Original Article

Pedagogical conditions required to improve the speed-strength training of young football players

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Abstract:

This study determined the pedagogical conditions that are necessary for the effective speed-strength training of young football players. These include the careful selection of children and their retention throughout the entire period of football education, differentiation and individualization during their speed-strength training, selecting the most effective means of developing speed and strength in young football players, and ensuring a balance in the development of their speed and strength. Less important conditions include the efficient use of time allotted for speed-strength training, the maintenance of a high team morale, and the efficient use of fitness equipment, such as kettlebells, barbells, and other means of speed-strength training of young football players.

Key words: pedagogical conditions, young soccer players, speed-strength training, performance, means of training.

Introduction

In modern football, achieving top results is impossible without quality training of young players. The success of any team, including youth teams, is defined by three major factors: player technique, tactics, and the overall condition of each player (physical, moral, psychological, etc.).

A skilled player who understands tactics will never be able to show what he is capable of if he is rarely passed the ball due to a bad physical condition, moves slowly across the pitch, or strikes the ball poorly. Muscle strength and speed allow the player to use his entire technical and tactical arsenal in a game.

An examination of literary sources and common practices in athletic training of young football players for ages 15 to 17 shows that the problem of speed-strength training has not yet been solved. Modern scientific literature provides a more detailed methodology for the development of speed and strength in adult football players, but the existing research results and methodological recommendations are too general and do not distinguish between young and adult players.

Meanwhile, young players are weaker than adults, and their speed and strength develop in a different way. Many experienced football experts believe the age between 15 and 17 years is perfect for the development of speed and strength in football players [4,5,7,11]. Thus, it is crucial to solve the problem of quality development of speed and strength in young football players.

Over the last few years, research conducted by Russian and foreign experts in the field of football training show that appropriate exercises for speed and strength training of young football players at the ages of 15 to 17 significantly lower the risk of injuries and improve future performance [4,6,8,10].

There are currently two opinions regarding the methods that should be used in speed-strength training of young football players. Some experts believe that this training should only include ball activities, whereas others claim that players should train without the ball during some portions of training. We support the latter opinion based on the assumption that during speed-strength training, particularly during speed and mobility exercises, most young players focus solely on the ball and therefore fail to unlock their physical potential.

However, we have not found any papers that provided the pedagogical conditions necessary for effective speed-strength training of young football players from the age of 15 to 17 that into account a balance between exercises with and without a ball. Thus, this study aimed to determine the pedagogical conditions that are required for effective speed-strength training of young football players.

Materials and methods

The training regime, distinctive features of speed-strength training, performance dynamics, and the speed-strength training management structure for young football players were examined using questionnaire surveys, interviews, and polls. Both football players and coaches took part in the questionnaire surveys and interviews. The interviews with athletes provided valuable information on their subjective attitude to certain

speed-strength exercises, revealed specific causes of their injuries, and helped us to determine ways to personalize self-training. Interviews and polls with the football experts clarified the various organizational issues and elements of comprehensive support of the training sessions.

The physical conditions and performance of the young football players were assessed using special tests, observations, a stopwatch study, pairwise comparison, and analysis of current ratings at a Russian youth championship.

The football players' physical conditions were assessed to evaluate their physical abilities, speed, and strength and to analyze the effects of the training methods on their performance.

To assess amount of nervous activity of the football players, the Wellbeing-Activity-Mood (WAM) method was used, which registers individual wellbeing, activity, and mood [1,2]. These indicators were determined before and two hours after a game using the fill-in-the-blank method. Self-assessment values were obtained by finding the average of ten answers. The WAM test takes into account absolute values of well-being, activity, and mood, and their correlation. We paid particular attention to the fact that in the context of intense play activity, mood does not deteriorate as significantly as condition and activity.

However, previous research shows that if the difference between the parameters goes beyond 0.6 points compared to the initial data, it may indicate a performance degradation in young football players.

The results of this study received a mathematical analysis. The results of mathematical analysis of the obtained scientific data were interpreted according to guidelines provided by A. E. Bolotin [2]. During the analysis, mathematical parameters were considered significant when $p = 0.05$.

Results

The development of speed and strength in young football players is one of the most crucial problems of modern sport science. Strong performance during the training of young football players is one of the major criteria for the effectiveness and correctness of the training process. It is therefore vital to examine problems in the speed-strength training organization to select the most effective means and their balance.

