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Original article

## COMPARATIVE STUDY OF SOMATIC AND MOTOR CHARACTERISTICS OF THE POLE VAULT ATHLETES PARTICIPANTS AT THE LAST EIGHT EDITIONS OF THE WORLD CHAMPIONSHIPS OUTDOOR

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### Abstract\*

*Aim.* Study bibliography; The collection and tabulation of the following parameters: performances, age, height and weight on pole vault athletes participating in the last eight editions of World Championships seniors outdoors; Processing statistical and mathematical data specified above, regarding the following indicators: number of cases, maximum value, minimum value, amplitude, mode, median, average, quartile 1, 3, quartile difference, dispersion, average of absolute deviation, standard deviation, coefficient of variation and correlation; Evaluation of the results and their interpretation.

*Methods:* As a research method we have used the case study, observation, statistics and graphics.

*Results:* After data processing have resulted 4 summary tables and 4 graphs.

*Conclusions:* Does not exist an increasing trend of performance in a World Championship to another. To get good results in international competitions men must obtain over than 5.80 m and women 4.75 m. The average age of pole volte athletes is between 26 and 27 years; The average height is 186.28 cm for men and 171.97 cm for women; The average weight is 78.45 kg for men and 59.45 kg for women; We have a slightly positive correlation between height and weight of athletes

*Keywords:* athletes, pole volte, high performance, statistics

### Introduction

The effort provided by the high jumpers, is a type of anaerobic alactacid. The small phosphocreatine (PC) deposit is that who supplies power for muscles for 7 to maximum 10 seconds. (Bompa, 2001)

As a general definition, we can say that the performance is "the result of human action superior to known results". (Țifrea, 2002) In evaluating athletes we must always take into account two fundamental components of human performance in general: the biological and psychological.

In this way the body composition corresponds to the structural components of the human body composed of elements of very different nature and density (bone, fat, water, protein), maintained in constant proportion and functionally integrated. (Cordun, 2011) In this way the precise knowledge of the athlete's height and weight and is welcome framing it in a test pattern.

### Methods

In this study we envisaged test pole volte that is performance level, age, height and weight of athletes. The study is transverse type, all measurements were taken with the date those competitions. It also has longitudinal character as most athletes have participated in several World Championships.

This paper presents the performance of

athletes at the last 8 editions of the World Championships and some of the athletes concerned somatic data (where they could be found). On this basis it could extract stable elements and exceptions in performance and somatic data. Material interest mainly specialists in the field, and future graduates with deepening athletics.

As objectives we have proposed:

- Study bibliography.

- The collection and tabulation of the following parameters: performances ([www.iaaf.org](http://www.iaaf.org)), age ([www.sports-reference.com](http://www.sports-reference.com)), height and weight ([www.european-athletics.org](http://www.european-athletics.org)) on pole vault athletes participating in the last eight editions of World Championships ([www.en.wikipedia.org](http://www.en.wikipedia.org)) seniors outdoors.

- Processing statistical and mathematical data specified above, regarding the following indicators: number of cases, maximum value, minimum value, amplitude, mode, median, average, quartile 1, 3, quartile difference, dispersion, average of absolute deviation, standard deviation, coefficient of variation and correlation. (A.B. Cărbunaru, 2009)

- Evaluation of the results and their interpretation.

As a research method we have used the case study, observation, statistics and graphics.

### Results

In what follows, we present the 4 tables and

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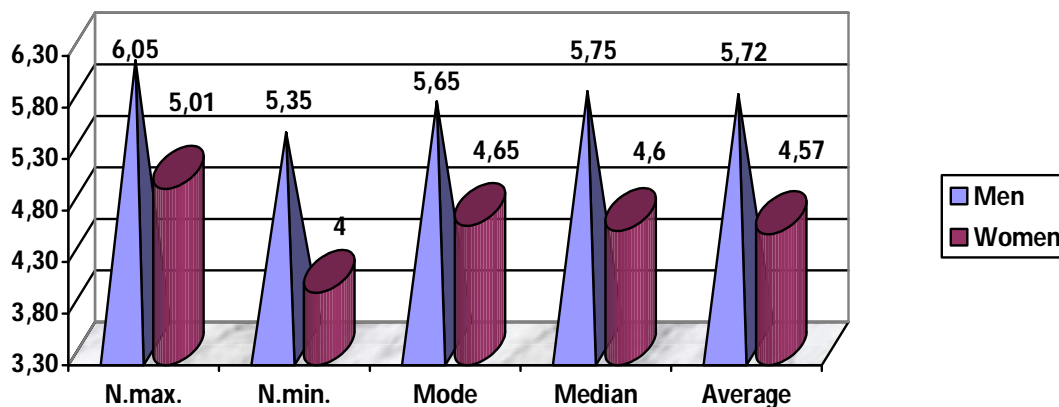
graphs representative research conducted.

