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STUDY ON ENERGY CHARACTERISTICS IN THE TRIPLE JUMP IN ATHLETICS

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Abstract

The main reason for choosing this topic is that in the literature there are not many studies on optimizing trial training for triple jump, junior girls and in choosing the most effective means of giving maximum efficiency in preparation.

This could deprive specialist practitioners, a system of references required in the selection process in general training and then specialized in the corresponding age groups this.

In preparing this paper we were motivated by the desire to express our experience in the 17 years of performance with juniors and develop a methodical approach exactly in terms of efficiency the most commonly used means jumping event, namely triple jump and long jump at the highest level: -junior World Championships in Athletics.

Keywords: athletics, junior, power, triple-jump.

Introduction

The triple jump, sometimes referred to as the hop, step and jump or the hop, skip and jump, is a track and field sport, similar to the long jump, but involving a "hop, bound and jump": the competitor runs down the track and performs a hop, a bound and then a jump into the sand pit. The triple jump has its origins in the ancient Olympic Games and has been a modern Olympics event since the Games' inception in 1896 (wikipedia).

In the introduction to this paper, state that in the literature there are not many works dedicated to female triple jump, and especially junior.

I played a few reasons, but I mentioned that female triple is one of those specialties that have a very low base in the number of athletes and coaches. Because it seems to be an unjustified fear to injury (known to be the most demanding test that requires serious preparation musculo-articular).

In triple achieve maximum horizontal distance through 2 factors: speed and reactivity. In various works, this reactivity was using different terms: expansion (Weineck, 1983), explosive strength (Federal Coach athletics, 1995), rapid force (Harre, 1986), elastic force (Thompson, 1991), and lately has become force-velocity term (Weineck, 1993).

In the interest of our grounds are a few observations:

1. At the core problem that we must solve, is primarily psycho-biological characteristics proper to this age, for which solutions must be found for adaptation efforts;
2. Then comes the knowledge and practice goal setting process;
3. Thirdly, it is necessary to determine the means that will be used in the training plan and establish a ranking, a hierarchy, a rationalization of resources.

The Triple Jump requires speed, power, rhythm, balance, flexibility, concentration, and body awareness. The triple jump has been referred to as "POWER BALLET." It is best to start out with the basic movements by having your athletes Hop, then Step, then Jump from a standing start. The take-off foot should be the athlete's strongest leg due to the fact it will be used for the Hop and the Step, or determined by the athlete's preference. The jumper should concentrate on an even rhythm for each landing. The foot strike of the Hop an Step should be flat or full-footed, with the landing leg knee bent slightly in preparation for take-off. (http://www.sprintic.com/training_long_and_triple_jump/)

The vast majority of any type and gender studies abroad are made by athletes are more or less known or adults. Studies in children are very rare (they are made with the consent of parents and other competent bodies). All is done in laboratories to measure aerobic and anaerobic capacity and power.

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Coach Emeritus Anatoly Golubtov of I. Kravets (Ukraine) in the Congress of the European Association of Athletics Coaches in Berlin 1993 believes that practicing triple jump training athletes should consider the following:

-characteristics of female body structure and function;

-technical-rational approach to jump;

-a great attention to the development and strengthening abdominal muscles, dorsal and the legs;

-attention on developing flexibility and suppleness in all stages of preparation;

-load-intensity training is 2-3% lighter than men.

F. Dick (EAA chairman) in EAA Congress in Italy 2004 coach believes that mastery lies in how to determine the junior performance consecrated to continue training under the motto "Tomorrow begins today" slogan which can be applied in practice by:

-develop a well-designed training plan based on sound principles of long-term development within the context of recalled;

-planning of career athletes must reflect attention to athletes' welfare and ensuring an appropriate balance between concerns for performance, physical development of "man"- athlete and results.

At the same congress, he reiterated that the years have passed achieve peak performance at a higher age limit than what was expected (34-35 years). At the same time, two years ago, there was an increase in the number of athletes aged 19-22 years and are world class.

To increase the level of world-class performance, it is suggested that the base be built between junior. This should be done with great care so wrong not to the pre-juniors and juniors.

