MORPHOLOGICAL CHARACTERISTICS OF ELITE ATHLETES, SPECIALIZING IN SPEED CLIMBING, CLIMBING AND ALPINISM

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Annotation. *Purpose.* Comparative characteristics of anthropometric features of elite athletes - representatives of climbing difficulty, speed and climbers. *Material, methods.* The study involved 26 world-class athletes: 10 - speed climbing, 10 - climbing difficulty, 6 - climbers. Age 19-22 years amounted to athletes. *Results*. Revealed that body length was significantly higher in speed climbing representatives compared with representatives of climbing difficulty. Do climbers - significantly higher compared with the complexity of climbing. Body weight at the highest climbers, significantly higher compared with the climbing on the complexity. It is shown that span most climbers, shoulder length at the highest climbers (climbing speed). Revealed that the greatest hip girth representatives speed climbing. *Conclusions*. Identified by morphological characteristics of athletes associated with specific training and competitive process and selection of sports.
Keywords: climbing, hiking, anthropometry, sport, speed, complexity, selection.

Introduction

At present there exists a trend to development of relatively young kinds of sports, which up to recent time had been a lot of little number of those, who liked extreme senses. One of such kinds of sports is rock climbing. Rock climbing is a kind of sports and active leisure, which implies climbing on natural (rocks) or artificial (rock site) relief (http://ru.wikipedia.org).

Having originated from mountaineering, at present rock climbing is an independent kind of sports [1, 12-15]. Rock climbing as a kind of active human functioning appeared, when man felt desire and need in overcoming rocky relief. Rock climbing is younger than mountaineering. However, not in all countries there are opportunities to practice mountaineering, overcoming high mountains, for which different kinds of mountain relief are characteristic: ice, snow, rocks. That is why rock climbing as mountaineering in hills became popular in different countries of the world. First rock climbers in Germany and Great Britain appeared partially because there are no high mountains in these countries. At present they distinguish several kinds of rock climbing.

Complex rock climbing is an individual climbing [2, 7, 8, 9]. Its aim is to reach the top. Sportsmen are given little time (usually 5 minutes) for examination of route, during which sportsmen think about every their step, like in chess; after it they tray in turn to climb all this route. Every participant is given only one attempt. As a rule there is restriction of time (from 4 to 5 minutes). Low supervision is used. Participants are being ranged depending on reached height.

This kind of rock climbing "the higher - the better" is very popular in all world and victories in this kind are considered to be of the highest prestige. Complexity – is technically different and difficult kind of motion functioning, which requires high self organization, self-discipline, coordination, accuracy and preciseness of movements. Endurance and strength, flexibility and plasticity, high intellect are components of success in complexity. For full fledged development of this kind it is necessary to have artificial rock sites of 18-22 meters' height.

Speed climbing is an individual climbing or pair race "who is quicker". The aim is to cover distance for minimal time. Upper supervision is used.

Speed climbing originated in Soviet Union in1974 as climbing "who is quicker" with upper supervision and first it was regarded as auxiliary kind of mountaineering. Then this kind of rock climbing was supplemented by climbing on more complex relief, but again basing on principle "who is quicker". Speed climbing became especially popular in Russia and in Eastern Europe and is becoming sill more popular in countries of Asia. If adult sportsmen from foreign countries reluctantly practice this kind of rock climbing then junior sportsmen from all the willingly take part in competitions for time, again proving that this kind of rock climbing has full right for existence and it is necessary to develop it. Routs of international competitions are formed up to height from 10 to 27 meters.

Speed climbing was defined as a kind of rock climbing by Committee on rock climbing of UIAA in 1987.

Bouldering is a kind of rock climbing, which is a series of short (5-8 segments) of extremely difficult routes.

The name origins from English "boulder"; bouldering means climbing on boulders.

At competitions, carried out by French system, several minutes are issued for every route and rest interval between them (as a rule 4-6 minutes). Sportsmen can use unlimited quantity of attempts. At competitions gymnastic sport hand and special mats – cash-pads are used.

Kinds of rock climbing, having originated from one kind of sports, at present differs from each other by requirements to both morphological-functional and psycho-physiological sportsmen's abilities [2, 3, 7, 8]. At modern stage rock climbing only is being started to be studied from the point of view of techniques, tactic, theoretical-methodic principles of rock-climbing [4, 5, 6, 10, 11]. Also studying of morphological characteristics of different kinds of sports'

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representatives and comparison of them with other kinds of sports, first of all with mountaineering, the kind of sports, from which rock climbing had originated.

