# Research on Construction of Sports Quality Index in Athletes' Physical Training Based on Resource and Environmental Protection

**Yue Wang[1, a], Xudong Yang[1]**

[1]Sports Department, Shenyang Jianzhu University, Shenyang 110168, China.

[a]646577365@qq.com

**Keywords:** Protection of Resources and Environment; Athletes; Physical Training; Construction of Quality Index.

**Abstract.** Using the methods of literature review, questionnaire survey, expert interview and mathematical statistics, this paper discusses the construction and application effects of physical fitness indexes in physical fitness training of Chinese elite male athletes based on the resources and environment protection and taking the indexes of physical fitness training in general physical fitness training of male athletes as research objects. AHP is used to establish the weight of each index, the percentile method is used to establish the evaluation standard for the general physical fitness training of male athletes, the individual evaluation and grade evaluation are organically combined, and finally the evaluation system of the index for the general physical fitness training of male athletes is established. The comprehensive evaluation standard can be used to evaluate the overall development level of athletes' physical quality. To provide theoretical basis for coaches to develop athletes' physical fitness level, and to make training more targeted.

## 1. Introduction

The improvement of sports training level is based on the natural growth and development of athletes' organisms. The wide application of modern science and technology in monitoring athletes' training process has rapidly improved the scientific training process, and athletes want to win Olympic gold medals [1]. In order to set a new world record, only through systematic and high-intensity training can it be possible to improve the performance of sports. Understanding of developmental characteristics at different ages. Only by mastering these characteristics can coaches adopt reasonable training methods and means and make a correct evaluation of athletes' achievements in training [2]. Therefore, it is a correct choice for today's society to put the protection of resources and environment in the context of civilization transformation and value recasting, to think about the relationship between man and nature, and to look for the support of resources and environment protection from the perspective of environmental ethics. However, at present, there is relatively little research on the special physical fitness of male athletes in China, and the research mainly focuses on the physical fitness characteristics, body shape, body function and basic physical fitness of athletes, while the research on the index system of special sports quality training and its effect evaluation in the special physical fitness training of athletes is rarely involved [3]. In view of this, on the basis of in-depth understanding of the characteristics of male athletes, the structural model of special sports quality training for male athletes is explored in combination with the characteristics of the events, and a simple and practical special sports quality testing index system is constructed on this basis. At the same time, the testing index is used to diagnose the physical training effects of athletes at different stages, thus providing guidance and reference basis for scientific training of male athletes.

## 2. Research Objects and Methods

### 2.1 Research Object

The indexes of physical training in general physical quality training of male athletes. There are 16 male athletes, the average age is (20.5 ± 3.2) years old, and the training period is (5.5 ± 1.8). Among them, there are 10 elite athletes and 6 first-class athletes.

  DOI: 10.25236/iceesr.2020.025

### 2.2 Research Method

Through electronic searches such as China Periodical Network, wanfang data and Superstar Library, the method of literature and materials refers to the relevant data of male athletes in and outside China, and carries out classification research on the data, thus obtaining certain enlightenment.

### 2.3 Expert Interview Method

Through interviews with experts, scholars and teachers, the author consults the construction and existing problems of the index system of training methods and methods in the general physical fitness training of male athletes in institutions of higher learning.

### 2.4 Questionnaire Survey Method

According to the purpose of the study, a questionnaire was designed. The subjects of the survey are coaches and related experts of the national team. A total of 16 questionnaires were distributed and 14 valid questionnaires were recovered. The content of the survey is to invite the coaches and relevant experts of the national team to make a two-to-two comparison of the selected primary indexes by using AHP (the method of AHP comparison and assignment is to tell the coaches and relevant experts in advance). Finally, the comparison results are processed to determine the indexes and index weights.

### 2.5 Mathematical Statistics

Sorting out the test results, eliminating invalid data, and using Microsoft Excel statistical software package to analyze the relevant data.

## 3. Results and Analysis

### 3.1 The Primary Selection Method of Sports Quality Index

On the basis of literature review and expert consultation, 15 sports quality indexes are drawn up, mainly including strength, speed, endurance, agility, flexibility, coordination and combination of the above qualities. The coaches of the national team are required to use Delphi method to assign values to various indexes, giving 5 points, 4 points, 3 points, 2 points and 1 point respectively according to very important, important, relatively important, general and unimportant. Finally, the weighted average value of the indexes is calculated, and the indexes with a value greater than 4 are used as primary indexes for the next test (Table 1).