The energy created by the body dropping is gravitational potential energy. When the body lands on a surface, it becomes kinetic energy, which is transfered in the body as a stretch reflex. In the calculation of kinetic energy, increasing velocity is much more important than increasing mass. This is because velocity is squared in 2 the equation KE = (1/2) mv. This is why the squat-under in Olympic lifting is so important. When the lifter falls under the bar, he is producing kinetic energy for reversing the direction of the bar. This dropping under the bar should not be confused with an eccentric phase. For an eccentric phase to occur, muscle tension must accompany the action. The squat-under has no such muscle tension. (Barbell, 2004)

We know that 40-50% more muscle can be used during the eccentric phase, and this is where a real problem occurs. As the barbell grows heavier, one tends to lower the bar slower and slower. However, this is counterproductive. When slowing down the eccentric motion, we are limiting the energy that can be stored in the muscles and tendons. The myotactic reflex occurs when a muscle is stretched by an external force. Yes, this causes a stretch reflex, but the faster the eccentric phase, the greater the stretch reflex. This, of course, can have a negative effect on the Golgi tendon reflex. Barbell, 2004).

Manipulating intensity in a periodised program by altering exercise demands is an essential part of a correctly structured training program. To assess the demands of jumping exercises we need to examine a few biomechanical studies. The following is a discussion of selected papers from the biomechanics literature and how their findings might be applied in coaching.

Prior to discussing these papers however, a few concepts have to be outlined. When training out in the field, purely concentric strength (where the muscle shortens to overcome resistance) in the quadriceps may be developed by jumping up onto a box from a position where the knee is at 90 degrees. Conversely, eccentric strength (where a contraction involving muscle lengthening occurs) may be developed by jumping down from a box and finishing in a 90-degree position. Pure concentric or eccentric strength in field event athletes may also be developed via exercises in the weight room for example, concentric strength may be expressed in the quadriceps in the upward phase in the squat whereas eccentric strength would be expressed in the downward phase of the squat. The difference between the two methods of developing concentric and eccentric strength lies in the time of force application. Again, squats develop the force component of power and the box jumps develop the velocity component of power. (Jacobs, et al,1996)

There is a place in most training programs for developing either concentric or eccentric strength however, it is a combination of these two forms of strength in varying proportions that is most commonly trained via jumping activities. For example, in alternate leg bounding, an eccentric contraction of the quadriceps assists in the body resisting collapse, whilst a concentric of the quadriceps assists in propelling the body off the ground. The combination of an eccentric action quickly followed by a concentric action develops elastic strength.

Using the Tendo unit, we found that when doing speed strength work in the bench press and squat, the eccentric phase moves at a rate of 0.7-0.8

meters per second (m/s). This is basically the same as the concentric phase. This maximizes the stretch reflex. Simply said, the faster down, the faster up. With near-maximal weight, the same trend was observed: the eccentric and concentric phases were both 0.45-0.6 m/s. (W. Barbell, 2004)

In both the horizontal jumps (long jump and triple jump) and the high jump, obviously jump training is a central part of training (Bianco et al, 1996). These jumps involve partial conversion of horizontal to vertical velocity as evidenced by the take-off angles involved in each of these events.

The need for jump training in the pole vault maybe a little less obvious. In the pole vault one of the key determinants of success is approach speed (McGinnis, 1989). Jump training such as bounding should be part of the training to develop speed. Furthermore, leg power is required to jump into the take-off. High level pole vault coaches talk about the pole vault take-off being similar in structure to that of the long jump. Examination of the biomechanical data from the 1988 Olympics supports this premise (Gros and Kunkel, 1990)

In the long jump the approach velocities are the fastest of all the jumps and contact times may range from 100-120 milliseconds. In the triple jump, pole vault and high jump these contact times may increase up to 0.18 of a second in the elite performer. The key to generating great distance in a jump, is to generate a high amount of ground reaction force within the very short period that the foot is on the ground.

As the angle of take-off increases, there is a greater need to convert horizontal velocity to vertical velocity, as the vertical velocity determines the height that someone an athlete will jump. Therefore, the foot needs to be on the ground long enough to generate sufficient ground reaction force to convert to vertical velocity. The contact time will depend upon the technique of the performer also. For example, there is some evidence that a triple jumper who utilises a single arm technique will have a shorter contact time than someone who utilises a double arm technique. Further, the high jumper that utilises the speed flop technique will probably have a shorter contact time than that of a power flopper.

Energy characteristics of the triple-jump

All movements made by man are possible because muscle functions as a power transformer, converting chemical energy into mechanical energy. As we know, chemical energy can be released through processes that do not interfere oxygen (anaerobic route), or where oxygen is essential (aerobic route) or mixed exercise (aerobic-anaerobic).

