

Influence of taping on athletes' psychomotor possibilities in sprint

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ABSTRACT

Sprint results are more often seen as deliberate practice model (DPM) effects. The performance is limited, as the goal is the same for every competition – to run as fast as possible. This requires a specific skill. The researches confirm that a prerequisite for elite sprinting is an exceptional speed to formal training; this exceptional ability is partially sprint-specific; many elite sprinters achieve the world-class status in less than 10 years, which suggests DPM (Michael, Lombardo, 2014). Introduce the technology of combining special exercises with kinesiotaping as a way to solve the motor task in the sprint - to run fast. In the training, the special exercises were used, the kinesiotaping was applied to enhance psychomotor skills and exacerbate the proprioceptive sensitivity of individual parts of the body. 10 qualified 21-24 year-old men-sprinters having 5-7 years of sprint training practice took part in sociological studies. A sequence of exercises is presented aimed at forming specialized sensations of 'track feeling' in a track and field athlete-sprinter with the help of kinesiotaping. The possibility of forming the motor composition of a new skill for implementing the athletes' sprinting capabilities is revealed. The special exercises and kinesiotaping made it possible to solve motor tasks to form the basic skill of repulsion after giving back a track of any stiffness.

Keywords: Taping; Biomechanical effect; Sprint; Motor skill.

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INTRODUCTION

Improving the training system in elite sport increases the efficiency of the qualified athletes' training process and competitive activity. This increases the effectiveness of training impacts and stimulates the athletes' realization opportunities in the process of competitive activity (Godunov, Martianov, 2000; Vinogradov, 2009; Platonov, 2013, 2017).

The important factor in the control of movements in the process of training and sports improvement is the participation of the athlete's psyche, focusing on the parameters of the athlete's movements control, this increases the effectiveness of learning complex coordination movements (Godunov, Martianov, 2000; Mishhenko, Lysenko, Vinogradov, 2007; Vinogradov, 2009).

'Memory for movements' largely determines the success of mastering motor skills in the initial stages of training. It also influences the qualified athletes' success, and the productivity of 'memory on the amplitudes of movements' may depend on both the chosen methods of memorization and external conditions (Goncharov, 2008).

The psychomotor abilities can be accelerated to form due to specially developed psychological and pedagogical techniques that provide faster psychomotor development and, as a result, more effective development of motor abilities in mastering specialized motor skills (Markov, Nikolaieva 2015; Kaminsky, Veraksa, 2017).

The information about the athletes' movement forms the specialized perceptions that appear in the specific conditions of sports activity. This activity causes the emergence and development of deeply specific sensations associated with sports specialization. Here, specialists differentiate the function of including one or a combination of analysers; conditionality perception of the peculiarities of the environment in which an athlete operates; features of objects with which (on which) motor actions are performed (Lazurenko, 2011, Klimenko, 2013).

There are separate publications in the literature that represent the physiological mechanisms underlying the visual perception in the athletes' training, the authors create an idea of 'creative perception of reality' among athletes, when self-organizing physiological systems of different levels provide an aesthetic perception of sports movements (Lindeman, 2000; Danilova, 2007; Kurashvili, 2010).

The determinants of the accuracy of 'sensory discrimination and perception', kinaesthetic perceptions of the main temporal characteristics of movement (duration, pace and rhythm, speed and time sequence of movements) depend on different factors. They are the specifics of athletes' motor activity (Bernstein, 1991; Platonov, 2013); the characteristics of a separate temporal component of movements (Popov, 2008; Thompson, 2013); the level of sportsmanship (Platonov, 2017); the interaction of visual, auditory and musculoskeletal analysers (Anokhin, 1980; Haverdovsky, 2007; Vinogradova, Sovenko, 2020).

The technical aspects of training in fast running in track-and-field (sprint) with the participation of psychomotor skills are not sufficiently represented in the specialized literature. The modern professional sport requires more specialists' attention to the technical elements of movements during the initial training. The process of training and improving the technique of physical exercises should be based on the systematic unity of purpose with the pedagogical, psychological, physiological and biomechanical components of sports equipment. Next is improving the technical skill at a professional level. A sports technique or a physical

exercise technique is a way of organizing internal and external forces in relation to an athlete's body into a functional system based on the goal of an action, regulated by motor capabilities, biomechanical criteria for optimizing movements, and situational expediency (Gamaliy, 2015).

