

Influence Altitude and Length of Stay in the Mountains of Physical Performance Tourists

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ABSTRACT

Development of adaptation, maintenance of normal human life in extreme environmental conditions is an urgent and a priority for all of humanity, for the recognition of the UN Commission on Sustainable Development "well-being" half of humanity in the XXI century will be directly related to the quality of development and the development of mountain areas. The purpose of the research is to study the level of physical performance is the most informative indicators of human adaptation to mountain conditions. The methodology of the paper presents experimental data on the effect of altitude and the duration of stay of the person on the active physical performance. It was established that during the first five days of active healthy people stay at an altitude of 2000m clearly develop beneficial effects of adaptation to muscular work. The high altitude (2300- 3340) significantly increases the reaction of the cardiovascular and respiratory systems, and physical performance is reduced by 20-25%. Results of the research based on research developed gradation of physical human performance in conditions of plain and mountainous terrain.

KEYWORDS

Physical performance, Kazakhstan, altitude

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Introduction

The concept of operation is associated with the potential for a person over a given time and with a certain efficiency to perform the greatest possible amount of work (Gazenko, 1987). Reduced efficiency 16-19% in a flat area is regarded as a sign of chronic fatigue, and more than 19% - overwork (Solodkov, 1990).

One of the specific forms of manifestation of health called physical performance (Borilkevich, 1993). The generally accepted criterion of physical performance is its level when the heart rate of 170 beats / min, referred to as FF 170 or PWC170 (Aulik, 1990). Evaluation of physical performance is based on a specially designed table.

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It is important both in theoretical and practical terms, the problem related to the optimization mode of physical activity, regulation is in the mountains of loads to be carried out taking into account the person's physical health, because it is the most informative indicator of human adaptation to mountain conditions (Gazenko, Gippenrejtter, & Malkin, 1986; Ajdaraliev & Maksimov, 1980). As for the influence of the mountain climate on physical performance, it is evidenced by numerous studies of domestic and foreign authors, is markedly reduced, depending on the altitude (Navar, 1965).

For example provides data that the maximum human performance and duration of the constant intensity in the first few days at an altitude of 3000-3500 m is reduced by 10-50% (Gippenrejtter, 1991). According to other sources, at an altitude of 3000m efficiency is 90%, 80%, 4000m, 5000m, 50%, 6200m, 33% of the maximum of its value at sea level (Rebuffce, 1991).

Depending on district height above sea level (in the range of heights from 1500 to 4000 m) partial restoration of shipping of muscular loadings happens within 7-20 days (Saltin, 1966). According to most of researchers, in the course of acclimatization in mountains the maximum consumption of oxygen gradually increases and in 20 days increases in relation to the first days of stay at the height of 2300 m at 2-5% (Makogonov, 2014). On the other hand, data that during 4-6 week expositions in mountains the maximum consumption of oxygen remains same, as well as in the first days of rise on height of 2240 m, that is below an indicator at sea level for 10-20% (Ghoshal, 1985) are provided. Reduction of MPK is the main reason for deterioration in physical efficiency of the person in the mountain district. Concerning duration of high-rise acclimatization of the data of literature considerably disperse. According to one data full acclimatization at the height of 3000 m requires 3-4 weeks, till other 14 months (Bernshtejn, 1967).

Three dimensions or 'pillars' of sustainable development are now recognized and underlined. These are:

— Economic sustainability, which means generating prosperity at different levels of society and addressing the cost effectiveness of all economic activity. Crucially, it is about the viability of enterprises and activities and their ability to be maintained in the long term.

— Social sustainability, which means respecting human rights and equal opportunities for all in society. It requires an equitable distribution of benefits, with a focus on alleviating poverty. There is an emphasis on local communities, maintaining and strengthening their life support systems, recognizing and respecting different cultures and avoiding any form of exploitation.

— Environmental sustainability, which means conserving and managing resources, especially those that are not renewable or are precious in terms of life support.

It requires action to minimize pollution of air, land and water, and to conserve biological diversity and natural heritage. It is important to appreciate that these three pillars are in many ways interdependent and can be both mutually reinforcing or in competition. Delivering sustainable development means striking a balance between them.

Tourism is in a special position in the contribution it can make to sustainable development and the challenges it presents. Firstly, this is because

of the dynamism and growth of the sector, and the major contribution that it makes to the economies of many countries and local destinations. Secondly, it is because tourism is an activity which involves a special relationship between consumers (visitors), the industry, the environment and local communities. This special relationship arises because, unlike most other sectors, the consumer of tourism (the tourist) travels to the producer and the product. This leads to three important and unique aspects of the relationship between tourism and sustainable development:

- **Interaction:** The nature of tourism, as a service industry that is based on delivering an experience of new places, means that it involves a considerable amount of interaction, both direct and indirect, between visitors, host communities and their local environments.

