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TRIPLE LUTZ

**Technical considerations on preliminary biomechanical
study of triple lutz**

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INTRODUCTION

The studies regarding the biomechanical analysis of artistic and ice skating are very few and the question is why there is this lack; many are the reasons, first of all these studies require a long time to be realized, very expensive technological equipment and people, who have skills and passion and, not least, also the problem of costs.

Another problem is the collection of data and their interpretation, this requires much time and attention: to mistake or misinterpret a result means to draw wrong conclusions.

Nevertheless, we took again the biomechanical study of jumps, and we filmed five of the best athletes of the moment and, why not, of the world, who offered with great patience and good will, taking advantage of the availability of the Italian Federation of Skating, the staff of the National Team and the staff of the University of Sport Sciences of Bologna, led by Professor Merna.

We have filmed several jumps, from Rittberger to Lutz, triple or double, but it was possible to do only a preliminary study on the triple lutz at the moment, leaving others for future discussion.

In the hope that we can proceed along this difficult but rewarding path for our sport, we set off by thanking all those who worked with passion and professionalism.

Many Thanks to:

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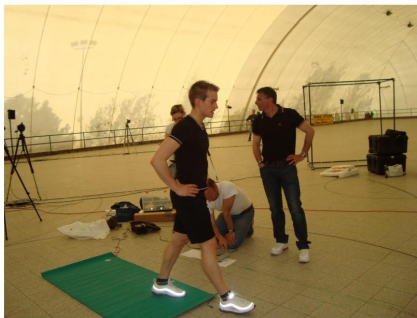
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Technical considerations on preliminary biomechanical study of triple lutz

These considerations relate to the biomechanical study of the triple lutz by the staff of Prof. Merni of the University of Technology of Bologna, the data were partially reported to be taken into consideration by a technical point of view.

In this study it was made a biomechanical analysis of the triple lutz, referring to the toe assisted, the take off of the gliding left foot, the take off of the right foot, the flight and the landing of the jump.

We made at first an analysis of the times, then we have considered distances, angles and speeds referring to the different performances of triple lutz and to the various body parts

Arms

We have the results of the performance of explosive strength of lower limbs, without **skates**, with and without the use of arms, of the tested athletes (none left-handed) namely with the following results:

Squat jump: average 45.4

countermovement jump: average 51.1

countermovement jump with the arms: average 57.7

These values are not the same with the skates, where the contribution of arms does not improve the jump for what concerns the rise (in fact, considering that during the triple lutz the center of the pelvis rises 50.5 cm. from the take off to the utmost height in flight, we could compare the performed thrust more at the countermovement jump (51.1 cm.) than at the countermovement jump with arms (57.7).

Often arms are not given their importance, and are often passive in relation to the movements of the legs; arms suffer the thrust of legs and often, with uncoordinated movements, hamper the movement of other parts of the body.

The strengthening of arms should not be considered to be a waste of time during the training without skates and athletic training, or on the rink with skates in learning the technical movements.

With the help of arms you can go higher if you perform a sweeping, powerful, coordinated, fast motion, but all these actions must be studied, taught, tested and must always have clear the aim.

You may decide, for example, to make a precise motion with energy to go higher or to close faster or closer to the body to turn faster, or move arms away with determination and control to define a landing, it must not be a spontaneous action only.

Arms may let us take a quality leap when used well.

The fact that all athletes use their arms in different ways, and anyway, I think, only partially effective, demonstrates the long road yet to be done in this direction, because obviously we do not have clear the more functional dynamics for the improvement of jumps or we do not fully applied the best techniques in this regard.

The phases of the jump: The toe-assisted

As for the jumping phases, the first thing examined was the toe-assisted

The free leg (right) before the toe-assisted is uneven; in some athletes bent, in others almost completely extended, but at the moment of the toe-assisted the leg is definitely bent (average 60 °).

Which system is better is not established;

Some coaches argue that, just before the toe-assisted, during the stretching, with the free leg bent or extended, one has a greater “feeling” of the body axis; “removing the weight from the free leg to place oneself better on the employed foot”, improving the take off. Other coaches, on the contrary, believe that, with the free leg stretched, the specific movements of the leg and of the jump can be better controlled.

But it is clear, that the free right leg, during the loading, must have a proper load to perform the take off, and on this we all agree.

