

## Concept Paper on the Status of Football Physical Training and Competition Demand in China

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### Abstract

The pace and intensity of the modern football game is getting bigger and bigger, and the requirements for the athletes' abilities are also higher. It requires more abundant physical energy to ensure the normal play of technology and tactics. The analysis of the real physical demands in training and competition is to carry out corresponding physical training. Only by analyzing the premise of training more accurately, can we carry out physical training pertinently and achieve the desired physical training effect. Different positions and different characteristics of the team's physical demand is different, in the overall arrangement of physical training on the basis of the specific analysis of individual characteristics. At the present stage, physical training is often ignored or not comprehensive enough, so as to fail to achieve the desired effect of training.

**Keywords:** Football, Physical Training, Competition Demand

### Introduction

Football, as the most popular and influential sport in the world today, has always captivated audiences across the globe with its distinct style and attractiveness. Physical fitness has always been one of the central contents of football training and an integral aspect of sports training (Serrano et. al, 2013). With the advancement of science and technology, as well as multidisciplinary expertise in professional sports, the technical advancement of football physical training is increasingly focusing on the discipline's strong scientific research and implementation capacity. Physical ability and other competitive ability elements have an independent and inseparable relationship. There are still many questions and deficiencies, particularly in the design and arrangement of football specific physical ability, especially in the real simulation of the situation.

### Literature Review

*Arrangement and control of overall sports load for football physical training*

"A New Approach to Monitoring Exercise Training," (Carl et.al, 2001) which has become the most centrally important literature on physical training in the database, examines the arrangement and regulation of physical training exercise load from the perspective of team impact and from the macro perspective of exercise training. The author develops basic

methods of sports load management in football physical training from a theoretical perspective. During this time, it became the subject of physical training research, promoting the advancement of football physical training theory and practice, and laying the groundwork for future research on football physical training. Foster (2001) claims that the arrangement of training calculation is the key to the creation of periodic training, especially the management of high intensity training load, which is more difficult to quantify with precise indicators. As a result, the author uses Rating of Perceived Exertion (RPE) to investigate how different training styles are measured by measuring athletes' heart rates. RPE is an appropriate tool for monitoring physical training, according to the findings. This technique is useful for determining the amount and strength of exercise performed during cycle training. In the field of physical training load arrangement and implementation impact in football, it has become the most active hot topic. Impellizzeri (2004) used the RPE method to verify and enhance the previous study. Eleven 19-year-old football players were put through a stage test over the course of seven weeks, with each test taking place after a regular training session. According to the RPE system, the correlation coefficient between heart rate and training load was 0.85 ( $P < 0.01$ ). As a result, it has been proved that this approach is both convenient and reliable, and that it can be used by coaches to monitor and organize their training load. After that, Alexiou (2008) chose 15 high-level female soccer players (average age 19.3 years old) for an experimental study to see how the RPE system affected the training load and monitoring impact of female soccer players. The experimental results show that by using the RPE method based on heart rate to organize training loads, technical training has the highest correlation with the impact of load, followed by physical training, and speed training has a higher correlation, whereas the effect of heart rate control is stronger in endurance training. This method has been shown to be the most effective in controlling training load during aerobic training and low-interval exercise in studies. Other related studies have attempted and examined the arrangement of football physical training load from various perspectives, pointing out that tracking and regulating the physical training load with relevant physiological and biochemical indexes will enrich the theoretical framework and practical process of football physical training monitoring through the incorporation of multi-disciplines, means and methods, implying a significant improvement in the theoretical system and practical process of football physical training monitoring.

The majority of the material to date focused on the description and experimental verification of sports load in football physical training. The research scope is relatively narrow, the size is small, the emphasis is on the total sports training load, and the topic is not much. However, at this point, the study has paved the way for more scientific investigation into football physical fitness, achieved some academic milestones, and laid the groundwork for future research.

#### *Information collection and evaluation method of football physical training*

One of the most important developments in football growth is the integration of modern science and technology, as well as multidisciplinary theoretical expertise into football training. In the practice of football physical training, the intervention and support of high-tech means cannot be differentiated from the innovation and advancement of the training process. As a result, we can only ensure the scientific standard of athletic activity by considering the physical condition and level of athletes during the training phase. Krstrup (2003) suggested that the Yo-Yo test has an effect on high-level football players' physiological reactions and