- **Awareness:** Tourism makes people (visitors and hosts) become far more conscious of environmental issues and differences between nations and cultures. This can affect attitudes and concerns for sustainability issues not only while travelling but throughout people's lives.

- **Dependency:** Much of tourism is based on visitors seeking to experience intact and clean environments, attractive natural areas, authentic historic and cultural traditions, and welcoming hosts with whom they have a good relationship. The industry depends on these attributes being in place.

This close and direct relationship creates a sensitive situation, whereby tourism can be both very damaging but also very positive for sustainable development.

Thus, the analysis of data of literature in general confirms very essential divergences in an assessment of negative influence of mountain conditions on physical working capacity. It, on the one hand, dictates need of continuation of researches for clarification of the reasons of divergences, on the other hand testifies to the expressed identity of process of adaptation of the person to height. Therefore optimization of adaptation to mountain conditions as from the point of view of preservation of high performance, and receiving improving effect it can be reached only on condition of the accounting of features of climate of this region, and also specific features of each person.

Methodology

The research purpose - to find out in what measure rise on height reduces physical working capacity and as duration of stay in mountains influences physical efficiency of the person.

Research methodology. Methodological a basis research are the principles of objectivity, systemacities of scientific knowledge based on understanding of indissoluble communication of unity of the person and environment. In work the provisions and regularities proved by the famous scientists in the field of physical culture, physiology and sports medicine are used. For the characteristic of functional adaptation to muscular work, determination of physical working capacity applied the veloergometric test including 3-5 minute loadings of low, submaximum and maximum aerobic power on the Monark stationary bicycle. A rest interval between the first and the second, the second and the third loading of 3 and 5 minutes. Podchityvala heart rate according to the electrocardiogram. Level of physical working capacity was defined at three pulse modes: 130, 150 and 170 beats/min.

In the first series of research, the influences of height of the district on physical efficiency of tourists connected with studying, were carried out at the height of 800 m and after 10-15 day active stay of tourists at the heights of 2300 i3340m above sea level. Under supervision there were 12 trained tourists. In the second series, influence of duration of stay in mountains on physical efficiency of tourists was studied. Researches were conducted at the heights of 2000, 2300 and 3340 m above sea level. Under supervision there were 3 groups of young men.

The first group consisting of number of the beginning tourists for 5 days, being at the height of 2000 m, daily I made campaigns along radionalny routes (with a height difference from 1800 to 2300 m) lasting 5-6 watch. The second group of tourists carried out all-physical and special training at the height of 2300 m within 18 days. Duration of training occupations of the third group at the height of 3340 m made 10 days.

Results and Discussion

The results of the first series of research connected with influence of height of the district on physical efficiency of tourists are presented on the table 1.

Table 1. Influence of height of the district on physical efficiency of the trained tourists at ChSS 130 (1), 150 (2), 170 (3) уд.мин. (n=12).

Heights, м	physical effeciency, kgm/kg					
	1		2		3	
	x	m (x)	x	m (x)	m x	m (x)
800	11,0	0,15	15,47	0,20	19,84	0,20
2300	9,97	0,31	14,37	0,37	18,59	0,42
3340	9,35	0,20	12,62	0,26	16,0	0,31

From tables 1. follows that at increase in height of the district up to 2300 m and 3340 m the level of physical working capacity at ChSS of 130 beats/min decreases in relation to height of 800 m, accepted for initial, by 9,4 and 15,1% respectively. That is, at rise physical working capacity at ChSS of 130 beats/min decreases by each 100 m on average on 0,6%.

Physical working capacity at ChSS of 150 beats/min in the range of heights of 800-2300 m decreases on average by 0,5% for each 100 m of rise, and in the range of heights of 2300-3340 m rise on 100 m is followed by decrease in physycal working capacity at ChSS of 150 beats/min on average for 1,1%. In other words, the negative effect of increase in height of the district, concerning physical working capacity at ChSS of 150 beats/min, since 2300 m, significantly increases.

Physical working capacity at ChSS of 170 beats/min at the trained tukrist at the height of 2300 m decreases, in relation to initial, by 6,3% or for 0,4% for each 100 m of rise. However in the range of heights from 2300 to 3340 m rise on each 100 m is followed by decrease in physical working capacity on average by 1,3%. Therefore, between increase in height of the district up to 3340 m and decrease in physical working capacity at tourists the return is observed, close to linear, dependence at ChSS of 130 beats/min. At ChSS of 150-170 beats/min linear nature of this dependence is broken. Results of supervision demonstrates

that, since height of 2300 m, rate of decrease in physical working capacity significantly increases.

