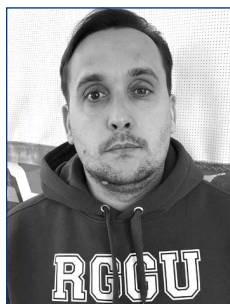




# Speed characteristics of jumpers in a running triple jump

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## Abstract

Increasing competitive results is a hot topic for specialists and athletes in any sport. This study analyzes previously obtained data on horizontal jumps. An assessment was also made of the speed capabilities of the best Russian triple jump jumpers, and the dependence of the quantitative values of the speed realization coefficient and the speed difference in the last and penultimate 5-meter run-up sections for highly qualified jumpers was experimentally proven. The work provides an assessment of the speed parameters of training runs with and without push-off. A comparative analysis of the performance of training and competition runs made it possible to identify differences in the speed characteristics and efficiency of jumping techniques of jumpers. As a result of the study, it was found that the best Russian triple jumpers have significant speed capabilities, which they successfully implement during competitive run-ups. The coefficient of speed realization and the difference in speed in the last sections of the run-up turned out to be significant indicators reflecting the efficiency of the jump and the level of training of the athletes. It is also worth noting that the preparation of jumpers for take-off significantly affects their speed characteristics. Analysis of training runs showed that the lack of take-off affects the jumper's speed drop. This demonstrates the importance of proper take-off technique and its impact on overall jump performance. In general, the study allows us to better understand the speed capabilities of triple jump jumpers, as well as the influence of preparation and various factors on the results of the competition. The data obtained can be useful for coaches and athletes, helping them optimize training programs and jumping technique in order to achieve the highest results.

**Keywords:** *athletics, highly qualified jumpers, speed capabilities, horizontal jumps, triple jump.*

**Introduction.** In the circles of horizontal jump professionals, everyone unanimously recognizes that high speeds in the last stages of the takeoff play an important role in achieving them. This can be done due to the jumpers ability to concentrate maximum speeds during this phase of training. Based on research by experts on long and triple jump techniques, one can clearly see the importance of high speed in the last steps of the run-up to achieve excellent results. If we consider the dependence of the competitive result and speed on the last 5-meter run-up section, we will see the result in the range from 0.730 to 0.943. The pattern of this parameter can be most clearly observed in all categories of jumpers-athletes, starting from the second category and up to an international

master of sports. Additionally, it should be noted that the strongest long and triple jumpers achieve speeds similar to those of the best sprinters. Moreover, some outstanding jumpers have also shown their talent in the 100 meters and 200 meters, ranking among the best athletes in the world.

**Objective of the study was to** analyze and assess the speed abilities of the best Russian triple jumpers, to consider how much the competition results depend on the application of these research parameters. Also in the study, it was possible to experimentally prove the dependence of such parameters as the quantitative values of the speed realization coefficient and the difference in speed in the last and penultimate 5-meter run-up sections for highly skilled jumpers [1].



**Methods and structure of the study.** The work used the method of content analysis of literary sources, the method of photodiode timing (accuracy of 0.001 seconds). The study involved 23 of the strongest jumpers in the Russian Federation. The study was carried out at the Russian championships in 2007 by members of the complex scientific group. The staff analyzed the data obtained during the preparatory and competitive periods.

**Results of the study and discussion.** In the first part of the study, we obtained indicators for comparing the speed parameters of the finalist jumpers among men, which are shown in Table 1.

For men, with a difference in the competitive result of the finalists of the World Championship among the finalists of the Czech Republic of 0.78 m (4.5%), the difference in speed in the last section of the run-up is 0.48 m/s (4.8%). Considering that on average 0.1 m/s, all other things being equal, gives an increase in the triple jump for men of 0.26-0.29 m (A. Oganjanov, 1990; G. Samoilov, 2002), we can conclude that the lag our triple jumpers from world athletes in this event is due to the low speed in the last steps (Table 1) [1].

The implementation of speed capabilities is assessed by the speed implementation coefficient, which shows how many percent jumpers use their speed capabilities during the take-off run (V. Kreer, 1992). In the scientific and methodological literature on horizontal jumps there is no experimental substan-

tiation of the quantitative value of this coefficient for qualified jumpers and vaulters.

We tried to fill this gap by using photodiode timing to record the speed in the last 5-meter section of the run-up when running it without take-off, with the last part of the run-up set to the maximum speed and with take-off. Based on the difference in speed values during such run-up options, the magnitude of the speed drop as a result of the jumpers' preparation for take-off was determined 7 men. The results are shown in Table 2 [2].

For men, the average value of the drop in speed when preparing jumpers for take-off was  $0.204 + 0.073$  m/s; for women  $-0.110 + 0.125$  m/s. Thus, the model value of the drop in speed as a result of preparation for repulsion can be taken as 0.1-0.2 m/s and a speed realization coefficient of 98-99%. A rate of less than 97% is an indication that the jumper is over-preparing for the first take-off of a triple jump. This is due either to the desire to increase the trajectory and vertical component of the take-off speed, or to shortcomings in the jumper's special speed-strength preparedness and inability to push off at full speed.

