

PROGRAMME OF INDICATORS RELEVANT TO SELECTION OF POLE VAULTERS

(Professional paper)

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Abstract

Information about the technique was obtained by structural analysis. Pole vaulting technique was developed together with development of a pole. When a bamboo pole was used there were two basic types of pole vault. The first type of the technique was a takeoff type and the other was a swing type. Athletes who used the first type of a technique based their vault on strong takeoff, and representatives of the other as they were ran into vault by a very strong swing. As a difference from contemporary poles, when metal poles were used, takeoff was directed forward and upward and due to the type of material the pole was made of, it was much more emphasised. As a difference from the takeoff, the grip, carrying and run were identical to those with contemporary poles. Anyway, every type of a technique, regardless of how unified it looks, must be conditioned by laws of biomechanics, which, on the other hand, in certain modifications of a basic technique, enable maximum use of individual potentials of a pole vaulter. It can be said that pole vault is the most complex individual athletic discipline. Top pole vaulters must have both sprint and throwing types of abilities. Besides, they also have a high level of coordination. Years of hard work are necessary to master this discipline completely. No other athletic discipline requires such hard technical training. Pole vaulters are often selected from gymnasts who, due to their potentials, perform the tasks of pole vault more easily than other sportspeople. Some of the best world pole vaulters were gymnasts before taking up pole vault. There are 4 basic phases in pole vault: the approach run phase, the plant / take-off phase, the fly-away phase and the landing phase.

Keywords: *pole vaulting phases, pole vaulting motor speed & strength, cognitive abilities, conative characteristics*

Pole vaulting has no reliable sources of its roots in ancient times, although it belongs to athletic disciplines with long tradition. Its origin lies in jumping over some obstacles (streams, brooks, holes, canals) with help of a pole, a thick and long stick. Pole vault is the only athletic jump discipline, disregarding whether we talk about long or high jump, where an aid, a pole, is used. This is why a pole represents a significant factor in achieving results in this discipline and it was very important in development of this discipline. At the beginning poles were made of ash, cedar, spruce, birch and pine trees. The wood for poles was found in local forests. These poles were heavy and inconvenient. The approach run was slow and unequal and pole vault technique was primitive. At the beginning of the 20th century athletes started using poles made of bamboo and those poles were dominant in the world of pole vaulting until the 1940s when during the World War II bamboo became hardly accessible and athletes started using hollow metal poles, most often made of aluminum. Fiberglass vaulting poles, poles made of glass fibers, represent

revolution in this discipline. Legendary American athlete, Bob Matxiac, double Olympic decathlon and not pole vaulting champion (London 1948, when he was 17 and Helsinki when he was 21 years old), was the first to use this pole officially.

Cognitive abilities enable processing information about movements and they represent a significant point in pole vaulting:

1. State of the receptor system, where all senses have to be healthy, undamaged and in excellent functional state starting from a sense of sight, proprioceptive sense and even sense of hearing.

2. Processors for decoding, structuring and browsing the input information. They have to be capable of processing information fast in unfamiliar situations.

3. Processors for serial analysis of information, starting from their efficiency in browsing memory and finding already prepared information responsible for a particular situation.

4. Processors for simultaneous analyses of information. They are responsible for browsing long-term and short-term memory from the previous experience,

both from competitions as well as from the training.

Conative characteristics is an extremely significant link in reaching top sports results. Professional teams engage psychologists who help athletes in maximum preparation for competitions. High motivation and self-confidence are some of prerequisites of sports success. Personal characteristics are responsible for efficient adaptation to specific conditions which sport and training require.

Top athletes, if they want to be successful, should have the following characteristics of their personalities: development of intellectual abilities, higher emotional stability, stronger and more stable emotional qualities and qualities of will, tendency towards domination, control of interactive functions and processes, orientation to achievement and success.

Pole vault is a vault upward over a bar performed by a pole. Speed, strength and courage are characteristics of a pole vaulter. Pole vault is the most complex athletic discipline consisting of 4 phases (according to Dick (1980).