Thus, on the basis of results of the conducted researches, it is possible to calculate the level of decrease in physical working capacity at ChSS 130, 150, 170 of beats/min in the range of heights of 800-3340 m taking into account which to carry out correction of loadings during a campaign and in general to optimize physical activity of tourists in mountain conditions.

On tables 2,3,4 the results of researches connected with studying of influence of duration of stay on physical efficiency of tourists at the heights of 2000, 2300 and 3340 above sea level are presented.

Table 2. Dynamics of physical efficiency of mountain tourists at ChSS 130, 150, 170 of beats per minute during 5-day stay at the height of 2000 m (n=6)

Stages of supervision	ChSS, beats/min	physical efficiency, kgm				
		min		kg		
		X	m(x)	X	m(x)	
Before rise to mountains	130	549	24	8,93	0,44	
	150	766	36	12,46	0,59	
	170	983	38	15,98	0,72	
Middle mountains, day	2	130	494	33	7,84	0,56
		150	697	41	11,06	0,67
		170	904	48	14,35	0,70
	5	130	531	39	8,40	0,52
		150	741	53	11,72	0,64
	170	951	66	15,04	0,78	

In the beginning we will consider results of supervision at the height of 2000 m. Follows from table 2 that rise to mountains is followed by decrease in physical efficiency of tourists. In particular for the second day of stay at the height of 2000 m physical working capacity at ChSS 130, 150 and 170 of beats/min has decreased in relation to her level to rise to mountains on 10; 9,4 and 8,4% respectively. The effect of rise to mountains connected with decrease in physical working capacity in more expressed form was reflected in indicators taking into account body weight.

For the fifth day of stay at the height of 2000 m physical efficiency of tourists has improved in comparison with the second day on average for 5-6%. Thus, during the first five days at the height of 2000 m moderate decrease in physical working capacity at the beginning tourists is observed. And, even within these five days positive dynamics of physical working capacity which is the evidence of increase of adaptation and reserve opportunities of tourists is noted. Nevertheless, apparently, loadings which accompany hikes in mountains in the range of heights from 1800 to 2300 m quite well are transferred by the beginning tourists.

The following series of supervision has been connected with definition physical working capacity at the trained tourists in dynamics of their 20-day stay at the height of 2300 m.

During the first 10 days after rise, tourists made everyday campaigns (in the range of heights of 2300-2800 m) duration till six o'clock during which

problems of increase of all-physical and special training were solved. The next 10 days have been connected with preparation and a pass of a route of the second category of complexity.

The results of researches executed for the third day after rise on height of 2300 m have shown that physical working capacity at the training of tourists at all ChSS modes has decreased in relation to her level to rise to mountains for 6,7-10,1% (table 3). However this decrease hasn't reached a necessary significance value. The repeated examination conducted in seven days of training occupations at the same height has shown that the physical working capacity of tourists remained at the level which has been registered for the third day after rise to mountains. For the 20th day of stay in mountains physical efficiency of tourists at ChSS 130, 150 and 170 of beats/min didn't differ from initial level trully, though conceded to him on 8; 4,5 and 2,6% respectively.

Conclusion

1. During the first five days of stay of young healthy people at the height of 2000 m in a distinct form favorable effects of functional adaptation to muscular work from cardiovascular system develop. Tourist campaigns for young people, since first days of their stay at the heights up to 2000 m, can be carried out without special restrictions.

2. In the first days of stay of tourists in the conditions of highlands muscular work is followed by essential increase of reaction of cardiovascular and respiratory system to loading and decrease in the general endurance on one third. For receiving reaction of ChSS, identical on expressiveness, to loading at the heights of 800 and 3340 m its power in highlands should be lowered by 20-25%.

3. Reaction of ChSS of tourists to physical activities in the range of heights from 800 to 3340 m increases at rise by each 100 m on average on one blow. So, if at the height of 800 m heart rate at the 1200 km/min. loading made 150-155 beats/min, then at height 3340m-175-180 beats/min.

4. Speed decrease in physical working capacity in the range of various heights isn't identical. In the range of heights from 800 to 2300 m decrease in physical working capacity averages 0,5%, rise on each 100 m at the heights from 2300 to 3340 m is followed by decrease in physical working capacity by 1,2%.

5. The developed gradation of physical working capacity allows to carry out not only a quality and quantitative standard physical working capacity at different heights, but also to determine the level of physical and functional fitness of tourists to mountain campaigns.

Disclosure statement

No potential conflict of interest was reported by the authors.

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