Triple jump fall within anaerobic efforts and entering deeper into the problem, part of alactacid anaerobic effort. Alactacide efforts (during 5-7s, Alexe, 1992), (4-7s, Luc Legros, 1980), muscles contract only a few times with maximum intensity. Such efforts are also called power efforts and is characterized by the expression of F maximum and minimum time that print body (entirely in our case), acceleration.

In this type of effort, energy decomposition adenozintriphosphors acid (ATP) and phosphocreatins (PC). Muscles can not store large amounts of ATP energy stores are emptied so quickly. In response, the PC also stored in the muscle cell, breaks down into creatine (C), phosphate (P) and energy. The energy released is used to ADP + P = ATP resynthesis and not muscle contraction. Because PC is stored in small amounts in muscle cells, this system provides power only 5-7s.

This is the main energy source for highly explosive activity, which is reflected in the triple jump.

Fosfagen restoring

The recovery (in fact, pause between repetitions), body energy reserves fill the place, trying to restore physiological balance on biochemical pathways.

Recovery of fosfagen occurs as follows:

- 70% in the first 30 s
- 100% after 3-5 min.

Biological factor limiting the anaerobic effort is given alactacid neuromuscular system.

Muscle structure is of great importance in achieving performance in this type of effort. It is mandatory that the number of fibers is mainly white and miokinaza and creatine kinase (enzymes crucial role in the breakdown and resynthesis of ATP and PC), to have increased activity. Lately, attention is given to the role of ammonium ion with intensity muscular work. This ion is produced in greater quantity during anaerobic efforts alactacide and its accumulation in muscle is another limiting factor in the activity of type II fibers (white). These data open a new road handling, more thorough preparation in this type of effort.

To triple jump, it appears that Quetelet index (number of grams relating to each cm of body height) has increased values correlated with the size of the load due to the technical requirements of proof, when loosening the ground.

Alactacid anaerobic exercise in type, it is considered fully mature neuromuscular system based on changes in maximal anaerobic power. Ceretteli and colleagues (quoted by Alexe, 1992) found that it increases until the age of 20 years, after which it begins to decline. Alactacid anaerobic effort is interrupted with energy substrate depletion (ATP and CP). The composition of the training program in the triple test, we consider the anaerobic system lactacid.

This system involves a undermaximal intensity with duration between 7-40s (T. Bompa, 2001). Volume is small, the energy is produced by glycogen breakdown. Result of anaerobic glycolysis lactic acid builds up in the muscles and blood and produce local and general changes which adversely affected development effort. If high intensity effort continues for a long time, lactic acid accumulates in muscle bulk, fatigue occurs and eventually the effort can not be continued.

Limiting factors in this type of effort are:

-neuromuscular system;

-the body's ability to withstand oxygen debt;

-lactic acid.

Home enzyme of this type of effort, lactate, acting on glycogen metabolism and makes lactic acid and release energy and speed during use of energy substrate (N. Alexe, 1993).

Restoration of glycogen

This takes a long time depending on the type of workout and diet:

1. the work force or intervals:

-40% after 2 hours;

-55% after 5 hours;

-100% After 24 hours.

2. endurance for intense efforts:

-60% after 10 hours;

-100% after 48 hours.

Elimination of lactic acid from its systems takes:

-10 min. to remove 25%;

-25 min. to remove 50%;

-75 min. to remove 95%.

Athlete can facilitate and speed up the elimination of lactic acid, makes 15-20 min. easy aerobic exercise (jogging). The sweat is eliminated lactic acid and other metabolites of wear. To effectively manage a training program must be understood very well these energy systems, the energy field is used for each system and the time needed by athletes to restore energy reserves consumed.

Thus, we can calculate the intervals of rest between activities in training, the training and after competition.

Alactacid power

Because efforts require triple manifestation of F maximum in minimum acceleration time to improve the entire body, they are called power efforts.

After research conducted by M. Georgescu et al., 1976, quoted by N. Alexe, 1992, that this power, the untrained, the girls grow continuously up to 15 years to 17 years is maintained then begins to decrease, the when the boys grow up to 18, then is maintained (for correlation).

In terms of functional neuromuscular system matures in both sexes by about two years before reaching the maximum anaerobic power. Finally, after 14 years in girls and 16 in boys maximal anaerobic power increased on the basis of increasing body mass contribution of each kg of body weight (maximum anaerobic power relative)
not exceeding level achieved at these ages.

