

## **New Features of Sprint Technological Development and Stagnant Causes and Countermeasures of Men's 100-meter Sprint in China**

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**Abstract:** With regards to lower indemnity state of 100-meter sprint in China in recent years, through literature, expert interviews, analysis, comparison and other methods, the author analyzed the new characteristics of contemporary sprint technology. On this basis, from the perspective of our sprint field's knowledge and understanding of sprint technology in the past, the author analyzed the reasons for floundered state of the men's 100 meters sprint.

**Keywords:** sprint; technical features; speed laws.

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### **INTRODUCTION**

Contemporary sprint competition becomes increasingly fierce, athletic performance continues to be improved and the world record was broken repeatedly. In addition to such factors as the scientific training and field and equipment update, the continuous improvement and development of sprint technology is an important factor in promoting the continuous improvement of sports performance. In contrast, men's 100-meter sprint in China has always no major breakthrough over the years and has been stagnant [1, 2]. In recent years, even the gap with the level of the world's best players continues to widen. Therefore, it has important theoretical and practical significance for men's 100-meter sprint in China in a poor state to make analysis of the new features presented by contemporary sprint technology development, find the reasons for stagnant men's 100-meter sprint in China from a technical point of view and then point out the direction of future efforts.

### **RESERCH METHODS**

Literature research method: Through reading books related to the sprint technology, various research results and Internet surfing, the author has access to relevant aspects of the information for the analysis of the article.

Interview method: Get relevant information by interviewing related scholars and coaches.

### **ANALYSIS AND DISCUSSION**

#### **New features analysis of modern sprint technology development**

(1) Bent step technology

Currently, although there is not yet a definitive conclusion of the concept of 'bent step technology', by comparison and analysis, it is an indisputable fact that range of flexion of bending knee of the world's best sprinters is significantly greater than that of our players. Studies have shown that knee bending angle of outstanding foreign players at the moment of departing from the ground is about 155° and that of our athletes is about 163°~165°. The easiest understanding of 'bent step technology' refers to the back step techniques at the back step stage of running with the third joint of the supporting leg not fully extended. But it has become a development trend of sprint technique, except for it is intrinsically linked with appearance of the plastic track, the more critical factor is because compared with the traditional 'back step technology', the 'bent step technology' is more economical and effective. The advantage is that knee angle change of the supporting leg when driving back is small and a short leg driving time of the support leg will help to improve the pitch; the small leg inclination angle and back driving angle will help increase the forward level speed and reduce fluctuation difference of the center of gravity, thereby increasing step amplitude; it can help reduce the folding angle of thigh and shank, shorten the time to fold and raise the forward swing speed and magnitude of the swinging leg, so that the conversion action of pedaling and swing is natural, consistent and rapid [3].

(2) Fast swing techniques

Modern sprint technology focuses on swing effect and gradually develops from 'back steps technology' to 'swing-type technology'. Studies have shown that support time of side leg of outstanding sprinters only is

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22.1% of double step time, and swing time accounts for 77.9%. For action of swing, the current domestic theory explains 'fast swing' as 'the extension of the hip and positive landing'. 'Hip extension' refers to with hip joint of the support leg as the axis, pelvis rotates forward when supporting, which aims to increase the angle between the two thighs after the end of leg driving and narrow the leg driving angle, thereby effectively increasing the pace; 'positive landing' means two stamping legs quickly swing in the opposing direction when leaving from the ground so that the horizontal ground speed of the foot of the stamping leg slows down; it can reduce the level brake resistance of human when touching the ground, has good forward running state and raise the level speed of running [4, 5]. Therefore, as for the technology itself, 'fast forward swing' is extremely important. Because of this, research on the world's best sprinter players in recent years finds that 'rapid swing type technology' has become an inevitable trend of modern sprint technology.