physical condition. Their high level of 37 men's football players on the experimental results show that Yo-Yo test for strong characteristics of intermittent football, has the rationality and validity, can obtain and evaluate the athletes' physical information and level, and plays an important role in the maximization of aerobic training and the production of anaerobic ability. Furthermore, it was reported that there is no connection between the generation of fatigue in football and muscle CP and glucose. Bangsbo (1991), who analyzed 14 high-level football players' running form, detected blood lactic acid value during the tournament, measured the height of high-intensity running and blood lactic acid correlation, and compared different location football players' blood lactic acid values. He also provided assistance to coaches in understanding and mastering athletes' body states and training arrangements. Impelizzeri (2005) performed a continuous follow-up analysis on the subjects through the physiological assessment of football aerobic exercise, and found that the team impact and clustering of football activities make it easy to overlook the internal load of training in the evaluation of physical training, i.e., the relative physiological and psychological workload of athletes. As a result, the integration and assessment of overall test outcomes by laboratory testing optimize football players' physical levels and provide coaches with a valuable guide for screening their physical state and level. Furthermore, Bangsbo (2008) suggested two Yo-Yo intermittent fitness tests, demonstrating that the Yo-Yo measure is an appropriate way to assess football players' ability to run repeatedly during high-intensity activities. It should be noted that the aim of test 1 is to completely mobilise athletes' maximum oxygen uptake in order to fully exploit their aerobic capability, while test 2 focuses on athletes' recovery performance during repetitive running, allowing for an accurate assessment of anaerobic capacity.

These research methods offer a wealth of information for the preparation and assessment of football physical fitness, and they are of critical practical importance and usefulness in the development of a tool and framework for evaluating football physical fitness in China. On this foundation, the techniques for collecting data and evaluating physical training for football players of various ages and levels have been improved.

#### *Performance characteristics and physical demands of football players*

The study of athletes' physical performance attributes and the discovery of specific physical demands in football matches have become the subject of related scholars' research and interest as contemporary football matches become more intense and confrontational, as well as the steady rise of different matches. According to the study carried out by Bangsbo's (2008), regular, constant and single action modes of physical training will help football players develop a unique mechanism of muscle contraction, the motor unit's ability to lift, muscle fiber type and energy metabolism and energy form, running technique and rhythm, and a variety of morphological changes in adaptive function, neurological, and biochemical characteristics. This adaptation change has a negative impact on key technical links such as sharp turn, sharp stop, grab, jump, change direction and so on. As a result, analyzing specific physical demands based on game success characteristics is important and useful in improving football players' physical training. Meeting the game's realistic needs is extremely important.

At the moment, the majority of football players' success characteristics are analysed using Time Motion (Time-Motion Analysis). In order to understand the athletes' running ability, running distance, and action style in the match, Time Motion is used to monitor the athletes' activity behaviour characteristics during the match. The most classic version of this

study model will be the game's player action way based on speed, length, movement distance, and frequency of movement modes, and then based on the intent of the research on athletes in the game running distance, intensity, forms the specific physical indices such as the concrete elaboration. With the advancement of science and technology, as well as the continued penetration of high-tech sports equipment, Time-Motion has progressed from its manual symbol analysis to a robust process in computer video and device analysis.

First, relevant scholars systematically analyzed the running distance and running intensity of athletes in the competition through the Time-motion method. Mohr et al. (2003) split a 90-minute football match into six 15-minute stages for study, found that male football players in the match ran an overall distance of 912 kilometres. They discovered that 15 minutes before the match's end, players' high-intensity running capacity declined dramatically, according to segmentation analysis. The dynamic variation characteristics of players' running speed in football matches are well-explained. (Figure 1). Furthermore, Alexandre (2011) studied the running characteristics of about 7,000 athletes in European high-level leagues and found that high-level football players run between 10,000 and 12,000 metres in matches, with the sprint being about 190280 metres and high-speed being about 240340 metres. Running with the ball accounted for 1.8 percent and running without the ball for 2.7 percent of the overall distance, respectively. This also offers useful evidence for scientifically teaching football specific physical ability.

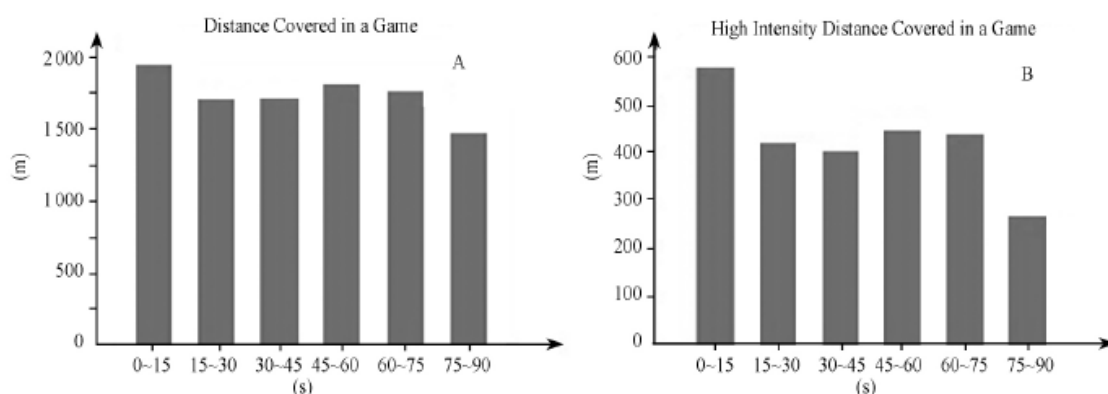


Figure 1. Time Characteristics of Total Distance and High Intensity Distance in Game

