

# BIOMECHANICAL ANALYSIS OF TWO DIFFERENT JUMPS IN RHYTHMIC SPORTS GYMNASTICS (RSG).

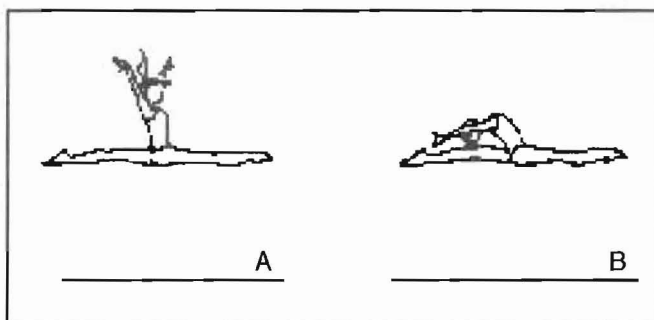
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## INTRODUCTION

Biomechanic analysis of rhythmic gymnastic technical skills a new field of working not often explored. Nevertheless, the most part of RSG coaches have great difficulties to analyse the most common errors on the execution. Jumps are the technical skills group that RSG gymnasts perform often during their routines (Lebre, 1992). FIG code of points (FIG, 1993) defines many different jumps, but two of the jump preferred by the most part of gymnasts are the leap jump and the leap jump with trunk extension.

The aim of this study was to analyse the different techniques used by RSG gymnasts to perform two jumps: the leap jump, and the leap jump with trunk extension (figure 1-A and B).



**Figure 1:** Two different leap jumps: A- normal leap jump; B- leap jump with trunk extension

## METHODS

Twelve high level RSG gymnasts aged  $15 \pm 3.2$  yrs,  $49.4 \pm 4.7$  Kg weight and  $167.2 \pm 6.8$  cm height were observed. Each gymnast performed the two different jumps. The parameters observed were: velocity of Centre of Mass (CM) on take off and landing; duration, high and length of the jumps, and the high of the CM in different moments of the jump (take off, highest point and landing). The jumps were filmed and analysed using the *Peak5 - Motion Measurements System* with a 16 points spatial model.

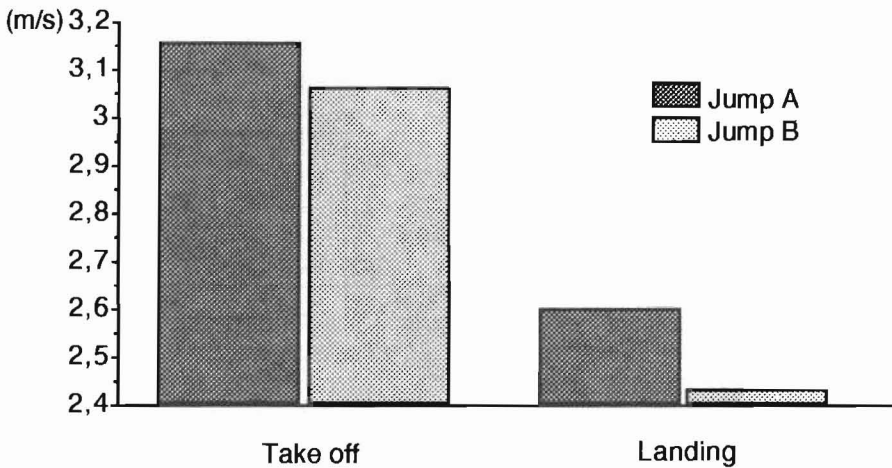
## RESULTS

The main results are resumed in table 1.

**Table 1:** Main results for the analysis of the jumps.

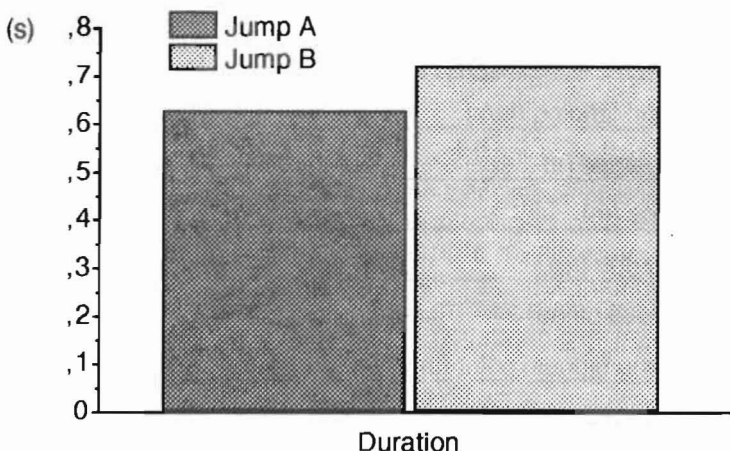
Parameters	Jump A	Jump B
Velocity of CM on take off (m/s)	3.15±0.33	3.06±0.26
Velocity of CM on landing (m/s)	2.60±0.49	2.45±0.53
Duration of the jumps (s)	0.63±0.05	0.72±0.02
High of the jumps (m)	0.44±0.07	0.54±0.06
Length of the jumps (m)	1.40±0.27	1.48±0.21
High of CM on take off (m)	1.42±0.05	1.38±0.07
High of CM on the highest point (m)	1.87±0.08	1.93±0.08
High of CM on landing (m)	1.42±0.07	1.39±0.07

When we compared the velocity values we observed that nevertheless the Jump A was easier to perform than the Jump B, the velocity values were higher for the Jump A (Figure 2).



