

Run-up Velocity in the Men's and Women's Triple Jump at the 2007 IAAF World Championships in Athletics in Osaka

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Abstract

The purpose of this report is to present the jumping distance and run-up velocity data from the men's and women's triple jump finals at the 2007 IAAF World Championships in Athletics in Osaka.

The instantaneous run-up velocities of all attempts of all athletes were measured by a laser distance measurement device (LAVEG by Jenoptik). The best record jumps of each athlete were included in an analysis.

Comparing with the past World Championships, the average performance in the men's triple jump did not improve remarkably. In the women's triple jump, the average jumping distance at the 2007 World Championships was greatest among the past World Championships. Therefore, the women achieved 86.0% of the men's jumping distances. While the women's run-up velocities reached 89.6% of the men's at the 2007 World Championships.

The run-up velocity was significantly related to the jumping distance in the men's and women's triple jump finals at the 2007 World Championships. These relationships indicated that one of the most important determinant of the triple jump performance would be the run-up velocity in both men's and women's finals at this competitions.

Introduction

The 11th IAAF World Championships in Athletics 2007 was held at Osaka, Japan, from August 26th to September 2nd. In the men's triple jump, Nelson Évora of Portugal broke his own record by 23 cm and won the gold medal with a record of 17.74 m. While Yargelis Savigne of Cuba showed a big jump of 15.28 m at the first attempt and captured the victory in the women's triple jump.

In the horizontal jumps, the run-up velocity is of major importance for a successful performance. The changes in world records of the men's triple jump also imply the importance of the approach speed. In 1960s, Jozef Schimidt of Poland, who was former Olympic champion and world record holder, was the first to break the 17 m barrier with a jump of 17.03 m. Schimidt's technique involved a low and fast hop and step in order to minimize the reduction of run-up velocity and energy loss during the hop and step. Moreover, Jonathan Edwards of United

Kingdom improved the world record considerably and became world champion in 1995 with 18.29 m. One of the greatest characteristic of Edwards' jump was high run-up velocity.

In this report, the purpose is to present the jumping distance and run-up velocity data from the men's and women's triple jump finals at the 2007 IAAF World Championships in Athletics in Osaka.

Methods

Data were collected at the men's and the women's triple jump finals at the 2007 IAAF World Championships in Athletics in Osaka. The best valid jumps from each of the twelve finalists of the men's and women's competitions were selected for further analysis. The official distances of the selected jumps of each athlete were shown in Table 1 for male athletes and table 2 for female athletes.

The instantaneous run-up velocities of the athletes

Table 1 Jumping distance (official), run-up velocity at the maximum point and 0 m point of the approach distance (foul line), location of the maximum run-up velocity and velocity change from the maximum point to the 0 m point of the approach distance for the best valid jumps from each of the twelve male finalists

Rank	Name	Nat.	Result	Wind	MAX m	MAX m/s	0 m m/s	Diff. m/s
1	N. Évora	POR	17.74	+1.4	4.25	10.49	10.22	-0.27
2	J. Gregório	BRA	17.59	+0.3	7.02	10.45	10.05	-0.40
3	W. Davis	USA	17.33	+1.0	3.25	10.23	10.07	-0.16
4	O. Tosca	CUB	17.32	+1.1	3.64	10.43	10.27	-0.16
5	A. Wilson	USA	17.31	+0.6	6.51	10.51	10.13	-0.38
6	P. Idowu	GBR	17.09	-0.9	5.53	10.26	9.92	-0.35
7	D. Giralt	CUB	16.91	+0.7	4.28	10.12	9.83	-0.30
8	A. Martínez	SUI	16.85	+1.3	6.32	10.49	10.08	-0.41
9	D. Kim	KOR	16.71	+1.1	5.67	9.94	9.70	-0.24
10	A. Petrenko	RUS	16.66	+0.8	3.34	9.89	9.73	-0.15
11	M. Zhong	CHN	16.66	+1.5	5.54	10.31	9.97	-0.34
12	D. Tsiámis	GRE	16.59	-1.1	4.09	9.77	9.53	-0.24
Average			17.06		4.95	10.24	9.96	-0.28
±SD			0.39		1.30	0.26	0.22	0.09

were measured by a laser distance device (LAVEG by Jenoptik), which operated at 50 Hz and was installed before the runway at the top of the stadium. The operator of the LAVEG targeted the athlete's chest and followed during the entire approach run. The position time history data were smoothed by the fourth-order low-pass Butterworth digital filter with a cut-off frequency of 0.5 Hz. From the position time history data, the object's run-up velocity was calculated by the first time derivative.

