

# The Effects of Sports Training and Nutritional Intervention on Disabled Athletes' Abilities of Sports Performance

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**Abstract:** *The differences of sports training for the disabled and the normal are distinct. They exist not only in sports categories but also in training intensity and nutritional intervention for the disabled athletes. Therefore, to keep the competition fair and better show the creativity and value of the disabled athletes, in addition to setting reasonable standards for the sports competition, targeted schemes for training intensity and nutritional intervention are also necessary to promote athletes' performances and enable them to have a equal competition with other athletes in the aspects of physical fitness, mental ability and live performances, etc. Therefore, this paper takes disabled athletes' performance ability as the research object and analyzes how to strengthen the performance of disabled athletes through sports training and nutritional intervention. Hopefully, this study will lay the foundation for the development of disabled athletes in the field of sports.*

**Keywords:** *sports training, nutritional intervention, disabled athletes, ability of sport performances*

## 1. Introduction

Disabled people are the ones who exist abnormality or deficiency in physical, psychological and even structural aspects of the human body. With the development of sports competition for disabled athletes, they have successively received more and more comprehension and support from other social groups. It has become an inevitable trend to care for disabled people and promote the development of disabled athletes in the field of sports. However, compared with normal athletes, disabled athletes have significant differences in both physical function and the ability of live performances. Therefore, more standardized training methods and nutritional intervention methods are necessary to replenish physical fitness. Targeted schemes for training intensity is also needed to cultivate their live performances. These measures can lay the foundation for the development of disabled athletes in sports.

## 2. The Impacts of Sports Training and Nutritional Intervention on Disabled Athletes

### 2.1. The Impacts of Sports Training

The sports for disabled people are also called special sports, which are aimed at people who have problem in physical, mental and intellectual aspects. Disabled people can improve their physical fitness and cultivate their will power through sports training. With self-care ability as foundation, they can use sports to harvest material and spiritual wealth. There is a direct relationship between the impact of sports training and athletes' live performances. Excellent training patterns can not only help disabled athletes do better performance, but also protect them, such as reducing the chances of physical injuries. Conversely, if sports training does not adapt to the needs of sports for disabled athletes, this situation will not only harm disabled athletes' overall performances, but also directly tamp down the athletes' enthusiasm for training<sup>[1]</sup>.

Since the 2008 Beijing Paralympic Games, China has made great achievements in sports for the disabled. It has ranked first in the number of gold medals and medals in three consecutive Paralympic Games, which has been widely recognized internationally<sup>[2]</sup>. Currently, there are 10 eligible injury types: impaired muscle strength, impaired passive range of motion, limb deficits, ataxia, athetosis, hypertonia (increased muscle tone hypertonia), short stature, differences in leg length, visual impairment, and intellectual disability<sup>[3]</sup>. Strength deficits are present in many health conditions, including spinal cord injuries, cerebral palsy, and muscular dystrophies, and are often associated with impaired physical

function and performance <sup>[4]</sup>.

Sports training should adjust according to the sports that the disabled athletes engage in and their physical fitness. What's more, the sports training instructed by scientific methods can enable the disabled athletes to gain breakthrough, and develop their desire to show themselves step by step when they face the limitations. The original purpose of sports for the disabled is to strengthen the athletes' residual athletic abilities with the help of scientific sports training and to exploit their athletic potential, helping them perform better in sports competitions. Therefore, based on the sports ability of the disabled, choosing a sports training model that is more suitable to the athlete's physical and mental needs is more beneficial to promote the athlete's ability of live performances.

## 2.2. The Impacts of Nutritional Intervention

Nutrition is an important factor affecting the physical performance of athletes and plays an important role in the lives of both disabled and non-disabled athletes<sup>[5]</sup>. Nutritional intervention is the prerequisite for athletes to maintain their good training condition. From the angle of physical fitness, there are perfectly distinct differences between them and ordinary athletes in terms of physical recovery, physical adaptability and physical status. Reasonable nutritional intervention can help disabled athletes recover to a good physical status after sports training. In addition, it can also provide sufficient energy substance to athletes, which ensures the normal physical function of body. After participating in strenuous sports training, athletes need to do physical recovery in time so that they can be thrown into the next stage of sports training as soon as possible<sup>[6]</sup>. Nutritional intervention is not only effective in relieving fatigue, but also in increasing athletes' stamina and reducing the physical exertion caused by training or competition. Therefore, each athlete can maintain good sports performances and achieve more satisfactory competition results.

Definition of a dietary supplement, a food, food ingredient, nutrient, or non-food compound that is purposefully ingested, in addition to the diet for which it is customarily consumed, for the purpose of achieving a specific health and/or performance benefit<sup>[7]</sup>. There are also distinct differences in the effects of different nutrition. Taking nutrients as an example, nutrients, including protein, fat, sugar and vitamins, are mostly supplemented for athletes. Various types of nutrients are used in an interconnected and cooperative manner to maintain athletes' physical status for training. At the same time, the differences between nutrients also cause different effects of nutritional intervention. As shown in Table 1, different nutrients have different effects on athletes' performances. In addition, in specific training, it is necessary for the disabled athletes to grasp the training characteristics, reasonably selecting nutrients and planning nutritional interventions, so as to enhance their performances and facilitate the development of athletes in the sports field.