The next stage of the study was to assess the speed capabilities of the jumpers. The speed realization coefficient, expressed as a percentage, was calculated (Table 3) [1].

The obtained coefficient value (about 99%) indicates a high degree of use of speed capabilities in

**Table 1.** Comparison of the run-up speed parameters of jumpers-finalists of the Russian Championship 2007

No.	Last name	Speed next to last. 5 m take-off, m/s	speed at last. 5 m run-up, m/s	Speed increase, m/s	Competitive result, m
1.	Sportsmen 1	9,92	10,02	0,10	16,94
2.	Sportsmen 2	9,90	10,18	0,28	16,91
3.	Sportsmen 3	10,22	10,44	0,22	16,88
4.	Sportsmen 4	9,80	9,98	0,18	16,63
5.	Sportsmen 5	9,51	9,78	0,27	16,55
6.	Sportsmen 6	10,00	10,04	0,04	16,43
7.	Sportsmen 7	9,52	9,69	0,17	16,42
8.	Sportsmen 8	9,67	9,82	0,15	16,37
Average HR		9,81±0,23	9,99±0,22	0,18±0,08	16,64±0,22
PD standard deviation		0,23	0,22	0,08	0,22
PD variation coefficient		2,34	2,20	4,44	1,32
Average World Cup		10,37±0,15	10,47±0,15	0,20±0,12	17,42±0,44
World Cup standard deviation		0,15	0,15	0,12	0,44
World Cup variation coefficient		1,46	1,43	60	2,52
Difference		0,46; D<0,01	0,48; D<0,01	0,02; D<0,05	0,78 D<0,01

**Table 2.** Running speed with and without push-off

Last name	Run-up without repulsion, m/s	Run-up with repulsion, m/s	Difference, m/s	Speed realization factor
Sportsmen 1	9,92	9,65	0,27	97,27
Sportsmen 2	9,88	9,77	0,11	98,88
Sportsmen 3	9,80	9,51	0,29	97,04
Sportsmen 4	10,00	9,73	0,27	97,30
Sportsmen 5	9,11	9,01	0,10	98,90
Sportsmen 6	8,83	8,61	0,22	97,50
Sportsmen 7	9,80	9,63	0,17	98,26
Average	9,620	9,416	0,204	97,87
Art. deviation	0,423	0,405	0,073	

**Table 3.** Realization of the speed capabilities of jumpers in a competitive run-up

Last name	Take-off speed, m/s	Absolute speed, m/s	Difference, m/s	Speed capability realization factor
Sportsmen 1	10,00	10,04	0,04	99,6
Sportsmen 2	10,18	10,54	0,36	96,6
Sportsmen 3	9,96	9,98	0,02	99,8
Sportsmen 4	10,44	10,38	-0,06	100,6
Average	10,15	10,24	0,09	99,1
Standard deviation	0,19	0,23	0,16	1,5

take-off conditions, and good command of take-off technique by Russian jumpers.

Our jumpers' high level of take-off technique is confirmed by their active approach to the bar. This indicator is characterized by a positive difference in speeds in the last and penultimate 5-meter run-up sections (Table 1). This difference for highly skilled triple jumpers should be about 0.2 m/s. For the finalists of the World Cup-97, as well as for the finalists of the Chechen Championship-07, the value of the speed differences is close to the model values (respectively, 0.20 m/s and 0.18 m/s for men; Table 1). A negative value of this parameter characterizes excessive preparation for repulsion and is usually associated with a high "jump" trajectory. This is typical for jumpers who have a pronounced "power" style and "jump-dominant" triple jump technique, as well as for beginner jumpers of 2-3 categories [1].

**Conclusions.** The recent lag in jumping is due to shortcomings in the speed training of most of our best jumpers and vaulters. At the same time, the special speed-strength and technical training of our athletes is at a fairly high level.

The speed demonstrated by triple jumpers in the run-up is somewhat lower than their absolute speed capabilities shown in the sprint. However, the differ-

ence values for highly skilled jumpers should not exceed 0.2 m/s, and the speed realization rate should be 98-99%. Our best athletes have a high indicator of this aspect of technical readiness (99.1%, Table 3), not inferior to the indicators of the world triple jump elite.

The high level of mastery of the take-off technique was also expressed in the rate of increase in speed on the last 5-meter run-up section, which averaged 0.18 m/s for the finalist jumpers of the ChR-07 (Table 1). This is quite consistent with the model values of the speed increase for this qualification of jumpers.

The rate of increase in speed in the last 5-meter section of the run-up, together with the coefficient of speed realization and speed indicators of the run-up, can serve as criteria for assessing the technique of performing this phase of the triple jump [1].

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