Kinesiotaping (KT) has been popular in sports since 1988, and although eleven comparisons have shown significant effects: 2 in favour of KT, 8 in favour of Mulligan tape and one in favour of lack of tape, there is no convincing evidence in favour of using KT to enhance athletic capabilities (Bandyopadhyay, Mahapatra, 2012; Reneker, et al., 2018). Nevertheless, in some works, we find them (Lumbroso, et al., 2014). At the same time, the prophylactic and therapeutic effects of KT are well known (Kenzo, Kaze, et al., 2015; Mosiejczuk, H. Lubińska, A. et al., 2016; Hosp, Folie, Ret al., 2017; Logan, Bhashyam, et al., 2017). The kinesiological taping method is based on the assumption that the peripheral receptor on the skin belongs to the nervous system, and the cell structure can affect the corresponding segment of the spinal cord. The kinesiotape applied to the skin stimulates skin receptors, which in their environment act on the nervous system (Bandyopadhyay, Mahapatra, 2012). Sports Kinesiotape can be considered as an additional means of the operative formation of muscular-articular sensations, improved controllability of movements, the ability to feel and present muscles as an organ knowledge and source of information (Vinogradov, Gusiev, Vinogradov, Grabko, 2015).

MATERIAL AND METHODS

The technology of combining the special exercises with kinesiotaping is presented as a way to solve the motor task in the sprint – to run fast. To accomplish the task, it is necessary to train an athlete to do running movements in a coordinated, economical and effective manner using the 'recoil of the elastic support of the track' and the development of free running inertia sensations. In the training, the special exercises were used, the kinesiotaping was applied to enhance psychomotor skills and exacerbate the proprioceptive sensitivity of individual parts of the body. The sociological studies involved 10 men, 21-24 year-old qualified sprinters and having 5–7 year inertia sprint training practice. The following methods were used to represent the main concept of this article: theoretical analysis, synthesis, practical experience, express survey of athletes. The information received from respondents was used exclusively for research purposes; the norms of confidentiality and respect for the individual were observed during the study at the data collection stage and in the processing of the results.

RESULTS

The pedagogical process of training and doing the movements of a sprint runner, who simulates the competitive activity, included the following sequence of actions for an athlete:

- When touching the surface of the treadmill, feel the reaction of the support, its amortization, then repulsion by the track of the foot;
- Concentrate on the sensations of 'springing' of the track after depreciation, the formation of the basic skill of repulsion after depreciation;
- Determine in sensations, then use reactive forces for developing sensations of movement inertia of the body parts in the process of fast running;
- Evaluate the difficulty of learning and the subjective effectiveness of new sensations in fast running according to the results of an express survey.

The implementation of the scientific and methodological approach to the content of means aimed at developing athlete's specialized sensations such as 'track feelings' is the application of two successive techniques:

- Kinesiotaping (to activate the proprioceptors of the body peripheral parts: in forming the muscle sense of 'elasticity of the track' as a skill; individual improving the psychomotor skills through the formation of a new way of movement, when the motive and goal lead to improve the technical skill in sprinting);
- Special exercises (developing reactive spatial-temporal sensations to accelerate the movement of the body parts; developing sensitivity for the appearance of sensations in the local zone of 'foot - lower leg').

When taping, the skin, subcutaneous tissue, fascial formations, muscles, ligaments are exposed, and the tension of the tape on the skin creates convolutions that raise the epidermis, reducing pressure on the mechanoreceptors located under this part of the skin. Due to the same mechanism, this technique can improve blood circulation and lymph circulation, thereby reducing pain intensity, improving muscle activity, and activating proprioceptors of muscles and joints (Kase, Wallis, Kase, 2003; Marcolin, Buriani et al., 2017).

In case of violation of the optimal motor stereotype and muscle imbalance, using various techniques for applying Kinesiotape, it seems possible to regulate the afferent flow from proprioceptors. Since the movement of the skin stimulates the receptors of the skin continuously, the effect can be lasting, which is important when learning new, complex coordination movements (Wilkerson, 2002).

The mechanism of the segmental influence of Kinesiotape on the internal organs is based on the peculiarity of metamere innervation. The clinical studies show that each segment of the spinal cord corresponds to a certain zone of innervation, in which the sensory, reflex and trophic processes are carried out by the afferent and efferent nerve fibres of this metamere. The neurons of the spinal node of each metamere carry afferent impulses from the skin, muscles, tendons, ligaments, periosteum, connective tissue structures, and blood vessels, somatic and autonomic ganglia of tissues of internal organs (Bernstein, 1991; Popov, 2008; Vinogradov, et.al., 2015). The sequence of applying tape is defined to develop sensations in the foot and sole, improve afforestation, differentiate sensations, and teach the distribution of effort along the length of the sole when learning the technique of movement.

