedback from the subjects. Links to self-monitoring diaries created in the Google Table were sent to personal emails; links to the Google "Rating" table, where places and points for each type of activity were distributed, as well as a rating of participants was built. Once every two weeks, students sent a video about their self-performance of physical exercises of the main part. Before starting the pedagogical experiment, the technique of each motor action was analyzed with the students.

The purpose of the physical training program is to form the needs of medical university students in the use of physical exercises in everyday life to increase the level of physical fitness and the possibility of participating in mass sports events.

The physical training program is designed for one academic year and consists of three levels. The physical exercises compiled for the program of the first level were performed with a fixed number of repetitions, and included a list of summing exercises that develop and strengthen certain muscle groups, preparing students to perform full–fledged exercises included in the list of norms of the All-Russian Sports Complex "Ready for Labor and Defense"; for the second and third levels - the maximum number of times and included a list of exercises, which are aimed at the development of basic physical qualities and require a student to have good physical fitness.

The physical training program was accompanied by a diary of self-control, a description of physical exercises, an illustration, a video recording of the technique of performing each motor action, a point-rating system.

In addition to performing basic exercises, you could get additional points for:

1) cross-country training, swimming, cross-country skiing and cyclocross;

2) participation in competitions in running, swimming, cross-country skiing, cyclocross at different distances included in the unified calendar of physical culture events in Russia;

3) participation in intra-university competitions in swimming, running and general physical training;

4) implementation of the GTO complex for gold, silver and bronze insignia.

For each completed physical exercise, a student received points, making their results in a specially created Google spreadsheet "Rating", confirming screenshots distances, competition reports, attached and stored in one of the storages (Yandex Disk, cloud Mail.ru, Google Drive).

Fitness bracelets and a phone with GPS were needed for cross-country, swimming, skiing and cyclocross. The following mobile applications were recommended for installation on the phone: Endomondo, Strava Cycling, iMapMyRIDE GPS, Strava, RunKeeper, Swimming Training, Swim Speeds, Skilanglauf-Technik, Ski Tracks.

Students taking part in the pedagogical experiment were exempted from classes in the discipline "Applied Physical Culture and sports".

3 STUDY RESULTS

At the stage of the pedagogical experiment, the indicators of the subjects in CG (preliminary tests and testing for transfer to groups at the stage of initial training) and in EG (preliminary and final assessments) obtained as a result of the control tests were compared.

The results are given in Table 1 and Table 2.

Table 1: Results of physical fitness of students of CG and EG (preliminary assessment).

Item	Name of		gender	CG	EG	

No.	exercises	Number of subjects (n)		$(\bar{x}\pm m)$		P
1	flexion-extension of the arms from the lying position (number of times)	n = 12	female	7.08±5.83	6.66±5.39	P ≥ 0.05
2	pull-up on a high crossbar (number of times)	n = 18	male	6.22±3.7	6.33±3.41	P ≥ 0.05
3	standing long jump (cm)	n = 30	male/female	189.33±36.33	189.83±32.95	P ≥ 0.05
4	sit-ups in 1 minute (number of times)	n = 30	male/female	34.33±10.74	35.66±4.6	P ≥ 0.05
5	leaning forward from standing position on gym bench (cm)	n = 30	male/female	11.2±5.89	12.73±8.46	P ≥ 0.05
6	running 2000 m (sec.)	n = 12	female	757.16±86.87	759±78.35	P ≥ 0.05
7	running 3000 m (sec.)	n = 18	male	862.33±48.68	857.55±43.26	P ≥ 0.05
8	running 100 m (sec.)	n = 30	male/female	15.8±1.61	15.05±1.65	P ≥ 0.05

Table 2: Results of physical fitness of students of CG and EG (final assessment).