Second, according to Bangsbo's (1994) study, the sprint of 1020 metres is the most common in football matches, but sprints longer than 30 metres still account for a significant amount, and the total recovery period of a high-intensity sprint is between 150 and 200 seconds. Sprint lengths greater than 30m increase the athlete's recovery time, but the race's actual conditions require the ability to sprint continuously without complete recovery (Figure 2). Ramsbottom (1988) used a 20m turn back run to assess the physical performance of football players. A total of 76 players were included in the study (36 male athletes and 38 female athletes). According to the results, this turn back test will meet the physical needs of football players while also making it easier for coaches to plan training material and choose suitable training methods. Furthermore, Reilly (2003) published an empirical analysis of high-intensity running characteristics of football players from the viewpoint of physical differences in positions and found that excellent England midfielders' range of movement in the match was considerably greater than that of players in other positions, and they could reach high expectations in sprint times, duration, sprint distance and speed. The average sprint speed is

25 to 30 km/h, with a top speed of 30 to 35 km/h (Figure 3). Side midfielders and forwards have faster running speeds and more straight sprints in the form of sprint than central midfielders, whereas central midfielders have better sprint accelerating potential than side midfielders. Coaches must have a good understanding of the position and physical traits of football players in order to create realistic training plans and strategies.

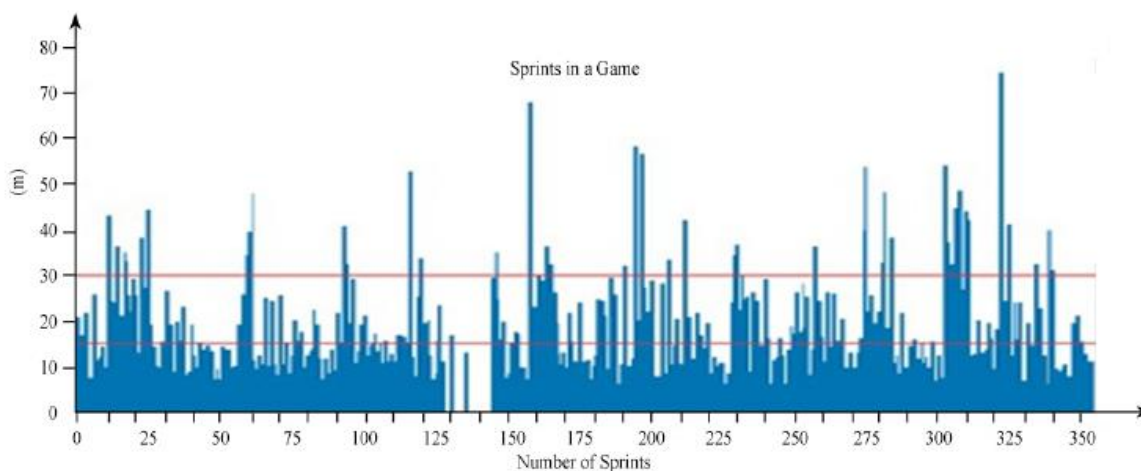


Figure 2. The Number and Distance Sprint of a Team during Game

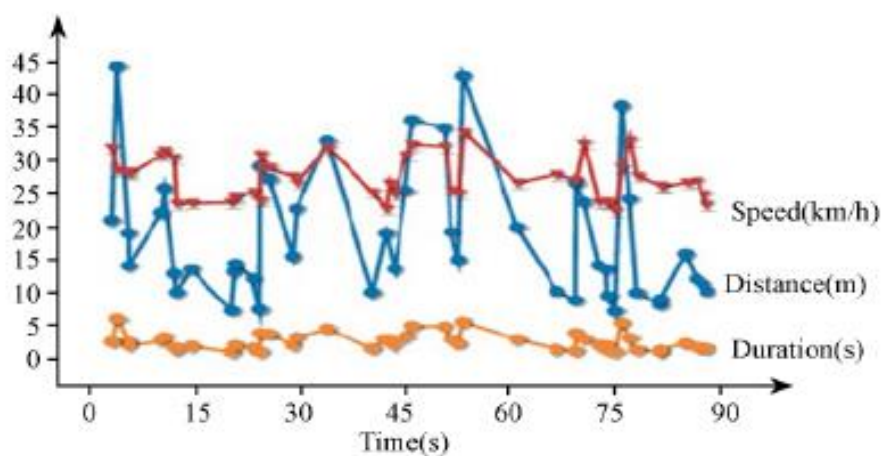


Figure 3. Sprint Characteristics of England Premier League Midfielder Player

#### 1.4 Design concept and training method of football specific physical training

Nowadays, as professional football becomes more competitive, the improvement and enhancement of athletes' physical performance is followed by an increase in body load and training intensity. As a result, how to organize the athletes' physical training in a reasonable and efficient manner, while completely tapping the athletes' athletic potential and physical ability, maintaining their fitness, and extending their exercise life, has posed new challenges for training design and formulation. Stolen (2005) highlighted in "Physiology of Soccer -An Update" that the design of football training schedule should consider not only technological and tactical considerations, but also the physiological process of football. In the design of physical training, the physical ability which has great influence on football should be structured reasonably, so as not to improve athletes' competitive ability at the cost of sacrificing their

health. This viewpoint provides effective physiological information and reference for coaches to formulate effective special strength, speed and endurance training programs.

Buchheit (2010) used the time-motion analysis technique to assess and research the running abilities of high-level youth football players in matches, pointed out variations in physical level and optimum state of players in various positions, and proposed that physical training should be dependent on the running ability in matches. The training design should be carried out according to the characteristics and requirements of players in different positions. According to Reilly & William (1976), the design and implementation of a physical stamina training plan for football players should be in line with the football competition period characteristics. Based on different format and different athletes, practice in the design of physical stamina training plan elements in the sequence should also be adjusted. In terms of training methods, Wisloff (1998) proposed earlier in "Strength and Endurance of Elite Soccer Players" that in the physical training of football, it is pointed out that the football physical training should get rid of the conventional idea of "strength room" training. More ball strength and endurance