Consequently, we provided the maximum run-up velocity and its location from the 0 m point of the approach distance (foul line) and the run-up velocity at

0 m point of the approach distance of all the male and female finalists, and the run-up velocity curves of the male and female top three athletes for the analysis.

Results and Comments

Jumping distance

Table 1 and 2 presents jumping distance (official), run-up velocity at the maximum point and 0 m point of the approach distance (foul line), location of the maximum run-up velocity and velocity change from the maximum point to the 0 m point of the approach distance for each

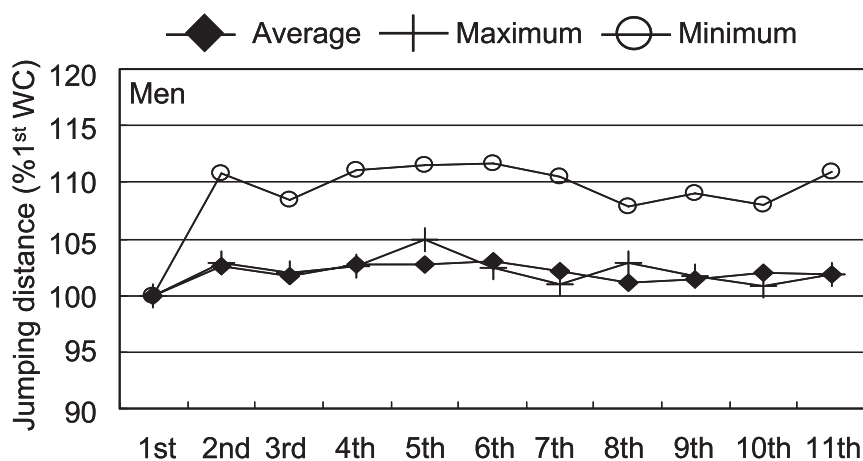


Figure 1 Changes in ratios of the average, maximum and minimum official distances in the men's triple jump finals at all the World Championships to those at the 1st World Championships (100%)

Table 2 Jumping distance (official), run-up velocity at the maximum point and 0 m point of the approach distance (foul line), location of the maximum run-up velocity and velocity change from the maximum point to the 0 m point of the approach distance (foul line) for the best valid jumps from each of the twelve female finalists

Rank	Name	Nat.	Result	Wind	MAX m	MAX m/s	0 m m/s	Diff. m/s
1	Y. Savigne	CUB	15.28	+0.9	3.53	9.49	9.26	-0.24
2	T. Lebedeva	RUS	15.07	+0.8	3.50	9.59	9.39	-0.20
3	H. Devetzi	GRE	15.04	-0.2	3.27	9.22	9.00	-0.22
4	A. Pyatykh	RUS	14.88	+0.3	2.64	9.10	8.96	-0.14
5	M. Šestak	SLO	14.72	+0.2	3.30	8.96	8.81	-0.15
6	M. Martínez	ITA	14.71	+1.3	4.19	8.98	8.72	-0.26
7	O. Saladuha	UKR	14.60	+0.7	3.23	8.96	8.73	-0.23
8	L. Xie	CHN	14.50	+0.9	5.64	9.22	8.61	-0.60
9	K. Costa	BRA	14.40	+1.1	4.08	9.55	9.20	-0.35
10	O. Bufalova	RUS	14.39	+0.7	3.59	9.03	8.84	-0.19
11	O. Rypakova	KAZ	14.32	+1.4	3.54	8.97	8.79	-0.18
12	D. Veldáková	SVK	14.09	-0.1	4.46	8.97	8.78	-0.19
Average			14.67		3.75	9.17	8.93	-0.24
±SD			0.35		0.77	0.24	0.24	0.12

of the twelve male and female finalists, respectively. Figure 1 and 2 shows changes in ratios of the average jumping distances in the men's and women's triple jump finals at all the World Championships to those at the 1st World Championships (100%) for the male and the 4th World Championships (100%) for the female, respectively.