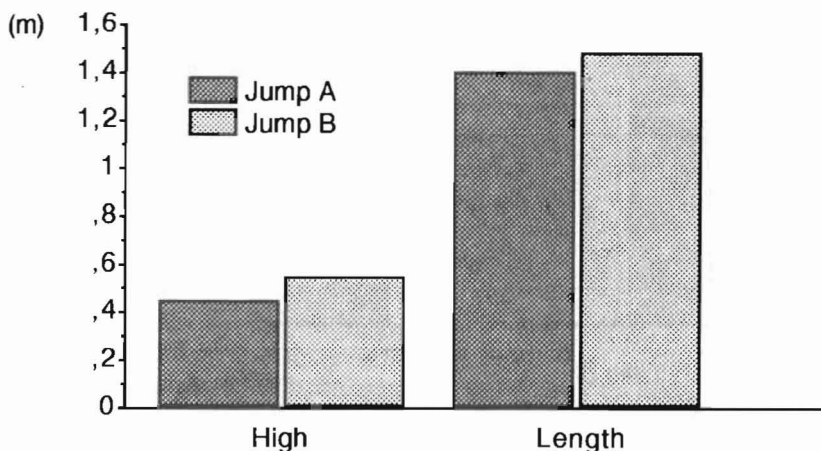
**Figure 2:** Comparison of velocity of the CM on take off and on landing

In spite of the velocity on the take off in the B jump be lower than in the A jump, the gymnasts performed the second jump during more than the first one (figure 3).



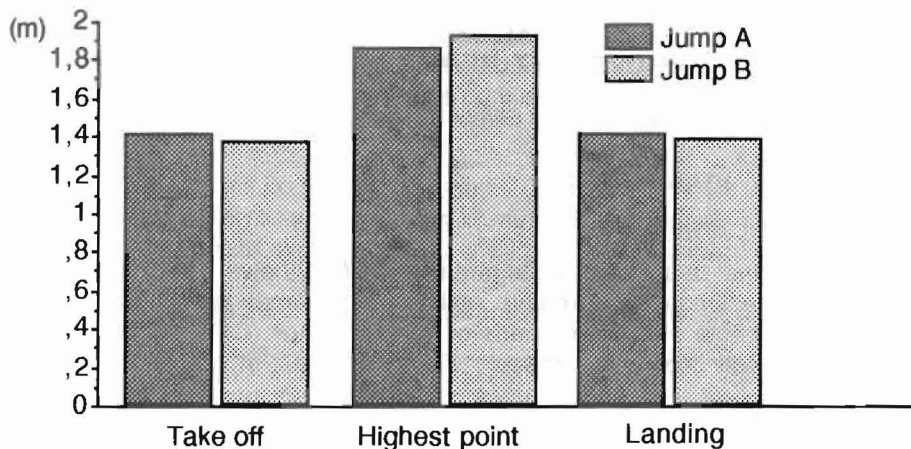
**Figure 3:** Comparison of duration of the two jumps.

The gymnasts observed performed the jump B both higher and longer than the jump A (figure 4). These results are not usual because they performed jump B with a lower velocity on the take off. Probably these results are due to a better engagement of gymnasts in the jump B because its execution much more difficult than for the jump A.



**Figure 4:** Comparison of high and duration of the two jumps.

Observing the trajectory of CM during the two jumps (figure 5) we can see that in spite the high of the CM on take off be lower in jump B, in the highest point the CM was higher in this jump than in the jump A. Once more, these results were probably due to the fact that as the gymnasts had more difficulties to perform Jump B they did this jump with more engagement than they did to jump A.



**Figure 5:** Comparison of high of CM on the take off, on the highest point and on landing of the two jumps.

So, if they performed the jump A the same way they performed jump B, the results for the first jump could be better that we observed in this study.

The values obtained for jump A were in accordance with the literature (Lisistkaya, 1985; Manoni, 1986). For jump B there are no published works about it.

### CONCLUSIONS

Observing the results we could conclude that, nevertheless the A jump was an easier one, the gymnasts performed B jump with a high technical quality, since the jump is better it is performed the highest, longest and during more time. The results showed also that probably gymnasts did not performed A jump the best way that could. This is an important remark to the coaches because many times gymnasts do not put the same emphasis in easy skills, and the penalties in the competition are the same for easy and for very difficult skills.

### REFERENCES

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