SPEED AND QUICKNESS

The Development of Speed and Quickness by Dr. Ben Tabachnik

The theory and methodology of sport coaching abound in publications dealing with developing quickness and speed. In special literature these notions are generally referred to as synonyms although many a scholar has already pointed out basic differences between them (F. Henry, 1954-1960; W. Lotter, 1962; D.Clarke, 1962; E. Fleishman, 1962; M.A. Godik, 1966; V.S. Gorozhanin, 1971; Yu. I. Shanenkov, 1970, and others). The above researchers were the first to differentiate between quickness and speed. They have established that the ability to quickly perform trivial tasks is poorly related to the speed of multi-joint locomotions. They have pointed out that quickness is fully manifest in locomotions that do not require muscle effort, complex coordination or great energy; first and foremost, the physiological mechanism of quickness is associated with the functional properties of the central nervous system. In other words, quickness is the ability to perform high-speed locomotions with no significant external resistance or great energy.

The following specific forms should be regarded as signs of quickness: quickness of the motor reaction (both simple and complex); quickness of realizing a single local unloaded movement (involving the leg, the trunk or the head); quickness of realizing multi-joint locomotions associated with changes in the body's spatial location as well as relapsing form one kind of activity to another in the absence of significant external resistance; frequency of unloaded locomotions.

These forms of quickness are independent (or poorly dependent) of one another and are not associated with (or poorly associated) with the level of physical training; nor are they related to the speed of locomotions requiring limited muscle exertion.

Let us dwell on the forms of quickness.

The quickness of the motor reaction is determined by the latent period of reacting. There are simple and complex reactions. A simple reaction is a response to a known and suddenly appearing signal through pre-trained locomotions. This example can be illustrated by the sprinter's starting reaction, speed shooting, etc. All the other types of reaction are complex ones.

The time of performing a simple locomotor reaction depends on the intensity of the stimulate, its sensor modality, durations, the space under effect, the localization of the point to which the stimulant is applied, the interval of consecutive stimulants and some other conditions.

The time of a simple locomotor reaction is generally divided into two periods, vis., the latent period and the time of locomotion (motor time). The latent period is the time from initiated stimulation till the emergence of muscle biocurrents.

It has been established in different sports that the latent period of simple reactions is not subject to training, is not related to the athlete's qualification and cannot thus be used as a parameter of man's quickness. The integral period of a simple motor reaction is chiefly shortened at the expense of the motor element.

V. S. Farel and Ya. M. Kotz (1970) contend that the overall time of a motor reaction is of paramount practical interest. They recommend that the athlete's motor reaction be characterized by measuring the duration of the whole reaction from initiated stimulation till completed locomotion.

Under sport activity a complex motor reaction calls for estimating the situation, choosing the best possible decision and its quick realization. Under such conditions, the time of reaction depends on the number of alternatives. Which is why the more difficult the choice the longer the time of reaction. In this case, apart from the preserved motor time the time of reacting to the situation or signal is significantly shorter. As the athlete's skill grows the time of receiving and processing the information becomes shorter.

Certain differences have been found in reaction time indices depending on the specifics of the motor tasks to be solved, as well as varying objectives during sport activity. Thus, in bond volley-ball players and counter-attacking boxers the reaction time of a simple reaction is slightly shorter and that of a complex one is 12-17% shorter than in starting volley-ball players and attacking boxers.

In some cases, (for example, in sport competitions) prediction of the imminent situation is an important factor to reduce the reaction time. For instance, an experienced goal-keeper can predict the direction of the blow by the forward's preparatory activity. Which is why experienced players pay particular attention to performing feigned maneuvers. As the football player's skill grows the time of feigned maneuvers prolongs, the time of performing the game-related movements being shortened. This is necessary for the counterpart to react to the false information. A too quick performance of feigned maneuvers may fail to mislead the counterpart.

Another form of quickness is the quickness of realizing a single local unloaded locomotion. It is realized as a single boxing punch, fencing prickle or hockey-stick movement. Local motions are also realized with an active participation of the leg and trunk muscles. Their coordination is relatively simple and provokes no effect on the quickness of the main movement.

Under more complex motor activity related to changes in the body's spatial localization the coordinational structure of muscle activity grows more complicated. A vivid example of this are a boxer's maneuvers characterized by shifts in the direction of locomotions, sudden side steps and sudden transition from defensive to offensive actions. In basketball the success of sport activity is determined by the quickness of simple and complex motor reactions, time of starting and supporting reactions in jumps, as well as by the speed of realizing a single movement. A high level of quickness is demonstrated by weight lifters during squatting. Under complex locomtions the shortening of their realization is associated with elaborating and strengthening rational muscle coordination. The less difficult and the more automated the locomotion, the lower the tension on the central nervous system. Yet, the more complex the coordination and the larger the transferred mass, the higher the correlation between the quickness of locomotion and strength-related characteristics.

Still another form of quickness is the frequency of unloaded locomotions which is seldom found in its pure form in sport activity (ball leading in basketball and grass hockey, boxers' movements). The frequency of simple unloaded locomotions (patting and waving) is not associated with the movement rate or the athlete's speed in cyclic locomotions. No correlation has been found between the maximum frequency of all one-joint locomotions and the maximum frequency of steps and the sprinter's speed. It has thus been concluded that all the body's characteristics cannot be derived from the frequency in one joint (A.N. Gontarenko, 1975). For example, the tapping test can be employed for studying the strength of the nervous system but not for determining the athlete's speed qualities. The frequency of locomotions can be trained. In boxers, for example, the movement rate increases as their skill grows. The respiration rate is influenced by the athlete's specialization. The corresponding indices are better in boxers than in wrestlers. Thus, in all its specific forms quickness is chiefly determined by two factors, viz., the promptness of organizing and regulating the neuromotor mechanism and the promptness of mobilizing the locomotion. The former is stipulated by the genotype and is perfected to an insignificant degree. The latter can be trained and is thus the main reserve in developing quickness. Hence, the quickness of a specific locomotion is largely secured by adapting the locomotor system to the conditions of fulfilling the motor task and mastering rational muscle coordination which would promote the complete utilization of the individual's nervous system.