At the World Championships 2007, six male athletes jumped further than 17.00 m and three female athletes

broke 15.00 m. The average jumping distance of the male changed little throughout the past World Championships (Figure 1). Comparing with the past World Championships, the average jumping distance was greatest in the women's triple jump at the World Championships 2007 (Figure 2). On average, the women reached 86.0% of the men's jumping distances at the 11th World Championships.

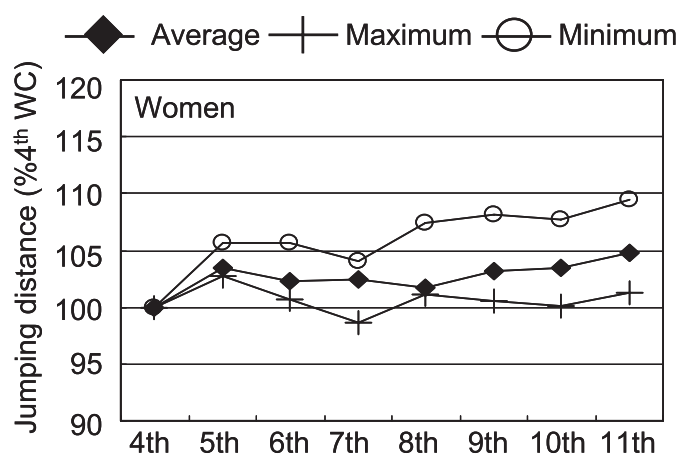


Figure 2 Changes in ratios of the average, maximum and minimum official distances in the women's triple jump finals at all the World Championships to those at the 4th World Championships (100%), in which the event was first included

Run-up velocity

The maximum run-up velocity and run-up velocity at 0 m point of the approach distance were 10.24 ± 0.26 m/s and 9.96 ± 0.22 m/s for the male and 9.17 ± 0.24 m/s and 8.93 ± 0.24 m/s for the female at the World Championships 2007 (Table 1 and 2). There were six male and four female athletes who kept the run-up velocity faster than 10.00 m/s for male and 9 m/s for female, respectively, from the maximum point to the 0 m point of the approach distance. The correlation coefficients between the maximum run-up velocity and the run-up velocity at 0 m point of the approach distance were highly significant for the men ($r = 0.93$, $p < 0.001$) and women ($r = 0.87$, $p < 0.001$). The women's run-up velocities at the maximum and 0 m point of the approach distance were both calculated to be 89.6% of the men's.

Relationships between jumping distance and run-up velocity

Figure 3 illustrates the relationships of the jumping distance to the run-up velocity at the maximum and 0 m point of the approach distance for the men's and women's triple jump finals. In the men's finalists, there were significant relationships of the jumping distance to the maximum run-up velocity ($r = 0.72$, $p < 0.01$) and the run-up velocity at 0 m point of the approach distance ($r =$

0.78 , $p < 0.01$). While in the women's finalists, significant correlation was found only between the jumping distance and the run-up velocity at 0 m point of the approach distance ($r = 0.59$, $p < 0.05$). However, considering the Costa's jumping distance (Table 2), her run-up velocity was extremely large in the women's finalists. These data of Costa indicated that she would failure to use her energetic potential in the triple jump. If Costa's data was excluded, the relationships of the jumping distance to the maximum run-up velocity and the run-up velocity at 0m point of the approach distance turned to be significant (maximum point, $r = 0.74$, $p < 0.01$; 0 m point, $r = 0.75$, $p < 0.01$).

These relationships underline the great importance of run-up speed for men not only for women.