Table 1: Statistics indicators of the women pole volte jumpers qualifications in last 8 World Championships

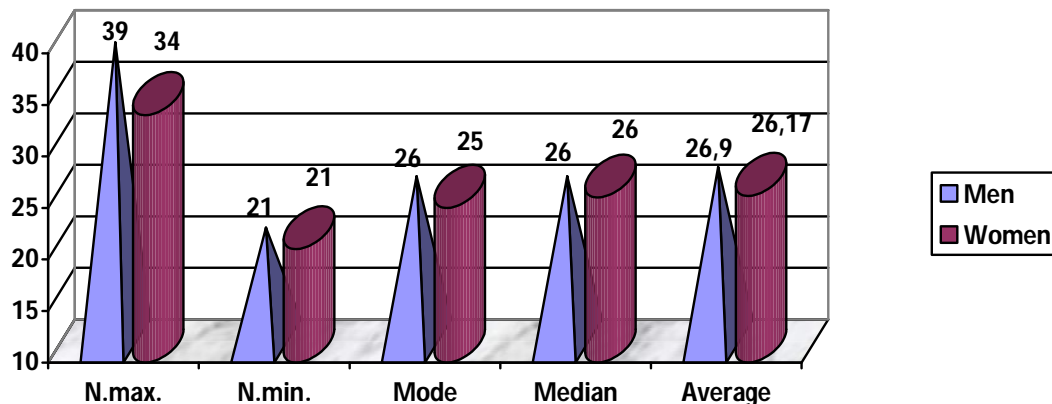
Indicators	Performance (m)	Age (years)	Height (cm)	Weight (kg)
N	215	215	178	177
N. max.	4,55	38	184	72
N. min.	4	17	159	50
Amplitude	0,55	21	25	22
Mode	4,55	26	172	57
Median	4,4	26	171	60
Average	4,370465	25,990698	170,9101	59,31638
Quartile 1	4,25	23	167	56
Quartile 3	4,55	29	174	63
Quartile difference	0,3	6	7	7
Dispersion	0,026	14,130146	37,30653	19,73041
Average of absolute deviation	0,134745	3,0052136	4,759879	3,855469
Standard deviation	0,161244	3,7590086	6,107907	4,441893
Coefficient of variation	3,689412	14,4629	3,573754	7,488475
Correlation*	0,201748	0,134165	0,0438876	0,631061

Table 2: Statistics indicators of the women pole volte jumpers final in last 8 World Championships

Indicators	Performance (m)	Age (years)	Height (cm)	Weight (kg)
N	91	91	83	83
N. max.	5,01	34	184	66
N. min.	4	21	159	50
Amplitude	1,01	13	25	16
Mode	4,65	25	172	57
Median	4,6	26	172	60
Average	4,578462	26,17582	171,9759	59,45783
Quartile 1	4,45	24	168	56,5
Quartile 3	4,7	28	174,5	64
Quartile difference	0,25	4	6,5	7,5
Dispersion	0,030569	9,573481	35,95123	19,7181
Average of absolute deviation	0,140085	2,494385	4,627958	3,983452
Standard deviation	0,17484	3,094104	5,995934	4,440507
Coefficient of variation	3,818752	11,82047	3,486497	7,46833
Correlation*	0,136194	-0,20879	-0,013283	0,538454



Graph 1 Statistics indicators of the pole volte jumpers performances in final at the last 8 World Championships



Graph 2: Statistics indicators of the pole volte jumpers age in final at the last 8 World Championships