Table 1 Selection of proposed indicators by experts (n = 5)

| Develop indicators | Weighted average of index assignment | Primary indicators |
|---|---|---|
| Illinois runs nimbly | 4.96 | Illinois runs nimbly |
| Bowing push-pull ball | 4.93 | 10 min run |
| Take-off reaction force index | 4.88 | Bench press |
| High turnover | 4.46 | Squat |
| Squat | 4.42 | High turnover |
| Sit and reach | 4.33 | Sit and reach |
| 10 min run | 4.01 | |
| Bench press | 3.79 | |

### 3.2 Statistical Examination and Screening of Sports Quality Indexes

Special physical training means that during the training process of athletes, special physical exercises that are closely related and closely related to special events are adopted to improve the quality required by special events that are directly related to the results of special events. In order to

ensure the mastery of reasonable special techniques and tactics and their effective application in competitions. In order to verify the mutual independence between the primary indicators and avoid the phenomenon of repeated measurement due to too strong correlation between the indicators, the primary indicators are used to conduct preliminary tests on the national team athletes, and Pearson correlation coefficient analysis and test are conducted on the test results. The results are shown in Table 2.

Table 2 Pearson correlation coefficient comparison between primary indexes

| | Illinois runs nimbly | 10 min run | Bench press | Squat | High turnover | Sit and reach |
|---|---|---|---|---|---|---|
| Illinois runs nimbly | 1 | | | | | |
| Bowing push-pull ball | -0.53 | 1 | | | | |
| Take-off reaction force index | 0.36 | -0.55 | 1 | | | |
| High turnover | -0.44 | 0.13 | 0.25 | 1 | | |
| Squat | 0.56 | -0.56 | 0.86 | -0.23 | 1 | |
| Sit and reach | 0.41 | 0.32 | -0.44 | -0.05 | 0.07 | 1 |

From the results in Table 2, it can be seen that Pearson correlation coefficient of high turning and horizontal pushing reaches R= 0.86, which is obviously highly correlated and has significant difference. It is suspected of repeated measurement. The correlation coefficient R between other indexes is below 0.5, which belongs to moderate and low correlation. This shows that these three main factors summarize 78.8% of the overall information, so it can be considered that other factor variables besides these three factors have little influence on the variance, and the first three factors can be accepted as the main factors. Therefore, the special quality index of Chinese outstanding male athletes is divided into three main factors.

### 3.3 Weight Determination of Sports Quality Index

The weight of indexes is mainly determined by the analytic hierarchy process. Coaches are asked to construct objective comparison values between indexes according to the scale, and give quantitative representation of relative importance accordingly. Then a mathematical model is established to calculate the weight of relative importance of all factors at each level and sort them. On the basis of reclassification of special quality indicators, the weight of each indicator in reflecting special quality is determined [4]. In general, in order to improve the basic physical form of sports, enhance the systematic initiative of athletes' organs in various parts, and give full play to the best mode of sports mechanism and effects, the physical quality index system is taken as an important reference standard in the training process. General physical quality mainly includes strength, speed, endurance, suppleness and agility. However, the specific physical quality varies with different sports events. The mutual influence between human beings and the environment comes into being with the appearance of human beings and develops with the evolution of human civilization. However, "environmental problems" are all kinds of negative feedback effects that endanger human existence caused by the destruction and pollution of the natural environment in the process of utilizing and transforming the natural environment. Good physical quality can not only avoid injuries, but also prolong the sports life of athletes. The relative importance of the index is obtained after the coaches get the judgment matrix by comparing the two. Then the coach's judgment is integrated to determine the overall ranking of the relative importance of sports quality indicators.

Table 3 Matrix model for comparing indexes in pairs

| Sports quality | Illinois runs nimbly | 10 min run | ... | Take-off reaction force index |
|---|---|---|---|---|
| Illinois runs nimbly | 1 | ... | ... | ... |
| 10 min run | ... | 1 | ... | ... |
| M | ... | ... | 1 | M |
| Take-off reaction force index | ... | ... | ... | 1 |

Because the eigenvalues and variance percentages of each principal factor are different, their weights in reflecting the overall information are also different. According to the method of calculating the weight (contribution rate) of each factor according to the percentage of variance in factor analysis (see research method), it can be calculated separately. The factors that determine the outbreak are the maximum muscle tension of the muscle, the contraction time, distance and speed of the muscle. According to Hill's equation, the muscle tension is negatively correlated with the contraction speed of the muscle, and the outbreak is the best combination depending on the muscle strength and contraction speed at the same force distance [5]. The method of mutual comparison between indexes is obtained by comparing the example element on the left with other elements in the same trade in pairs, and stipulates that an element is equally important when compared with itself. See Table 3 for the comparison mode. See Table 4 for the scale of the comparison.

