Study On the Influence of Training Methods on Track and Field Athletes' Performance

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Abstract

The study undertakes a thorough review of the variables impacting the track and field athletes' unsatisfactory performance in an effort to improve their performance. It looks into how track and field athletes' training methods affect their physical performance. It also comes up with a way to measure their training progress and makes it easier to figure out how different factors affect their overall performance. Then, experiments are done to make sure that these results are true. This study also looks at the exact methods and approaches that track and field athletes use to train and improve their ability. The relationship between different training techniques and the performance outcomes in field events including the long jump, high jump, shot put, and javelin throw is carefully examined. This study tries to pinpoint the most efficient methods for realizing athletes' potential by examining the effects of various training strategies on their physical prowess, technique mastery, and overall performance. The suggested evaluation model is a useful tool for evaluating how well athletes' training programs are working. It considers a number of performance characteristics, such as technique precision, mental agility, strength, and endurance. Coaches and trainers can create training plans that are specific to each athlete's demands by a methodical analysis of these aspects, enhancing the way they perform on the field.

Keywords: Athletes; Field Performance, Track and Field, Mental Agility

Introduction

Track and field are a very well-liked sport all around the world. Thousands of fans follow their favorite competitors and athletes intently via live broadcasts and other news outlets. Similar to the United States, track and field enjoys tremendous public appeal and media interest in China. However, with diminishing international rankings, China's track and field performance has recently experienced difficulties (Pedersen et al., 2020). Despite the national athletic organizations' best efforts, improving the performance of Chinese athletes hasn't yielded the intended results. The Chinese track and field team's strength and capabilities need to be improved, according to the country's sports business.

Technical proficiency, tactical awareness, psychological aptitude, intelligence, and physical fitness are some of the characteristics that affect a track and field athlete's ability to compete. The tactical approach has accepted a tendency of complete specialization as the sport continues to develop, where athletes concentrate on dominating particular events (Güllich et al., 2019). Track and field competitions now have distinctive qualities, such as fierce competitiveness and impressive speed, as a result of this specialization. Athletes must have higher levels of physical fitness because to the quick changes between offensive and defense techniques. As a result, separate from technical and tactical training, physical training has become a distinct training element. Top track and field nations all over the world hire full-time physical coaches to train their athletes in accordance with the particular demands of the sport because they understand the value of physical preparation. A team's performance is substantially impacted by the scientific quality of physical training, with strength training playing a key role in this area (Mayer & Thiel, 2018). In competitive sports, strength training is a crucial component of physical preparation and frequently affects level of performance as a whole. Strength training is still not well understood scientifically in China's track and field community. The development of smaller muscles is frequently neglected in favor of high-load, high-intensity exercises that focus on training large muscular groups. The result is a hindrance to the complete development of the muscles. Athletes in track and field must carry out technical maneuvers in uncertain circumstances. For instance, jumpers must avoid physical contact during takeoff and landing, sprinters must maintain balance while sprinting at high speeds, and throwers must develop power while retaining synchronization (Baqutayan & Md Salimun, 2018). These situations emphasize how crucial it is to combine general and specialized strength training techniques in order to achieve peak performance. The track and field sector in China must therefore review and update its current

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training strategies. The coordinated growth of athletes' musculature can be aided by a fresh emphasis on strength training using cutting-edge scientific methods. Athletes can improve their overall skills and execute technical moves more successfully by putting an emphasis on both general and specialist strength training activities. Along with enhancing individual performance, this comprehensive training strategy will strengthen the track and field team of China as a whole. Teenagers are the future of Chinese track and field athletics performance (Mastromartino et al., 2020). In order to catch up with and surpass the world's advanced level, Chinese athletics must adopt a scientific mindset and an inventive spirit in order to advance and surpass the advanced level of track and field performance and field events seen around the globe. Prioritizing the development of talent reserves would help Chinese athletics reach new heights and provide a powerful boost for their development. Only a small number of academics have studied training in an unstable state, according to research done using keywords like "unstable state training" and "rapid change movement ability" on Chinese and foreign literature platforms. The effect of unstable state training on athletes' lower limb rapid strength, balancing skills, and core strength was the main area of study. Research on the capacity for rapid direction shift in an unstable condition is still substantially undeveloped. Athletes regularly face quick changes in direction, sudden stops, and high speeds throughout different portions of their events in track and field competitions. In their struggle for dominance or position, they also get into violent fights (Abdullaev, 2020). The athletes' centers of gravity are constantly shifting during these movements, which causes their bodies to become unstable (Stanković et al., 2018). However, the significance of this aspect is occasionally overlooked when developing physical training programs for track and field players. The goals of the training don't align with the particular requirements of the sport as a result. Based on the idea that athletes perform their activities on the field while maintaining a state of unpredictability, this research aims to investigate the potential effects of strength training in an unstable condition on the ability of track and field athletes to perform what they are doing while keeping a state of unpredictability. Additionally, it compares the effects of traditional strength training and unstable state training on the capacity for quick directional shift movement under identical training circumstances with a stable interface (Boccia et al., 2017). The goal of the study is to examine the factors influencing the observed findings and evaluate whether there is a statistically significant difference in motor performance between the two training regimens.It is intended that by doing this study, track and field professionals would gain useful knowledge that will help them when creating physical training programs for players. A new dimension can be given to the athletes' capacity to change directions quickly, improving their performance in track and field events, by introducing the idea of training in an unstable state memory (Casa et al., 2019).

The influence of training methods on the performance of track and field participants

Track and field player training evaluation model

Performance-based decision-making in track and field refers to a thorough procedure where competitors' athletes gather and evaluate outside data before taking appropriate action. Due to the restricted amount of information provided, the tight deadline, and the unpredictable results, this procedure is different from normal decision-making tasks (Burke et al., 2019). Track and field athletes' decision-making behavior is simple to monitor and quantify in the present sports environment, but researchers should concentrate on learning how athletes perceive, evaluate, and make quick decisions in stressful competition settings. Investigating this procedure is essential for understanding the mechanics underlying decision-making and for assisting coaches in improving the decision-making skills of field athletes (Wilson & Di Zhang, 2018). Individuals must accurately interpret the information offered during the event, store it in short-term memory, and then compare it to their implicit and long-term working memories in order to make decisions in the setting of track and field based on the general evaluation model, as shown in the Figure 1 below.