Based on the foregoing, we suggested the possibility of increasing the effect of learning the technique of movements, improving the quality of performance by activating the athletes' proprioceptive sensitivity according to subjective sensations (express questionnaire).

To increase the biomechanical and neuromuscular efficiency of the training process in the sprint, in the presented algorithm, the first, third, fifth, seventh part of the sequential actions presented by us is taping, the second, fourth, sixth, eighth part of the algorithm is special exercises (Table 1)

The preparatory taping is presented and the following special exercises are interconnected, and their sequence is strictly determined by the approved methodology (Vinogradov, 2009; Vinogradov, et al, 2015).

Table 1. The methodology of combining special exercises and taping for a biomechanical and neuromuscular effect in the sprint.

Stage	Description	View
Part 1	<i>First taping</i> The tape is superimposed on the front of the transverse and internal spring arch of the foot, taping starts from the thumb toe with the back flexion through the back to the little finger and from the bottom to the thumb, sometimes in 2 rounds.	
Part 2	<i>Exercise 1</i> in walking is presented below. At the end of the exercises, remove the tape from the front of the foot.	
Part 3	<i>Second taping</i> The tape is superimposed on the middle part of the transverse and internal spring arch of the foot, similar to the movements in the first part, but the beginning is from the middle of the long flexor of the thumb through the back of the transverse arch to the beginning of the tape. Fingers in the position of the back flexion, sometimes 2 rounds.	
Part 4	<i>Exercise 2</i> in walking is presented below, repeated in the same sequence. At the end of the exercises, remove the tape from the middle of the foot.	
Part 5	<i>Third taping</i> The tape is applied to the heel of the arch of the foot, the technique of applying, as with a bruised heel, or, as when applying to the entire sole, only a shortened, "heel".	
Part 6	<i>Exercise 3</i> in walking is presented below, repeated in the same sequence. After exercise, remove the tape from the heel of the foot; <i>Exercises 4 - 6</i> in walking are presented below, repeated in the same sequence.	
Part 7	<i>Fourth taping</i> We apply Kinesiotape with tension from the knee to the thumb according to the projection of the long flexor of the thumb, we fix the upper part of the tape with a transverse round, sometimes we strengthen the Achilles tendon and arch of the foot to the extent necessary transverse tours.	
Part 8	<i>Exercises 7</i> in slow running and with acceleration are presented below, repeated in the same sequence.	

With the development of reactive spatial-temporal sensations and the acceleration of the movement of the body links with the help of special exercises, an athlete needs to focus on switching the movements of the right, then the left side of the body, thus freeing the left, then the right side of the body with their links for the 'automatic brain search' true, the most rational movement of 'attention-free' links. The exercises are performed on a straight line of 30-40 meters, in competitive sports shoes (studded shoes), in summer, you

can perform the initial exercises barefoot at a distance of 15-20 m. Just 2-3 passes after taping each part of the foot for the appearance of depreciation and 'track recoil after repulsion'. The similar technology for developing athletes' sensations was tested while learning the technique of sports walking (Vinogradova, Sovenko, 2020).

Exercise 1. Tape on the forefoot. Walking at a slow pace in a straight line, 2-3 sets × 20-30 meters. The athlete's eyes are closed, use 'ear plugs', this blocks auditory irritation, the athlete plunges into the 'inner body'. The trainer is walking nearby. The athlete's legs are straightened. The mental representation of 'rotation of the hip joints from top to bottom and back and forth in a circle'. Perform a preliminary simulation of this movement with your hands. This is an effective technique for forming the kinaesthetic images of movements: activating the function of some analysers due to the artificial shutdown of others. The exercise should be performed by 'inertia', maintaining balance and constantly shifting the centre of gravity, controlling the feeling of 'fullness, plenum' in the supporting leg and that the body part on which weight is transferred. The athlete is trained to move first due to the active movement of the link 'pelvis-hip'. The knee and foot do not participate in active movement to the extent of development of individual coordination.

Exercise 2. Tape in the middle of the foot. Walking at a slow pace in a straight line, 2-3 sets × 20-30 meters. We change the angle of bending of the legs by 5°, the athlete designates and remembers the springy movement of the pelvis, knee, middle part of the foot. Due to a change in the angle of the legs bending, a slight muscle tension occurs; an athlete expects repulsion of the track without the participation of a visual and auditory analyser.