#### (3) Relaxation techniques in high-speed running

The 'relaxation techniques' in high-speed running refer to that in sprint sports, physiology, psychology and exercise load can adapt to each other, so that the nervous system and muscular system are highly matched, muscle contraction and relaxation is conducted in a coordinated way in accordance with the technical requirements and the body plays its energy to the greatest extent and gets the maximum speed [6]. Studies have shown that among many factors that the result of the 100-meter sprinter is improved from 10.9 seconds to 10 seconds, increased explosive power accounts for 20.57 percent, increased strength accounts for 12.34 percent and improved muscle relaxation capacity accounts for 21.57 percent, which is a strong evidence of the important role of relaxation techniques in improving performance of the high-speed running [7]. Relaxation techniques in high-speed running emphasizes the coordination of action in the fierce competition, muscle relaxation and reasonable force use, which is characterized by natural running motion, coordinated force, large range of motion, quick pedaling and swing speed and economic and practical motion [8, 9].

#### (4) Reasonable rhythm throughout running

Reasonable rhythm throughout running requires the technical and speed of athletes throughout running should meet the 'global optimization' principle, which requires the athlete getting the best motion effects with minimal energy consumption, the minimum price and the best technical movements in the shortest possible time. Our sprint field has not sufficient understanding for this problem. It thinks in the short distance running, as long as making every effort to run, the athletes can achieve outstanding results. Thus, the athletes always use the method to fight all the way in the race, resulting in rhythm problem of the Chinese athletes in the whole

running progress that athletes desperately run in the first 30m with short speeding up process and large energy consumption; the maximum speed appears earlier in a lower level. The speed in the lower half decreases clearly, so that the whole speed curve shows a larger gap, undermining the rhythm in the whole 100 meters sprint; therefore, it is difficult to achieve 'global optimization' effect. The advantage of reasonable whole race rhythm is that it is more in line with the law of human energy supply, which will help reduce premature excessive energy consumption of athletes, thus postponing fatigue. It will help athletes play speed and increase the maximum speed level; it is conducive to relaxation action, helps improve speed endurance level, help to form the best match of stride and stride frequency and form the 'global optimization' effect.

#### **Causes for stagnant state of men's 100-meter sprint in China**

From new features present by contemporary sprint technological development, we can see that modern sprint technology is more in line with ergonomic anatomical and physiological characteristics, follows physiological and biochemical rules and more highlights economy and effectiveness of actions. Our accomplishment in men's 100 meters sprint has always been stagnant over the years; the author thinks the main problem is the problem of understanding. It is caused because our knowledge and understanding of sprint technology still remains at the original level and a scientific and clear understanding is lacked for a number of key issues and key technologies in sprint [5]. And to make use of new features presented by contemporary sprint technology to analyze stagnant reasons for Chinese men's 100 meters sprint precisely reflects the problem most profoundly.

#### (1) Lack of sufficient knowledge for the problem of power source of running

Before the 1980s, China had been using the traditional theory of leg driving back power and considered the power of running came from reaction force of the supporting leg's driving back and it was the only power to affect forward displacement of the human body. It is also under the guidance of the theory that the traditional 'back step technology' was produced. But with the evolution of field and equipment, as well as continuous improvement and development of sprint technology, the traditional leg driving back theory has been behind the development of sports practice; sprint technology has gradually developed from 'leg driving back type' to 'swing-type' technology; then the 'bent step style' technology and 'fast swing' technology appears. Currently, the traditional theory of the only power of leg driving back has been denied, the swing strength increasingly received people's attention, but for the problem of the power source of running, it still has different views and lacks authoritative interpretation. It makes our sprint technique training inevitably blind in a

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certain degree and lack target; for the impact the relationship between the 'bent step style' technology and 'fast swing' technology presented by contemporary sprint technology and the power source of running, it still has no profound awareness and understanding and lacks authoritative theoretical explanation.

