

SOME DIFFERENCES BETWEEN KOVACS AND GAYLORD SALTOS ON HIGH BAR

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Present Code of points in men's artistic gymnastics is dividing elements by subjective criteria into the different groups of difficulty. There are five groups of difficulty, the easiest is an A group and the most difficult is an E group. On the high bar we have an interesting situation, where are two flight elements - Kovacs salto (double salto backward tucked over the bar to the **regrasp**) and **Gaylord I** (11/2 salto forward tucked over the bar to the **regrasp**) in the two different difficulty groups. **Gaylord I** is a D and Kovacs salto is an E element. The gymnast who performs **Gaylord** will receive 0.1 bonus points and those who performs Kovacs 0.2 bonus points. This is the main reason why at the Worldchampionship in Brisbane 1994 and European championship 1994 in Prague we could not see more than one **Gaylord** and on the other hand we could see that the gymnasts are performing even two Kovacs saltos in their routines. This shows bad balanced routines by using elements from the same structural groups. The aim of the investigation is to find kinematical and dynamical characteristics of both elements and decide whether they should belong to the same difficulty or not.

The **Gaylord I** was successfully performed by Blaz Puljic, member of Slovene national team. The gymnast is 177 cm tall and weighs 70 kg. The Kovacs salto was successfully performed by Csaba Fajkus, member of the Hungarian national team, The gymnast is 167 cm tall and weighs 64 kg. As this is quite big difference between the gymnasts the dynamic parameters will be related to the body weight.

Both elements were analyzed by the **Consport** Motion Analysis System. For the definition of the 3D coordinates we used two one meter cubes. We recorded the motion with two SVHS cameras at a frequency of 25 frames per second. The digitalization of the chosen points, from the videorecorder to the computer was done with the genlock supported with the **Consport** Motion Analysis Software. For the analysis the following points of the body were chosen: face up and down, left and right wrist, elbow, shoulder, foot, ankle, knee and hip, body centre of gravity (BCG), all together 17 points which formed the following 15 body segments: face, left and right forearm, upperarm, instep, calf, thigh, hip, transversal segments of hips and shoulders.

We used the Susanka body model, which is implemented into the CMAS software.

For the calculation of the forces we made a special computer program.

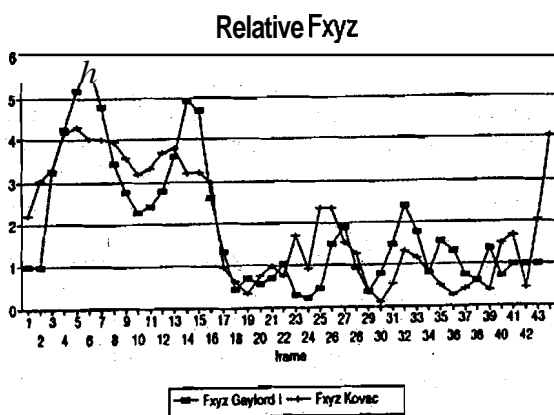
In both cases we started with the analysis when the body passed from the first quadrant to the second. Both elements were analyzed up to the **regrasp** moment plus 3 frames. We analyzed the preparation phase, the release from the bar, the flight and **regrasp**.

For this presentation we chose the following results:

- velocity of the body centre of gravity (BCG) in x, y axis and space,
- angle y plane - horizontal bar - BCG
- trajectory of the BCG in y axis
- force of BCG in x, y axis and space.

RESULTS

- results on **Gaylord I** are better but still in range with the results of other authors (Alp, **Brueggeman**, Cheetham 1993, Oester 1993, **Čuk** 1993).
- **kinematic** results on Kovacs are in range with other results (Alp, **Brueggeman**, Cheetham 1993, Oester 1993, **Krug 1993**), but calculated forces are on the low level of other results (Krug 1992, **Krug 1993**),
- we would need a statistics analyse to prove there is no difference between those two elements,
- simple comparison between those two elements shows no big difference, neither in **kinematics** or dynamics,
- the definition of the Kovacs salto should be changed into 1112 salto backward over the bar to **regrasp**,
- the Men's Technical **Comite** of the FIG should determine biomechanical parameters or criteria to range the elements into different difficulty groups,
- as almost all known elements can be developed **i.g.** Kovacs to **Kolman** or **Gaylord I** to **Pegan**, there should be no limits for the number of the difficulty groups.



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