Item No.	Name of exercises	Number of subjects (n)	gender	CG	EG	P
				$(\bar{x}\pm m)$		
1	flexion-extension of the arms from the lying position (number of times)	n = 12	female	8.83±3.21	11.41±3.11	P ≥ 0.05
2	pull-up on a high crossbar (number of times)	n = 18	male	6.94±3.11	9.33±3.21	P ≤ 0.05
3	standing long jump (cm)	n = 30	male/female	205.06±28.06	214.33±26.38	P ≤ 0.05
4	sit-ups in 1 minute (number of times)	n = 30	male/female	38.46±6.92	42.46±5.12	P ≤ 0.05
5	leaning forward from standing position on gym bench (cm)	n = 30	male/female	12.33±5.08	15.16±7.97	P ≤ 0.05
6	running 2000 m (sec.)	n = 12	female	738±82.2	705.33±79.16	P ≤ 0.05
7	running 3000 m (sec.)	n = 18	male	839.05±41.44	817.55±40.99	P ≤ 0.05
8	running 100 m (sec.)	n = 30	male/female	14.9±1.58	14.62±1.63	P ≤ 0.05

We also decided to look at how many students in CG and EG coped with the control tests.

Table 3: Number of CG and EG participants certified at the beginning and end of the academic year.

	Name of	CG	EG

Item No.	exercises	beginning of the academic year		end of the academic year		beginning of the academic year		end of the academic year	
		certified	not certified	certified	not certified	certified	not certified	certified	not certified
		number of participants							
1	flexion and extension of the arms from the lying position	4	8	5	7	2	10	8	4
2	pull-up on a high crossbar	3	15	3	15	3	15	8	10
3	standing long jump	16	14	23	7	14	16	30	0
4	sit-ups in 1 minute	21	9	24	6	23	7	30	0
5	leaning forward from standing position on gym bench	24	6	26	4	24	6	26	4
6	running 2000 m	7	5	8	4	7	5	9	3
7	running 3000 m	9	9	11	7	9	9	15	3
8	running 100 m	22	8	29	1	24	6	30	0

4 RESULT DISCUSSION

As can be seen in Table 1, in CG and EG, in flexion-extension of the arms from the lying position, pull-ups on a high crossbar, sit-ups, standing long jumps, a flexibility test, running 2000 m, 3000 m and 100 m as a result of statistical processing ($P \leq 0.05$) indicators are reliably insignificant. This suggests that in CG and EG, the level of physical fitness of the subjects is the same.

Comparing the results in CG and EG, the growth rates in pull-ups on a high crossbar, standing long jumps, sit-ups, a flexibility test, running 2000 m, 3000 m, 100 m are reliably significant ($P \leq 0.05$). In flexion-extension of the arms from the lying position, the growth rates are reliably insignificant ($P \leq 0.05$).

When comparing control tests in CG at the beginning and end of the academic year as a result of statistical processing ($P \leq 0.05$), the growth rates were reliably significant in standing long jumps, running 2000 and 3000 m, for all other indicators – reliably insignificant ($P \leq 0.05$). Analyzing the results, we can conclude that there was an increase in other indicators, but it was insignificant.

When comparing control tests in EG at the beginning and end of the academic year, the growth rates were reliably insignificant ($P \leq 0.05$) in the flexibility test, for all other indicators they were reliably significant ($P \leq 0.05$).

In Table 3 it can be seen that in CG the number of certified increased by 12% in flexion-extension of the arms from the lying position, standing long jumps by 43%, sit-ups and a flexibility test by 34%, in 2000 m running by 20%, in 3000 m running by 23%, in 100 m running by 88%; in pull-ups on the high crossbar, the number of not certified remained unchanged. In EG, the number of non-certified decreased in flexion-extension of the arms from the lying position by 60%, pull-ups on a high crossbar and a flexibility test by 34%, in 2000 m running by 40%, in 3000 m running by 67%; results in standing long jumps, sit-ups and 100 m running, they improved to 100% positive ratings.

5 CONCLUSION

The use of differentiated physical training programs developed on the basis of modern technologies made it possible to form the needs of medical university students in the use of physical exercises in everyday life to increase the level of physical fitness and the possibility of participating in mass sports events.

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