Characteristics of the run-up velocities of the top three athletes

Figure 4 and 5 depicts the developments of the run-up velocities of the top three athletes of the en's and women's triple jump finals, respectively. Évora showed large run-up velocity almost entire points of the approach, and the run-up velocity at the end of the approach distance (0 m) was greatest among the top three athletes. Although Gregório xceeded Évora in the run-up velocity from 15 to 5 m points before the take-off, his

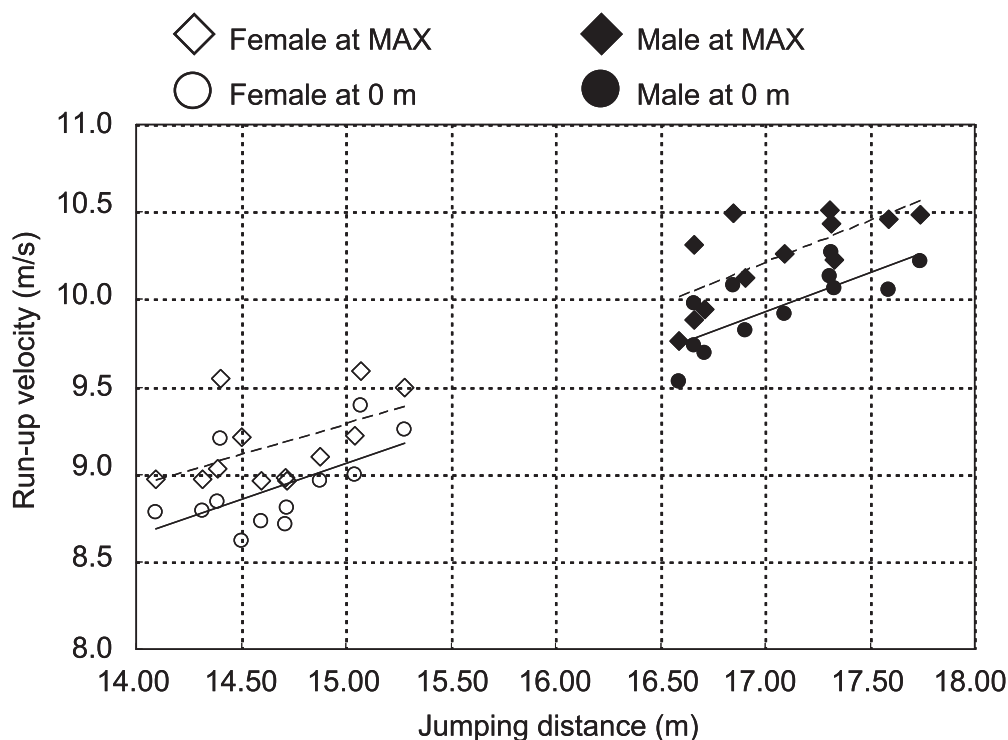


Figure 3 Relationships of jumping distance (official) to the run-up velocity at maximum and 0 m point of the approach distance (foul line) for the men's and women's triple jump finals

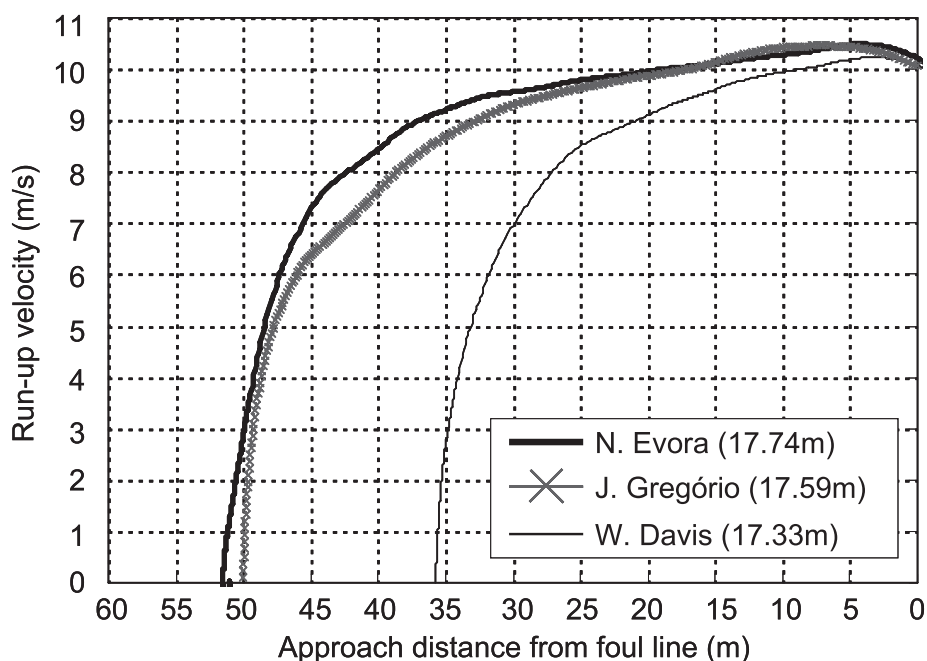


Figure 4 Development of the run-up velocity of the top three athletes of the men's triple jump final: N. Évora(17.74m), J. Gregório(17.59m) and W. Davis (17.33m)

