

# 3D KINEMATICAL ANALYSIS OF BRAZILIAN FEMALE POLE VAULTERS

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**INTRODUCTION:** Pole Vault is one of the most technical events in track and field. Schade et al. (2005) evaluated kinematical and dynamic variables during the 2005 World Championship in Helsinki providing data of world class vaulters for comparison. Recently, Brazilian pole vaulters have obtained world class results but, despite this, no biomechanical analysis has been conducted with such athletes. Therefore, the aim of this work is the 3D kinematical analysis of the best female athletes during the "XXVII Brazilian Trophy" in 2008.

**METHODS:** Five female vaulters with jumps ranging from 3.90 to 4.80 meters were analysed, totalling 13 jumps. The Dvideo kinematic analysis system (Figueroa et. al., 2003) was used for 3D kinematical analysis. Four Basler cameras (A602fc,100Hz) were located in the field beside the runaway corridor, 2 cameras to record the approach and maximum pole bend position and two others to record the bar clearance. The follow variables were analyzed: Grip height at the takeoff (GHTO), takeoff distance (DTO), Grip Height (GH) defined as the distance between the middle of the upper grip hand at the pole and the deepest point of the planting box at the moment of the pole straight position, Pole chord length at maximum pole bend (MPB) defined as the distance between the middle of the upper grip hand at the pole and the deepest point of the planting box at MPB, % MPB that is  $(1-(MPB/GH)) * 100$ . The results were compared to those presented by Schade et al. (2005) on the final report of the 2005 World Championship. A statistical test (Mann-Whitney  $p < 0.05$ ) was done to compare the average height jumped in both events.

**RESULTS:** Table 1 shows the kinematical data of the three best pole vaults of Brazilian Trophy in 2008 and the data of the winner of the 2005 World Championship in Helsinki.

**Table 1 Kinematical variables of the vaulters**

Vaulter	Height (m)	GHTO(m)	DTO(m)	MPB(m)	GH (m)	%MPB
1 <sup>st</sup> Fabiana Murer 2008	4.80	2.13	3.84	3.21	4.30	25.4
2 <sup>nd</sup> Joana Costa 2008	4.35	2.11	3.26	3.28	4.20	21.9
3 <sup>rd</sup> Carolina Torres 2008	4.15	2.11	3.16	3.50	4.12	15
1 <sup>st</sup> Yelena Isibayeva 2005	5.01	#	3.41	2.98	4.37	31.7

The overall mean value of pole vault in the World Championship in 2005 (N=10) was  $4.47\text{m} \pm 0.22\text{m}$  and in Brazilian Trophy in 2008 (N=13) was  $4.31\text{m} \pm 0.24\text{m}$  with no statistical difference ( $P < 0.05$ ). Comparing the kinematical data of the winner of the World Championship (5.01m) with data of the winner of the Brazilian Trophy (4.80m), in both cases, the best results occurred when they achieved the best use of the pole %MPB.

**DISCUSSION:** According to Schade, the more effective the interaction with the pole the better is the performance. Considering our overall results, this conclusion was confirmed with just one exception. However, this relationship should be carefully interpreted since the pole stiffness could interfere with the results and this factor was not controlled in both studies.

**CONCLUSION:** The present study show original data obtained of Brazilian female pole vaulters and these kinematical variables can be useful for academic and applied purposes.

**REFERENCES:** Schade, F., Brüggemann, G.-P, Isoletho, J., Komi, P., Arampatzis, A., Pole vault at the world championship in athletics Helsinki 2005. Final Report

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