Activities in Physical Education and Sport
2014, Vol. 4, No. 2, pp.158-161

METHODICS OF DEVELOPING SPEED IN YOUNG ATHLETES

(Professional paper)

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Abstract

There is a consensus among numerous sports experts that speed, as the basic motor ability, has enormous significance for success in many sports. Regardless of the fact that it remains significantly influenced by genetic factors (90-95%), its development is connected with the motion structures and dynamic characteristics of the numerous sports disciplines, hence it shows in a combination with strength, coordination, flexibility, endurance and accuracy. Speed is mostly manifested as reaction speed, start speed, stop speed, maximum speed, speed--endurance and agility. Each of the mentioned parts of speed manifestation can be improved by certain methods with maximum willpower and functionality of nervous-muscular systems. The paper provides a detailed description of several basic methods of developing speed in children involved in sports, such as plyometric, repetition and alternating workouts method. All these methods and modes of work are applicable in schools, and have given good results in practice provided that they have been timely and persistently applied.

Keywords: *plyometric method, repetition method, method of alternating workouts, latent time of motor reaction, cyclic speed, speed frequency movements*

INTRODUCTION

Most sports experts agree that speed, an elementary motor skill is important to success in many sports disciplines. We can note also that literature dealing with sports training, as a rule, pays less attention to it than to the speed endurance, power and other motor skills. The reasons probably lie in a more complex structure of speed compared to other physical abilities. Zeljaskov (2001) points out that there is still plenty of uncharted space and disagreement comes to speed training and its definition and segmentation. Brown, Ferrigno, & Santana (2000) states that the description of the speed and its manifest forms in the world literature uses over 50 different concepts. Finally, although speed is just one segment of the physical condition, most of the authors point out that it is not just fitness, but also very complex coordination ability, emphasizing that speed is influenced by numerous mechanisms, especially energy and nerve control mechanism.

The basic speed or "speed potential" of man is largely an innate trait (85-90%). Speed depends on the quality of muscles and nerves, less than on the metabolism and condition of the heart, circulation and respiration.

Training the speed of movement of the beginner is very important. However, with further practicing only speed stabilizes and further improvement is very slow. It is true that man is born with certain predispositions; however, we cannot expect that these characteristics radically alter coaching, although certain changes can be achieved by the appropriate physical training activities.

Čoh (2003) points out that speed in many sporting events appears as a complex ability, having several interrelated factors. Some experiments with the theory training (Mero, Komi and Georg, 1992, Brown, Ferrigno and Santana, 2000), cite following types of speed:

1. *The reaction rate*
2. *The starting speed (acceleration)*
3. *Deceleration (deceleration)*
4. *Maximum speed*
5. *Speed-endurance*

6. Agility

These types of speeds are represented in real sports situations, mutual relations and form a so-called: "Velocity potential" athletes. One of the most segmental potentials is cyclical locomotor speed, which is manifested in the form of sprint. However, it is of great importance for the development of the general speed and all other types of speed, so it must be developed parallel with the appropriate methodological procedures. Otherwise, speed depends on the following factors:

- The activities of the central nervous system.
- The structures of the muscle system.
- Elastic properties of muscle.
- Inter and intra coordination.
- Flexibility.
- Fast and flexible force.
- Movement techniques.
- Alactate anaerobic energy processes (ATP and CRP).
- Motivation-concentration.

METHOD OF SPEED

The reaction rate-(latent time chain reaction)

The reaction rate is the ability of athletes to react to a particular signal in the shortest possible time. Considering the type of stimuli, the speed of response can vary:

- Visual (fencing, karate, boxing, motor sports, etc.)
- Acoustic (athletics, swimming, etc.)
- Tactical (wrestling, judo)
- Kinesthetic signals (sports gymnastics water jump, etc.)

Each motor activity essentially initiates a latent period of motor response, which lasts from 0.1 to 0.3 milliseconds, while in the short period in the muscles occur bioelectric and other biochemical processes that precede muscle reaction. Conditionally speaking in this very short time interval three phases occur:

1. Sensory Stage (nervous time)
2. Premotor phase
3. Motor phase

Sensory phase lasts from acting signal to the first signs of muscle activity (measured by bioelectrical potential muscle).

Premotor phase is very short (0.03m milliseconds) and signals the appearance of bioelectric events in the muscle until the beginning of the movement.

Motor phase lasts from the beginning to the end of the movement.

