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PULSOMETRIC PECULIARITIES OF SPORTSMEN 16-17 YEARS IN DYNAMICS OF THEIR ADAPTATION TO CONDITIONS OF INCREASING MOUNTAINOUS HYPOXIA

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Abstract
Pulsometric peculiarities of sportsmen in dynamics of their adaptation to conditions of increasing mountainous hypoxia. Some information about increasing the pulse rate (pulsometry) of sportsmen in the process of adaptation in the conditions of hypoxia on the height of 2100–2400 m over sea level is given in this article. Te increasing of pulse rate from the 1st day till 7th day on the height of 2100 m and the remaining on the high level if control indicators on the 15th day of experiment afer physical load on the height of 2400 m showed that it great differs from the quiet position on the height of 2100 m and let us speak about inadequate compensator of heart.

Keywords: pulse rate, hypoxia, adaptation, sea level, physical load, heart, beat.

Introduction

Te essence of problem to adaptation in psychology of sport is defned, frst of all, the organism of sportsman has to adapt to physical load in short time. Precisely, the speed of adaptation and its duration are defned the health and state of training of sportsman. Tat's why the special scientifc interest for practice of sport presents the development of systematic foundation of adaptation of sportsman's organism in the process of achieving the highest sport mastery [1–4]. It is known that morphofunctional peculiarities of person's organism formed in the process of long evolutional period, can't be changed so fast as structure, function and character of trainingcompetition loads in sport. Contradiction of time between these processes can lead to functional decay, which can be displayed as different pathologies [4–6].

It is proved that the condition of experience has a great essence in assessment of pulse change [5–10]. Te assessment of changing the heartbeat rate of persons in a short period in mountainous depends on: a) height of place; b) climate-geographical position of mountainous region and c) degrees of adaptation of organism to different heights. In this case, analyzing the contradicting literary information on studied issue, it can be defned the lack of information about reaction of cardio respirator systems in the process of person residing in various mountainous areas.

Methods of researches Reaction of pulse on proportional physical load is considered as the main aerobe indicator, which characterize the productivity of cardiovascular system.

Tat's why in functional diagnostics of sportsmen the Index of Howard step-test (IHST) is ofen applied, which is used to defne the reactions of cardiovascular system to hard physical load. In testing monitor for defning pulse of the term "Sein" (Southern Korea), regulated by step-ergo meter mechanic metronome and stopwatch are used in testing. Te height of step and time of climbing are chosen in according to the sex and age of examined people. Rate of climbing is equal to 30 cycles per minute. Each cycle includes 4 steps. Rate is defned by metronome, which is fxed in every 120 beats per minute. Afer fnishing the test, examined person sits on the chair and during frst 30 seconds with 2-,3-and 3th minutes of rehabilitation, the numbers of pulse beats are counted three times.

If examined person due to his exhaustion, can't reach the necessary rate in 15–20 seconds. Test also can be fnished in external features of excessive fatigue: paleness of face, stumbling and etc. IHST – is calculated as the following formula: IHST = t IHST t F f f=·( ) + + ·100 2 3 4 2(c) time of climbing, f1, f2, f3, f4 – the amount of pulse beats during the frst 30 seconds in 2-,3-and 4-minutes of rehabilitation. For saving time, the contracted formula can be used in large researches which allow for one calculation of pulse beats in frst 30 seconds the second minute of rehabilitation.

Ten Physical training is assessed according to given index. On IHST below 55 is considered as weak, 55–64 is considered as less medium and 65–79 as weak, 80–89 as good and more than 80 as excellent. Statistic calculation of given material is made according to criteria Student-Fisher, where is X ± Sx . Results of investigations. Given results proved that in the process of adaptation of sportsmen-trackmen in the height over 2 km over sea level (afer prediction of their adaptation to the height of 1800 m) concise tendency of increasing rate of heartbeat is pointed out. Analysis of percent attitude to pulse rate of participants' group of experiment showed that if the 1st day of adaptation the quantity is equal to 127 ± 6.5%, next days in the height of 2100 m is equal to 149.7 ± 5.7 (third day), 148.3 ± 4.6 (seventh day),142.9 ± 3.8 (15th day). Te frst day of adaptation on the height of 2100 m over sea level the pulse rate is equal to 77.8 ± 3.1, when the next days 84.2 ± 3.8 (3rd day), 82.4 + 3.6 (7th day) and 80.8 ± 3.9 (15th day). In these series of experiments are clear that the frst days sportsmen on the height of 2100 m over sea level felt the decreasing of aerobic opportunities, worsening of functional state of organism and insomnia. Afer 3–5 days they began to adaptation, it is characterized that sportsmen in retrained muscle activity feel

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themselves well, but hard physical load, when oxygen decreases in blood (hypoxia) encumbered.

Special atention was paid to pulse rate of sportsmen and rate of their normalization afer proportioned physical load. So, the rate of pulse normalization on the 4th minute physical load afer 2100 m is higher than background is fxed up. Given results on dynamics of pulse rate on given height afer physical load showed palpitation, which is connected with hemodynamic and cardio respirator indicators in the conditions of mountainous hypoxia (Table 1).