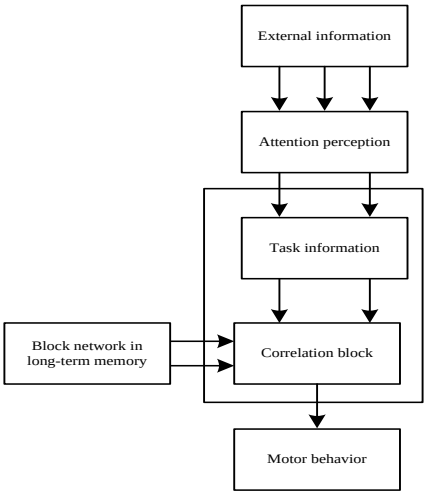

Figure 1. Motion decision information processing process in Athletics

We must distinguish between two different decision-making processes in the study of sports decision-making: cognitive decision-making and intuitive decision-making. Based on how quickly decisions are made, these two styles of decision-making can be distinguished. While intuitive

decision-making is linked to personal instinctive responses, cognitive decision-making is primarily motivated by logical reasoning. In actual study, psychologists can distinguish between these two categories of decision-making tasks by changing guidance and regulating variables like the length of stimulus presentation. According to studies, players typically make intuitive judgements in high-stress, time-sensitive athletic circumstances. Athletes desire to both great physical skills and the ability to make good decisions in order to do their best. Psychologists are becoming more and more interested in sports because they can study how players make decisions through direct observation of sporting events. In sports, too, decisions have to be made quickly, with limited access to useful information, and with less certainty about how actions will turn out, especially in fast-paced situations like track and field events (Verde et al., 2021). The ability of athletes to understand and evaluate the competitive environment on the field is largely reflected in their decision-making in sports. Therefore, it is imperative to do research on sports decision-making. Due to the variety of decision-making information involved, track and field offers a wealth of experimental material for decision-making study. Athletes must swiftly recognize essential scene information in rapidly changing events based on the positioning of rivals and their own teammates. They then quickly digest the information, make decisions based on it, and compare it to their prior experience. Athletes are given a variety of task information and shifting cues depending on the track and field circumstance (Bao, Meng, & Zhu, 2020). Athletes that excel in track and field should be able to absorb information quickly and make good decisions. Additionally, research on sports decision-making based on track and field competitions gives stronger ecological validity when compared to other fields. Given these elements, the following functional structure for track and field performance and field events training programs can be optimized:

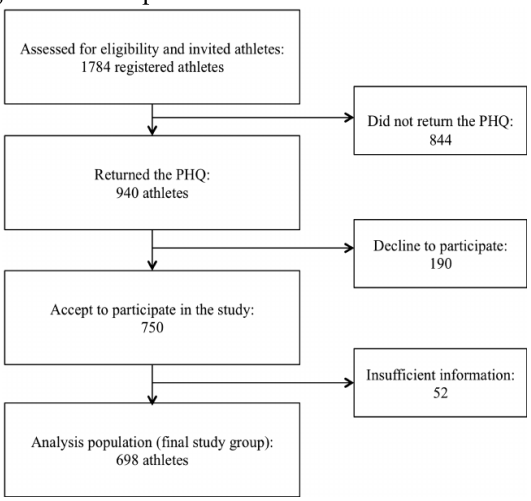

Figure 2. Functional structure of track and field training categories

In track and field performance and field athletics, athletes are required to continuously observe and make crucial decisions, just like in soccer/football. Whether it's observing the movements and positions of fellow athletes during relay exchanges, predicting the landing point of a long jump, or gauging the distance between throwers and competitors in javelin, keen observation and decision-making skills are essential. This aspect of the sport adds to its validity as a research tool, as it closely aligns with the competitive nature of the events. A comprehensive understanding of the unique characteristics and fundamental principles of track and field events is crucial for their development (Daugherty, DePadilla, & Sarmiento, 2020). These characteristics primarily revolve around the harmonious integration of external biomechanics and the internal biological mechanisms exhibited by athletes during training and competition. This integration distinguishes track and field from other sports, highlighting its distinct competitive abilities. A deep comprehension of these special characteristics is vital in identifying the key elements that impact performance in these events and improving athletes' competitive abilities. By effectively coordinating and integrating these elements, sports training and competition can be better guided. It is evident from the above analysis that understanding the developmental patterns and fundamental attributes of track and field events is a fundamental prerequisite for fostering the growth of the sport and enhancing athletes' competitive levels (Bandeiras, 2019). The comprehension and appreciation of these special characteristics ultimately determine the level of training excellence. When it comes to training for track and field events, special emphasis must be placed on grasping the underlying training principles. This ensures high-quality training outcomes and enhances training efficiency. By doing so, clear goals and directions are established, guaranteeing a scientific and sustainable training process.