The reserve of locomotion amplitude attained by improving the flexibility and elasticity of the muscles and the mobility of the joints, as well as by developing the ability of independent muscle relaxation promotes fast realization of the neuromotor program.

To improve muscle coordination locomotions should be rendered more difficult to perform. This quickly involves the muscles in the locomotion and mobilizes the fast motor units thus determining the elaboration of the most effective intramuscular coordination. In locomotions related to the quickness of reacting to the external signal this technique shortens its motor component. This method can be used both in competitive and auxiliary exercises. To develop the quickness of movement the load shall not exceed 15-20% of the maximum.

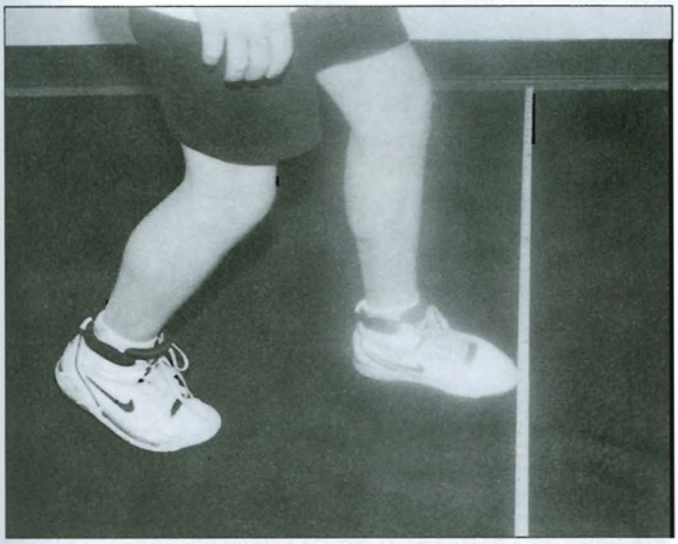
It is quite effective to perform the main training exercise after previous tension-regulating work plus load application. It has been shown that the pushing of a 5-10kg stuffed ball stimulates the quickness of the boxer's subsequent punches. The quickness and frequency of the boxer's movements is effectively perfected by strength-developing exercises corresponding to the boxer's punch and defense, with their subsequent performance at the maximum rate and with no load. The use of dumbbells for developing locomotion quickness in boxers has been experimentally motivated. First, various movements were performed with dumbbells and then without them. In both cases particular attention should be given to the ability to relax the muscles prior to the exercise, to perform the locomotion very quickly and then relax again.

Soviet scientists have proven the efficacy of using the express information method to enhance locomotion quickness in various sports (gymnastics, volleyball, handball, soccer, fencing, boxing and sprints). The essence of the method consists in comparing the real parameters of a performed exercise and their subjective estimation. This helps enhance the motor-emotional performance of locomotions.

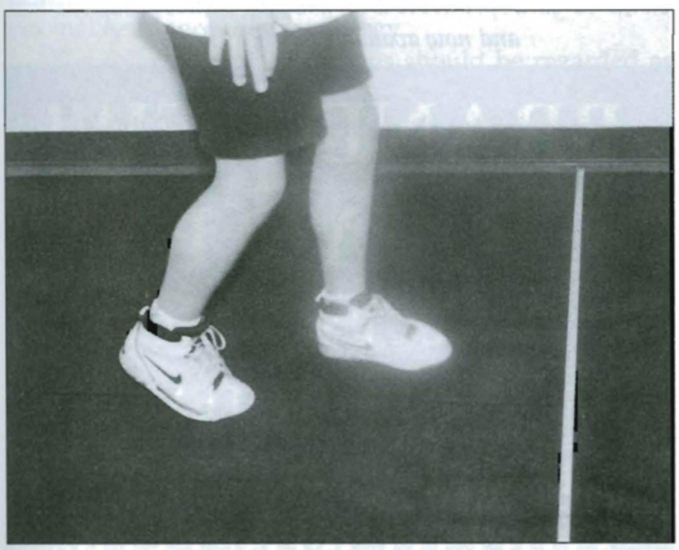
Various simulation forms involving reaction to the situation and signal have been shown to provoke a positive effect on perfecting locomotion quickness.

I would like to dwell on my experience of perfecting the quickness of motor reactions in athletes. It is known that the most widespread way of improving a reaction is to repeat a crouch start to the sound of standard commands (hand clapping, voice, start shot). In beginners this method yields quick positive results. Yet, in its long-term use the reaction quickness gets stabilized and its subsequent improvement is hard to achieve. The available data on modern physiology indicate that the common quality of almost all receptors is their adaptation to the force of stimulating. Incidentally, it has been established that the stronger the stimulation the quicker the adaptation. This prompted me to conclusion of using should stimulants of varying intensity (with the prevalence of weak ones). I believed that this would make it possible to avoid the adaptation to the force of stimulation on the one hand, and to render the situation more complex on the other hand, namely the athlete will have to be very attentive to react to a weak signal. I told the athletes to react as fast as possible to any signal given from any place. When experimentally tested the method yielded quite convincing results. In my further practice I often used this method not only in a crouch start but in various start exercises.

DR. TABACHNIK CORRECTS BFS SPRINT-START TECHNIQUE



Old BFS Technique Shows Lead Foot on the Starting Line.



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