The facts of differentiation of information from the articular receptors (reaches the higher parts of the brain) and information from tendon receptors are known. This is of independent importance, since the magnitude of the angular displacement (changing angles from 5° to 20°) causes a switch from the magnitude of muscle tension to controlling movement in the joints (Agadzhanian, et al. 2003).

For better control of the subjective sensations by an athlete, when there is an inaccuracy in movements and when the visual information of the trainer is not sufficiently informative, he needs to use a photo and video to clarify the flexion angles in the athlete's joints.

Exercise 3. Taping the heel of the sole. Walking at a slow pace in a straight line, 2-3 sets × 20-30 meters. The athlete must increase the bending angle in all joints of the legs to 10°, there is a slight tension in the joints of the legs: pelvis, knees, heel of the foot (taping the heel helps to focus). Maintain a pause when new sensations of 'recoil' the track along the length of all links of the lower extremities. After the exercises, a complete restoration of heart rate (3-4 minutes) is required.

Exercise 4. Without tape. Walking in a natural position in a straight line, with visual and auditory control, 2-3 sets × 20-30 meters. An athlete accentuates the springy movement from top to bottom-forward: the pelvis-knee-foot is the track, enlivens the 'leading reflection', that is, it predicts the sensation of the body repelling the track through the foot to accelerate the general movement of the body. It is necessary to maintain a pause of several milliseconds until the track 'depreciation' 'turns on' and acts after depreciation, accelerating the movement of the links during repulsion.

Exercise 5. 'Impact movement' along the track, the so-called 'wheel', popular in its time in the sprint and undeservedly forgotten. In the single support phase, quickly raise the fly leg bent at the knee up; quickly lower it with a change in foot position and a quick rebound. The half-torso of the body, the arms bent at the elbows,

the calf muscles tense, and the feet at a distance of 15-20 cm from each other in the anteroposterior direction. Alternatively, simultaneous jumps on two legs with a quick reflex bounce off the track due to the 'foot-to-foot' link (6-8 bounces), then at the fast pace the same repulsions are performed, but from foot to foot with the transition to fast running up to 20 -30 meters.

Exercise 6. Walking first on straight legs, then with the amortization of all links, acceleration to exacerbate the acquired sensations: the track 'carries'; 'Inertia of free play'. Walking at a slow pace in a straight line, 2-3 approaches × 20-30 meters with an increase in the inclination forward, a decrease in the angle of flexion of the elbows, acceleration of movements and a set of speed after the manifestation of the indicated sensations.

Exercise 7. Taping from the knee to the thumb according to the projection of the long flexor of the thumb. Running at a slow pace in a straight line, 2-3 sets × 20-30 meters, keep new sensations, and then run with acceleration 2-3 sets × 20-30 meters to consolidate new sensations. Pay attention to the 'short return' of the track to the foot after passing the vertical moment to the supporting phase of each leg.

It is known that the mechanism of occurrence of a sequential image is associated with the phenomenon of aftereffect of the stimulus on the nervous system. The sequence of sensations, their special organization provides an accurate reproduction of the rhythm, speed, sequence of actions by the kinaesthetic analyser. The termination of the stimulus does not cause an instant termination of the process of irritation in the receptors and excitation in the cortical parts of the analyser (Smirnov, 1985).

After completing the training, the questionnaire of athletes was conducted for the subjective evaluation of individual technical training in the sprint. In the responses, the athletes rated the complexity of the proposed exercises as sufficient for the lesson, the degree of difficulty in maintaining attention on the performance of the proposed exercises as surmountable, and the changes in their feelings after performing the complex of the proposed exercises as positive-intellectual. The athletes evaluated the effects of taping by subjectively improving the tone of the muscles of the foot and sole; the appearance of a sensation of elasticity of the track ('track feeling'); noted an improvement in motor sensations associated with the technique of fast movements.

DISCUSSION

It is important for an athlete to withstand a temporary pause until sensations appear. The adhesion of the leg to the support during actions along its surface should correspond to the force and angle of interaction: the stronger the action and the sharper the necessary angle relative to the surface of the support, the greater the necessary grip with the support. The use of studded shoes technically correctly builds repulsion, in the execution of which the entire sprinter motor apparatus is involved. The accelerated flywheel movement of the links remote from the support is an integral technical component of this movement, without which, in principle, it is impossible to develop the force on the support. The repulsive swings are not only fast movements, but also accelerated movement of massive links towards the support, primarily the upper torso. Therefore, it is important to develop sensations to feel the elastic support, to adapt to it, taking into account the speed-strength, power capabilities of an athlete.

