PNEUMATIC SUPPORT IN LONG AND TRIPLE JUMPS

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KEYWORDS: pneumatic support, elasticity, hitting load, long and triple jumps

INTRODUCTION: When training for competition, it has been established that the degree of impact absorbed by the body can influence the work capacity of athletes. Excessive shock load can often lead to trauma in one form or another. For this reason, when there is potential for increased volume and intensity in training sessions, it is important to provide favourable conditions during contact with the ground. Traditionally, support has been provided in the form of grass surfaces, sawdust, wood, and sand. However these materials should only be used for special or auxiliary exercises, not for training routines and basic exercises. Therefore a need arose for design of a special device (equipment) capable of changing requirements of the basic interaction of the athlete with the contact surface under training conditions. Another aspect of this study was the application of this technique to performance of the athlete in competition.

METHODS: A PS in 2 forms of modification was attached only to the take off board and consisted of a pneumatic path of 20m length comprising modules of 5m with thickness of 0.05 m. The technique was offered to athletes who agreed to participate in the study. With regards to changing magnitude of air pressure in chambers of a PS, it is possible to vary coefficient of elasticity from 0 up to $2 \cdot 10^{-5}$ n/m. The focus of this research is testing outcomes of athlete's interaction with support when performing the long jump from standing start and landing with subsequent vertical jump, comparing both tartan and pneumatic covering. Kinematic characteristics of athletes movements while taking off from running jump were defined in long and triple jumping with different supports. Measuring systems were used: biomechanical cinematography (picture camera «Actionmaster 500», analyzer of films «Nac Sportias»); dynamographic platform with it own friquency 400 Hz; accelerometers with its own friquency 400 Hz.

RESULTS: Measuring of length and height in vertical jump from PS at a different magnitude of pressure (elasticity by being varied) has shown that there is an explicitly expressed maximum in explored dependence with individual preference expressed by athletes, each having their own requirement for maximum pressure. Measurement of acceleration in ankle and hip joints during contact of an athlete with PS demonstrated the potential of this technique to reduce the amount of stress on the lower extremities. There is a considerable (1.5-2 times) drop in the peak shock load on landing and in the phase of foot placement on a support surface. The result of calculations shows that with propulsion from a PS (as compared with standard jumping conditions) there is a magnification of vertical component flight velocity of body mass center by 4-6 %. Horizontal component velocity is characterized by smaller losses of its magnitude in a basic phase in case of use of a pneumatic support by 3-4 %. The advantage for the athlete in the take off phase, using PS is clearing a support in a more straightened position. An experimental assessment of the PS effectiveness in training process was being carried out during competition preparation of top long and triple jumpers. (Please see Table 1)

Table 1 Descriptive Results of the Length Jump and Relaibility

	Length of a jump (L)		Reliability of differences	
the sportsmen	Before experiment	After experiment	on Student	
	$\bar{L} \pm \sigma$	$\bar{L} \pm \sigma$	t	P
The man	7,23±0,1	7,45±0,06	4,73	<0,001

The man	6,99±0,1	7,25±0,07	5,18	<0,001
The woman	5,94±0,09	6,21±0,08	5,38	<0,001
The man	15,54±0,1	15,55±0,14	0,45	>0,05
The man	14,01±0,14	14,48±0,16	5,26	<0,001

The quoted data show the results of athlete's performance at the competitions under standard conditions in 6 attempts. An experiment lasted 10 weeks. The effectiveness of PS use in the training process of top long and triple jumpers was carried out in the course of experimental tests. Athletes used PS 3 times in a week, using microcycle in which elasticity was selected and adjusted for each individual in performing of the following exercises: jumping down from various heights with subsequent jumping out forward over a hurdle, multihops, and long jump from complete run up. Partial volume of jumps from complete run up was enlarged in 2.5 times with full scope of training jumps remaining. The result has increased the average by 0,4 m when taking off a PS. During the training sessions athletes noticed that the fall in magnitude of shock loads on landing raised the comfort level of interaction with a support. There was added potential of more active take off phase as a result of the greater tension of muscles. Accordingly the athletes sensation of fatigue is considerably reduced. They also experience practically no pain in ankle and knee joints even when performing jumps of greater intensity.

CONCLUSION: From the practical point of view there are some positive effects from using PS: an increase of various conditions in executing jumping exercises, fall in magnitude of a shock load on landing, an individual selection of ways of interaction with support, an increase of the amount of jumps from complete run up, positive experience in using a new training device in practice.

In view of the changeover from take off in standard conditions the last 1-2 weeks microcycles practice is carried out with an increased elasticity of PS when values are approximated to elasticity of standard support.