Athletes are always tilted in the direction from which they come, especially during the toe assisted but, even less, also in the other phases.

This is attributed to the angle of the trunk, according to the vertical axis of the ground and let us think that, after the toe assisted, we pass from a right angle to an extension of the body upwards, but always with a slight inclination forward.

As for the **left** leg, at the toe assisted, knee and left ankle are firmly bent; at the take off the leg is extended (the athlete bends it again to perform a momentum upward) and in any case, straight after, it bends again to prepare the position of crossing out (screw)

The athlete who throws the bent leg upward most significantly, bring it then backwards to perform the screw. Professor Merni said that in the Biomechanics it is more correct to exploit this momentum, because the athlete will reach a greater height in flight and, in any case, the force of gravity will help him to set the leg closing in a short time.

At the toe assisted the distance between the two feet along the length has a range of 26.2 cm (distance of the toe assisted), while the lateral distance of the two feet 29.4 cm.

This opens an important parenthesis: the distance of the toe assisted must be controlled by the first setting out of a lutz with one rotation: a too close toe assisted creates significant problems in the shift of the axis with following falls and a too far toe assisted can cause a giving up during the take off phase.

Losing a little more time in the setting out will determine an automatism, which will be most valuable in the lutz with more rotations and therefore it will not be wasted time.

As for the lateral distance of the feet in the toe assisted, you realize that a not overly large toe assisted will let the left foot glide in a more or less straight way, preventing strange drawings of curves before the take off.

The time, that elapses from the descent phase of the basin during the toe assisted, is 0.04 seconds which corresponds to 14 mm, and being fairly ridiculous measures, they could be related to the amortization phase of the ankle, rather than to a loading after the toe assisted.

Calculating that the bending of the right knee does not increase in a decisive way during the toe assisted (from 60° to 66°), to arrive then at 16° with the extension, it will be helpful to use this information to improve the rhythm of the take off of the jumps.

The total phase toe assisted-glide-takeoff takes only 0.18 seconds, of which 0.12 seconds in the glide and then the push on the right limb just 0.06 seconds. Even this datum should give us a sense of quick movement also in relation to the contact time of the toe assisted.

Take off

Being such short times, it appears clear that rhythm and coordination are the key to take off a jump successfully and have no nasty surprises at the landing; the body must be prepared for the take off with the right tensions in some parts of the body, while other body parts address the jump with due accuracy and fluency of the movement.

The ankle, which during the toe assisted is in a neutral position (2°), performs at the take off, contrary to the knee, an apparent tibiotarsal range (41°)

Regarding the advances of the trunk, in its torsion the examined athletes find different strategies and different rates of torsion, clear sign that, if there is no precise rule, everything is left to chance. It lacks a clear directive for the use of the rotations of the body and of its execution times, before the take off, as amount of rotations and rates of executions

Flight

The flight phase lasts on an average 0.64 seconds, equally divided between rise and fall. At the take off the legs are stretched, at the landing slightly bent, perhaps preparing to absorb the jump.

The distance ranges from a minimum of 163 cm to a maximum of 259 cm

The average height of the travel in flight is 50.5 cm (while without skates one reached greater heights through the use of arms), as already noted.

Another interesting datum is that the maximum cross of the ankles (minimum distance between feet from each other diagonally 21.8 cm) is reached after 0.21 seconds, that is roughly equivalent to a rotation turn, but in some subjects even before (0, 10 seconds).

This means that the screw (we are talking about the low one in this case) is applied by all athletes immediately after the take off with or without the upward momentum of the left leg. The flight phase is characterized by this relatively new position, it is not for many years that we have persuaded all athletes and coaches to take this type of technique, that during the flight is extremely functional and aesthetically correct.

Speed

Regarding the speed some athletes seem faster than others, but do not change completely the horizontal- in vertical speed, others on the contrary go very high while getting the jump with a smaller horizontal speed.

It would be ideally if the two speeds were proportional in an optimal way so that, as the study of biomechanics, "we have the angle of the resulting speed, when the horizontal speed will be the same as the vertical one, i.e. 45° "

In conclusion it was observed that the tested athletes are more similar in technical gesture regarding the lower limbs, while for the upper trunk there are many differences and this will stimulate us to work more on technique to optimize it, trying to get even the best strategy to achieve even better jumps.