# COMPARATIVE STUDY OF SOMATIC AND MOTOR CHARACTERISTICS ON HIGH JUMPERS PARTICIPANTS AT THE LAST FOUR OLYMPIC GAMES

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**ABSTRACT:** An overview of the athletes participating in the last 4 Olympic Games is welcome, as it helps in detaching certain key elements in the selection and preparation of our athletes, in the perspective o participation in Olympic Games Rio de Janeiro 2016. In this study we envisaged high jump test namely the performance level, age, height and weight of athletes. Data were included in Microsoft Excel of Microsoft Office and processed on the following statistical indicators: number of cases, the 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.
*Key words:* athletes, 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. [1]

As a general definition, we can say that the performance is "the result of human action superior to known results". [2] 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. [3] In this way the precise knowledge of the athlete's height and weight and is welcome framing it in a test pattern.

Many times in the sport's practice, while coaches respected the specific training method's guideline, worked with athletes selected by the constitutional model, they did not achieved the expected performance, because they neglected psychological component.

The goal of mental preparation for competitions, consists in forming for athletes, of a system of attitudes and behavior, with operational and regulative character through which it is flexible and adapts to contest's situations and opponents actions. [4]

## Materials and methods

In this study we envisaged test long jump 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 Olympiads.

This paper presents the performance of athletes at the last 4 editions of the Olympic Games 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.

This work has proposed that purpose, to separate the essential data for selection and training high performance athletes in the perspective of major international competition.

In this study I begin with the following hypotheses in order to be tested:
- The minimum and maximum performance is improving from one Olympics to the next;
- The average age of women differs by no more than 3 years from the men;
- The average height of women differs by no more than 15 cm from the men;
- The average weight of women differs by no more than 15 kg from the men;
- No significant differences regarding of statistical indicators trend men and women.

As research methods I used the case study, observation and statistics.

It has been processed the data of 132 women and 141 men Following data collection resulted in 376 performances and age, [5] 153 data on height and weight high jump athletes. [6]

## Results

In what follows, we present the 4 tables and graphs representative undertaken research.

**Table 1: Statistics indicators of the women high jumpers qualifications in last 4 Olympics**

| Indicators | Performance (m.) | Age (years) | Height (cm.) | Weight (kg.) |
|---|---|---|---|---|
| | 132 | 132 | 131 | 131 |
| . max. | 1,96 | 38,00 | 193,00 | 73,00 |
| . min. | 1,80 | 17,00 | 160,00 | 49,00 |
| mplitude | 0,16 | 21,00 | 33,00 | 24,00 |
| ode | 1,93 | 22 | 180 | 60 |
| edian | 1,90 | 26,00 | 180,00 | 60,00 |
| verage | 1,89 | 26,38 | 180,38 | 61,09 |
| uartile 1 | 1,85 | 23 | 176,5 | 58 |
| uartile 3 | 1,93 | 30 | 185,5 | 65,5 |
| uartile difference | 0,08 | 7,00 | 9,00 | 7,50 |
| ispersion | 0,002118 | 19,47773 | 41,51844 | 30,25115 |
| verage of absolute deviation | 0,038409 | 3,667126 | 5,005536 | 4,426898 |
| andard deviation | 0,046019 | 4,413358 | 6,443481 | 5,500105 |
| oefficient of variation | 2,431089 | 16,73071 | 3,572137 | 9,003045 |
| orrelation[*] | 0,054917 | 0,29066 | 0,1854098 | 0,792316 |

**Table 2: Statistics indicators of the women high jumpers final in last 4 Olympics**

| Indicators | Performance (m.) | Age (years) | Height (cm.) | Weight (kg.) |
|---|---|---|---|---|
| | 52 | 52 | 52 | 52 |
| . max. | 2,06 | 37,00 | 193,00 | 71,00 |
| . min. | 1,85 | 20,00 | 169,00 | 51,00 |
| mplitude | 0,21 | 17,00 | 24,00 | 20,00 |
| ode | 1,93 | 26 | 180 | 60 |
| edian | 1,96 | 26,50 | 181,00 | 61,00 |
| verage | 1,96 | 27,12 | 181,81 | 61,98 |
| uartile 1 | 1,93 | 24 | 178 | 59 |
| uartile 3 | 1,9925 | 30 | 186 | 66 |
| uartile difference | 0,06 | 6,00 | 8,00 | 7,00 |
| ispersion | 0,002424 | 14,02515 | 29,61686 | 19,67271 |
| verage of absolute deviation | 0,040377 | 3,12426 | 4,423077 | 3,595414 |
| andard deviation | 0,049235 | 3,745016 | 5,442138 | 4,435393 |
| oefficient of variation | 2,510753 | 13,81141 | 2,993348 | 7,156079 |
| orrelation[*] | -0,00477 | 0,118396 | 0,14803 | 0,829212 |