This suggests that the efforts of power, the body can support high-level functional requests from the 14 years girls and 16 boys, but biological prerequisite for achieving great performance is the increase muscle mass to the upper limit (15 years-F, 18 years, B).

In the context of the above mentioned acts as volume, intensity, density and complexity during exercise on maximal anaerobic power.

Following several years for maximal anaerobic power development in several phases of training (Georgescu, 1976, quoted by Alexe, 1993), notes that the volume of exercise stages was higher, rising aerobic exercise capacity and maximal anaerobic power fall below the beginning of the preparatory period. Only after much effort was clearly reduced, maximal anaerobic power increased again.

There are many coaches and athletes that do not allow recovery after a major competition. It's just not a good thing, because in time lead to wear faster, and if that count more than 3-6 days we have another contest, the safe will not give 100% maximum efficiency. Different techniques make recovery process psycho-physiological recovery after competition is quickly and completely, so that after 1-2 days to start training after 3-6 days, or another competition. Immediately after the contest, it is necessary to continue with moderate exercise for the removal of metabolites of muscle cells. Then follow neuromuscular restoration. Is hydrotherapy (15 min), massage, relaxation services. In the competition between the 2 is made requiring the training no more than 40-50% in intensity.

The final conclusion is that the volume is worth the effort to increase anaerobic exercise capacity alactacid (or power) only when its shares do not exceed the limit beyond which the intensity can not be maintained at the maximum level to individual possibilities. Working methods that emphasized heavy workload and the intensity is low, erroneous, because this reduces the functional capacity of the neuromuscular system, so the maximal anaerobic power.

Because of efforts triple-jump require maximum expression of F in less time to print the whole-body acceleration, they are called power efforts. Pursuing for several years maximum anaerobic power development in several stages of the process of training, (Georgescu, 1976, quoted by Alexe, 1993), notes that the stages in which the amount of effort has been greater effort to increase the capacity of aerobic and anaerobic power fall below the maximum level at the beginning of the preparatory period.

Only after the amount of effort was obviously reduced, the maximum anaerobic recrudesce to increase.

Shares the workload should be raised only up to the level that allows working with the appropriate intensity level of perfection required effort competition (maximum). Regarding the intensity of effort to increase the maximum anaerobic power, must work with maximum intensity.

Workload quotas should be lifted only to the level that allows working with appropriate intensity level of perfection required by competitive effort (maximum). On the intensity of the effort to increase maximal anaerobic power must work with maximum intensity. Working with the request is smaller decreases in performance are obtained.

We need to make a statement and that is that there is a big difference between exercise intensity (feature effort) and intensity of application (characteristic of the body). Maximal anaerobic power development, the application must have full strength and this means that it may take more than a few seconds.

Studying intensity by measuring serum lactate request body has been very useful. Increased serum lactate above the 4mmol / l (anaerobic threshold) is a sign that requests are totally anaerobic athletes who are doing the work with the same intensity, can produce different lactic acid (a 2, another 3 or 4 mmol / l). Knowledge intensity request body is essential in conducting training.

It was found that the training isometric force development is optimum results intensities of 50%. And yet not to remain at this level is recommended as best practice to use intensity (Hettinger, 1968). The more high intensity anaerobic effort, the results will get more valuable.

Referring to the influence of exercise duration on anaerobic energy substrate alactacid, we have the following situation: the total of 2 hours of specific training efforts power during effort is very low, because after each repetition of a few seconds, recovery will break more several minutes.

In strength training with maximum contractions, the effective duration of contraction with maximum intensity takes virtually seconds, although muscles are contracted for a period much longer. Improving this ratio, the maximum contraction duration and total duration of contraction, we obtain greater strength gains in a short period of training.

Efforts lasting less than 10 seconds, causes depletion substances phosphatemacroergics (ATP and CP) and this results in anaerobic exercise capacity increased by subsequent growth of these substances and enzymes involved in the breakdown and resynthesis of them.

Along with these parameters, another equally important is the effort density. To work with the same volume, intensity and duration, the request body is even higher as the density increases effort. The density increases, the body does not recover completely. To increase maximal anaerobic power density indicated that this does not cause "fatigue" (incomplete recovery) even if the intensity and duration of repetitions determines high demands of the body.

In the literature we don't found studies that highlighted the importance of increasing complexity alactacid anaerobic exercise capacity. However, Alexe N. (1992) believes that learning a complex skill we require a lot nervous system, which leads to faster fatigue, so ask the complexities effort on maximal anaerobic power, the latter having no significance.

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