The research was carried out as per topic of Ministry of education and science, youth and sports of Ukraine for 2011-2016, 91: "Theoretical-methodic principles of individualization in physical education and sports" (state registration No. 0112U002001 and by state financed topic 3-13 of Ministry of education and science, youth and sports of Ukraine fro 2013-2014 "Theoretical-methodic principles of application of informtional, pedagogic and medical-biologic technologies for formation of healthy life style" (state registration № 0113U002003).

Purpose, tasks of the work, material and methods

The purpose of the work is to give comparative characteristic of morphological features of sportsmen – representatives of different kinds of rock climbing and mountaineering.

The methods of the research: theoretical analysis and generalization of literature sources, anthropometrical methods of researches (determination of body length, body mass, lengths and masses of body segments, circumferential sizes of body segments), mathematical statistic methods.

The research covered 26 sportsmen; from them 10 were international masters of sports, specializing in speed climbing, 10 were international masters of sports, specializing in complex climbing and 6 mountaineers of international class. Age of sportsmen was 19-22 years old.

Results of the researches

In order to determine anthropometrical characteristics of rock-climbers we analyzed results of elite sportsmen's testing, who specialize in different kinds of rock climbing as well as advanced domestic mountaineers for comparing of them.

Let us regard the obtained results of comparative analysis of morphological functional characteristics of rock climbers, who specialize in speed climbing, complex climbing and mountaineering.

Representatives of speed climbing have confidently higher ($p<0.05$) length of body (179.14±7.95cm) in comparison with representatives of complex climbing (174.8±3.67cm), and mountaineers (178.0±2.29 cm) (see fig.1). However mountaineers have the greatest distance between fully parted aside hands (185.0±0.87cm), and it is confidently greater than the same of speed climbers (181.0±8.52 cm) ($p<0.05$) (see fig.1). Also mountaineers have the greatest mass of body (72.0±3.77 kg) that is confidently higher than the same of complex climbers (65.8±6.53 kg) ($p<0.05$) (see fig.2).

Confident differences were found in indicators of shoulder length, the highest value of which speed climbers have (37.14±2.22 cm), the least value belongs to complex climbers (35.1±1.62 cm) ($p<0.01$) (see fig.3). Speed climbers have the highest value of thigh circumference (52.0±3.1cm) that is confidently higher in comparison with complex climbers (48.0±2.7 cm) ($p<0.001$). Mountaineers have thigh circumference 50.67±4.09 cm and it is confidently higher in comparison with complex climbers ($p<0.05$) (see fig.3). Between lengths of hand, length of fingers, width of hand, length of forearm, width of back there were found no confident difference between representatives of different rock climbing and mountaineers (see figs. 1-3).

We explain the obtained differences by specific features of training-competition functioning of representatives of different rock climbers and mountaineers. So, in spite of the fact that in all kinds of rock climbing and mountaineering for achievement of success relative strength is very important, which is naturally higher is sportsmen have low mass and, accordingly, length of body, in speed climbing often higher length of body is important because it permits for longer sportsmen to reach more distant hitches and, thus, quicker pass route.

By this reason speed climbers have longer length of shoulder.

Thigh circumference reflects development of "fast" muscular fibers, which influence on fulfillment of speed-power work in anaerobic (kreatine-phosphate) mode. Rock climbers, specializing in speed climbing, have the highest value of this indicator that is completely explained by specificity of their competition functioning.

In its turn, complex climbers have the least thigh circumference that is also connected with specificity of their competition functioning, which requires higher power endurance than explosive strength in comparison with speed climbers.

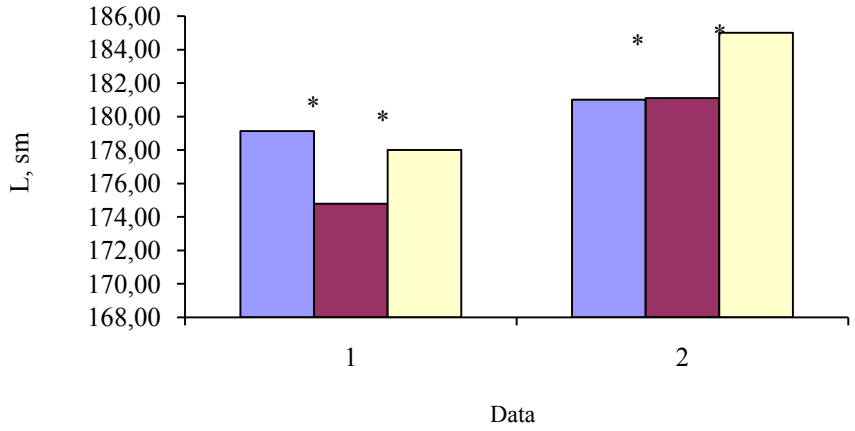

Fig.1. Anthropometrical indicators of elite sportsmen, who specialize in speed climbing (n=10), complex climbing (n=10) and mountaineering (n=6):