**Graphic 1 Statistics indicators of the high jumpers performances in final at the last 4 Olympics**
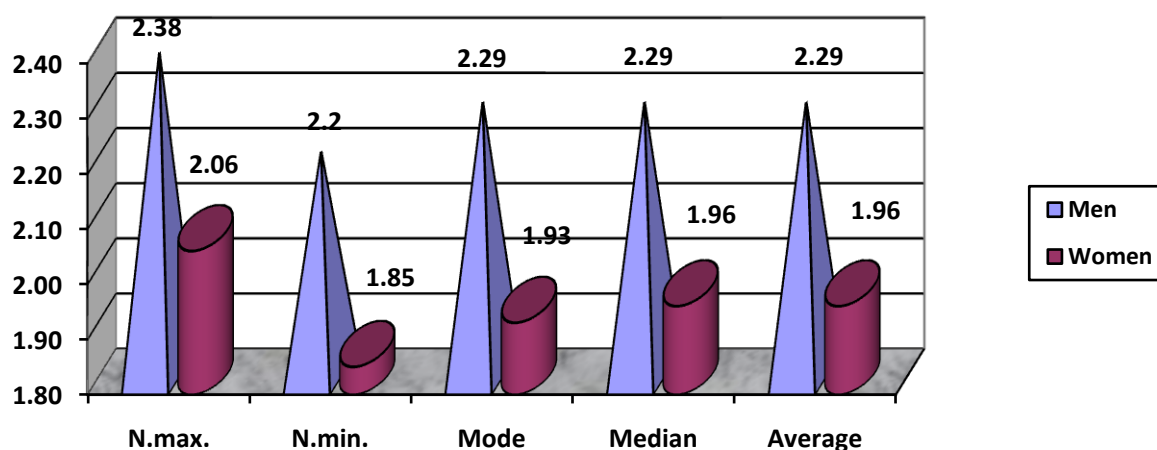
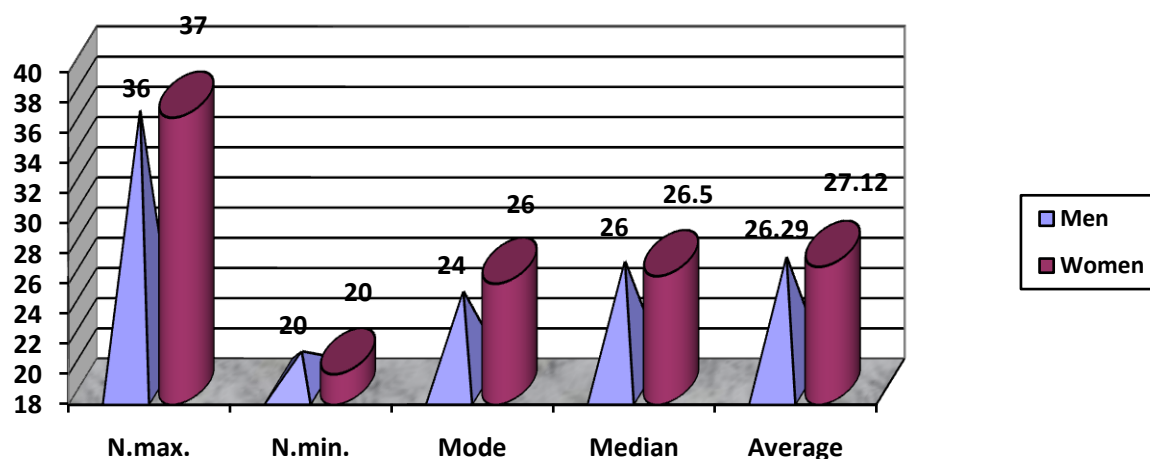**Graphic 2: Statistics indicators of the high jumpers age in final at the last 4 Olympics**



