

The Physical Development and Physical Preparedness of the Students at the Age of 17-20 Years Old Who Go in for Track and Field

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Abstract

The impact of regular track and field trainings on student's physical development and physical preparedness have been studied in the work. The study was conducted in the Kyrgyz-Turkish Manas University. In total, 64 students at the age of 17-20 years have participated into the study. Applied methods: anthropometry, physiometry, the Stange-Hench tests. Sports and pedagogical control tests (on flexibility, strength, speed, endurance and agility) have been used as well.

While evaluating students' physical development, the second study of both 'Sports' and 'Initial' groups has revealed the high indices among boys according to the following criteria: body height and weight, chest bulk, vital capacity, chest excursion and the Stange-Hench tests. According to the heart rate criterion, the indices of the "Sports" group were reliably higher than those of the "Initial" group ($P < 0.05$). During the comparison of the second study results of girls' physical development, more reliable distinctions have been found out ($P < 0.05$). When the physical development indices were under the study, the second examination exposed and proved that the flexibility of boys from 'Sports' group being higher on 7.1 cm ($P < 0.05$).

The experimental materials provided in this article gave an opportunity for concluding that systematic track and field trainings had had a positive impact on the physical development indices, to be precise on the functional condition and physical preparedness level of boys and girls at the age 17-20 years old.

Keywords: Physical development, Physical preparedness, Student, Functional condition

1. Introduction

Students' community has its own place within the social structure. This part of society can be interpreted as matured, socially organized and an important group of next generation, which is aware of all the last tendencies occurring in scientific, educational and cultural spheres. Therefore, keeping young generation in sound mind and sound body is considered to be vital social task.

Sport is really important activities for students (Çelik, Zengin, & Baş, 2017). In the sport, sports activities are thinking physical superior among the athletes (Zengin & Kırkbir, 2020). So, there are students who actively go in for sport among those, who take physical education classes and usually, they are the one who performs the major part of the training load, that is constantly increasing and performed with the high intensity (that determines the necessity to increase the sports indices). As a result, students stop their sports training or cease the additional study program in the framework of their private training, but in that case, they will not become a part of the 'sport of the highest achievements' and to some extent hypokinesia can be typical to them (as it was previously, in comparison of their activity regime that has been before university study) (Arshavskiy, 1982; Fomin & Vavilov, 1991).

At this juncture, the deterioration is observed if we mention students' general physical condition as well as their physical preparedness, the functional state of their main physiological systems and general level of physical health. According to opinion of expert's majority, there are several reasons for this phenomenon which are not limited with the negative exposure of socio-economic and environmental background, but this takes place due to the overriding the main principles of healthy lifestyle like physical activity by nowadays students, the decrease of students' interest in sport and physical culture and at last the decrease in the efficiency level of the physical culture process within the institutes of higher education (Bakhrakh, 1980).

A lot of researchers note that the universities put in claim to develop the physical education system further. At the moment, the most topical issues are relevant to the development and strengthening of physical qualities, such as endurance, speed and strength (Zhestkov et al., 2015).

A great deal of various authors' researches has shown the positive impact of the sustainable physical trainings and sport on the components of the physical condition, like the state of the health and functional condition of the growing organism (Lagutkina, 2004). In a study conducted in this direction, wrestling training applied to university students during two education periods; It has been reported that it has a positive effect on the development of muscle strength, anaerobic power levels and body circumference measurements (Demirhan,

2020). Certainly, only the thorough study of the reaction details of a young organism on the regular trainings with track and field can allow to build an efficient study program for the students in the framework of athletics (Balsevich, 2002).

As the analysis of methodological literature has shown, the recommendations for students provided in the literature on the development and strengthening of physical qualities are divided and are of discrepant character. The methodology on the development of endurance and speed are mostly borrowed from the sports, with students' physical education goals and tasks remaining ignored along with the peculiarities of their study and occupation being not taken into the consideration. The selection of means, methods and most importantly the physical activity of the training are of mostly empirical character. In this regard scientific studies will be required. The health condition is in tight relation with man's physical activity and physical preparedness. Therefore, the lessons of physical culture as an only means of increasing the physical activity among the majority of students and schoolchildren have great importance in relation to health maintaining and strengthening of the younger generation. Students with high indices of physical activity, physical preparedness, and exercises execution have shown good abilities of memory mobilization, emotional sustainability, and a good level of faith in their own strength. As it is well-known, aiming to develop the motor functions potential and strengthen the health of schoolchildren, the application of sports preparedness is considered to be the most efficient in physical culture. Track and field own the richest arsenal of means for those, who goes in for track and field purportedly for their physical preparedness (Makarova, 1987).