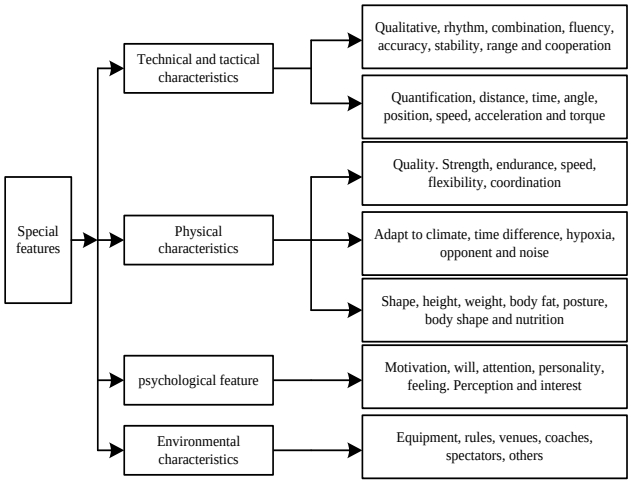

Figure 3. Characteristics structure of track and field special sports

There are different opinions on the understanding of the concept of physical fitness in the track and field performance, which can be operationally defined from different angles and horizons (Herold & Sommer, 2021). Therefore, this study aims to put forward the understanding of the concept of physical fitness on the basis of previous studies: from a broad perspective, that is, the basic physical abilities accumulated and stored by the human body to meet the needs of sports, including general sports ability most importantly in athletics. The special exercise ability and the adaptability of the body are the comprehensive embodiment of the basic activity ability of the human body and the comprehensive reflection of the internal system of the human body in exercise (Wirth et al., 2021). In a narrow sense, that is, the plasticity and adaptability of the structure and function of athletes' body organ system in terms of body shape, body function, sports quality and the natural environment of competition can be obtained through congenital inheritance and acquired training. Specifically, it is composed of the following parts. See the Figure 4 for details.

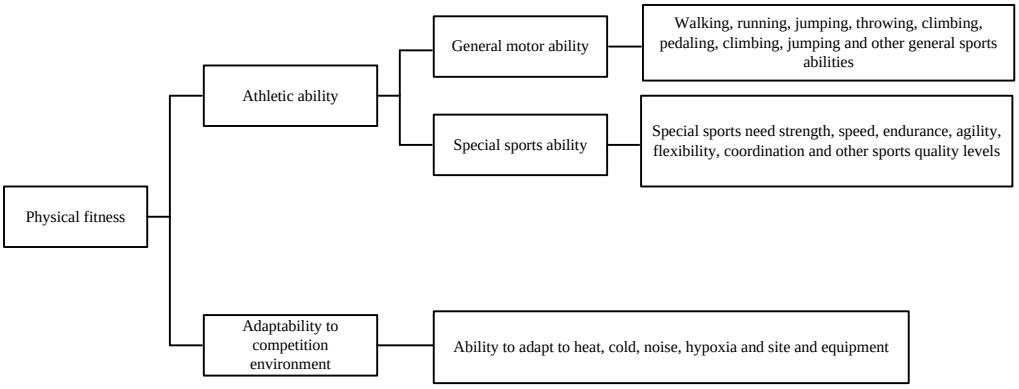

Figure 4. Structural characteristics of special physical training

Special physical fitness is the physical activity characteristics, performance characteristics and competition demand characteristics different from other sports based on Athletes' physical activity ability to meet the needs of competition. Its core is to meet the physical needs of the competition, and the second is to maintain the continuous exercise ability suitable for the competition. Before the concept of physical training was widely used in sports training academic circles, Chinese scholars and experts mostly used the basic concept of "physical quality" or "physical training" (Pontillo et al., 2020). At present, covering and updating the concept of physical fitness or physical training with physical fitness training is not only because the concept of physical fitness can more comprehensively and systematically summarize the basic content of physical fitness, but also reflects the cognitive depth and system of China's training theory (Kodera et al., 2020). Physical training, as the name suggests, refers to the training for developing human physical fitness, that is, the training that uses scientific loads and means to promote the adaptive changes of human body shape and function, so as to improve the ability of the body to adapt to specific sports.

Evaluation index of influence degree of football players' physical training

Physical exercise is essential to sports training and is a key way to improve athletes' performance in track and field competitions. It entails enhancing athletes' physical prowess and general athletic condition through specially designed training regimens that successfully address the demands of their preferred sport. Physical training lays the groundwork for specific technical and tactical training by properly managing training loads. It greatly improves athletes' ability to bear training loads, helps prevent injuries, and keeps athletes' athletic careers alive (Eltoukhy et al., 2019). The main goals of physical training for track and field athletes are to improve their sporting prowess, maximize their functional status, and create a body type that is compatible with the demands of their chosen activities (Amick, 2021). This viewpoint provides explicit and extensive recommendations on the particular needs, energy metabolism traits, and activity patterns associated with track and field physical training. Physical training includes deliberate alterations to an athlete's body's composition and mechanics with the goal of enhancing their overall physical prowess. This is accomplished by incorporating event-specific demands and using carefully controlled training loads, improving an athlete's form, functionality, and overall degree of athletic excellence. In the end, it helps them develop their competitive skill (Ghaderi et al., 2020). Therefore, mentioned guidelines can be used to guide the training strategies for various events when thinking about track and field performance. For sprinting competitions like the 100-meter dash, for

instance, physical training may concentrate on enhancing explosive power, speed, and agility. To improve their leg strength and acceleration, athletes should use plyometrics, sprint drills, and resistance training. Physical training for long-distance running competitions may focus on increasing stamina, cardiovascular fitness, and endurance. Long-distance runners can improve their aerobic capacity and endurance by include aerobic workouts like long runs, interval training, and tempo runs in their training program (Reche et al., 2020).

Field events, like the long jump and shot put, call for particular physical qualities. Exercises that improve leg power, core strength, and flexibility, including as bounding exercises, weightlifting, and plyometric drills, may be included in the physical preparation of long jumpers. Conversely, shot put throwers may concentrate on developing upper body strength and explosive power with weightlifting drills, medicine ball tosses, and rotational exercises (Fitch, 2015; Sidharthan et al., 2017).