Table 1: Categories and Effects of Nutrients

Categories	Intervention Effects
Vitamin A	Be suitable for sports requiring a very good vision, such as shooting and fencing, and help enhance the light-sensitive substances in the visual cells.
Vitamin E	Suitable for strengthening the antioxidant capacity, improving muscle strength and enhancing protein synthesis.
Vitamin B1	Suitable for losing the fatigue of athletes, reducing the probability of overexertion, and enabling athletes to recover as soon as possible.
Vitamin B2	Suitable for stimulating nerve excitability and enhancing the effect of redox.
Vitamin C	Suitable for removing fatigue and preventing the occurrence of overexertion.
Calcium	Enhances muscle endurance and maintains bone health and nerve flexibility.
Creatine	Enhances explosive strength by stimulating muscles.
Caffeine	Reduces neural fatigue caused by sports training and maintains concentration.

### 3. The Methods Based on Sports Training and Nutritional Interventions to Enhance Performance

#### 3.1. Improve Sports Training Scheme

Based on the analysis of the physical and mental characteristics of disabled athletes, their needs for sports training programs are different from those of ordinary athletes. Therefore, it is necessary to improve existing training schemes to guarantee that they can meet the needs of the disabled. As shown in Table 2, the psychological state of disabled athletes changes significantly before and after participation in sports. All of these changes have a direct impact on the performance of disabled athletes. Therefore, the training strategy should be adjusted according to the athletes' physical and psychological changes before and after training, so that each disabled athlete can prepare well before training and quickly gain physical recovery. In addition, with the development of sports for disabled people, the competition is becoming fierce day by day. For this reason, scientific training should adapt to the activities before, during and after training to strengthen physical fitness of athletes so that their physical fitness can support them to maintain their performances. At the same time, combined with the athletic effects of disabled athletes, although a systematic sports training model can improve athletes' performance to some extent, their performances are affected by not only physical fitness and skills but also their psychological state, including athletes' perspectives of sports training<sup>[8]</sup>. For this reason, interesting training activities are more helpful to increase athletes' training enthusiasm, and they can relieve the pressure caused by the intensity of training.

Table 2: Sports Training Scheme for Improving Disabled Athletes' Sports Training

Improved Methods	Specific Implementation
Enhance attention to physical condition	Find out if athletes have problems in sleep and physical fitness and adjust the sports training scheme based on the problems. Enhance the effect of massage and stretching activities after training.
Adopt scientific training ratios	Carry out specialized training in combination with sports. Monitor heart rate during training; Provide high-energy drinks. Test the situation of the accumulation of creatine in muscles in time after training. Accept regular recovery treatment.
Adopt interesting training	Combine competition. Change training format and environment.

#### 3.2. Enhance Training Practices

Through improvements of training schemes, disabled athletes will show an increased desire to perform well in sports, whether motivated by achieving self-worth or aiming at high ranking. In order to fundamentally strengthen athletes' performance abilities, after sports training programs are improved, disabled athletes need to carry out the scheme and do the practice. For example, in the case of endurance training through running laps, the method of changing training environment and enhancing the fun of training can be the main way. In the practice, instructors need to break the traditional style of running laps by leading athletes to the field or training the athletes on the empty road and combining the element of competition within the training. Disabled athletes can be organized to carry out relay races or chase races. These methods can improve the training format and environment to enhance the athletes' performances, so that each athlete can actively show themselves in the competition. Another example is variable speed running. In the past, in order to avoid injury caused by excessive intensity of training to the athletes, plenty of sports training focused on the average speed jogging. However, athletes easily had a sense of boredom [9]. Therefore, the acceleration training can be accompanied by the variable speed running, which requires athletes to stand in a vertical line. The overall team to jog at a constant pace, but the last athlete of each team will be required to accelerate speed to run to the front of the team and then keep the constant pace again. This method helps to enhance the participation of athletes and increase their performance steadily. In addition, there are many other sports for the disabled athletes, such as wheelchair racing<sup>[10]</sup>. Wheelchair racing is often considered as a sport for aristocrats, because it requires not only high technical skills, but also huge investment in equipment. So, it is easy to combat the confidence of the athletes and affect their desire for sports competition. Therefore, rules before, during

and after training should be improved according to the sports that disabled athletes take part in, such as 200-meter, 400-meter, 800-meter and 10,000-meter race. For example, the 10,000-meter race requires a lot of physical strength. Therefore, training scheme should be made by taking the training intensity of endurance, speed and strength into consideration based on the condition of athletes. Strength training is to enhance athlete's physical fitness and endurance which are the fundamental abilities for disabled athletes' live performances. From the perspective of the content of strength training of the wheelchair racing, the strength training can be divided into two levels, level A and level B. Level A requires athletes to complete 5 sets of push-up exercise with 30 push-ups each group, 5 groups of sit-up training with 50 each group, roughly 5 groups of back muscle training with 30 each group and 3 groups of barbell bench press training only since barbell bench press training is the maximum load training. Level B is different from Level A. Level B requires athletes three sets of 20 kg arm bar training with nearly 40 each group. Sit-ups, back training, barbell bench press are needed to be completed in 5 groups, 3 groups and 4 groups, respectively, with 30-50 each group. During training, the intensity should be adjusted to the best according to the athletes' level and result of training, which will lay the foundation for the improvement of athletes' performances.