Special speed-strength training of young football players is viewed as a specialized function of the entire training process that focuses on achieving an expected result. The level of athletic fitness during different training periods undergoes complex structural changes. Therefore, the assessment of speed and strength at each particular stage must be focused on the complex training that is specific for that period. This complex training is basically a minimized set of the most effective means of speed and strength development and how to obtain a balance between them [2, 3].

Selection of these means, according to which informative indicators are chosen, is an important task that defines the effectiveness of the test box. One requirement for the complex assessment of athletes' speed and strength is to identify information criteria that have a high correlation with the markers of football players' play activity. Based on the scientific literature and known sport practices, we could pick a set of speed-strength exercises that address particular aspects of the fitness of young football players.

Training process management involves the transition of football players from the initial physical condition to a new, expected one. For this to happen, the following basic conditions should be met: 1) one must understand the current condition of the player and have a description of the required condition and 2) the most informative means for effective development of speed and strength in football players must be determined, and any changes to them must be controlled.

Our data suggest that the first condition was partially experimentally justified. The second condition, however, has not been thoroughly studied. Therefore, the problem of identifying the most effective means of speed-strength training to determine the efficiency of young football players' training management requires particular attention. Effective management of the fitness of young players means the careful planning of the training process and its continuous adjustment based on obtained data.

Quality is the cornerstone of exercises that emulate basic elements of play activity. Additionally, it is desirable to register these parameters as a coordination of the complexity, speed, and length of the distance covered during training or a game.

The objective assessment of the fitness of young players and the dynamics of its changes are the key conditions of effective management of the training process. Complex control procedures provide an objective assessment of the fitness of young players that will consider all aspects of speed-strength fitness for a particular period.

Data obtained via complex educational controls in football allow an objective assessment of the level of player fitness during various stages of training. Comparing this data with model values provides the conditions that are required for effective management of the training process. To better understand what determines the effectiveness of speed-strength training in young football players, we conducted a survey of football coaches. There was no consensus regarding the duration of special exercises aimed at developing speed and strength: 15% believe it must be two to three weeks and another 15% claim it should last 90 days. Finally, 70% of them believe that such exercises should be used all year long (on a regular basis). For the survey results of the football coaches, see Table 1.

According to the survey, there is no consensus regarding the structure and content of speed-strength training for young football players. It is common knowledge that the play activity of young football players requires a high endurance. Research over the last few years has shown that modern football demands strong dynamic efforts from players. This leads to joint and ligament degradation in the lower limbs of football players. Thus, particular attention should be paid to a properly organized training process that is aimed at increasing the endurance of joints and ligaments that suffer the most during intense play activity.

Table 1. Most effective methods of speed-strength training for young football players according to football coaches (n = 37)

Ranking	Classification of exercises	Rate (%)
1	Wind sprints from different positions	21.2
2	Wind sprints combined with exercises to improve reaction time with the ball	17.8
3	Short-distance wind sprints	15.3
4	Fast run along the midfield line	13.1
5	Winders with the ball	11.9
6	Wind sprints combined with exercises to improve reaction time	9.7
7	Maximum speed run from different positions	7.2
8	Exercises involving the use of fitness equipment, barbells, and kettlebells	3.8

The health and sports longevity of athletes hinges on that. When a football player has fewer injuries, his performance in tournaments will be better. Considering how superficially this problem has been studied, we focused on analyzing the injuries of young football players. To improve speed and strength development in young football players and to lower the risk of injuries, it is essential to understand the structure and nature of the injuries sustained during their play activities.

Table 2 shows a breakdown of injuries sustained by the youth teams in St. Petersburg. According to an analysis of the obtained data, ankle joint injuries are the most common. This is likely because the load on this joint during a football game is considerable, and the joint and ligaments are not properly prepared for a competitive effort.

Table 2. Breakdown of injuries in young football players in St. Petersburg (n = 237)

Ranking	Injuries	Rate (%)
1	Knee joint	32.2
2	Ankle joint	28.2
3	Lumbar spine	16.4
4	Groin	12.2
5	Other injuries	11.0

According to the study, young players with a lower level of overall and special physical fitness are more susceptible to injuries. Dynamic (jumping) activity damages areas where ligaments are attached to the bones. Muscle ruptures are most common in areas where the muscle tissue pass into ligaments.

