

Balancing and Optimizing Speed and Endurance Training in Track and Field

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Abstract: This paper aims to explore the strategies for balancing and optimizing speed and endurance training in track and field. By analyzing the relationship between speed and endurance, and evaluating the scientific and effective training methods, a comprehensive training program is proposed. The goal is to provide theoretical guidance and practical reference for the training of track and field athletes. The article will start by discussing the roles of speed and endurance, explore their interrelationship, then analyze how to balance the training of speed and endurance, and finally propose specific measures for optimizing training.

Keywords: Track and field; Speed training; Endurance training; Balancing strategy; Optimization methods

Introduction

With the exacerbation of global climate warming, reducing greenhouse gas emissions and increasing carbon sequestration have become urgent priorities. Urban green spaces, as a key component of urban ecosystems, are increasingly prominent in their roles in regulating urban microclimates, improving air quality, and enhancing urban carbon sequestration capacity. Therefore, how to optimize the layout of urban green spaces based on carbon sequestration benefits has become an important research topic in the current field of urban planning and construction.

1. Overview and Relationship between Speed and Endurance

1.1 The Importance of Speed

In track and field events, speed is one of the key factors

determining the outcome. Whether it's sprints, long jumps, or throwing events, athletes need to possess excellent explosive power and speed capabilities. Therefore, speed training holds a critical position in track and field training.

1.2 The Fundamental Role of Endurance

Endurance forms the foundation for athletes to maintain high performance levels throughout a competition. It is particularly crucial in middle-distance, long-distance, and marathon events. Good endurance helps athletes better cope with fatigue during competitions, allowing them to maintain a stable competitive state.

1.3 The Relationship between Speed and Endurance

Speed and endurance do not exist in isolation; rather, they are interconnected and mutually reinforcing. On one hand, a solid foundation of speed helps athletes quickly secure advantageous positions in competitions,



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enhancing their overall competitive level. On the other hand, sufficient endurance reserves ensure that athletes can maintain stable speed output over long-duration events, avoiding early fatigue. Therefore, balancing and optimizing speed and endurance in track and field training is of paramount importance.

2. Methods for Balancing Speed and Endurance Training in Track and Field

2.1 Alternating Periodization Training

In track and field, alternating periodization training is widely used to balance speed and endurance training. The core idea of this method is to design a structured training cycle where speed and endurance sessions alternate, aiming to comprehensively enhance the athlete's overall capabilities. Specifically, a typical approach involves alternating three speed training sessions with two endurance training sessions per week^[1]. On speed training days, athletes focus on sprinting, explosive strength exercises, and high-intensity interval training (HIIT). Sprint training may involve different distances such as 30m, 60m, or 100m, aimed at improving burst speed and acceleration. Explosive strength exercises could include plyometrics and quick power movements to enhance rapid muscle contraction in the legs. High-intensity interval training might consist of activities like 400m sprints followed by short rest periods, repeated to improve speed endurance and recovery capacity. On endurance training days, the focus shifts to activities like long-distance slow runs, hill climbs, or sustained aerobic exercises. Long-distance slow running helps build foundational endurance and can be performed on soft track surfaces to reduce joint impact. Hill climbing exercises strengthen leg muscles and endurance by utilizing terrains with varying slopes. Additionally, sustained aerobic activities such as cycling or swimming can complement endurance training to enhance cardiovascular fitness and endurance levels. The key to alternating periodization training lies in effectively managing training intensities and recovery times to prevent over-fatigue. Furthermore, training plans should be adjusted based on individual athlete differences to ensure challenges are within their capabilities without causing excessive strain.