### 3.3. A Balanced Nutritional Diet

Combined with the analysis of the nutritional interventions of disabled athletes, instructors can choose specific dietary guidelines to ensure that the foods eaten by disabled athlete will have adequate nutrition to support their performances. In practice, firstly, the total intake of cereal for disabled athletes can be increased to ensure food diversity and nutritional balance. In general, the intake of protein accounts for 12%-15% of the total energy. The diet scheme should provide food options as much as possible for the athletes. Secondly, the intake of food should be matched with the training intensity and volume. In total energy, fat accounts for 25%-30%. But the content of fat can be increased to about 35% in diets for some athletes engaging in winter sports. The coordination of their body fat and weight is beneficial to the live performances of disabled athletes. At the same time, the addition of the intake of legumes, fruits and vegetables can ensure athletes' basic physical fitness. Athletes should also get into the habit of drinking yogurt or milk, consume meat and water on a regular basis and replenish sugars and nutrient fluids. Finally, additional meals can be provided for the athletes if necessary. At the same time, the athletes should attach great importance breakfast, and the breakfast should be provided with adequate amounts of supplements of nutrients so that they can continue to be in an ideal state of health and thus gain more desirable grades. This will lay the foundation for improving their performance<sup>[1]</sup>.

## 4. Conclusion

In conclusion, the performance ability of disabled athletes directly affects their sports training effects and performance in sports, and sports training methods and nutritional interventions can also affect the improvement of athletes' performance abilities. Therefore, it is necessary to analyze the characteristics of athletes' sports training and nutritional interventions to identify the factors that influence athletes' sports performance ability. At the same time, the instructors should improve the existing sports training schemes based on athletes' characteristics, and implement the schemes into practice. What's more, interesting and systematic sports training is necessary to carry out. Finally, nutritional diet should be made according to the nutrition demand of disabled athletes for supporting the improvement of the performance ability of disabled athletes and providing sufficient nutrition.

## References

- [1] Hobara Hiroaki, Murata Hiroto, Hisano Genki, Hashizume Satoru, Ichimura Daisuke, Cutti Andrea Giovanni, Petrone Nicola. *Biomechanical determinants of top running speeds in para-athletes with unilateral transfemoral amputation [J]. Prosthetics and orthotics international, 2022.*
- [2] Wang Dan. *Research on the current situation of the selection of track and field reserve talents for the disabled in Henan Province—Taking the Henan Provincial Track and Field Championships for the Disabled as an example. 2018, Collection, 3.*
- [3] Fiorese, B. A. (2021). *Para runners with brain impairment: Biomechanical characteristics and evidence-based methods for classification.*
- [4] Verschuren, O., Smorenburg, A. R., Luiking, Y., Bell, K., Barber, L., & Peterson, M. D. *Determinants of muscle preservation in individuals with cerebral palsy across the lifespan: a narrative review of the literature. Journal of cachexia, sarcopenia and muscle, 2018, 9(3), 453-464.*

- [5] Rastmanesh, R., Taleban, F. A., Kimiagar, M., Mehrabi, Y., & Salehi, M. (2007). Nutritional knowledge and attitudes in athletes with physical disabilities. *Journal of Athletic Training*, 42(1), 99.
- [6] McConkey Roy, Menke Sabine. *The community inclusion of athletes with intellectual disability: a transnational study of the impact of participating in Special Olympics [J]*. *Sport in Society*, 2022, 25(9).
- [7] Maughan, R. J., Burke, L. M., Dvorak, J., Larson-Meyer, D. E., Peeling, P., Phillips, S. M., & Engebreetsen, L. *IOC consensus statement: dietary supplements and the high-performance athlete. International journal of sport nutrition and exercise metabolism*, 2018, 28(2), 104-125.
- [8] Jeoung Bogja, Kim Jiyoun. *Analysis and Evaluation of Nutritional Intake and Nutrition Quotient of Korean Athletes with Disabilities in the Tokyo Paralympic Games [J]*. *Nutrients*, 2021, 13(10).
- [9] Jin-woo Park, Jung-heung Park. *Understanding of Performance Enhancement Attitude in the Athletes with Disabilities: A Perspective from the Health Action Process Approach [J]*. *Journal of Rehabilitation Research*, 2021, 25.0(3.0).
- [10] Dong Sun, Liang Zhao, Ying Huang, Yang Song, Qichang Mei, Jianshe Li, Yaodong Gu. *Research progress on improvement of athletic performance of disabled people from the perspective of sports biomechanics [J]*. *China Sport Science*, 2020, 40(05):60-72.
- [11] Wenhua Fan. *A Study on Psychological Intervention in the Training of Disabled Table Tennis Players [J]*. *Sport*, 2019(04):21-22+52.