Sensory and premotor phases make latent time phase of motor reaction, while the motor phase speed is actually the speed of a single movement.

For a demonstration of fast-moving extremely important are the speed nerve-muscle reactions. There are simple and complex neural muscular reactions.

Methods of developing speed of reaction

The reaction time is largely genetically determined and is possible to improve only by limited training. In a simple reaction it can be improved from 10 to 20% and in the reaction of choice, up to 30%. To this purpose, several methods are used.

1. The repetition method

This method is relatively fast, leads to the improved performance, then to the stabilization and further improvements are absent. The stagnation in further development can occur by varying the type and intensity of stimuli, where the concentration should be focused on the maximum performance of the fast movement, not to the signal itself.

2. Parsing Method

In this method, the goal is to provide by the analytical approach facilitated conditions for the reaction to occur on a given signal. Thus, for example, when a sprinter uses high start during which the load on arms is less than in the low start. Increasing load prolonged reaction time, while better developed stamina and power positively affect shortening of the reaction time.

3. Sensory methods

It is based on the correlation of the reaction speed and ability of athletes to differentiate short time intervals. Athletes are first exposed to certain signals that they need to quickly react to, but in such a manner that after every reaction they have a feedback from the coach on the achieved time (eg. start and sprint 5 meters). After that athletes have the task to estimate the time that they have achieved and to compare it with the actual achievements. At the end, athletes try to achieve times which are self set.

Cyclic Speed

There is a huge number of activities in which the ability to quickly perform repetitive movements is manifested. These are generally cyclical movements that are performed at high frequency, as seen in sprint, speed skating, rowing, cycling. However, scientific observation revealed that in such movements a combination of several different types of speed is manifested. This cannot immediately be noticed as more attention is concentrated on the frequency of movement than on the time difference between different parts of the movement (the shares) frequent moves can conditionally be divided into:

1. Movements of the same amplitude
2. Movements of different amplitudes

Movements of the same amplitude are seen in turning the pedals on a bicycle, with tapping hand and foot, with the pace of the movement.

Movements of different amplitudes are encountered in 100 and 200m running, in swimming the short distance at top speed and paddling. In this complex, speed frequency movements along the whole section are determined by the ability to perform work under anaerobic conditions, combating the negative effects of variable conditions of the organism and adapting techniques of the rapid movement to the surrounding conditions.

Regardless of how simple frequency movements

may seem they require complex motor structure, therefore there is no possibility of sensory corrections during rapid manifestation of an activity, because it would otherwise come to a premature end of the movement.

The highest increase in the rate of frequency of movement occurs in the period between 8-12 years of age while in the later period up to 15 years of age this motor size slows down. In females, the development of speed frequency movements is slower and more uniform than in the boys of the same age.

Method of cycle speed

The basic principle consists in applying maximum muscle strain in the activities performed at high speed provided three general requirements are met:

1. Technique of movements' performance must be such as to ensure maximum speed.

2. Athletes must develop almost automatic technique to overcome the movement and not to think about the move.

3. Duration of activities shall be coordinated with the speed of movement, which does not last longer than ten seconds.

Method of repetition

One fairly reliable method of the speed development is a method of repetition.

The essence of this method is the following:

a) The length of the run must be such that the speed in the end is not reduced.

b) Speed of movement must be maximized.

c) Duration of rest between sets must be decently long, so that the body almost completely recovers from the previous activity. (To be determined individually on the basis of pulse rate and other precise indicators).

d) Rest after a quick movement as a rule must be active.To this purpose, one can use easy running, exercise, stretching and walking to maintain high CNS irritability.

e) Number of repeated sections should not exceed 4-5 series so that during one sprint training of the 1500-1600m run is divided into sections.

f) As a rule, speed exercises should be applied in the beginning of the main part of the class or training. In micro cycles work on speed is predicted for the first or second day of rest. The level of recovery after practicing speed needs to achieve a value of over 95%. Thus, for example, if it is needed 6 minutes for a complete rest from running at 50m, 95% recovery is realized in about 5 minutes. This means that after this time, athletes have to re-run the same section at the maximum speed. However, this advanced method based on a large number of repetitions, has a drawback in that it leads to the creation of dynamic stereotypes, and while working on the development of speed other methodological procedures must be considered as well.

Method of alternating workouts

Characteristics of this method is a gradual increase in the intensity of work and speed with each succeeding section contestant or a student runs during a training session. The aim is to run the last section at a maximum speed greater than the others'.