exercises should be carried out to align the intensity and characteristics of training with the demands of football matches, which provides a reasonable research idea for the related practitioners engaged in football physical training. Hoff et al. (2002) combined the specific characteristics of football with the design of aerobic high-intensity small-field game exercises, which combined a variety of sports forms such as change direction, sprint, and escape, and showed that training with a ball could increase energy consumption by 8%, making a positive contribution to adapting to the intensity of sports in the game. Plat et al. (2001) also showed through the research on the practice method of small field competition that the use of 3 to 3, 5 to 5. The training intensity can be effectively controlled by reducing the number of players and increasing the competition area, and the coaches can make decisions based on the individual needs.

### **Analysis of Football Specific Physical Ability**

#### *Overall relationship analysis of football specific physical ability*

Football physical training encompasses the entire football physical training exercise, including load management and monitoring, football physical training knowledge gathering and assessment methods, football athlete performance characteristics and physical criteria, the design concept of football physical training, and four aspects of training method. These four aspects are interrelated and independent. It comes down to a point that football specific physical training serves to improve the performance of athletes in the game and their athletic ability. Therefore, regardless of the arrangement of the overall load, the collection of training match information or the training design concept method should be carried out around the football match. Only when these aspects are well integrated to form an organic and mutually adaptive state, can the expected results and goals be accomplished.

#### *Partial relationship analysis of football specific physical abilities*

The four aspects covered by football physical training are often organized in a specific order. First of all, the corresponding assessment and test must be carried out on the physical function state of football players prior to the formulation of training arrangement and control and the formulation of physical training methods, and then the application and evaluation should be made after the collection of information. At the same time, relevant information should be collected for evaluation of athletic performance and physical demands. Based on

the outcomes of the actual data gathered, the next step is to develop the training content and process. The arrangement and management of the training load should be covered in the training content, process, and subject. Simultaneously, the training phase can be updated in real time in response to current demands and conditions by collecting and analyzing information continuously while training. It is a cyclic process whereby both are mutually independent and combined together.

### Conclusion

Football specific physical training is based on the needs of the competition and improve the performance of the athletes, so it needs to address the comprehensive goals, content, methods, load and training cycle design system. In the training of football specific physical fitness, the training mode and scene must correspond to the match. In the training of physical training, test method must be matched with the characteristics of football specific and mixed oxygen intermittent characteristics. Currently, the football specific fitness in China is still in a relatively weak phase, thus specific physical training assessment and real-time monitoring of the information are collected as a basis for the training design. At the same time, this speeds up the evaluation system, sets up a large amount of data to support the design of the specific training to improve China's football. Other than that, coaches should monitor and analyzed individual performance from all aspects of physical and strength performance, because it can help coaches to prescribe individual exercises to correct imbalance and/or asymmetry.

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