1 – length of body, cm;
2 – distance between fully parted hands, cm;
L – length;
Data –indicators;
* - differences are confident at p<0.05;

- «speed»; - «complexity»; - mountaineers

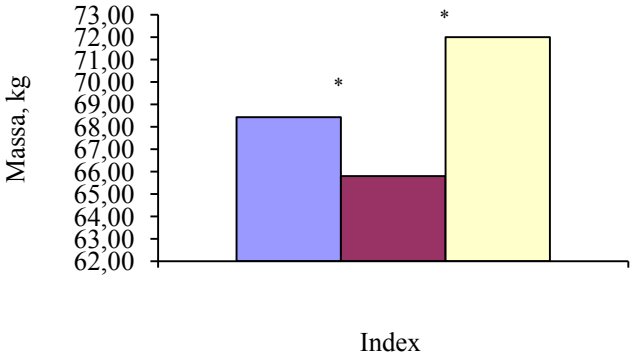

Fig.2. Body mass of elite sportsmen, who specialize in speed climbing (n=10), complex climbing (n=10) and mountaineering (n=6):

* - differences are confident at p<0.05;

- «speed»; - «complexity»; - mountaineers

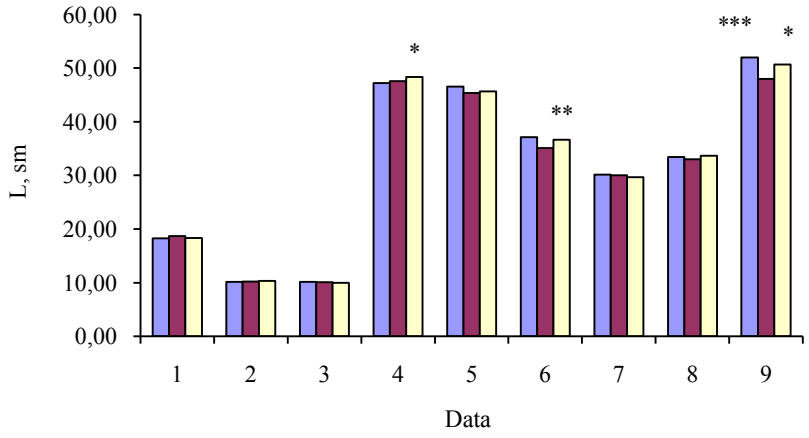

Fig.3. Anthropometrical indicators of elite sportsmen, who specialize in speed climbing (n=10), complex climbing (n=10) and mountaineering (n=6):

L – length;
Data – indicators;
1 – length of hand, cm;
2 – length of fingers, cm;
3 – width of hand, cm;
4 – length of forearm, cm;
5 – width of back, cm;
6 – length of shoulder, cm;
7 – circumference of forearm, cm;
8 – circumference of shoulder, cm;
9 – circumference of thigh, cm;
* - differences are confident at $p<0.05$;
** - различия достоверны при $p<0,001$;

- «speed»; - «complexity»; - mountaineers

Conclusions:

1. We have analyzed results of elite sportsmen's testing, the sportsmen, who specialize in different kinds of rock climbing as well as advanced domestic mountaineers. It was determined that speed climbers have confidently longer body (179.14±7.95 cm) in comparison with complex climbers (174.8±3.67 cm), as well as mountaineers, who also have this value (178.0±2.29 cm) – confidently higher than complex climbers ($p<0,05$). Mountaineers have also the highest mass of body (72.0±3.77 kg) that is confidently higher in comparison with complex climbers (65.8±6.53 kg).

2. It was found that mountaineers have the highest distance between fully parted aside hands (185.0±0.87 cm) and it is confidently greater than the same of speed climbers (181.0±8.52 cm) ($p<0.05$). Confident differences were also revealed in indicators of shoulder length, the highest value of which belongs to speed climbers (37.14±2.22 cm), the least – to complex climbers (35.1±1.62 cm) ($p<0.01$).

3. It was determined that speed climbers have the greatest thigh circumference (52.0±3.1 cm) that is confidently higher in comparison with complex climbers (48.0±2.7см) ($p<0.001$). We did not found any confident differences between length of hand, length of fingers, width of hand, length of forearm, width of back, circumference of shoulder.

The prospects of further researches imply studying of physical fitness, functional and psycho-physiological abilities of rock climbers of different specializations.

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