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The Present Situation of Overseas Teenagers' Altitude Training

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Abstract

Teenagers ' altitude training is an effective method to improve their special ability. By summarizing the current situation of altitude training for strong teenagers abroad, it plays a positive role in further promoting the development of youth altitude training. This paper describes the application and development of altitude training methods in adolescent athletes from the aspects of training strategies, blood oxygen transport and function changes, physiological changes and sports performance changes of altitude training, and makes corresponding prospects for the problems existing in adolescent altitude training.

Keywords

Altitude training; Teenager; Sports performance.

1. Introduction

Altitude training is a training method to improve the special ability in suitable natural plateau areas or artificial simulated plateau conditions. Altitude training method has been widely used in adult athletes, but there are few relevant research data on adolescent altitude training. Adolescents are a special group. Their physical and physiological functions are in a dynamic development process, which makes it difficult to control the program, mode and intensity of altitude training for adolescents, and faces difficulties in implementation and individual research that cannot be promoted to group research. The purpose of this paper is to summarize the training strategy, physiological indicators, psychological and sports performance of foreign youth altitude training, and further understand the development of foreign youth altitude training, research results and the application of altitude training in youth groups.

With the increasing specialization of youth sports, altitude training has gradually been applied to youth sports training. Plateau training has a significant effect on improving cardiopulmonary function, blood indexes and exercise performance of adolescents. This article from the training strategy, the blood oxygen transportation and the function change, the plateau training physiology change, the movement performance change, through the altitude training to determine the measure athlete training effect index, the youth carries on the plateau training other research further elaborated the overseas youth plateau training development condition. At present, the application of plateau training in adolescent training is less, mainly focusing on endurance sports. Among them, there are more studies on running, football, swimming, bicycle skiing and other projects. Physiological indicators, as a dominant data, are widely used to measure the performance of adolescents. In addition to this also includes some adolescent plateau disease and psychological research. Adolescent altitude training should study the influence of environmental change on adolescents ' exercise ability from multiple perspectives, and analyze the influence of environmental change on cardiopulmonary function adaptability and disease of normal adolescents from multiple perspectives.

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2. Training Strategies

A variety of training strategies are applied to plateau training to achieve different training purposes. The first is ' High Living Low Training ' (LHTL), in this training strategy, athletes in the LHTL conditions, athletes live at an altitude of about 2500 middle altitude, but at an altitude of about 1000-1200 meters low altitude training. The effects of " high living and low training " on training " on increasing VO2max ventilation adaptability[15] , the influence of adaptation to middle altitude and low altitude training performance [17], the influence of " high living and low training " on swimming performance and total hemoglobin quality [30], and the change of blood morphology and index of anaerobic ability of female hurdlers under hypoxic conditions[34],the psychological and physiological responses of two-week " high living and low training " team athletes (hockey) to six repeated sprints in atmospheric hypoxia (RSH) and normoxic normal oxygen (RSN) were compared[33] .

The second is HRV (heart rate variability) -guided exercise training research[2] , the use of heart rate variability-guided adolescent altitude training to assess the effect of adolescent runner training in short-term, high altitude training camps, that is, HRV-guided training to promote superior physiological adaptation (increase vo2max), which is reflected in the best performance of each athlete in their respective areas.

In modern sports, if we don ' t use altitude training and hypoxia training, it is unimaginable to continuously improve sports performance in cycle training. Hypoxia training has become an effective training method to improve the performance of young people ' s training[4、24、26], including the study of sprint sprint ability under hypoxic training conditions and normoxia conditions[4] , the influence of swimmers ' hypoxic training performance for 6 weeks[24] , and the influence of hypoxia treatment combined with altitude training on blood cells and immune system of swimmers [26]. Therefore, hypoxia training is also applied to adolescent plateau training strategies. This strategy is an important part of athletes ' sea level training plan. At the same time, the combination of different altitudes and physical training methods can significantly improve the effect and performance of endurance training.