It is well known that today's children do less physical activity than recommended (Toivo & Growth, 2000). Studies on participation in lifelong physical activity have shown that the rate of individuals' participation in physical activity decreases especially depending on age. The age groups in which this decrease is most evident are stated to be in late adolescence, post-high school and university years (Anderssen et al., 2005).

At the moment the most modern and efficient branch for increasing the physical preparedness and activity as well as health strengthening of the younger generation is considered to be the sports technologies, that should be included into the study program of university students and basing to this, organize and conduct lessons of according kinds of sport (Arnst, 2011).

Especially the university period is considered as one of the most critical periods in gaining or quitting the habit of doing regular physical activity (Irwin, 2004). The importance of raising this group as individuals who have the habit of doing regular physical activity increases even more when the social leadership duties they will undertake after higher education are considered (Hildebrand & Johnson, 2001).

In this study, which was designed in the light of this information, the physical development of university students who practice athletics was examined.

1.1 Topicality of the Research

During evaluation and observing the health condition the basis for observing the changes that occurred under the impact of trainings has become evaluation of the physical development

and preparedness level. The assessment of the condition of physical indices of students as well as the evaluation of the physical development of those students who keep ordinary life rhythm and the difference in physical indices of those who go in for sports regularly form the basis of the long-term trainings according to the adaptive shift character.

These aspects have an important role not only in the framework of students' health strengthening but for organizing physical education processes, trainings, and the content improvement of these processes as well.

1.2 The Purpose of the Research

The purpose of the research is to study the impact of regular track and field trainings on the physical preparedness and physical development of the students.

1.3 Tasks of the Research

- (1) To evaluate the physical development of the students, who go in for track and field.
- (2) To determine the differences in the indices of physical development and physical preparedness according to the period, students had devoted to physical trainings.

1.4 Hypothesis

On the basis of regular track and field trainings, the improvement of students' physical development and physical preparedness is expected.

2. Method

2.1 Research Model

The research has been conducted at the Kyrgyz-Turkish Manas University. In total, 64 students at the age of 17-20 years took participation. They were divided into two groups: 1st group included students, who has been training with track and field regularly (within last 1-2 years), *i.e.*, Sports group. They had 4-time trainings per week. There were 16 students in general (7 male and 9 female athletes). 2nd group was called "Initial" group as the students involved in this group had only started their trainings with track and field. They also had 4-time training per week regime. The number of students in this group was equal to 48, among which there were 10 male students and 38 female students.

Control over the determining the physical development and preparedness of the students at the age 17-20 years old who go in for with track and field has been conducted in the research.

The first study on the physical development and physical preparedness was conducted in the beginning of an academic year, in September and October while the second study was conducted 6 months later. Protocols preparation, research introduction and analytical characteristic on methodological literature was performed within first study along with group selection.

During the second part of the research measurement method has been selected and was applied to measure necessary indices.

2.2 Data Collection Tools

Medical-biological methods: Anthropometry (height, weight, chest bulk in a calm state, at maximum inhale and exhale). Physiometry (vital capacity, arterial blood pressure, heart rate): Breathing tests: the Stange-Hench test.

Sports-pedagogical control tests: Flexibility test, strength (push-ups), agility (coordination test), speed (100-meters race), endurance (cross race, 500 meters for female and 1000 meters for male).

2.3 Analysis of Data

SPSS mathematical-statistical methods have been applied and the level of significance was taken as ($p < 0.05$).

