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THE DYNAMICS OF THE WORLD RECORDS AND THE TOP 3 RANKINGS IN THE LAST 5 WORLD CUPS AND WORLD CHAMPIONSHIPS OF WOMEN'S LONG JUMP

Case Study

Keywords
Long jump,
World records,
Dynamics,
World Championships

Abstract

An important source of understanding and perfection of athletic events is the knowledge and application of the biomechanical laws to the study and analysis of motive actions specific to athletic events. At the current level of sport performance, without a precise and thorough technique improvement work, it is impossible to advance towards outstanding results. The lack of a rational technique even becomes a limitative element in enhancing the psycho-motor skills of the athlete. The athletic exercise technique shall not be evaluated exclusively from the kinetic point of view (succession of apparent moves), but also in relation with the forces involved in its development, that can be hardly seen from outside, and therefore in relation with their dynamics. Thus, the kinetic evolution of the moves is just a component of the space-time technique, while the athletic exercises may be also carried out based on dynamic processes, integrated in one's kinetic evolution. Thus, we may say that technique means the most rational and economical use of the kinetic and dynamic potential. Thus, by reducing the human body to a system of segments and considering it a commonplace mere object and therefore subject to the general laws of mechanics, in order to analyze a given move, we shall determine and analyze forces acting upon one's body.

Out of the four phases of the long jump , the most important is, as with the other jumps, the beating/hop step. In order, we mention the following: the take-off, the landing and finally the flight. This order is not accidental. The hop step comes first place as it emphasizes both the speed of the impulse and the ability of the athlete to grapple an effective action on this speed. Since the long jump is measured horizontally, we understand the importance of the take-off, on which the velocity depends, to a large extent, on the translational component of the flight.
In turn, the landing can lead to lengthening the long jump distance, while, whatever the flight technique, it only focuses on creating favorable landing conditions.
The taking-off. Taking-off in long jump consists of an acceleration run, so that when the jumper reaches 8 m-10 m ahead of the threshold, the speed of movement has reached its maximum value. The magnitude of the acceleration is variable. This must be all the more intense as the momentum is shorter. The last steps of the taking-off have a characteristic rhythm, serving to bind the impulse to the hop step. Hop step requirements determine the rhythm of the last steps of the impulse. This rhythm can be easily read by measuring the lengths of these steps: the last step - the beat - is shortened, the penultimate step is extended, the second before last is shortened, and the precedent is again longer. This integrates into the normal value of the runner's step. By this rhythm the muscles of the beater's foot is prepared for the threshold effort, the weight of the jumper is slightly lowered, and at the same time the slowing down effect of the attenuation phase is reached (by shortening the last step)(Bruggemann et al, 1999).
However, the horizontal speed decreases during the attenuation phase on the threshold by about 10% of its maximum value. This loss of speed is inevitable, as it is not possible to obtain a favorable separation angle but by interfering with a resistant work on the contact leg with the threshold.
The hop step. During the taking-off, the athlete must get the maximum ascension speed. This velocity is the result of the upsurge of the flapping leg and arms and of the pushing of the beating leg.
Because at the end of the impulse the beating leg is tilted forward, the beating force will be oblique and thus it will give two components: a component which is parallel with the soil that adds to the horizontal force resulting from the momentum and whose value increases again and again and a normal component on the ground, which will lift the athlete off the ground (Hay, 1993).
Because the horizontal velocity is always superior to the ascending one (which as we have seen is inclined up and down), the resultant will necessarily be at an angle lower than 45 degrees. In case of long jumps, performed with a velocity at the maximum speed, the angle of detachment is 13-18 degrees. The size of this angle, provided that the athlete has made the most of the effort during the beating, can only result from a decrease in the horizontal velocity of the impulse, but this process is irrational because it reflects negatively on the most important of the factors that determine the length of the jump.
The point of application of the snapping force in length must coincide with the center of gravity of the athlete. This avoids real rotations whose outcome is detrimental to the measured jump value.
Technical Differences. Different technical procedures can be categorized by how landing is prepared. We can distinguish between the following: squatting jump, in which the preparation of the landing results only from the pre-tension of the muscles, simultaneous with the end of the beating; stretched or extended jump, in which preparation for landing is made by bilateral contraction of the thigh flexing muscles; airborne jump (one step and a half, two steps and a half and three steps and a half), where the landing is unilateral (Hay & Miller, 1985).
Below we present the evolution of the first 3 places in the long jump in 5 editions of the European Outdoors Championships and 5 editions of the Outdoor World Championships (Bruggemann, 1990)

CONCLUSIONS

- For the 1 st place, we notice that the lowest score was in 2012 at the European Championships, while at the World Championships the lowest score was registered in 2011.
- For the 2nd place, we notice that the best European Championships were achieved in 2010 and 2016, while at the World Championships the best result was in 2015, followed by the 2017 edition.
- For the 3rd place in the European Championships, the last three editions have had close results, namely the editions of 2016, 2014, 2012, while the World Championships have oscillated, the best result being in 2015.

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