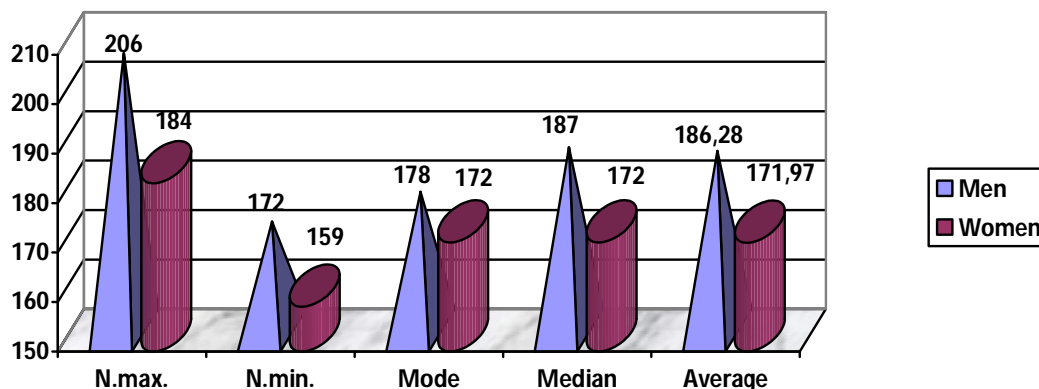
Table 3: Statistics indicators of the men pole volte jumpers qualifications in last 8 World Championships

Indicators	Performance (m)	Age (years)	Height (cm)	Weight (kg)
N	221	221	204	204
N. max.	5,7	40	206	96
N. min.	5,2	19	170	55
Amplitude	0,5	21	36	41
Mode	5,7	24	190	82
Median	5,55	26	186	79
Average	5,538462	26,497738	186,0784	78,63235
Quartile 1	5,4	24	182	75
Quartile 3	5,65	29	190	83
Quartile difference	0,25	5	8	8
Dispersion	0,019788	15,26357	39,49385	56,00454
Average of absolute deviation	0,118865	3,1603776	4,945021	5,836649
Standard deviation	0,140669	3,9068619	6,284413	7,483618
Coefficient of variation	2,539851	14,744134	3,377293	9,517225
Correlation*	0,062321	0,097456	0,0439066	0,743774

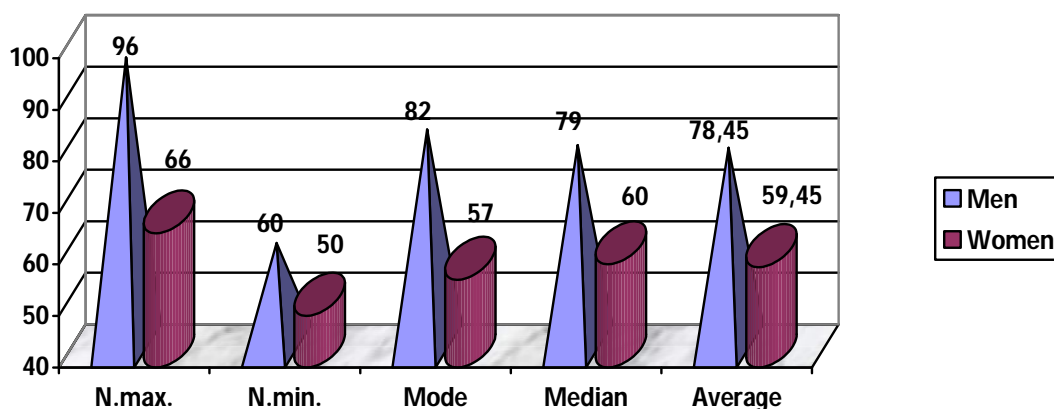
Table nr.4: Statistics indicators of the men pole volte jumpers final in last 8 World Championships

Indicators	Performance (m)	Age (years)	Height (cm)	Weight (kg)
N	99	99	99	99
N. max.	6,05	39	206	96
N. min.	5,35	21	172	60
Amplitude	0,7	18	34	36
Mode	5,65	26	178	82
Median	5,75	26	187	79
Average	5,720303	26,90909	186,2828	78,45455
Quartile 1	5,65	24	182	73
Quartile 3	5,815	29	191	83,5
Quartile difference	0,165	5	9	10,5
Dispersion	0,016902	12,85032	45,41496	68,85399
Average of absolute deviation	0,108154	2,874197	5,521069	6,651974
Standard deviation	0,130007	3,584734	6,739062	8,297831
Coefficient of variation	2,272737	13,32165	3,617651	10,57661
Correlation*	-0,06475	-0,10398	-0,070259	0,803692

\* - In order from left to right: correlation between performance and age, the correlation between performances and height, the correlation between performances and weight, the correlation between height and weight.



