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THE POWER AND POWER CHANGES IN QUALIFICATIONAL ASPECT FOR COMPETITORS IN JAVELIN THROW

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Abstract: *It is most common in sports practice the following exercises from weigthtlifting tobe borrowed for the development of javelin throwers' strength development: barbell snatch, barbell clean turn, lying clean, squat, etc. This article deals with strength training of both men and women.*

Keywords: *power changes, competitors, javelin throw*

1. Introduction

Strength development of javelin throwers is a delicate matter. Working too fast on it without consideration of the individuals technical abilities may result in undesirable consequences in their further technical improvement. Premature strength development most frequently results in 'throwing from hand' because of the false feeling of the apparatus light weight. Premature strength development combined with low sports performance may have a negative effect on the young javelin thrower's mental condition and motivation. That is the reason why knowledge about the strength training of the best is essential for the preparation of young javelin throwers - preparation with fewer mistakes on the road to high sports performance.

2. Methods

The aim of the study is as follows: modeling of the changes in javelin throwers' strength potential during the process of changing their sports qualification aiming at higher effectiveness of the training process.

The object of this study was 43 men with performances ranging from 53.04 m to 89.22 m and 36 women with performances ranging from 53.32 m to 68.34 m.

The subject of study was their strength abilities

The follow of the changes in the strength potential of the persons under study was carried out on the basis of five indices (Table 1).

Indices Table 1

Men	Women	Name of five indices
Y	Y`	Sports performans - m
X1	X1`	Barbell snatch - kg
X2	X2	Barbell squat – kg
X3	X3`	Barbell clean turn - kg
X4	X4`	Lwing barbell clean – kg

Variation, correlation, regress and sigma methods as well as comparative analysis have been applied to analyze the results. values of the respective index of motor potential, the coefficients of asymmetry (a), excess (e) and variation (V%).

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3. Results and Analysis

Table 2 shows the results from the variation analysis on the data in the study. Here are presented the mean (X mean), minimal (X min) and maximal (X max)

Variation Analysis Table 2

Sex	*Ind.*	*Xcp.*	*Xmin.*	*Xmax.*	*a*	*e*	*Rx*	*V%*
M E N	Y	66,02	53,04	89,22	0,9	-0,07	36,18	11,20
	X1	90,98	70	115	0,07	-0,54	45	12,10
	X2	158,90	120	220	0,59	-0,77	100	11,86
	X3	123,35	100	170	0,77	-0,21	70	10,44
	X4	107,93	80	155	0,54	-0,85	75	10,59
W O M E N	Y`	61,25	53,32	68,34	-0,38	0,21	15,02	5,32
	X1`	68,97	55	87,5	0,41	0,43	32,5	11,06
	X2`	127,39	100	155	-0,17	-0,64	55	11,31
	X3`	84,61	67,5	110	0,85	0,98	42,5	10,76
	X4`	79,51	65	100	0,49	-0,44	35	11,02

The mean values (X mean) of sports performance (66.02 m for men and 61.25 m for women) determine the sample of the competitors under study as qualified.

The swing (Rx = X max – X min) completes the picture presenting an opportunity to follow the changes in the indices under study with the changes in sports qualification in a great range of 36.18 m with men and 15.02 m with women.

Similar is the picture of the other strength potential indices under study.

The strength abilities of the athletes under study also reveal substantial values which undergo considerable changes together with the changes in their sports-technical .abilities.

The variation coefficient values also guarantee high homogeneity of data. When we add excess (Ex) and asymmetry (Ax) coefficients values which are lower than one we come to the logical conclusion that the sample is highly homogenous of normal Gauss distribution of cases. This has given us the opportunity to apply a number of mathematical and statistical methods for the procession of the data the result of which are presented here.

Table 3 shows the results of the correlation analysis for the two groups of athletes. Exceptionally high correlation has been found between the sports results and the indices under study as well as between the indices of the strength potential in both sexes: r varies from 0.813 to 0.967. This determines the indices themselves as highly informative for javelin throwers' strength development. It also provides possibilities for application of the regress method for the development of models of control and management of the training process.

Tables 4, 5 show the models: straight, reverse and multiple

Correlation Analysis Table 3

Sex	*Indices*	*У*	*X1*	*X2*	*X3*	*X4*
M E N	У	---	0,825	0,928	0,894	0,944
	X1		---	0,907	0,892	0,916
	X2			---	0,955	0,967
	X3				---	0,938
	X4					---
W O M E N	*Indices*	У`	X1`	X2`	X3`	X4`
	У`	---	0,917	0,954	0,869	0,906
	X1`		---	0,853	0,931	0,837
	X2`			---	0,813	0,862
	X3`				---	0,852
	X4`					---

Regression Models (Men) Table 4

Positive models	*SE*	*r*	*Negattive models*	*SE*
У = 7,58 + 0,64 . X1	6,12	0,82	X1 = 21,03 + 1,06 . У	4,93
У = 13,41 + 0,33 . X2	4,05	0,93	X2 = -12,66 + 1,49 . У	11,34
У = -0,23 + 0,54 . X3	4,84	0,89	X3 = 25,00 + 1,49 . У	8,07
У = 16,97 + 0,45 . X4	3,57	0,94	X4 = -21,55 + 1,96 . У	7,42
Multiple model: У = 22,648 – 0,248 . X1 + 0,156 . X2 + 0,31 . X3 + 0,418 . X4			SE 3,302	R 0,89