As a result, physical training for track and field players takes into account a variety of factors, including body type, physical capabilities, athleticism, and general health. It centers on a deliberate training regimen that modifies an athlete's physical makeup and function to better suit the demands of their chosen events. Physical training seeks to increase athletes' track and field performance levels by adding suitable training loads, ultimately resulting in increased competitive abilities.: (see the Figure 5 for details)

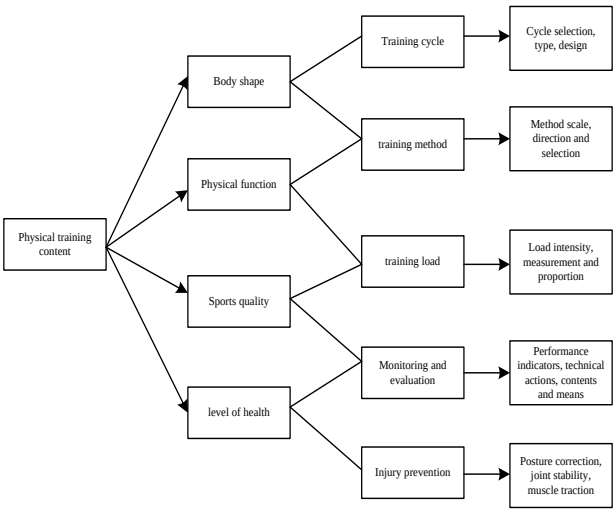

Figure 5. Structure system of track and field fitness training

According to the training adaption law of human function, it is essential to create a high-quality athletic performance model during track and field training by integrating fundamental training like coordination, flexibility, and stability. A high-quality performance model can only be executed by the human body with effectiveness after developing a certain set of physical traits. The foundation of athletic performance is movement training, which is a large part of track and field training. Through workouts that simulate functional movements pertinent to certain track and field sports, the goal is to aid athletes in developing proper movement patterns (Ataya et al., 2019). This exercise program is designed to help athletes have better body control, develop the skills needed for specific motions, and improve their overall stability and balance. Furthermore, it tries to reduce compensatory actions and force imbalances within the dynamic chain, often known as "weak links."

Track and field movement pattern training's primary objective is to develop the various athletic skills required for particular events. Ultimately, the goal is to acquire specialized knowledge. Track and field are a multifaceted sport that calls for explosive force, strength, agility, and endurance. In a high-level competition, for instance, participants might run for a distance of around 14,000 meters while often changing directions, accelerating, decelerating, and jumping. To use Charles Hughes' definition of specialized physical fitness in football as an example, he previously said that it is "a physical ability that enables the execution and realization of techniques, tactics, or competition." Similar to this, specialized physical fitness in the context of track and field can be interpreted as the athletic prowess displayed by athletes during competitive events and training sessions to satisfy the unique requirements of track and field contests. It includes a wide range of skills, including as endurance and the capacity to do high-intensity, intermittent activities. Additionally, it emphasizes how important it is for track and field athletes to have both physical and psychological training, with the latter aligned with athletic success. Any psychological criteria must complement an athlete's overall athletic prowess. According to the analysis above, it is clear that in track and field, specialized physical fitness includes the overall athletic abilities that result from a combination of an athlete's functional level, quality level, technical and tactical level, mental intelligence level, and ability to adapt to competitive environments. Both inherited qualities and learned skills can be used to improve these talents. The end goal is to acquire the specialist athletic skills needed for track and field competitions. An examination of performance traits within the sport provides the essential basis for specific physical training in track and field. As a result, the components of specialized physical training for track and field can include the following components: Therefore, the constituent elements of football special physical training can also include the following aspects:

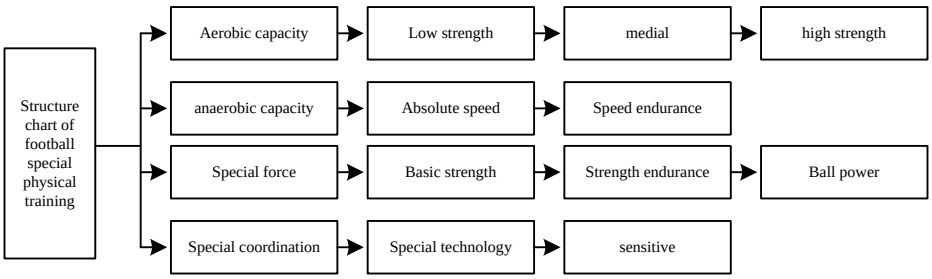

Figure 6. Content structure of track and field special physical training

Through the above analysis, it can be seen that track and field special physical fitness is the overall sports ability under the comprehensive action of athletes' functional level, quality level, technical and tactical level, mental intelligence level and ability to adapt to the competition environment. It can be improved through congenital inheritance and acquired training. Its goal is to develop the special sports ability required by athletic projects. The essential attribute of track and field special physical training comes from the analysis of competition performance characteristics. In training, speed quality is defined as the ability to complete actions quickly, including reaction speed, action speed and displacement speed.

Evaluation on the influence track and field participants racing performance

A speed rivalry is what track and field is. Fast and effective performance has been the dominant development trend in today's track and field scene, and the speed characteristics are more visible, especially with the growingly tough competition. Action speed and displacement speed are two crucial aspects of speed for track and field competitors, according to research. Athletes must move swiftly and have a good starting speed in track and field events to gain an edge. Athletes must also perform tasks fast, including throwing, jumping, and sprinting at top speed during the athletics games. The Athletes participating in the athletics games must improve speed holistically because the youth stage is a delicate time for the development of speed qualities. Researchers have also looked into how quickly track and field athletes react. The capacity to react swiftly to alterations in the surrounding environment is referred to as reaction speed. The ability to react quickly is absolutely necessary for athletes who compete in track and field performance. According to the findings of the study, athletes who compete in track and field events have faster reaction times than the typical person does on the track. There is no obvious difference in the reaction time of top athletes and backups, as well as competitors in other sports that compete against sprinters. However, elite athletes typically respond quicker than replacements.