Table 4 Scale of relative importance

| Weight of relative importance | Definition |
|---|---|
| 1 | Equally important |
| 3 | Slightly important |
| 5 | Obviously important |
| 7 | Strong importance |
| 9 | Extremely important |

According to the result of rotating the factor load matrix by the variance maximum method, in the load matrix that has not been rotated, the factor variables have higher and similar loads in many variables, and its meaning will be fuzzy. After orthogonal rotation, the meaning of each factor will be clearer [6]. According to the consistency test of analytic hierarchy process, it can be seen that the matrix has a matrix with satisfactory consistency, which shows that coaches' judgment has overall consistency, and the determination of index weight is more reasonable and effective. From a physiological point of view, it is not difficult to explain the phenomenon that the physical quality shows increasing with age. The best development periods of various physical qualities of male teenagers are also different. Through factor analysis, the special quality indexes of our country's outstanding male athletes are divided into three main factors with smaller correlation degree, and each index in each factor has different factor loads, and different factor loads reflect the different correlation degree between the indexes and each factor [7]. Illinois sensitive run, 0.324 prone push-pull ball, 0.214 high turn/body weight, 0.175 take-off reaction force index, 0.179 half squat, 0.094 sitting position, 0.017 forward flexion, and 0.036 running 0.017 ,10 min. This provides an effective means for the future comprehensive evaluation of athletes.

### 3.4 Effect and Evaluation of Exercise Quality Index Application

#### 3.4.1 Initial Diagnosis Before Training

Through the test of athletes' 7 sports quality indexes before training, we can master the initial overall physical condition of athletes, understand the differences between athletes and the differences of athletes' own sports quality [8]. According to the research method of calculating the weight of each index in different factors, the weight of each index in each factor can be calculated. And determining the final weight of each index in reflecting the special physical fitness is the key step to construct the special quality weight model. Not only does it increase the load of athletes according to the changes in the environment, but also it is necessary to passively accept the development of "combining two into one" according to the physical quality of athletes. Individual training should be combined into a single adjustment of the internal mechanism of athletes' bodies, and targeted adjustments should be made to the training. Training plans should be regarded as the "necessities" of athletes. Athlete's development in speed, agility and coordination quality is not balanced, the overall level is low, and there are obvious differences between individuals. statistical analysis of data shows that $p< 0.05$. This result provides a theoretical basis for understanding that

athletes are at the level of the whole team in this index, and for paying attention to strengthening the speed, agility and coordination quality training of athletes with lower level in future training.

Advantages and disadvantages of horizontal comparison of athletes' own sports quality. Different indexes reflect different quality requirements, and the quality index values are unbalanced. Illinois's poor performance in sensitive running indicates that the athlete's ability to start, accelerate, decelerate, brake, re-accelerate and change direction is poor. Since the measurement units of each index in the special quality model are different, when evaluating the special quality model, the individual indexes should be scored first, the index units should be unified by standardizing the scores of each index, and the athletes' special quality indexes should be given corresponding scores, thus making it possible to comprehensively evaluate the special physical fitness model. Adjusting the athlete's body function to the maximum can stimulate the limit of the athlete's body bearing capacity, at the same time it will not harm the athlete's body, and only by controlling the change of "degree" can the accumulation of "quantity" be achieved, and finally the mutation of "quality" be produced, scientific distribution be carried out, appropriate stimulation be added, and the "freshness" of the body function be maintained. The result of leaning and pushing the ball is not very good either, which indicates that the athlete's core strength is weak, and the results of sitting forward flexion and 10 min running are poor, which indicates that the athlete's flexibility and aerobic endurance are insufficient. Individual evaluation criteria can reflect the specific physical development of athletes. Coaches and athletes can make targeted adjustments to follow-up training according to the physical development reflected in individual evaluation criteria.

### 3.4.2 The Stage Tasks and Main Measures of Training

In view of the initial state, the proposed stage training task is to continue to improve the working ability of various body moving organs and make further preparations for the later stage of training that bears a large amount of load. Among the special speed factors, the 10 min run has the largest weight, which reflects the higher special speed demand of male athletes. The index of other factors in each factor has a relatively small weight in this factor, which also shows that the above naming of each factor is correct. In the model based on upper limb strength as the basic quality training, dynamic training is often the main method, which can ensure the athletes to complete the specified actions within the specified time and limit the time within a certain range, thus effectively cultivating the athletes' ability of rapid contraction and relaxation of body muscles. Perhaps because men's speed and endurance qualities should be given priority, sending matches the physiological characteristics of men's physical development. There may be two main reasons for this phenomenon. The first reason may be that the number of excellent young athletes in the age group is already limited, and the number of good athletes is even less [9]. Gradually improve aerobic endurance and prepare and pave the way for special training in energy metabolism; Joint strength exercises under unbalanced conditions can improve the bearing capacity of weak links to sports load.