3. Changes in Blood Oxygen Transport and Function

At present, Kenyan athletes perform well in all kinds of track and field competitions in the world. Then what has accomplished Kenyan athletes By comparing the aerobic exercise ability of Scandinavian runners and Kenyan boys, junior and senior athletes at sea level and high altitude, and by describing the oxygen uptake and blood and ammonia reactions of Kenyan runners during running[5] . Some studies have shown that high altitude will cause oxidative stress. In order to prove whether endurance training will cause the redox the redox homeostasis of young athletes, we compared the 12 - week training of professional young runners in the off-season with those of the same age who completed the training at sea level at an altitude of 1700 m, and concluded that long-term natural low altitude training is unlikely to cause changes in oxidative stress of young athletes[6].

The performance of endurance running depends on hematology, physiology, anthropometry, nutrition, genetics and training characteristics. Increasing the efficiency of oxygen transportation and tissue extraction is the main determinant of endurance competition. Therefore, the hematological parameters of young runners from different clubs at different altitudes were compared, providing valuable information for coaches and doctors, and monitoring the hematological and health status of athletes living and training in different altitude areas[7] .

Cross-country skiing is a lasting exercise that requires high aerobic capacity. It is not clear how the athletes ' maximum aerobic capacity and the changes of red blood cells and hemoglobin in

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the blood during exercise. Therefore, four weeks of altitude skiing training for cross-country skiers is conducted to explore the influence of altitude on the athletes ' maximum aerobic capacity and red blood cells and hemoglobin, so as to provide help for the planning and application of cross-country skiers in high altitude training projects[12]. Alpine skiing requires high strength of athletes ' lower limbs, especially among elite standing skiers with disabilities. Therefore, the effect of short-term blood flow restriction (BFR) exercise on muscle perfusion and high-intensity exercise performance is determined to evaluate whether this is an effective training program for elite athletes with disabilities[11] .

In high altitude football matches, hypoxia causes some adaptive changes of the body. Athletes may be prepared to go to or off the plateau in advance, but the strategy of football team competition is not clear, that is, the timing of ' entering and leaving the plateau ' and the short-term plateau adaptation. Therefore, by comparing the changes of blood gas transportation between local football players at high altitude and those in sea level areas at high altitude, we can provide guidance for football players to grasp the timing of entering and leaving the plateau and to adapt to the environment in the short term[30]. During weeks of altitude training, it is of certain research value to observe the quantitative changes of blood components. Due to the increase in altitude, the availability of oxygen is reduced, resulting in changes in arterial oxygen content, hemoglobin-oxygen saturation, hemoglobin quality, blood volume and blood gas concentration[27] .

High altitude training in hypoxic or hypoxic environment, the body in order to adapt to this change, will accelerate the use of oxygen, resulting in changes in lung function. Exposure to carbon monoxide under low pressure and hypoxia can exchange gas in the lungs of swimmers, causing hypoxic pulmonary vasoconstriction and even inducing pulmonary edema [25]. In addition to the lung function of swimmers will be affected in sports training, the lung function of bicyclists will also change. The heart rate, oxygen saturation and lung function before and after the competition were measured to measure the cardiopulmonary function of the uphill race between 1400 m and 2800 m after the bicycle[28]. Swimming and cycling will have corresponding changes in lung function under hypoxia and hypoxia environment. A certain degree of hypoxia training can improve the efficiency of lung and oxygen exchange and use, and play a positive role in improving athletes ' performance.

4. Physiological Changes in Altitude Training

In the past few decades, the number of adolescents exposed to high altitude is increasing. The development of plateau diseases is affected by altitude, altitude migration, residence time at high altitude and age. Therefore, the 6 - minute walking test (6MWT) was used to evaluate the resting cardiopulmonary physiology and submaximal exercise response under natural HA (high altitude training) conditions, so as to evaluate the signs and symptoms related to the onset of acute mountain sickness (AMS) in children and adolescents after acute hemagglutinin exposure [13].