Table 1

Reaction time of athletes in different track areas

	Sprinter /s	Hurdles /s	Relayer /s	Jumper /s	Average /s
Reaction time	0.265	0.272	0.272	0.273	0.271
Sort	1	2	3	4	

The CT training has grown in popularity among track and field competitors because it can improve a variety of physical attributes, including power, speed, agility, and coordination. By combining explosive movements like leaps, sprints, or agility drills with strength workouts like weightlifting or resistance training, CT training aims to increase an athlete's all-around athletic performance.One of the key advantages of CT training for track and field athletes is an increase in power output. By including harder strength training like squats or deadlifts, athletes can increase their physical strength, which translates into more force creation.. Sprinting, jumping, throwing, and even hurdle events may benefit from this enhanced power output. Additionally, CT training can enhance acceleration and speed. Athletes can improve their capacity to create maximum velocity and accelerate quickly by including high-intensity speed exercises like sprint intervals or resisted sprints in their training program. In competitions like the 100-meter sprint or relays, where milliseconds can make a big difference, increased speed is essential.Additionally, CT training can improve agility and coordination, which are crucial for track and field athletes competing in events like the hurdles or the 400-meter sprint that call for quick changes in direction. Combining agility drills or ladder exercises with strength training can help athletes become more adept at quickly changing directions, decelerating, and maintaining body control during difficult movements.

Additionally essential components of track and field performance are stability and balance. Exercises that test balance, like single-leg balancing exercises and stability ball exercises, can enhance an athlete's capacity to maintain correct body alignment and control while performing different techniques or actions. Improved stability and balance can help athletes perform better in competitions

like the long jump, pole vault, or high jump.Although CT training can be very effective, it must be carefully planned, progressed through, and customized to meet the unique needs and objectives of track and field athletes. When creating a CT training program, it's also crucial to take into account the athlete's present level of fitness, injury history, and the particular requirements of their event.Therefore Complex Training (CT) techniques have shown to improve athletes' track and field performance. Power, speed, agility, coordination, and balance can all be enhanced with CT training by combining strength training with explosive movements.

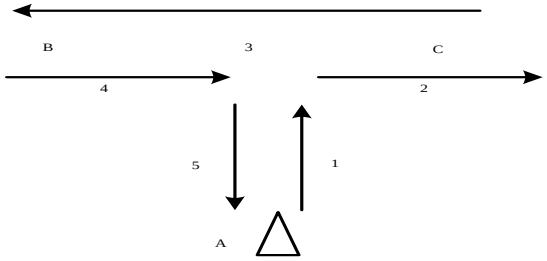

Figure 7. T-type test model of the track and field fitness training

T-test method (as shown in the figure): the athlete starts from a mark barrel, starts timing, runs to the middle of the B and C mark barrels in a positive direction, then changes to a fast lateral sliding step to the right, reaches the B mark barrel, and then quickly slides to the left to the C mark barrel. Then slide to the right to the middle of the B and C mark barrels, and quickly rotate forward to rush through the mark to record the time. Skank used t-test on 60 19-year-old track and field athletes to test their speed and agility. Among the 60 athletes, the best score was 5.03 seconds, and the average score was 5.89 seconds. He believes that the t-test can well evaluate athletes' ability to change direction and perform lateral movements.

Illinois test method (as shown in the figure): the team member lies prone on the ground at the starting point, lands on the abdomen, his hands are flush with his chest, his legs are straight, the soles of his feet are upward, and the cleats cannot land. Hearing the start command, the athlete quickly climbs up and rushes to the No. a mark barrel. He must touch the barrel a; Then quickly sprint back around the inner side of No. 1 sign barrel according to the route shown in the figure; Then do a snake run back and forth in the middle area; Then sprint forward, touch barrel B, rush from the outside of barrel 2 to the end stop table, and record the time. From the relevant literature at home and abroad, the relevant research on the theory and method of track and field physical training design is relatively limited, and most of the existing achievements are limited to the exploration of the process control of track and field physical training and the design idea of training plan, which still has a certain gap with the real special physical training design. The research focuses on the design and implementation of special physical fitness training program, and emphasizes the design of physical fitness training program according to the characteristics of competition cycle of track and field events. It is pointed out that a year can be divided into different periods, namely preparation period, competition period, and the rest period, and the modes of physical training plans can be formulated respectively. Each stage has different training priorities and training elements.

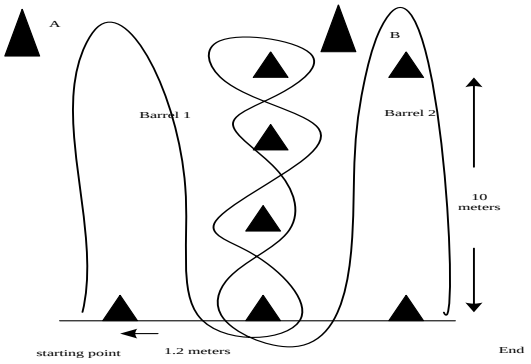

Figure 8. Illinois test model to show the training exercise of the track and field performance.

Table 2

Annual track and field performance training schedule

	Adjourning		Preparation period			Competition period						
Aerobic training												
Moderate	3344	4445	5555	4433	4343	4343	4343	4343	4343	4343	4343	4343
Strength	2223	3234	4445	4555	5545	5545	5545	5545	5545	5545	5545	5444
Anaerobic exercise												
Endurance	1111	1111	2234	2234	4355	4355	4355	4355	4355	4355	4355	4355
Train	1111	1111	2234	4555	5555	5555	5555	5555	5555	5555	5555	5554
Strength training												
Basics	3334	5555	5543	2323	2323	2323	2323	2323	2323	2323	2323	2222
Function	2222	3333	3344	4343	4343	4343	4343	4343	4343	4343	4343	4322
Muscle speed	1111	1112	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333
Flexibility training	3232	3434	4444	4444	4444	4444	4444	4444	4444	4444	4444	4444