Regression Models (Women) Table 5

Positive models	*SE*	*r*	*Negattive models*	*SE*
Y` = 34,265 + 0,391 . X1`	1,31	0,95	X1` = -62,6 + 2,14 . Y`	3,07
Y`= 33,773 + 0,215 . X2`	0,89	0,91	X2``= -131,227 + 4,22 . Y`	4,35
Y` = 34,938 + 0,310 . X3`	1,62	0,86	X3` = -64,232 + 2,43 . Y`	4,54
Y` = 34,481 + 0,336 . X4`	1,39	0,90	X4` = -69,981 + 2,44 . Y`	3,74
Multiple model: Y` = 31,479 + 0,153 . X1` + 0,1159 . X2` – 0,028 . X3` + 0,085 . X4`			SE 0,685	r 0,97

Here we suggest more opportunities for quality evaluation of javelin throwers' abilities.

Tables 6 and 7 show evaluation of the respective ability developed on the basis of sigma method. They are as follows: 6 (excellent), 5 (very good), 4 (good), 3 (satisfactory) and 2 (poor).

Evaluation By Sigma Method (Men) Table 6

Note	У (м)	X1 (кg)	X2 (кg)	X3 (кg)	X4 (кg)
6	+83,50	+118	+ 219	+ 158	+ 152
5	78,33– 83,49	115 - 118	189 - 219	141 - 158	131 - 152
4	70,23 – 78,32	77 - 114	129 - 188	106 - 140	86 - 130
3	62,05 – 70,22	64 - 76	99 - 128	88 - 105	64 - 85
2	- 62,05	- 64	- 99	- 88	- 64

Evaluation by Sigma Method (Women) Table 7

Note	Y`(м)	X4`(кg)	X5`(кg)	X6`(кg)	X7`(кg)
6	+ 67,76	+156	+84	+103	+97
5	64,51-67,76	142 - 155	77 - 83	94 - 102	88 - 96
4	57,99-64,51	113 - 141	61 - 76	76 - 94	71 - 87
3	54,74-57,99	99 - 112	54 - 60	66 - 75	62 -70
2	- 54,74	- 99	- 54	- 66	- 62

Table 8 offers quality evaluation of the degree of utilization of the respective ability, developed as a result of the difference between the result calculated theoretically in the respective index and its empirical value. The grades reflect the degree of transformation of the respective quality, 6 (excellent). 5 (very good), 4 (good), 3 (satisfactory) or 2 (poor).

Transformation of the Respective Abilitys (Men) Table 8

	X1 (Ym – Ye)	*X2 (Ym – Ye)*	*X3 (Ym – Ye)*	*X4 (Ym – Ye)*
6	+3,0	+ 4,0	+3,50	+3,20
5	1,50 – 3,0	2,0 – 4,0	2,0 – 3,50	1,60 – 3,20
4	1,50 – -1,50	2,0 – -2,0	2,0 – -2,0	1,60 – -1,60
3	-1,50 – -3,0	-4,0 – -4,0	-2,0 – -4,0	-1,60 – -3,20
2	- 3,0	-4,0	-4,0	-3,20

Transformation of the Respective Abilitys (Women) Table 9

	X1 (Ym – Ye)	*X2 (Ym – Ye)*	*X3 (Ym – Ye)*	*X4 (Ym – Ye)*
6	+2,60	+ 2,0	+3,20	+2,80
5	1,30 – 2,60	1,0 – 2,0	1,60 – 3,20	1,40 – 2,80
4	1,30 – -1,30	1,0 – -1,0	1,60 – -1,60	1,40 – -1,40
3	-1,30 – -2,60	-1,0 – -2,0	-1,60 – -3,20	-1,40 – -2,80
2	- 2,60	-2,0	-3,20	-2,80

As a result of the study carried out on the strength development of competitors (male and female) in javelin throw we have developed example norms presented in Tables 10 and 11.

The Models of the Development of Javelin Throwers (Men) Table 10

Y	50	55	60	65	70	75	80	85	90
X1	40	50	60	72,5	85	95	105	115	130
X2	90	110	130	145	160	175	190	205	220
X3	55	70	85	100	115	130	140	150	160
X4	60	70	80	95	110	120	130	140	150

The Models of the Development of Javelin Throwers (Women) Table 11

Y`	40	45	50	55	60	65	70
X1`	30	40	50	60	70	80	90
X2`	40	60	80	100	120	140	160
X3`	40	50	60	72,5	85	97,5	110
X4`	40	45	50	62,5	75	87,5	100

4. Conclusion

Here is presented a unique opportunity for following up the qualification aspect of javelin throwers' strength development.

In order to achieve international level performances (over 80 m) with male javelin throwers their strength abilities should be measured as follows: barbell snatch - over 100 kg, squat - over 160 kg, clean turn – 140 kg, lying barbell clean – over 130 kg.

In order to achieve performances of high international level (over 60 m) with women with female javelin throwers their strength abilities should be measured as follows: barbell snatch - over 70 kg, squat - over 120 kg, clean turn – 90 kg, lying barbell clean – over 80.

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