Athletes need to overcome the dual pressure of high altitude hypoxia and body exercise hypoxia in altitude training. In group sports, it is not only necessary to overcome the physiological pressure caused by hypoxia in the environment and training, but also to withstand the psychological pressure caused by confrontation. Therefore, by comparing the psychological and physiological responses of team athletes to six repeated sprints in atmospheric hypoxia (RSH) and normoxia (RSN) in the two-week " high living and low training " training camp[33], the psychological and physiological changes of team athletes in atmospheric hypoxia or normoxia are explored. Hypoxia improves athletes ' physiological and perceptual response in the first stage of training. After physiological hypoxia stress, athletes ' physiological and perceptual adaptation occurs, mainly reflected in the improvement of sprint performance.

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5. Changes in Sports Performance

The training completed under anoxic condition can arouse physiological load more than that under normal oxygen condition. The training carried out under anoxic condition in plateau training can also cause certain physiological load. Running speed as a sport performance is very important for athletes. Therefore, through training at altitude of 2100 meters, the influence of altitude on athletes ' running speed is explored[3].

Ethiopian middle and long distance runners have long dominated the world track and field sports. Therefore, many researchers analyze the success of Ethiopian athletes. Genetics, anthropometry, physiological, biochemical and biomechanical characteristics, environmental factors such as high-altitude life and training, positive lifestyle in childhood and nutritional practice have been the main areas of concern in the past research involving endurance athletes in East Africa. In all the proposed variables, researchers have recognized the positive role of environmental factors on the success of these athletes. Therefore, a natural high altitude training model is used to test whether this method improves the long-distance performance of Ethiopian athletes[8].

Alpine skiers often train at some high altitudes, but training at high altitudes aggravates the physiological load of athletes. In order to explore the influence of altitude on the performance of alpine skiers, this paper studies the influence of balance, selection reaction time, strength, speed, flexibility, strength endurance and Vo2max of young athletes[9]. Mountain skiers not only bear the body load caused by high altitude hypoxia, but also face the risk of body fluid loss. Ensuring adequate body water is very important for athletes ' health, exercise performance and recovery, but it is a challenge for skiers trained in dry and cold environments. Therefore, by studying the water supplement of young alpine skiers during high altitude training camps[10], a reasonable water supplement proposal is provided for athletes and coaches to ensure that athletes have good sports performance in training.

Plateau training is widely used and plays an important role in the physical preparation of world athletes. In order to improve the performance of sea level training or competition, there is evidence that at least 22 swimming training centers around the world are built between 1000 meters and 3000 meters above sea level to provide plateau training environment for athletes. Swimmers often carry out altitude training, which can be seen in the popularity of altitude training among swimmers. Studies have assessed the effects of altitude training (AT) camps on swimming start time and load squat jump performance [22], and studies have analyzed the relationship between squat jump height and swimming start performance after altitude training camps [23].

6. Determination of Indicators to Measure the Training Effectiveness of Athletes Through Altitude Training

Resting heart rate is an important indicator to measure cardiovascular health. Therefore, through the development of norms on resting heart rate of male youth residence in the Kashmir Valley, a resting heart rate scale suitable for measuring the Kashmir Valley is developed as a normative reference for measuring resting heart rate[14] .

In swimming, coaches have been trying to find some methods to quantify the anaerobic threshold, which are different from the current methods. These methods are used to measure the fatigue of swimmers below 1000 meters above sea level. Some commonly used methods to quantify the load are based on the percentage of competition rhythm and the concentration of blood lactic acid. In view of this, finding a method to quantify the anaerobic threshold rhythm at high altitude in Bogotá and determining the method according to internal and external loads is the theme of many years of research. To this end, the anaerobic threshold of swimming

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athletes training at 2600 m above sea level in Bogotá was determined[21]. During the tense plateau training, cyclists are affected by external and internal load, so external load monitoring and internal load control are needed to avoid excessive load of young cyclists by fine-tuning exercise load. However, there are few studies on the stress response of adolescents ' plateau training load, especially biomarkers. Therefore, the training load of young athletes during the training camp is measured by using a multi-level method to investigate training load measures and biomarker responses during the seven-day training camp for young cyclists[29] .