There is a slightly different version of the first, except that the running different progressions are used where in each series speed gradually increases from section to section until the last section is run at the maximum speed. Basic orientation in this work is to develop speed in such a way that the student or athlete in each subsequent training exceeds the average speed from the last workout.

Intervals of rest between series need to be used for active rest. This means that all exercises of low intensity are recommended for the musculature, which had previously been active, in order to maintain positive CNS irritation.

What one should particularly be focused on is that the transfer of speed is quite limited and is primarily expressed in the same or related exercises and activities. (Running speed for example does not affect the speed in swimming.)

The maximum speed

The maximum speed is the highest possible maximum speed an athlete can achieve when performing movements with little resistance. To develop maximum speed we need 20-30m starting acceleration. Generally speaking, a person can develop a maximum speed of 12.5 m / s (43.38 km / h). From a biomechanical point of view the maximum speed is the product of frequency and step length. To achieve a higher speed one should increase one or the other−parameter, or both of them (Coh, 2001).

Method of developing maximum speed

There are several methods for the development of maximum speed, but the basic principle is to increase the frequency and step length. To increase the speed one should increase one or the other or both parameters, but this is a complex physiological and biomechanical process and depends largely on the morphological characteristics of the particular longitudinal and extraordinary strength of the individual.

Observing the top athletics and other competitions we see more and more athletes with exquisite body muscle mass, which leads us to the reasonable suspicion of the numerous scientific studies pointing out to the existence of a negative correlation between speed and body mass, especially in running the short distance, swimming, long jump, high jumps or basketball. However, getting better results and fantastic explosive strength of the individuals clear this doubt and assure us that between strength and speed, there are some kinds of complex mechanisms in the neuromuscular system that regardless of negative correlation, give positive results. Indeed this is true. It was found that work to improve

the dynamic power improves the speed of the body or its individual parts, and over recent years it is has been increasingly used in the training of the speed.

Development of maximum power by plyometric method

According to (Coh 2001) plyometric training is the most effective tool for the development of elastic forces. Elastic strength is related to all kinds of sprints, sports and changes in direction in this mode of work, in the muscles, in the eccentric phase, accumulates elastic potential energy involved in the reflection in the second, plyometric training includes drop jumps, deep-altitude and deep-diving remote jumps, vertical jumps, vertical hurdle jumps, horizontal jumps and leaps in the lateral direction.

The principle of performing plyometric training (Coh 2003):

- Plyometric work requires a certain level of general fitness and conditioning training, especially good level of general strength.
- This operation is not implemented until 13 years of age.
- During the week, there can be 2-3 plyometric trainings.
- At one training session it is recommended 40-60 jumps for beginners, 60-80 for intermediate level athletes and 80-120 rebounds for the well-prepared athletes.
- In depth jumps, breaks between units must be 10-15s, with a series of jumps between 3-5min.
- Between two plyometric trainings there must be rest time of 24-48h.
- More than three sessions a week can lead to injuries.
- Due to the fatigue of the CNS it is not recommended to apply the combination of strength training and plyometric techniques.
- Optimum height for depth jumps is 40-120cm.
- Jumping must be brought to the front of the foot, the heel should not touch the ground.
- It is not recommended to combine strength training and plyometric on the same day.
- Horizontal and vertical jumps can be combined with tied jumps over a hurdle and with speed training.

All these exercises should be performed technically correct and at a high level to balance targeted increase in speed and performance technique. If one does some of the exercises it is fist necessary to apply lower intensity loads, and if the athlete wants to extend and develop technical exercise mastery, there must be sub maximal intensity or supramaximal one.

CONCLUSION

Speed is an ability which may be affected only at certain intervals of age and can be developed by the well-selected training. An important factor of the speed of movement is the sports technique, which means that in order to increase the efficiency of movement it is necessary to eliminate the superfluous movements, to emphasize the "natural" speed. Speed is the physical conditioning-coordinating ability of the highest coefficient of innateness. According to many experts, this is the ability of an adult, not a trained person and by training it can be repaired by 20%.

However, when working with young people we must look for satisfaction in a rapid success, which is only expressed through competition results.

The paper describes a number of methods of developing speed as basic motor skill that can be used successfully for children in school and the athletes-sprinters, as well. All of these methods are the result of long-term research of the top scholars and experts in this area.

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