From this data, we prepared a comprehensive classification of injuries in young players, which indicates a need for a rationalized training process involving special speed-strength exercises. Currently, many different methods have a positive effect on the structure of muscles and ligaments that can be used for the speed-strength training of young football players. We believe that including special exercises in the overall and special training system could improve the effectiveness of speed-strength training management. Thus, it is vital not only to select the most effective means of speed-strength training but also to maintain a balance in the training process.

To determine the most suitable method combinations for speed-strength training for young football players, 37 football coaches were surveyed. For the results of the survey, see Table 3.

Table 3. Correlation between different speed-strength training methods for young football players according to a survey of football coaches (%)

Speed-strength training methods	Football players		
	15 years old	16 years old	17 years old
Wind sprints, maximum speed run	40	35	30
Jumps and jumping exercises	25	20	15
Wind sprints, run with the ball, ball exercises on the move	15	20	25
Exercises to improve reaction time with the ball on the move	15	15	20
Exercises involving fitness equipment, barbells, and kettlebells	5	10	10

Our analysis of this survey of football coaches showed that the training of the 15-year-old players should focus on wind sprints and maximum speed runs without the ball, whereas older players should train with the ball at maximum speed.

In this case, exercises involving fitness equipment, barbells, and kettlebells become more important.

This study allowed us to determine the most effective means of speed-strength training of young football players and to provide a balance for the training process.

The results of the experimental study show that the personal managerial capabilities of a coach largely depend on the conditions of their professional activity. Coaches work with a group, which requires a differentiated and individual approach to the education and training of young football players. Differentiation involves not only determining players' positions but also taking into account their temper, fitness, mental processes (attention, memory, way of thinking, etc.), natural skills, etc. Individualization means selecting the most talented players who require a different approach to become 'one-of-a-kind' players. When working with these players, the coach must consider the peculiarities of the talent and cultivate hard work, perseverance, discipline, responsibility, commitment, and other essential ethical qualities.

As shown by our data, speed-strength training of young football players can be improved only under certain pedagogical conditions. To find a solution to this problem, we surveyed 37 football coaches. Table 4 shows the ratings of the basic conditions required to improve the effectiveness of speed-strength training of young football players.

Table 4. Rating structure of pedagogical conditions required to improve the effectiveness of speed-strength training of young football players

Ranking	Conditions required to improve the effectiveness of speed-strength training	Rate (%)
1	Careful selection of children and their retention throughout the entire football education period	19.7
2	Differentiation and individualization of speed-strength training of young football players	17.8
3	Implementation of measures to improve the knowledge of coaches in speed-strength training of young football players	16.3
4	Selection of the most effective method of speed-strength training of young football players	14.9
5	Balance of means of speed-strength training of young football players	10.1
6	Rational use of time allotted for speed-strength training	8.7
7	Maintaining a high morale within a football team	7.2
8	Appropriate use of fitness equipment, kettlebells, barbells, and other means of speed-strength training of young football players	5.3

Our experts correctly placed the selection of children in football schools at the top of the ranking. We believe that this is vital to the emergence of talented players in 'adult' football. Significant attention should also be paid to the differentiation and individualization of speed-strength training of young football players.

Another important condition is the coach's ability to use the most effective means of speed-strength training for young football players. As shown by this survey, the existing system of coach selection and appointment meets the requirements and allows them to make the training process effective. Therefore, heads of football schools should take into consideration the individual capabilities of coaches and their other personal qualities.

This study demonstrates that rational use of allotted time for training has a strong effect on the development of speed and strength in young football players. In this regard, special attention should be given to finding ways to increase the time allotted for speed-strength training of young football players. One way to save time is to optimize individual planning of the football coaches' work.

Maintaining a high morale in a football team is another important condition that makes speed-strength training of young football players more effective. Public opinion, interpersonal relations, management style, and other factors have a significant effect on the quality of speed-strength training. To create a positive public opinion of speed-strength training, it is advisable to debrief coaches. During debriefings, heads of football schools must unequivocally support ideas that facilitate a positive psychological climate in a football team. Material and moral stimulation for coaches is important for effective training process management.

Thus, we concluded that the determined pedagogical conditions must be taken into account when determining the methods of speed-strength training of young football players.

Conclusion

This study revealed the most important pedagogical conditions that determine the effectiveness of speed-strength development in young players. These include carefully selecting children and retaining them throughout the entire period of football education and differentiation and individualization of speed-strength training of young football players. Another important condition is selecting the most effective means of speed-strength training for young football players and finding a perfect balance between these means.

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