Football is a popular sport, football games will be held in the plains will also be held in the plateau, but in 2007 FIFA 11th this vetoed in the altitude of 2500 meters above the competition, because too high altitude athletes have potential health risks, so that some of the altitude of 2500 meters held in the World Cup football events are affected, such as in Colombia, Ecuador, Bolivia and other high altitude World Cup held. The ban was lifted shortly, however, because there was insufficient data to prove that football at an altitude of more than 2500 metres was not feasible. Therefore, it is successful to study the training and competition of football players at the altitude of 3600 m, including the comparison of the change degree of football players ' running performance at the altitude of 3600 m and the sea level, the study of the physiological adaptation process of football players at the altitude of 3600 m[32], and the attempt to study the acute and chronic effects of youth football players at the altitude of 3600 m on football running performance, hematology, training, sleep and health. Because the game is carried out at high altitude, then whether the intensity of the game will be affected by altitude.The relationship between altitude and competition intensity was explored by comparing the relative competition intensity of two-week training camp at 3600 meters above sea level with that of local athletes at high altitude[31]. During the competition, the competition intensity and physical activity were adjusted according to the maximum athletic ability of young football players to avoid damage.

7. Other Studies on Altitude Training for Adolescents

High altitude hypoxia can lead to a variety of adaptation mechanisms, including changes in attention and cognition caused by brain hypoxia. In order to further prove the changes of adolescents ' attention and a variety of physiological adaptation mechanisms, by determining the morphological and physiological patterns of students from high altitude and sea level positions and the changes of attention ability and perception[18],high altitude will lead to changes in body shape, physiological patterns and responsiveness. However, the research on psychological cognition needs to be further studied from the perspectives of race, culture, world outlook and personal response level. It is reported that cognitive ability is affected by hypoxia. In addition, reasonable physical exercise has a certain improvement on cognitive function, but there is little understanding of the impact of exercise hypoxia on cognitive function. Therefore, by examining the effects of hypoxia (HYP) and long-term exercise (EX) on attention performance, to explore the relationship between exercise hypoxia and cognitive function and attention [19].

Some health conditions, especially respiratory diseases, occur when performing intensive exercise. Bronchial contraction caused by intensive exercise is extremely unfavorable for asthma patients and some people engaged in intensive exercise, which is mainly caused by insufficient oxygen supply during intensive exercise. Therefore, the epidemiological characteristics and degree of bronchial contraction induced by exercise in Mexico City (2240 m above sea level) were determined through research [20].

With the increasing specialization of youth sports, coaches have to consider adding a certain amount of altitude training to youth training, but there are few studies on the training of adolescents in the plateau. Therefore, the response of adolescents to altitude training is

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evaluated, and the data of adolescents ' response to hypoxia are collected to guide the altitude training of adolescents [16]. High altitude training can bring good training stimulation, but there are few individual studies on adolescents, especially on aerobic and anaerobic capacity of adolescents. Therefore, by evaluating the changes of aerobic and anaerobic abilities of adolescents in the 11 - day plateau training camp, we can better understand the impact of plateau training camp on running performance [1] .

8. Conclusion

Through the use of altitude training for young people training, to improve the heart and lung health of young people, aerobic exercise performance and competition performance effect is remarkable. Although altitude training can increase the fatigue of young athletes, resulting in difficult to improve the intensity of sports, and increase the risk of sports, but as long as reasonable arrangements for training to ensure that the exercise load within the scope of the athletes, which is very useful to improve the performance of athletes. At present, there are some problems in adolescent plateau training, such as less research on individual projects, in-depth research, and large fluctuations in the age range of most research subjects. In the future, the development of adolescent plateau training should be more specific to a certain age stage of adolescents, and specific sports projects should be studied from multiple perspectives. In addition, the study should establish a relatively systematic and complete theoretical basis, so as to guide the study of adolescent plateau training to make it more scientific, feasible and efficient. Youth sports are becoming more and more specialized, and the development of youth plateau training has become an urgent need. However, there are few studies on youth plateau training, and it needs to be broken through in future practical research.

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