The approach run

Basic tasks of the approach run phase in this discipline are very similar to those in other jumps. Athletes have to achieve as high controlled speed as possible, which should be kept at the highest possible level during planting a pole into the box. An important difference is that in comparison to other jumps, the athlete has a pole in his hands during the approach run phase, so that a technique of complete approach run has to be adapted to it. Before the approach run phase starts, a pole is gripped by both hands and it is carried with both hands during the whole phase. Distance between the grip of one and the grip of the other hand is between 50 and 80cm. Characteristics of a pole grip, besides the basic ones, are individual. The grip is not something changed from one vault to another, but something that takes a long time to define on the training. There are certain variations when conditions for the competition are different from standard ones. However, even such changes are something that a pole vaulter is prepared for in his/her training. Basic factors influencing the height of a pole grip are speed of the approach run, power of take-off, height of a pole vaulter, level of mastery over pole vaulting technique. Length of the approach run is different from one vaulter to another, but it is most often between 35 and 45m. That length approximately corresponds with the length of 18 to 22 running steps. Basic factors of the approach run length are a pole vaulter's motorical abilities and morphological characteristics. Length must be defined precisely because short approach run will prevent a vaulter from reaching maximum controlled speed and from being concentrated enough to plant the pole, whereas very long approach run will make it harder for a pole vaulter to keep the optimal speed, what will lead to the effort which will prevent a vaulter from planting the pole into the box well and in that way lead to bad vault. In order to define the length of the approach run

precisely and the way of running it, athletes use markers which enable control of parameters of their running.

Depending on the form, part of the season, then the terrain, weather conditions, markers are placed differently. Therefore, consistency of running speed during the approach run phase depends mostly on the quality of a sprint running technique together with the correct body posture (upright). It enables reaching the maximum controlled speed which is the first condition for the top result. Athletes start the approach run in many different ways, by characteristic walking for a few steps, slow running, energetic running from the spot or some other specific, completely individual way, which will enable concentration and increase of speed in continuation of the approach run. It means that a vaulter and a pole represent one entity. Holding a pole in a natural way during the approach run is a basic prerequisite for planting a pole in a box successfully. The angle of a pole is held at during the approach run as between 40 and 60 degrees. The tip of a pole is most often above a vaulter's head and slightly towards the inside of the middle line of movement, so that vaulters could run more easily. While approaching the box, a pole tip descends gradually. Final steps of the approach run are characterised by increasing tempo with approximately the same length of steps. In that way increase of the speed at the very end of the approach run is achieved. That increase is achieved freely and gradually. The running strides, often referred to as steps, during the approach run for pole vaulting are slightly shorter in comparison with the sprint running, and a torso becomes erect. At the end of the approach run, if everything before that was done well, the most important phase, planting a pole in a box, happens. This part of pole vaulting technique is analysed separately in work of some authors, what implies its importance. Since planting a pole in a box in its essence is the last part of the approach run because its preparation and performance happen during the last steps of the approach run, it will be analysed in that light.

The plant of a pole tip in a box is initiated three or three and a half steps before the take-off. The tip of a pole is directed towards a box by arm which is in front of a vaulter, and the top arm, which up to that moment was at the back in the approach run, is positioned as high as possible and it is in projection of a jump foot. All the movements that a vaulter makes at that moment must be harmonious. Top arm (the right hand for the right-handed athletes and the left hand for the left-handed athletes) continues to move forward and upward above the head, whereas the bottom arm (left hand for right-handed and right hand for left-handed athletes) directs a pole into the box. It is extremely important to plant a pole high and early enough in order to reach the largest possible angle between the pole and the ground.

During the plant, shoulder axis must be parallel to transversal edges of a box. Athletes must not lean against a pole during the plant, swinging the left shoulder forward and positioning the top arm out and far

from the body. It is crucial that during the plant, pole vaulters move in a straight line towards the pole. Correct technique of pole planting is defined by simultaneous positioning of take-off foot, reaching the end of a box by a pole tip and throwing the end of a pole upwards above the head.

The take-off phase

Take-off in pole vaulting is in comparison with other jumping events significantly different. Presence of a pole makes the whole athletic discipline of pole vaulting significantly different, but this difference is expressed fully during the preparations for take-off and later in the phase of flight. Although it belongs to the group of vertical (high) jumping events, take-off when landing in pole vault is directed completely forward and it is not particularly emphasized. It can even be said that by the final step of the approach run only slightly longer jump in running is made. These are the reasons why take-off in pole vault is also called "running into the pole". Take-off foot is placed at the position of vertical projection of a right hand (although take-off is from the left foot). At the end of a take-off, a take-off foot will be at about 20cm in front of vertical projection of a right hand which holds a pole, that is the grip. At that moment torso is erect. Right hand is completely stretched out and it raises a pole above the head, and the left one is slightly bent at the elbow, which is turned downwards. While the feet are being positioned on the ground, hips and the upper part of the body are pushed forward. The knee of the trail leg moves fast and efficiently forward and up.