Graph 3: Statistics indicators of the pole volte jumpers height in final at the last 8 World Championships



Graph 4: Statistics indicators of the pole volte jumpers weight in final at the last 8 World Championships

### Discussions

Statistical indicators of results (tables 1, 2, 3 and 4):

- Compared with the 1993 data the best men performance in our study is 15 cm bigger. (A.N.E.F.S., 1993)

- The number of cases for women in the pole volte final (91) is lower than that of men (99) with 8.

- The amplitude of results in the pole volte final for women (1.01 m) is greater than that of men (0.70 m) with 0.31 m.

- The mode of performances in the pole volte final to the women is 4.65 m and for men 5.65 m.

- The median of performances in the pole volte final to the women is 4.60 m and for men 5.75 m.

- The average of performances in the pole volte final to the women is 4.57 m and for men 5.72 m.

- The middle interval (half of cases) in the pole volte final for women is lower than that of men, as follows: 0.25 m between 4.45 m and 4.70 m at the women and 0.16 m between 5.65 m and 5.81 m at the men.

- We have a very good homogeneity both women

(3.81%) and men (2.27%).

- Is there a lack of correlation between results and other parameters investigated.

Statistical indicators of age (tables 1, 2, 3 and 4):

- Compared with the 1993 data for best performance, age of men in our study is 2 years greater (26 years as compared to 24 years). (A.N.E.F.S., 1993)

- The number of cases for women in the pole volte final (91) is lower than that of men (99) with 8.

- Maximum age in the pole volte final for women (34 years) is lower than that for men (39 years) with 5 years.

- Minimum age in the pole volte final for women and men is 21 years.

- The amplitude of age in the pole volte final for women (13 years) is lower than that for men (18 years) with 5 years.

- The mode of age in the pole volte final to the women (25 years) is lower than that for men (26 years) with 1 year.

- The median of age in the pole volte final for women and men is 26 years.

- The average of age in the pole volte final to the



women (26.17 years) is lower than that for men (26.90 years) with 0.73 years.

- The middle interval (half of cases) in the pole volte final for women is lower than that of men, as follows: 4 years between 24 and 28 years at the women and 5 years between 24 and 29 years at the men.

- We have a medium homogeneity both women (11.82%) and men (13.32%).

- Is there a lack of correlation between age and other parameters investigated.

Statistical indicators of height (tables 1, 2, 3 and 4):

- Compared with the 1993 data, for the best performance, height of men in our study is 1 cm lower (182 cm compared to 183 cm). (A.N.E.F.S., 1993)

- The number of cases for women in the pole volte final (83) is lower than that of men (99) with 16.

- The amplitude of height in the pole volte final for women (25 cm) is lower than that for men (34 cm) with 9 cm.

- The mode of height in the pole volte final to the women is 172 cm and for men 178 cm.

- The median of height in the pole volte final to the women is 172 cm and for men 187 cm.

- The average of height in the pole volte final to the women is 171.97 cm and for men 186.28 cm.

- The middle interval (half of cases) in the pole volte final for women is lower than that of men, as follows: 6.50 cm between 168 and 174.5 cm at the women and 9 cm between 182 and 191 cm at the men.

- We have a very good homogeneity both women (3.48%) and men (3.61%).

- We have a lower positive correlation between the height and weight for women (0.53) and a good positive correlation for men (0.80).

Statistical indicators of weight (tables 1, 2, 3 and 4):

- Compared with the 1993 data, for the best performance, the weight of men in our study is bigger with 2 kg (82 kg compared to 80 kg).

- The number of cases for women in the pole volte final (83) is lower than that of men (99) with 16.

- The amplitude of weight in the pole volte final for women (16 kg) is lower than that for men (36 kg) with 20 kg.

- The mode of weight in the pole volte final to the women is 57 kg and for men 82 kg.

- The median of weight in the pole volte final to the women is 60 kg and for men 79 kg.

- The average of weight in the pole volte final to the women is 59.45 kg and for men 78.45 kg.

- The middle interval (half of cases) in the pole volte final for women is lower than that of men, as follows: 7.5 kg between 56.5 kg and 64 kg at the women and 10.5 kg between 73 kg and 83.5 kg at the men.

- We have a good homogeneity both women (7.46%) and men (10.57%).

### Conclusions

Does not exist an increasing trend of performance in a World Championship to another. To get good results in international competitions men must obtain over than 5.80 m and women 4.75 m.

The average age of pole volte athletes is between 26 and 27 years.

The average height is 186.28 cm for men and 171.97 cm for women.

The average weight is 78.45 kg for men and 59.45 kg for women.

We have a slightly positive correlation between height and weight of athletes.

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