3. Results

Table 1. The physical development indices of the studied groups (M±mx)

Groups	Height	Body weight	Chest bulk in a calm state
Male			
Sports group (1 st measure) n = 7	173.3±1.8	71.1±2.7	84.0±2.2
Sports group (2 nd measure) n = 8	174.5±1.8	68.6±6.6	88.4±1.9
Initial group (1 st measure) n = 8	173.5±1.67	65.3±4.5	81.0±0.9
Initial group (2 nd measure) n = 7	173.4±2.02	64.7±5.9	84.3±1.2*
Female			
Sports group (1 st measure) n = 8	165.1±1.68	65.3±1.6	81.0±0.9
Sports group (2 nd measure) n = 6	165.5±1.31	63.7±1.1*	83.0±1.3
Initial group (1 st measure) n = 36	158.5±0.66	57.3±0.9	79.7±0.9
Initial group (2 nd measure) n = 13	159.1±0.86	56.7±1.3	78.6±1.08

Note. Definite distinction *: $P < 0.05$; ***: $P < 0.001$ comparing to the first study.

The body weight indices among male students was lower on 2.5 kg and on 1.6 kg among female students after the second study. Due to the training they have lost some weight, but male students could not gain muscle mass because of which this index cannot play the role of the muscle improvement assessment. As for the chest bulk in a calm state, in the second study the indices of male students were higher on 4.4 cm and on 2 cm among female students.

In the second study the height indices of male students from the Initial group were higher on 0.1 cm and on 0.6 cm among female students. The body weight indices in the second study

were lower on 0.6 kg among both male and female students. The chest bulk in calm state of male students in the second study was higher on 3.2 cm, proving to have definite distinction ($P < 0.05$), while this index among female student was higher on 1.1 cm in the first study.

As for the functional indices, lungs vital capacity indices of male students from the Sports group in the second study was higher on 200 ml and female students have had indices, higher on 387.5 ml, by this proving the definite distinction ($P < 0.001$) (Table 2)

Table 2. The functional indices of the studied groups ($M \pm mx$)

Groups	Lungs vital capacity	Chest excursion	Stange test	Henche test	Arterial blood pressure	Heart rate
<i>Male students</i>						
Sports group (1 st measure) n = 7	3200±92.6	10	42.4±2.2	28.2±2.4	$\frac{117.1 \pm 1.8}{75.7 \pm 7.8}$	15.8±0.3
Sports group (2 nd measure) n = 8	3400±113.4	10.8	47.7±2.9	33.4±3.1	$\frac{120 \pm 0.0}{76.2 \pm 1.8}$	13.6±0.4*
Initial group (1 st measure) n = 8	2928.5±41.9	6.7	50.8±1.8	29.2±2.7	$\frac{115.0 \pm 1.9}{72.5 \pm 2.5}$	16.7±0.5
Initial group (2 nd measure) n = 7	2937.6±114.9	6.75	51.6±3.1	31.1±2.1	$\frac{117.1 \pm 1.8}{72.8 \pm 1.8}$	14.1±0.3*
<i>Female students</i>						
Sports group (1 st measure) n = 8	2550±71.8	6.75	41.4±6.2	29.2±2.7	$\frac{115.0 \pm 1.9}{72.5 \pm 2.5}$	16.7±0.5
Sports group (2 nd measure) n = 6	2937.5±41.9***	7.3	43.6±1.6	32.5±2.3	$\frac{113.3 \pm 2.1}{75.8 \pm 2.7}$	14.7±0.6*
Initial group (1 st measure) n = 36	2338.9±34.6	6.5	37.6±1.0	23.9±0.7	$\frac{114.7 \pm 0.9}{76.9 \pm 1.2}$	19.6±0.3
Initial group (2 nd measure) n = 13	2500±27.7***	6.9	40.7±1.2	28.4*±0.9	$\frac{116.1 \pm 1.4}{76.9 \pm 1.3}$	15.7±0.4*

Note. Definite distinction*: $P < 0.05$, ***: $P < 0.001$ comparing to the first study.