The tempo (speed) properties of movement largely determine not only its dynamic qualities and, as a result, the sporting result of the exercise, but also the accessibility, in particular, the controllability of the movement during its development (Gavierdovskiy, 2007).

Perception, cognition and the construction of movements through the activity of external, internal and motor analysers have long been of interest and are studied by sports science. It is known that improving various types of sensitivity helps in the formation of motor skills (Bernstein, 1991).

Some recent researches have shown that sensorimotor and cognitive processes are inseparable. Therefore, it is known that, like a mental elaboration, a visual demonstration of the motor model causes the activity of the brain zones involved in the actual execution of the corresponding movement (Lindeman, 2000).

For forming new images of movement for each athlete, the better development of the technical parameters of movement, it is necessary to activate his cognitive processes, dedication to work, it is important to have an optimal functional body state, which can determine the level of success of such work.

While studying the technique of sports exercises of gymnastics, V. N. Boloban (2013) developed and proposed the method of postural orientation of movements, indicating that the body posture should be such that its implementation automatically determines the biomechanics of previous and subsequent movements. Similarly, in the above program of mastering movements, an athlete first ideomotorically simulates the position of the trunk, vertical moment, and movement of the thigh, lower leg, and foot. He simulates depreciation and then expects the track to 'recoil', then practically performs a complex coordination movement, in the reverse circuit, connecting the feet, knees, hip joints to a common centre of mass of all elastic strength. It is in this sequence that it is possible to recommend 'forming sensations' for using an impulse of a force of reactive-mechanical origin, inertia of free running at a speed when the role of elastic deformation is more important and important than the power muscle component.

In the same training session, an athlete performs the task until a clear reflex sensation of the natural inertial course appears, when the track 'carries', and the speed is automatically adjusted. Then you need to 'designate' the movement of the head; 'release' the free muscles of the neck and upper bundles of the trapezius muscles; housing; adjust the slope and length of steps by the length of the arm of the arms; get the result - sprint.

When performing exercises, the specific psychomotor mobilization is required; one can rely on the reliability of the parts of the body only with a certain physical and functional preparation, when there are no pre-competitive states with their expectations and intentions. The response process of the body in a complex search for sensations of 'reactive forces' should be made in the appropriate periods of the training process.

Given the certain difficulties of forming psychophysiological conditions, it is desirable to pay attention to the following circumstances:

The first of them is inversely related to the difficulty level of the task, i.e., the more difficult the task for the subject is, and the lower the level of optimal motivation is.

The second is associated with the optimal mental stress of work. Sometimes this condition is displayed, realized, evaluated and regulated by indicators of well-being. They are coloured by positive sensations of the movement aesthetics – inside and outside – feelings of muscle joy.

The sequence of exercises presents certain difficulties in the development of new sensations even by qualified athletes, therefore, in the initial stage of training there requires a separate training session (classes). Subsequently, taking into account the effects of the training process and the change in the functional state,

it is necessary from time to time to maintain the level of sensitivity of peripheral links and preservation (updating) of the presented components of the movement technique. This refers to the revitalization of the sense of combat readiness in the process of pre-competition and prelaunch training in athletics (sprint) and other sports.

In the future, when educating and training in the sprint, researches on forming and constructing the individual psychomotor models of biomechanical organization of movements at speed may be of great interest.

CONCLUSIONS

The perceptions approach facilitates the athletes' training in the muscular sensations of 'elasticity of the track', the use of reactive and ballistic forces in fast running. The use of 'blocking' visual and auditory information, taping during exercises allows you to activate tactile sensations as compensatory in the peripheral parts of the musculoskeletal system of athletes more effectively than with traditional teaching methods. Special exercises and kinesiotaping allow you to solve motor tasks in a sprint with a greater concentration of attention to form a basic repulsion skill after giving back a track of any stiffness.

AUTHOR CONTRIBUTIONS

Conceptualization, VV, VB, ST; Methodology, VV, HL ST; Data collection, VV, VB; Statistical analysis, VS, ST; Writing-Original Draft Preparation, AN, HL; Writing-Review & Editing, MK, ST,. All authors were involved in manuscript development.

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