### 3.4.3 Comparative Analysis Before and After Training

Before and after the training, the results of all the players' sensitive running qualities were improved. Through the statistical analysis of the data, it was found that the performance was significantly improved ($P < 0.05$). According to the individual scoring standard of excellent athletes, the individual scoring of athletes is carried out to convert the specific quality index value of each athlete into the corresponding score, so that the specific quality indexes of different measurement units are relatively comparable; One of the important strength indexes of strength quality combined with technical training is fast backhand pull-up, which is not only the embodiment of strength of back muscle group and lumbar abdominal muscle group, but also the embodiment of special ability of male athletes. In addition, the index of parallel bar arm flexion and extension is used to measure the control ability of athletes' handstand technique on the bar. This is also in line with the theory of sports training. With the improvement of training level, it is more difficult to improve the training results, but this does not affect the player's position in the first group in the team. According to the principle of "barrel theory", the weakness of individual physical quality will inevitably affect the level of comprehensive physical quality, thus affecting the athletes' athletic ability.

Before the training, the athletes' performance of various quality indicators was not balanced. After the training, the athletes' performance of various qualities had been improved to different degrees, among which Illinois's sensitive running and leaning push-pull ball improved the most. On the one hand, it has maintained and improved its superiority index, on the other hand, it has exploited and expanded its weak link potential. On the basis of constructing the index model and weight model of the special quality model of our country's outstanding male athletes, the single scoring and comprehensive evaluation criteria of the established special quality model are of great theoretical and practical significance for understanding the special quality status of our country's outstanding male athletes and carrying out quantitative evaluation. Theoretical analysis and practical experience at home and abroad show that the lower limb explosive force of male athletes is the core of all strength qualities of male athletes. For example, the practice of running along the wind to reduce the resistance of external natural conditions; Downhill running, flat running, continuous high-speed fast running, using action acceleration or using the aftereffect obtained after the weight change of the equipment. This index mainly shows the ability of the lower limbs to continuously churn in the special training of male athletes. At the same time, it can also show the coordination ability of muscle groups in various parts of the athletes' bodies, which is an important index to measure the strength and explosive force of athletes and other factors among male athletes. This laid a solid foundation for the later stage of technical and tactical training. Of course, it should also be noted that the performance of the take-off reaction strength index has not improved much, which indicates that the knee injury maintenance and functional training of the player need to be further strengthened in the future.

## 4. Conclusion

During a certain period of training, athletes lose the balance of their overall control of physical fitness and sports function, which is one of the main reasons that lead to athletes' injuries, intermittent training, variation of sports skills and the improvement of sports performance. Not only can the physical fitness level of male athletes be effectively improved, but also the sports potential of male athletes can be fully developed, utilized and exploited, thus laying a solid foundation for their adult stage sports training and improvement of sports level. Physical fitness is an athlete's body's athletic ability, which consists of three major elements: body shape, body function and athletic quality. The earth's environment is the common wealth of mankind. No country, region or generation can disregard the stability and balance of the ecosystem for the benefit of local small groups. Contemporary people cannot overdraw the environmental resources of future generations to meet all their needs. The balance of body shape, the stability of function and the controllability of quality are the main basis for evaluating the physical fitness of Chinese outstanding male athletes. Through the reasonable evaluation index system of physical fitness, it provides a simple diagnostic measure for the evaluation of stage or final training effect, and also provides a reference basis for selecting effective training methods and means.

## References

[1]. Wang Lihai, Fan Qingmin, Qiu Bingxin. Brief analysis of boxer's psychological adjustment, special training and physical training [J]. Sports, (2017) No. 11, p. 26-26.

[2]. Zhang Bo. Discussion on the application of physical fitness training in volleyball [J]. Sports Goods and Technology, Vol. 20 (2017) No. 20, p. 185-186.

[3]. Guo Zhihao, Zhang Haiquan. Discussion on New Methods of Ice Hockey Athletes' Physical Training [J]. Sports Fashion, (2017) No. 12, p. 69-69.

[4]. Song Rui, Sun Zili, Hao Zhiwei, et al. Analysis on Physical Training of Professional Basketball Players [J]. Sports Goods and Technology, (2017) No. 24, p. 174-175.

[5]. Zou Yan Wei, Liu Zhibin. Research on methods of physical fitness training for competitive aerobics athletes [J]. Examination Weekly, (2019) No. 25, p. 139-139.

[6]. Zhang ying. discussion on swimmers' physical fitness training on land [J]. sports goods and technology, (2019) No. 6, p. 235-236.

[7]. Zhao Hua. Implementation Methods and Promotion Strategies of Physical Fitness Training in Colleges and Universities [J]. Contemporary Sports Science and Technology, (2018) No. 21, p. 36-36.

[8]. Zhang Dongqiang. Research on the Current Situation and Countermeasures of Physical Fitness Training of Chinese Young Basketball Players in the New Era [J]. Sports Goods and Technology, (2017) No. 24, p. 187-188.

[9]. Mi Qian. On women's football players physical training methods and issues [J]. Sports Supplies and Technology, (2017) No. 4, p. 191-192.