As for the chest excursion in the second study, the indices of male and female students were higher on 0.8 and 0.55 cm correspondingly. In the Stange test, the second study's indices were higher on 5.3 and 2.2 seconds among male and female students correspondingly, while in the Hench test these indices were higher on 5.2 and 3.3 seconds among male and female students as well. In the second study, the systolic blood pressure indices were higher on 2.9 mm of mercury and the increase on 0.5 mm of mercury was seen in diastolic blood pressure indices among male students. Regarding the female students, the systolic blood pressure indices were higher on 1.7 mm of mercury in the first study, while the diastolic blood

pressure indices were higher in the second study on 3.3 mm of mercury. As for the heart rate criterion, the second study revealed the increase in the indices on 2.2 beats per/minute among male students and 2.0 beats per/minute among female students, displaying the definite distinction ($P < 0.05$) in both of the groups.

The lungs vital capacity indices among male students from the Initial group in the second study were higher on 9.1 ml and on 161.1 ml among female students, settling the definite distinction ($P < 0.001$). As for the chest excursion in the second study, the indices of male students were higher on 0.05 cm and 0.4 cm among female students. According to the Stange test, the second study's indices were higher on 0,8 and 3,1 seconds among male and female students correspondingly, while in the Hench test these indices were higher on 1.9 and 4.5 seconds among male and female students as well, showing the definite distinction ($P < 0.05$).

The hypoxemic tests provide an opportunity for evaluating man's adaptation to hypoxia and hypoxemia. The Stange-Hench test's indices for males are equal to 46.54 seconds and 63.65 seconds; and for females, they are equal to 35 seconds and 45.85 seconds. On the basis of an analysis of the gained data, it is possible to conclude that the results of hypoxemic tests coincide with the average indices of athletes.

Relying on the obtained information, it is possible to make a conclusion that the respiratory center of the students from the Sports group in the second study was well-adapted to hypoxia, which allows students to endure the physical activities on a good level. The systolic blood pressure indices of male students in the second study were equal to 2.1 mm of mercury, while there was an increase in the indices of diastolic blood pressure on 0.3 mm of mercury among male students and on 1.4 mm of mercury in the systolic blood pressure indices among female students. However, the diastolic indices among female students were the same in both of the studies. Regarding heart rate, the second study's results were lower on 2.6 beats per/minute among male students and on 3.9 beats per/minute among female students, thus in both groups, the definite distinction has been identified ($P < 0.05$). Basing on the training sessions, definite distinctions have been revealed under the influence of loads given to the organism.

The phenomenon of bradycardia (the decrease in the heart rate) is considered to be the special impact of getting better endurance. The higher is heart rate, the more is energy waste as well as oxygen demand and ensuring blood flow. Thus, the decrease of the heart rate (bradycardia) is considered as a method for significantly economical work of the heart. While studying the physical preparedness indices of the students, who go in for track and field, the flexibility indices of male students from the Sports group in the second study were higher on 7.1 cm and on 1.4 cm among female students (Table 3).

Table 3. The physical development indices of the studied groups (M±mx)

Groups	Flexibility (cm)	Push-ups (times)	Agility (seconds)	100 m Race (seconds)	Cross country 1000/500 m (seconds)
<i>Male students</i>					
Sports group (1 st measure) n = 7	17.6±1.8	31.7±3.3	19.4±1.2	13.2±0.2	3.9±0.1
Sports group (2 nd measure) n = 8	24.7±3.4*	35.4±2.2	19.2±0.3	13.1±0.4	3.7±0.1
Initial group (1 st measure) n = 8	16.8±2.8	34.5±4.01	20.4±0.7	14.8±0.3	4.2±0.1
Initial group (2 nd measure) n = 7	18.4±3.4	35.0±1.6	19.7±0.4	14.05±0.3	3.9±0.1
<i>Female students</i>					
Sports group (1 st measure) n = 8	17.0±1.7	34.5±1.01	20.8±0.7	14.8±0.3	2.0*±0.1
Sports group (2 nd measure) n = 6	18.4±1.19	34.8±1.2	20.4±0.6	14.8±0.4	1.9±0.1
Initial group (1 st measure) n = 36	17.5±0.9	14.7±0.8	24.5±0.6	19.06±0.2	2.4±0.05
Initial group (2 nd measure) n = 13	18.2±1.1	24.8***±1.5	21.9*±0.5	17.1*±0.5	2.1±0.04

Note. Definite distinction*: $P < 0.05$; ***: $P < 0.001$ comparing to the first study.