Table 1. – Character and rate of normalization of pulse after proportioned load on the height of 2100 m over sea level

Indicator	The 1st day		The 3st day		The 7st day		The 15st day	
	back ground	experi ence	back ground	experi ence	back ground	experi ence	back ground	experi ence
	n=7	n=7	n=7	n=7	n=7	n=7	n=7	n=7
Repose	72.2 ± 2.2	74.6 ± 2.6	72.4 ± 2.2	70.6 ± 2.4	60.6 ± 1.8	65.9 ± 1.3	72.6 ± 2.2	70.8 ± 2.2
In 4 minutes afer load	75.4 ± 2.6	78.6 ± 1.3	79.4 ± 3.1	72.4 ± 2.2	75.5 ± 2.6	76.4 ± 2.8	75.9 ± 2.6	72.8 ± 2.2
Percent to repose	1210. ± 7.4	105.4 ± 4.6	127.4 ± 8.1	102.9 ± 4.1	125.0 ± 7.6	101.5 ± 4.1	121.0 ± 7.4	102.9 ± 4.1

It is defned that increasing of pulse rate afer physical load on the height of 2100 over sea level was less than background, though in absolute quantity it is comparable. If we consider that beat amount doesn't change, we can speak about maladaptive reaction of heart activity on physical load on atitude to repose. So the 1st day of adaptation on the height of 2100 m over sea level the rate of increasing pulse in percent atitude was equal to 121.0±7.4% on atitude to repose. Tis tendency lasts during all periods of observations and on the 15th day this amount is equal to 02.9 ± 4.1%.

So in our opinion, increasing, then decreasing the pulse rate is the frst, easily defned circular effect of hypoxia. But hypoxic state which leads to changing the activity of central nerve system accompanies with decreasing the rate of heart beating, it may depend on increasing tone of pneumogastric nerve. More important variation of rate is observed afer climbing of participants of experiment to the height of 2400 m over sea level as it is shown in 2-Table background indicators of pulse rate are equal to 69–72 beats/min, afer climbing to the height of 2400 m these indicators rose in following

order: 94.2 ± 7.1 (the 1st day), 87.7 ± 6.8 (the 3rd day), 86.6 ± 6.7 (the 5th day), 85.5 ± 6.1 (the 7th day), 76.8 ± 4.9 (the 10th day) and 85.4 ± 6.1 (the 15th day). If on the frst day of adaptation was observed the highest rate of pulse (94.21 ± 4.9 beats/min), on the 10th day of mountainous adaptation it was the lowest (76.8 ± 4.9 beats/min). But all these indicators were higher in comparison with background amount.

Table 2. – Character of changes of background amount of pulse in quiet position on the height of 2400 m over sea level

Indicator	**Days**					
	The 1st day	**The 3st day**	**The 5st day**	**The 7st day**	**The 10st day**	**The 15st day**
Number of partici pants	n=14	n=14	n=14	n=14	n=14	n=14
Background, beats/min	69.4 + 3.4	69.413.4	72.6 + 4.3	69.8 + 3.4	69.6 + 3.4	**69.5 + 3.4**
Height 2400 m, beats/min	04.2 + 7.1	87.7 + 6.8	86.6 + 6.7	85.5161	76.8 + 4.9	85.4 + 6.1
Percent to back ground	157.7110.2	145.518.9	138.716.9	134.917.3	126.7 + 6.8	141.7 + 8.1

ground As it is clear from (Table 2), dynamics and character of pulse change in different periods of observations of sportsmen on the height of 2400 m over sea level are simple enough, though on the 10th day of adaptation in a quiet position is pointed out the tendency of decreasing the pulse rate, then its increasing is observed.

As it is fxed (3-Table), reaction of pulse rate on proportioned physical load of permanent and temporarydwellers-participants of experiment is diametrically opposed. So, if percent of declination of permanent dwellers of mountains on the 7th day to the atitude of background is equal to 15.1 ± 1.2, on the 10th and 15th days is 35.3 ± 2.6 and 16.1 ± 1.2%. Temporary dwellers' declination is 50.3 ± 3.8 (on the 7th day), 60.6 ± 6.2 (the 10th day) and 75.2 ± 5.6% (the 15th day).

So, on the height of 2400 m over sea level the pulse rate of permanent and temporary dwellers (sportsmen) afer physical load considerably increased than on the height of 2100 m. Te changes in pulse rate on the 15th day of adaptation are interconnected due to emotional reaction while climb-down from the height of 2400 m.

As on the height of 2100 m, sportsmen's pulse rate is increased afer physical load though absolute amount are high in these conditions of mountains. The underlined position is individual also for normalization of pulse after physical load that in certain measures let us consider that the conclusions of some PULSOMETRIC researchers [8; 11] about increasing physical ability of person based on the assessment pulse rate during proportioned physical load. On the examples of reactions of cardiovascular system, it is proved that climbing of sportsmen up in different height of mountains is accompanied with particular reconstruction of functional reactions, which has the aim to compensate the lack of oxygen in the organism. As step-by-step climbing to different height showed that every step of height leads to specific reconstruction of cardiovascular system functions [9; 10]. Besides it, ultraviolet sun radiation plays a particular role on different heights which remain in the atmosphere on the highlands and has sensibility of organism to the lack of oxygen (hypoxia).

Conclusion

It is necessary to widen the devices of investigation on the direction of complex multifunctional assessment of state and reconstruction of immune competent bodies for full characteristics of dynamics of mechanisms of formation in mountainous adaptation of person in order to deepen the knowledge about qualified state characteristics in the conditions of high mountains.

So, we can conclude that.

1) Te tendency of increasing pulse rate, in particular sportsmen decreasing of pulse from 1st till 15th day is observed in the dynamics of adaptation of sportsmen to increscent mountain hypoxia. Increasing of pulse rate afer proportioned physical load on the height of 2100–2400 m over sea level is much more than background data and this amount can be compared in absolute ignifcance;

2) Increasing the pulse rate in the conditions of mountain hypoxia provoked by increasing of peripheral resistance of circulatory vessels connected with defcit of oxygen and character of regional bloodstream;

3) Changing of heartbeat rate in the conditions of increasing mountain hypoxia is connected with the activity of cardio respirator mechanisms where the vegetative mechanism of regulation has leading importance. Reaction of pulse on the height can be individually fluctuated.

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