Furthermore, the sequence of practice components in physical training design may be altered in accordance with the variations of various competition systems and athletes engaging in track and field activities. The training plan is a realistic strategy for the entire training cycle, including training objectives, objectives, contents, time, load, cycle, and other elements, according to some research conducted abroad. The model for diagnosis and testing is known as. The approach is founded on an early review procedure. Three fundamental physical functional elements—track and field specific endurance, sprint, and bounce ability—must be put to the test by athletes. The original sample data of the dynamic detection and evaluation index of metabolic circulatory function of track and field participants are collected through the development of the aforementioned metabolic circulatory function and evaluation parameter index system of track and field activities. Football players' metabolic and circulatory function are dynamically detected using the multiple linear regression evaluation method. Firstly, the maximum oxygen uptake $x_{i+\tau}$, Max / kg and maximum anaerobic work (PKG) and the fatigue coefficient of anaerobic work decline as an independent variable, multiple regression discriminant statistics are defined, and the expression is

$$Q_{rev}(\tau)=\frac{1}{N-\tau}\sum_{i=1}^{N-\tau}\left(x_i-x_{i+\tau}\right)^3 / \left[\frac{1}{N-\tau}-\sum_{i=1}^{N-\tau}\left(x_i-x_{i+\tau}\right)^2\right]^{\frac{3}{2}} \quad (1)$$

In the above formula, $x_i$represents the discriminant statistics of multiple regression, Nrepresents the parameter sequence of metabolic and circulatory function, and τ represents the statistical frequency of metabolic and circulatory function of athletes, τ is the monitoring interval. Conduct sigma test on the collected data before and after the two training cycles, take the maximum oxygen uptake $Q_{rev}(\tau)$ that can reflect the aerobic metabolic cycle function as the independent variable and other indicators as the dependent variable, construct the multiple linear regression equation surface, and the inclusion standard is a = 0.05. The multiple linear regression equation is obtained as follows:

$$x_n=\varphi_0+\sum_{i=1}^{p}\varphi_i x_{n-i}+\sum_{j=0}^{n}\theta_j\eta_{n-j} \quad (2)$$

Where $\varphi_0$is the fatigue% index, φ_i is the independent identically distributed variance of the maximum anaerobic work, $\theta_j$is called multiple linear autoregressive coefficient, which respectively represents LGA, LGG, LGM, bun and other indicators, η_{n-j} which is called the significance factor of multiple correlation analysis of track and field participants. These are the parameters to be evaluated for the model. To realize the multiple autoregressive dynamic tests of the metabolic cycle mechanism of track and field participants. In the inspection process, it is necessary to define the difference significance s to represent the significant difference, which is.

$$S=\frac{|Q_S-Q_0|}{\sigma_s} \quad (3)$$

In the above formula, Q_i represents the average value obtained from the statistical frequency n times of athletes' metabolic and circulatory function, Q_s is the numerical standard deviation obtained from the statistical frequency n times of athletes' metabolic and circulatory function, and the calculation formulas are as follows:

$$Q_s=\frac{1}{N}\sum_{i=1}^{N}Q_i \quad (4)$$

$$\sigma_s=\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}\left(Q_i-Q_s\right)^2} \quad (5)$$

The sigma test method is used to dynamically test the functional monitoring indexes before and after the phased training cycle, and the multivariate correlation analysis is carried out. Because the probability distribution of the index data is a common normal distribution, if the difference between Q and (q) exceeds a certain critical value Q., bring:

$$p(|Q_0-Q_s|>Q_c)\geq 0.05 \quad (6)$$

At this time, it indicates the significant level of difference. The application information increment of track and field performance data is set as the attribute selection basis, and the attribute with the largest information increment is set as the root attribute. The calculation method of expected information is as follows:

$$Info(E)=-\sum_{j=1}^{n}q_j\,log_2\left(q_j\right) \quad (7)$$

Where, the probability of track and field training data sample e_j belonging to class D_j is q_j, the entropy of track and field training data set E is $Info(E)$, and $Info(E)$ can describe the average information of D_j in sample e_j. The decision tree can iteratively divide the specified football training data set E into subset $\{E_1, E_2, \ldots, E_m\}$, and classify all track training data samples belonging to the same category D_j. The expected information of realizing the accurate classification of track training data sample e_j according to attribute B_j in setting E is $Info_B(E)$, and the operation method is:

$$Info_B(E)=\sum_{i=1}^{m}\frac{|E_i|}{|E|}\times Info(E_i) \quad (8)$$

Where $\frac{|E_i|}{|E|}$ describes the i-th partition weight.

From this process, we can learn the basic data of athletes' special physical characteristics, so as to provide basis and reference for formulating a physical training plan and improving and determining athletes'

advantageous ability and defect range. The results obtained through the basic diagnosis and test are generally applicable to the objectives of the overall training plan, and the evaluation results based on the advanced diagnostic test are the core and foundation of the individual physical fitness training plan of track and field players. Therefore, the diagnostic model established by foreign scholars can be used to formulate an effective individual physical training plan, which also provides a good guarantee for the pertinence and training effect of special physical training for athletes in different positions and characteristics.