Regarding the number of times of push-ups, there are increase on 3.7 performed by the male students in the second study and on 0.3 among female students. As for the agility, the indices of the second study among male students are faster on 0.2 seconds and on 0.4 seconds among female students. In running 100 m race, the indices of the second study among male students were higher on 0.1 second and in the indices of female students differences have not been seen. In cross running the indices of the second study among male and female students were faster on 0.2 seconds and on 0.1 seconds correspondingly.

In the Initial group, the flexibility indices in the second study among male and female students were higher on 1.6 and 0.7 correspondingly. As for the number of push-ups made by both male and female students, their indices were higher on 0.5 and 10.1 correspondingly as well as the definite distinction has been revealed ($P < 0.001$). Regarding the agility, there were found increase in the indices of male and female students on 0.7 and 2.6 seconds with the definite distinction ($P < 0.05$). In 100 m race, the indices of male students in the second study were higher on 0.75 seconds and increase on 1.96 seconds has been identified among female students along with the definite distinction ($P < 0.05$). In cross run during the second study there were found a rise in the indices of both male and female students on 0.3 seconds.

Training loads applied on the basis of obtained results have had an impact that is seen in the indices. Results, gained during the research proves the presence of strong relation between students' physical development and regular physical exercises aimed at developing physical preparedness of the students. Physical exercises have naturally positive impact on the physical preparedness and physical development level of the students.

4. Discussion and Conclusion

Physical development is understood as one complex definition and sign, which characterize it very differently. However, the main qualities of physical development are considered to be body height, chest bulk, lungs vital capacity, and muscles' strength (Fomin & Vavilov 1991). The result of physical development is the improvement degree of physical preparedness, the perfection degree of motor skills and abilities, a high level of development of vital forces and sports achievements (Karpman, 1987).

The students of Kyrgyz-Turkish Manas University at the age 17-20 years old who go in for with track and field have participated to this research. There were found following differences between two groups (Sports and Initial) on the basis of studies' outcomes, conducted at the beginning of an academic year and in the end.

(1) While evaluating the physical development of the students, in the second study of male students from both Sports and Initial groups the indices of body height, body weight, chest bulk, lungs vital capacity, chest excursion and Stange-Hench tests were higher as well as the heart rate indices on 2.2 beats per/minute and 2.6 beats per/minute in two corresponding groups. The definite distinction has been identified ($P < 0.05$). Regarding the female students, in most of cases of the comparison of physical development indices from the second study there were found definite distinctions: in the Sports group the indices of body height were higher on 0.4 cm, body weight on 1.6 kg, lungs vital capacity on 387.5 ml and heart rate on 2 beats per/minute ($P < 0.05$). In the Initial group girls had lungs vital capacity indices higher on 161.1 ml, heart rate on 2 beats per/minute and Hench test index higher on 4.5 second ($P < 0.05$). In the rest, there were slight rise in other indices.

(2) While studying the physical development indices, the flexibility indices of male students from the Sports group in the second study were higher on 7.1 cm and that was truly identified ($P < 0.05$). In the Initial group there also were slight increases in other normative.

(3) The experimental materials, provided in this research, allowed us to say, that the regular lessons of track and field had positive impact on the physical development indices, precisely on the functional condition and physical preparedness level of both male and female students at the age of 17-20 years old.

The findings we obtained in the participation of young individuals in sports are similar to the results of many studies. Thus, According to the results of a study, it was concluded that even the students who have regional health reasons, according to their current situation, their participation in exercise has a positive effect on their physical characteristics (Gungoren et al., 2021). In another study, it was reported that regular fitness and physical activity improved anthropometric features positively (Çelik et al., 2015). In another study, in the study conducted by Donelley et al. (2003) on 131 randomly selected men and women, they divided the subjects into two as exercise and control groups and stated that there was a significant decrease in the body weights of the subjects after the 16-month exercise program.

As a result, it has been determined that regular participation of students in sports training as well as their education can help optimize their physical condition.

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