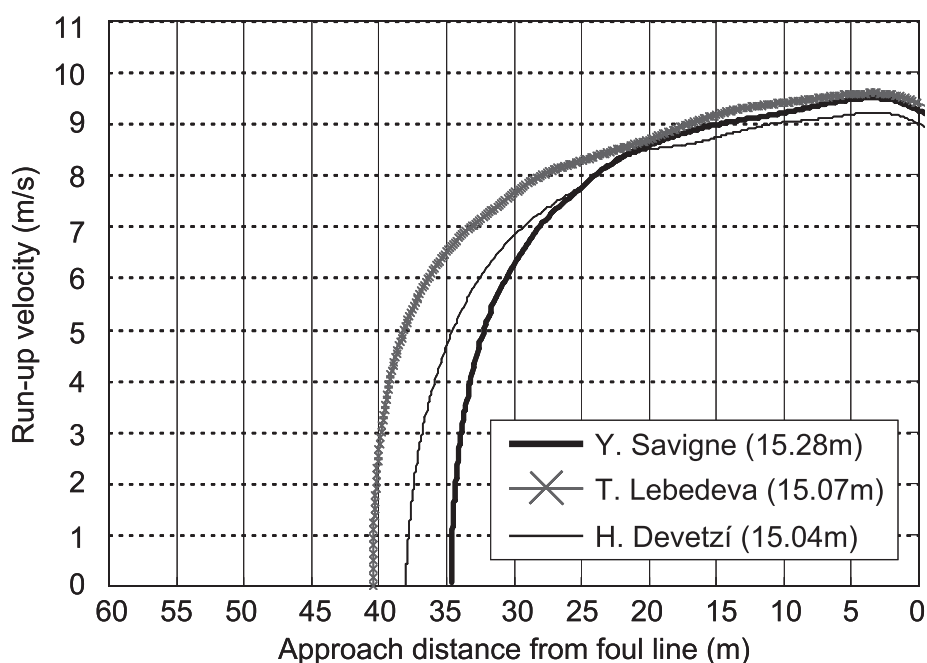


Figure 5 Development of the run-up velocity of the top three athletes of the men's triple jump final: Y. Savigne(15.28m), T. Lebedeva(15.07m) and H. Devetzi(15.04m)

location of the maximum run-up velocity was earlier than that of Évora and the loss of the run-up velocity became greater before the takeoff (Table 1). While Davis used shortest approach distance among three athletes, around 35 m point of the approach distance. However, his run-up velocity immediately increased and reached its peak of 10.23 m/s at 3.25 m point of the approach distances, which was nearest among the three athletes.

Savigne started the approach from about 35 m point

of the approach distance. She accelerated immediately and the maximum run-up velocity reached the second largest among the women's finalists (Table 2). Lebedeva showed the greatest run-up velocity throughout the approach from about 40 m point of the approach distance. Although she could produce the greatest kinetic energy (increase run-up velocity) before the take-off, she was unable to improve the jumping distance within six attempts. The maximum run-up velocity of Devetzi was

smallest among the three athletes.

Summary

Run-up velocities of the best attempts of the twelve male and female finalists in Osaka 2007 were measured using a laser distance measurement device. We analyzed the maximum run-up velocity and its location from the 0 m point of the approach distance (foul line) and the run-up velocity at 0 m point of the approach distance.

The average performance in the men's triple jump did not improve remarkably throughout the past World Championships. While in the women's triple jump, the average jumping distance at the World Championships 2007 was greatest among the past World Championships. The women reached 86.0% of the men's jumping distances and 89.6% of the men's run-up velocities at the 11th World Championships.

The run-up velocity was significantly related to the jumping distance in the men's and women's triple jump finals at the 2007 World Championships. These relationships indicated that one of the most important determinant of the triple jump performance was the run-up velocity in both men's and women's finals at this competitions.