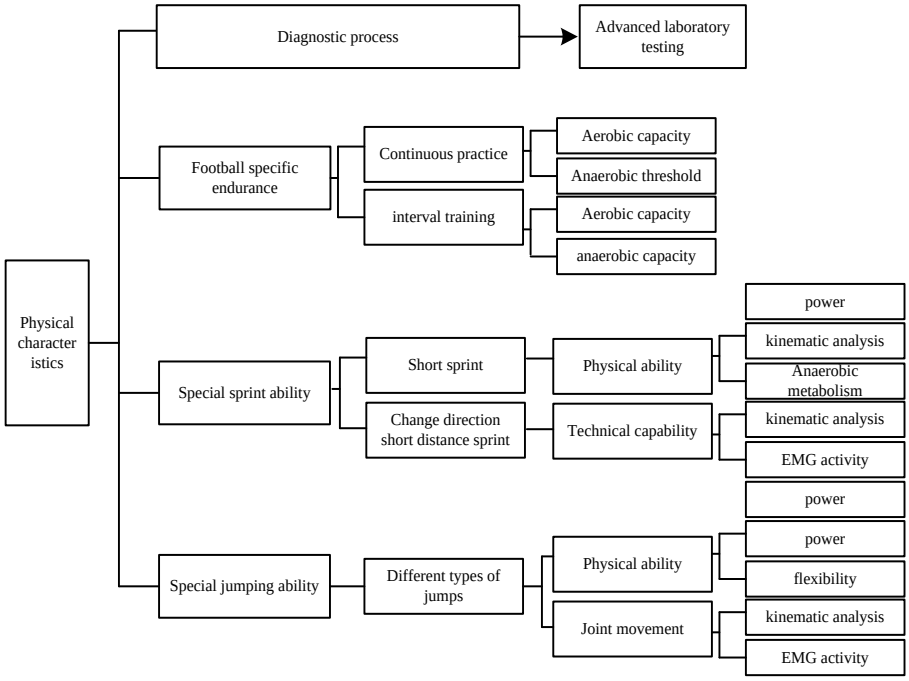

Figure 9. special physical fitness diagnosis test model of individuals participating in the track and field event

In terms of diagnosis and evaluation of special endurance, foreign scholars have proposed three different forms of field test methods 9, namely, the cycle test of the time spent running a fixed distance, the cycle test of medium to large fatigue at increasing speed, and the cycle test of repeated sprint, each test makes an objective and accurate evaluation of track and field players' special endurance according to different principles and purposes.

Analysis of experimental results

The research applied the Excel spreadsheet to sort out and summarize the obtained data, and then used the SPSS17.0 data analysis software to analyze the influence of the post activation enhancement effect caused by different load squatting exercises on the results of "t" and lines runs at different intermittent time points. The results before and after the experiment in the group were compared by using the paired sample t-test in the group, and the results between the experimental group and the control group were compared by using the independent sample t-test between the groups. In addition, the weight-bearing squat exercise adopted different load exercise forms of 90% 1RM and 50% 1RM respectively, in order to compare the effect of different exercise intensity on the direction changing movement ability of athletes. What form of load can make the post activation enhancement effect reach the best level. This experiment also uses the inter group independent sample t-test to analyze the impact of different load squatting exercises on the later test results. If $P \leq 0.05$ is set, it indicates that there is a significant difference between the two, and $P \leq 0.01$ indicates that there is a very significant difference between the two. The basic conditions of the experimental group and the control group were compared and analyzed with SPSS17.0 software, as shown in the Table 3.

Table 3

Comparative Analysis of basic conditions of long jumpers in the experimental group and the control group

	Experience group	Control group	T	P
Age	20.68±2.35	20.85±2.65	-0.116	1
Height (CM)	182.3±2.15	183±2.29	-0.653	0.79
Weight (KG)	69.6±3.40	70.6±3.39	-0.512	1
Best result (m)	7.03±0.23	7.06±0.19	0.055	0.97

The test results of "t" running at different time points of the 90% d students in the experimental group after squatting practice are analyzed as follows:

Table 4

90%1rm comparative analysis of results of T-shaped running test before and after weight-bearing squat practice

Pre test and interval time	Mean value	Standard deviation	Mean difference	T value	P value
Pre test 1	5.1200	0.1475	-	-	-
3 minutes after the test	5.0010	0.1291	0.1190	4.165	0.002<0.01
6 minutes after the test	5.0600	0.1239	0.0600	2.792	0.021<0.06
Pre test 2	5.1171	0.1263	-	-	-
9 minutes after the test	5.0611	0.1249	0.0560	3.345	0.009<0.01
12 minutes after the test	5.0361	0.1469	0.0821	3.110	0.013<0.06
Pre test 3	5.1071	0.1350	-	-	-
15 minutes after the test	5.1100	0.1836	-0.0030	-0.078	0.939>0.05
20 minutes after the test	5.1420	0.1206	-0.0350	-1.169	0.275>0.06

It can be seen from the table that three minutes after the subjects completed the 90% 1RM weight-bearing squat exercise as required, the average value of the "t" running test increased by 0.119 seconds compared with the test results before the experiment, and the "t" running test can be completed in 4-6 seconds, which belongs to an explosive form of exercise dominated by ATP-CP energy supply. Therefore, the increase after the experiment is very large. As can be seen from the p value, the 3-minute interval after practice has an extremely significant impact on the whole test effect. The test results 6 minutes after the subjects completed 90% 1RM weight-bearing squat were also 0.06 seconds higher than the previous test results. From the difference analysis, it can be seen that this interval still left a series of contraction marks after the acute force output of skeletal muscle, and the muscle can still play a strong force at this time point. Therefore, there is a significant difference between the test results 6 minutes after squatting and the pre-test. The t-test analysis of the bench press indexes of the experimental group and the control group before and after the experiment shows that the average value of the bench press indexes of the experimental group before the experiment is 55.83kg, the standard deviation is 3.76kg, the average value of the control group is 55kg, the standard deviation is 3.16kg, $P > 0.05$, and there is no significant difference: after the experiment, the average value of the bench press indexes of the experimental group is 56.67kg, the standard deviation is 2.58kg, the control group is 62.5kg, and the standard deviation is 2.74kg, $P < 0.05$, showing significant difference.

Table 5

Comparative analysis of bench press indexes between the experimental group and the control group before and after the experiment (unit: kg)

Group	Experience group	Control group	T	P
Before experiment	55.85±3.77	55±3.18	0.145	0.688
After the experiment	56.68±2.59	62.6±2.75	-3.796	0.005

Stage 1: pre test. All subjects underwent change awareness pre-test task and exercise decision-making pre-test task phase 2: 8-week training. One group of subjects was the experimental group, who received track and field specific working memory training for 8 weeks from 3:30 p.m. to 5:30 p.m. from Monday to Friday. The other group was the control group, which carried out routine track training for 8 weeks. Stage 3: post test. After 8 weeks of training, all participants were tested for change awareness and exercise decision, and the test content was the same as that of the pre-test. The training methods are the same as the six training methods selected in pre Experiment 2. The weekly training schedule is shown in the Table 6 below.