(2) Having deviation in the understanding of key sprint technologies

For a long time, as there is a certain deviation on the understanding of the power source of running, in sprint technique theory, 'back step theory' occupies an important position; with support of the theory, leg driving technique is naturally considered as the key running technology. However, it is proven traditional 'back step theory' objectively has seriously hampered the further improvement of the level of sprint in China and modern sprint technology has developed from 'leg driving technology' to 'swing-type technology'. Studies have shown that in the modern sprint technique, hip is the key joint to accelerate the human level speed. High-speed swing with the hip as axis - the translational movement is an essential feature of sprint and sprint technology. The key technology of sprint is swing of the lower limbs-landing technology and relaxation techniques in the highest running speed. Relaxation skill in high-speed running is playing and use of swinging technology and swinging force, and it is the core technology of sprint and is a major factor to improve the performance of high-level sprinter; it is considered to be 'the essence of contemporary sprint technology development'. It is precisely consistent with new characteristics present in the contemporary sprint technological development.

(3) Lack of depth in research on sprint velocity rule

As we all know, 100 meter score depends on four areas of the starting speed, acceleration ability, the maximum speed and speed endurance. From the fifties to the eighties in the 20<sup>th</sup> century, as in the men's 100 meters sprint game with foreign players, our runners are mostly performed as quick starting and slow process, it was considered the reason for the lagging behind achievement of our men's 100 meters sprint was poor performance in the later process; namely, the speed endurance was poor; therefore, speed endurance training was implemented as the dominant ideology, but practice proved it got little success. Then people began to use scientific methods to make analysis of the reason why our men's 100 meters sprint lagged behind. The study found that compared to world best players in men's 100 meters sprint, our athletes had a certain gap in acceleration capability, top speed and capability to maintain maximum speed. Among them, the poor highest speed capability is the main factor to impact the improvement of our men's 100 meters sprint [10]. It is because of our lack of in-depth study of the sprint speed laws in the past that we did in a wrong way on the issue, seriously hindering the achievement improvement of

our sprinters. The feature of 'reasonable rhythm throughout running' present in contemporary sprint technique just is the best manifestation of the problem.

**Direction of future efforts of our men's 100 meter sprint**

In the past, because we had many problems on sprint technical understanding, it made a serious impediment to the development of our sprint project. Although in recent years it has made significant changes, there are some key issues still needs. Therefore, we should continue efforts in the following aspects:

(1) Strengthen research on the basic theory of sprint, especially on technical theory

Only with full understanding and scientific understanding of sprint technology, by correcting deviations in understanding of the power source of running, key sprint technologies, speed laws and other issues in the past, breaking the shackles of traditional concepts, and establishing a more unified and correct understanding, it can better guide the training practice and form scientific training guidelines. Therefore, the author believes that research on technical theory should precede training practice, and training practices, in turn, can verify whether the technical theory is correct or not.

(2) Sprint technology research should towards 'standardized, individualized and optimized' direction

'Standardized' direction means the structure of technical action of running is more in line with sports biomechanical principles and in line with the characteristics of human anatomy structure, so that running technique is more economical and efficient. 'Individual' refers to that on the basis of their morphology, structure, physical quality and function and psychological quality, combining the characteristics and laws of sprint, athletes form the technical style with individual physical and mental characteristics. 'Optimization' refers to when the technical action is completed; athletes can get optimal athletic performance with best action, the shortest possible time and the minimal energy consumption. "Standardized, individualized and optimized" purposes can be concluded as the economy and effectiveness of technical movements, so we can use "standardized, individualized and optimized direction" to study the technology and "two features" to evaluate the technology.

(3) Training high-level coaches

The first thing Chinese famous coaches Ma Junren and Kan Fulin can go higher to the peak of world records and world level on our disadvantage project of track is their understanding of the characteristics of the sprint project and special technology is in the world leading position. Thus, if the athletics project in sports expects to achieve a breakthrough and has greater

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development, high-level coaches will play a crucial role.

## CONCLUSION

In order to make the men's 100 meter sprint of our country go out of the woods and break years of stagnant situation, we must closely seize the pulse of modern sprint technology development, renew ideas and make bold innovation combined with the specific situation of China's sprinters to go out of a new path of Chinese sprint technological development. Only in this way, Chinese men's sprint athletes can take off as soon as possible in the world arena.

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