2.2 Integrated Training

Integrated training is an efficient method that combines

speed and endurance training to simultaneously enhance both aspects in athletes. Fartlek training and High-Intensity Interval Training (HIIT) are two representative integrated training methods. Fartlek training, derived from Swedish meaning "speed play," integrates various running forms such as continuous running, jogging, fast running, and sprinting. Athletes adjust their speed and running style based on terrain, personal feeling, and training objectives. For example, in a 40-minute training session, an athlete might start with a 10-minute warm-up jog, followed by 5 minutes of moderate-speed running, then perform 3 sets of 30-second all-out sprints, with 2-minute jogs or walks for recovery between sprints, and finish with a 10-minute cool-down jog. This training mode enhances endurance and significantly improves speed during the sprint phases. High-Intensity Interval Training (HIIT) is a more structured integrated training method. Athletes perform short bursts of high-intensity exercises, such as all-out sprints or rapid strength exercises, followed by short rest periods, repeating the process. For example, a typical HIIT session might consist of 8 cycles, each involving 30 seconds of all-out sprinting followed by 30 seconds of rest^[2]. This method quickly raises heart rate and promotes recovery during rest periods, effectively improving both speed and endurance. When performing integrated training, athletes need to monitor training intensity and duration to avoid over-fatigue. Additionally, warm-up before training and stretching after training are essential to prevent injuries and enhance recovery efficiency.

2.3 Personalized Ratio

In track and field training, personalized ratio is a crucial strategy that finely adjusts the proportion of speed and endurance training based on individual differences and specific event requirements of athletes. Different athletes have varying physical conditions, technical characteristics, and competition goals, leading to diverse needs for speed and endurance. Therefore, training plans must be highly personalized to ensure each athlete derives maximum training benefits. For sprinters, speed is the key determinant of success. Hence, their training plans should emphasize speed training more prominently. For instance, scheduling more sprint drills, explosive strength exercises, and reaction speed training sessions weekly can significantly enhance sprinters' start,

acceleration, and maximum speed abilities, leading to improved competitive performances. Additionally, strength training focusing on leg and core muscles is essential for sprinters to enhance explosiveness and stability. In contrast, long-distance runners require more endurance training. Their training regimes should include extensive long-distance runs, aerobic exercises, and recovery sessions. These activities help improve runners' cardiovascular fitness, endurance, and recovery capacity, enabling them to maintain consistent performance over prolonged competitions. Furthermore, flexibility training is crucial for long-distance runners as it reduces the risk of injuries during extended running sessions. Adjusting training ratios based on the sport and individual athlete characteristics is essential. For example, younger athletes may benefit more from foundational fitness training, while experienced athletes may focus on technical refinement and mental toughness. Coaches must closely monitor each athlete's development and flexibly adjust training plans accordingly. Implementing a personalized ratio strategy requires regular assessment and feedback mechanisms. Periodic physical fitness tests, technical evaluations, and psychological assessments enable coaches to timely assess athletes' progress and challenges. Based on these evaluations, coaches can adapt training plans to ensure effectiveness and specificity.

3. Optimization Strategies for Speed and Endurance Training

3.1 Precision Monitoring and Adjustment

In track and field training, precision monitoring and adjustment are key strategies for optimizing training effectiveness, especially in speed and endurance training. To maximize training outcomes, it is crucial to closely monitor athletes' physiological responses and changes during training. Firstly, real-time monitoring using modern technological tools is essential. Heart rate monitoring is a commonly used method where athletes wear heart rate monitoring devices to continuously track their heart rate variations during training. This helps in understanding cardiovascular responses and promptly assessing if the training intensity is appropriate. For instance, during high-intensity interval training, if the heart rate remains excessively high with slow recovery, it may indicate that the training intensity is too high