The left leg is stretched to full extension and at the moment of separating from the ground it creates vertical line together with the upper part of the body. At the very end of take-off, vaulters push a pole in upward direction by left, bottom arm, while the vaulter's body moves forward and over the right, top arm compresses the pole which begins to bend. The angle which a pole makes with the ground at the end of take-off is slightly bigger than 30 degrees, the take-off angle is between 70 and 75 degrees, whereas the body center of gravity moves under the angle of 18 to 20 degrees. Thus, a vaulter during the take-off phase tries to run with a pole. The top arm will take over the larger part of body mass, and the bottom arm is fixed with a very slight pressure forwards. The pelvis begins to move forward following the moving of the trail leg forward and up. At the very end of the take-off, as a result of double power, a pole bends and a vaulter starts the phase of flight.

It can be said that, during this phase, a vaulter gets from the pole everything he/she transmitted to it by his/her movements with it and on it. The body at the moment of extension looks like a rock at the end of a catapult. A vaulter starts going over the bar by shooting his/her legs up over the cross bar. By outstretching the legs, a vaulter moves his/her shins back, throwing his/her feet back and upward, so that they are above the head. Further extension of a vaulter's body continues

in all joints of legs and trunk in a way that a body is stretched along the pole. Top pole vaulters, at the end of this phase, reach almost vertical position of their bodies and begin the next subphase of body turn. Before a body reaches totally vertical position, a vaulter begins a turn by moving the upper part of the body to the left side by dragging the right shoulder to the pole. Legs and hips remain at almost the same position. The movement which moves the body to the pole, and turns the body to face the bar by its front part is a movement which has to be performed in high coordination by arm muscles and torso rotator with the help of their synergists, as well as with cooperation of the muscles which keep the lower part of the body fixed. A vaulter should stay in a position where he/she is still turned mostly by his/her back to the bar long enough because this is the position where a vaulter rises most easily. The whole turn on a pole finishes by going of a pole in a position on the ground where it cannot slip, when the body has already started crossing the bar. Thrust by the bar is the last subphase of the second phase of flight.

The phase of flight

The athlete is with legs high in the air and right shoulder is directly next to the pole with bent right arm and right hand still holding it. At that moment the left arm is completely outstretched and begins to move away from the pole. After that, the right arm energetically stretches out and pushes the body off the pole. At the moment when the right arm finishes stretching out and moving away from the pole, the athlete's body (legs) has already crossed the bar. The third and the last phase of the flight starts by separating the vaulter's right hand fingers from the pole. At that moment the athlete starts moving upward with a body bent to a certain point. When the body is above the bar, it often has a "U" shape. Arms are pushed off the pole with the hands close to the shoulders, and the elbows are pushed outside, which gives an impulse for crossing the bar. A vaulter has to make all the movements timely, so that after moving away of the left and then the right hand, when he/she is in a position that his/her chin is above the bar, his/her head and shoulders move backward. Then the arms move up and backward with the elbows towards outside. By these movements, a vaulter pushed off the pole, that is, flew away or crossed the bar. The actions which follow are a part of the last phase, the landing.

The phase of landing

Immediately after clearing the bar, a vaulter gets ready for landing on his/her back. After moving away from the bar, an athlete slightly bends his legs in joints of hips and knees, and arms are positioned in front of him/her in order to protect him/herself from possible injuries. Since the height an athlete lands from is big, always above 4m, all the movements performed after clearing the bar are intended toward safe landing.

Although it is authentically not an athletic discipline,

first of all because of complexity of its whole structure of movements (together with high jump it is different from other athletic disciplines which actually are natural forms of movement) and presence of a pole as an external object, throughout the twentieth century pole vault imposed itself as a very attractive and demanding discipline with the same kind of training support. Every vaulter must have training which will take him to consistent and maximum performances. What must be taken into account is the following: strength, flexibility, pole vaulting skill, speed, endurance for vaults, agility and coordination (gymnastics), agility in the air, spacious orientation (trampoline), rest (the most important in the season of big competitions) and mental concentration. New generations of pole vaulters which appear nowadays in the world of pole vaulting, shed new light on this discipline and announce a new wave of great and maybe the greatest results in the history of this athletic discipline.

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