Table 6

Specialized working memory training program

Training process	Task content
Week 1	Control method 1, refresh method 1, refresh method 2
Week 2	Control method 2, conversion method 1, conversion training method 2
Week 3	Control method 1, refresh method 1, refresh method 2
Week 4	Control method 2, conversion method 1, conversion training method 2
Week 5	Control method 1, refresh method 1, refresh method 2
Week 6	Control method 2, conversion method 1, conversion training method 2
Week 7	Control method 1, refresh method 1, refresh method 2
Week 8	Control method 2, conversion method 1, conversion training method 2

After 8 weeks of training, the experimental group and the control group were tested before and after the football decision-making task.

Table 7

Reaction time and accuracy of experimental group and control group in track decision-making task

	Experience group				Control group			
	Reaction time (ms)		Correct rate		Reaction time (ms)		Correct rate	
Time	M	SD	M	SD	M	SD	M	SD
Pre test	1541.36	178.98	0.37	0.15	1540.27	164.08	0.39	0.15
Post test	1452.32	92.08	0.57	0.09	1544.96	167.08	0.61	0.08

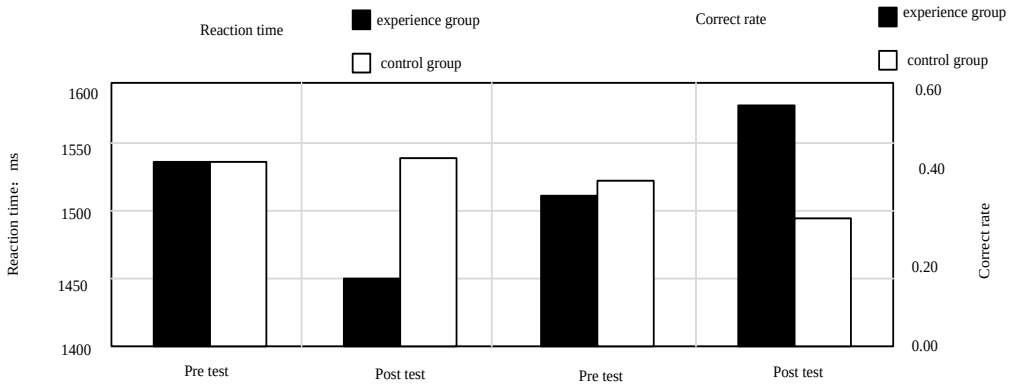

Figure 10. Reaction time and accuracy of experimental group and control group in track and field decision-making task

Taking the difference between the reaction time and the accuracy before and after the test as the dependent variable index, the independent sample t-test was carried out. The reaction time results showed that the reaction time of the subjects in the experimental group was significantly lower than that in the control group, (26) = 2447, P = 0.021, large effect quantity, Cohen'sd = 0.93, and the 95% confidence interval was [0.14,1.70]. The results of accuracy rate showed that the accuracy rate of the subjects in the experimental group was significantly higher than that in the control group, P < 0.001, large effect amount, Cohen'sd = 4.05, 95% confidence interval was [2.71,5]. The results showed that after 8 weeks of football specialized working memory training, the performance of the subjects in the experimental group on sports decision-making tasks was significantly better than that in the control group, and the intervention effect was large effect.

Conclusion

In today's fast-paced world of track and field, the initial stages of a competition play a crucial role in shaping the overall performance. To ensure that athletes can exhibit their full potential and even surpass their capabilities, effective preparation activities are of utmost importance. These activities serve the purpose of increasing body temperature, enhancing muscle strength, improving the excitability of the nervous system and muscle tissue, and priming various bodily organs for high-intensity exercises to follow. Although preparatory activities activate muscles and stimulate cardiopulmonary function, they may not fully align with the rhythm required at the beginning of a competition. Therefore, it becomes crucial to explore methods that can further stimulate muscles beyond the scope of conventional preparatory activities, as it directly influences athletes' performance at the start of the event. In light of modern sports development and scientific advancements, novel ideas have emerged to address the aforementioned challenges. Scholars have begun to focus on the application of effective methods to rapidly enhance athletes' physical fitness levels. One such concept gaining attention is the Post Activation Potentiation (PAP) effect. The underlying principle of this effect is that by subjecting the muscles to a strong stimulus, more motor units can be recruited within a short period. Consequently, this leads to an increased number of muscle fibers being activated, enabling the muscles to generate greater tension and exhibit enhanced performance during subsequent exercises. The PAP effect can be observed through various training methods.

Numerous experts from the American Physical Fitness Association have conducted empirical research on muscle activation training, employing exercises such as squats, bench presses, and other compound movements to stimulate the body's weight-bearing capacity. Additionally, super isometric training methods and instrument-assisted

techniques are utilized to induce muscle backlog, thereby enhancing muscle excitability and mobilizing more motor units. These muscle activation training methods can be applied to track and field athletes, as studies have demonstrated that stimulating the muscles before an activity can maximize their contraction capacity. Consequently, these activated muscles can exert their maximum strength during subsequent movements, facilitating athletes in accomplishing challenging feats. The application of muscle activation training methods exemplifies the concept of the Post Activation Potentiation effect. By employing targeted training methods tailored to specific physical fitness requirements, the muscles primarily involved in the activity can attain peak contraction ability. In conclusion, just as in soccer/football, the effects of complex training (CT) methods on track and field performance for track and field athletes are paramount. By incorporating muscle activation training techniques, athletes can optimize their muscle contraction capabilities, allowing them to perform at their peak. These methods, supported by empirical research and embraced by scholars, serve as a valuable approach to improving athletes' physical fitness levels within a limited timeframe.

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