and requires adjustment. In addition to heart rate monitoring, blood lactate testing is another important tool for evaluating training effectiveness. Blood lactate levels reflect the athlete's metabolic state during high-intensity exercise, indicating the balance between aerobic and anaerobic endurance. Regular blood lactate testing allows coaches to accurately assess athletes' endurance levels and adjust training plans accordingly to better match their actual capabilities. Furthermore, based on real-time monitoring data, coaches need to flexibly adjust training intensity and content. If the data shows that athletes are adapting well to the current training intensity, coaches may consider increasing the training difficulty appropriately to further stimulate athletes' potential. Conversely, if athletes exhibit signs of significant fatigue or discomfort, training intensity should be reduced to prevent over-fatigue and potential sports injuries. When implementing precision monitoring and adjustment strategies, it's crucial to ensure the continuity and comparability of data^[3]. Long-term data accumulation and analysis enable coaches to accurately track athletes' training progress and physical changes, thereby providing robust support for developing more scientific and rational training plans. By employing these precision monitoring and adjustment strategies, coaches can effectively optimize speed and endurance training, ensuring athletes achieve their maximum potential while minimizing the risk of injuries.

3.2 Nutrition and Recovery Strategies

In track and field training, proper nutrition supplementation and recovery strategies are crucial for enhancing athletes' physical recovery and performance. To ensure athletes can recover quickly after high-intensity training, it's essential to develop a scientific dietary plan. The dietary plan should include adequate amounts of protein, carbohydrates, and healthy fats. Protein is essential for muscle repair and growth, helping athletes recover damaged muscle fibers caused by training. Carbohydrates serve as the primary energy source, replenishing energy expended during training efficiently. Additionally, moderate amounts of healthy fats from sources like fish oil and nuts contribute to athletes' recovery and overall physical enhancement. In addition to diet, adequate rest and recovery time are equally important. After intense training sessions, athletes' bodies require time to repair and adapt.

Therefore, coaches should schedule training and rest periods sensibly to avoid physical fatigue from over-training. To accelerate muscle recovery, physical methods such as cold and heat therapy, as well as massages, can be beneficial. Cold therapy helps reduce muscle inflammation and swelling, while heat therapy promotes blood circulation, aiding in the removal of waste products from muscles. Massages help relax tense muscles, reducing muscle soreness and stiffness. By implementing scientific dietary plans and sensible rest and recovery schedules, athletes can better adapt to high-intensity training, thereby performing at their best levels during competitions. These strategies not only enhance physical recovery but also contribute to long-term athletic development and overall well-being.

3.3 Psychological and Motivational Support

In track and field training, psychological and motivational support plays a crucial role in enhancing athletes' performance during speed and endurance training. Optimizing strategies in this area can significantly improve training effectiveness and competitive results. Firstly, providing psychological counseling and guidance is essential. Training processes often come with high pressure and setbacks, leading athletes to experience anxiety, frustration, and other negative emotions. Professional psychologists or counselors can regularly engage with athletes, employing effective psychological techniques such as relaxation training and cognitive restructuring. These methods help athletes better cope with pressure and setbacks, enhancing their mental health and improving their self-awareness and self-regulation skills. Ultimately, this enables athletes to engage more effectively in their training. Secondly, setting clear training goals and establishing reasonable reward mechanisms are key to boosting athletes' training motivation. Goals should be specific, measurable, and aligned with athletes' long-term career plans. For example, goals could involve achieving a certain percentage improvement in speed or endurance within a specified time frame. To motivate continuous effort, a series of rewards can be established, such as material incentives or public recognition upon achieving specific

training objectives. These rewards not only satisfy athletes' sense of achievement but also further stimulate their training enthusiasm and motivation^[4]. Moreover, coach and team support are indispensable. Coaches should build strong trust relationships with athletes, providing positive communication and feedback to acknowledge athletes' progress and efforts. Mutual encouragement and support among team members create a positive training environment, enhancing athletes' training motivation and team cohesion.

Conclusion

The balance and optimization of speed and endurance in athletics is a complex and systematic project. Through the development of personalized training plan, scientific arrangement of training load, strengthening technical training and psychological adjustment, as well as focusing on nutritional supplementation and recovery and regeneration and other measures, it can effectively improve the comprehensive athletic level of athletes. In the future, with the continuous progress of science and technology and the continuous innovation of training methods, speed and endurance training in track and field will be more scientific and efficient, laying a solid foundation for athletes to create more brilliant athletic performance.

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