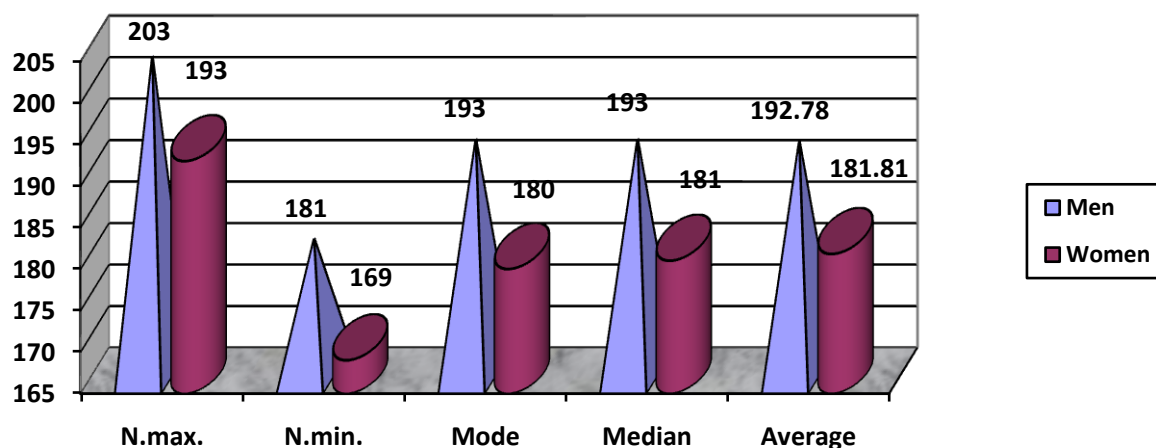**Table nr.3: Statistics indicators of the men high jumpers qualifications in last 4 Olympics**

| Indicators | Performance (m.) | Age (years) | Height (cm.) | Weight (kg.) |
|---|---|---|---|---|
|  | 141 | 141 | 139 | 139 |
| . max. | 2,29 | 37,00 | 204,00 | 97,00 |
| . min. | 2,10 | 18,00 | 178,00 | 60,00 |
| mplitude | 0,19 | 19,00 | 26,00 | 37,00 |
| ode | 2,2 | 25 | 190 | 82 |
| edian | 2,24 | 25,00 | 192,00 | 78,00 |
| verage | 2,22 | 25,77 | 191,88 | 76,66 |
| uartile 1 | 2,2 | 23 | 189 | 73 |
| uartile 3 | 2,27 | 28 | 196 | 82 |
| uartile difference | 0,07 | 5,00 | 7,00 | 9,00 |
| ispersion | 0,002558 | 13,38112 | 33,02272 | 44,38207 |
| verage of absolute deviation | 0,043747 | 2,896534 | 4,541483 | 5,429843 |
| andard deviation | 0,050575 | 3,658021 | 5,74654 | 6,661987 |
| oefficient of variation | 2,273744 | 14,1932 | 2,994785 | 8,690092 |
| orrelation[*] | 0,190848 | 0,119139 | 0,1109184 | 0,642988 |

**Table nr.4: Statistics indicators of the men high jumpers final in last 4 Olympics**

| Indicators | Performance (m.) | Age (years) | Height (cm.) | Weight (kg.) |
|---|---|---|---|---|
|  | 51 | 51 | 51 | 51 |
| . max. | 2,38 | 36,00 | 203,00 | 96,00 |
| . min. | 2,20 | 20,00 | 181,00 | 65,00 |
| mplitude | 0,18 | 16,00 | 22,00 | 31,00 |
| ode | 2,29 | 24 | 193 | 80 |
| edian | 2,29 | 26,00 | 193,00 | 80,00 |
| verage | 2,29 | 26,29 | 192,78 | 77,53 |
| uartile 1 | 2,25 | 24 | 190 | 73 |
| uartile 3 | 2,32 | 28,5 | 196 | 82 |
| uartile difference | 0,07 | 4,50 | 6,00 | 9,00 |
| ispersion | 0,00214 | 14,1684 | 24,20838 | 38,1707 |
| verage of absolute deviation | 0,036125 | 3,024221 | 3,78316 | 5,160323 |
| andard deviation | 0,046258 | 3,764093 | 4,920201 | 6,178244 |
| oefficient of variation | 2,021033 | 14,31534 | 2,552179 | 7,968904 |
| orrelation[*] | -0,00139 | -0,02007 | 0,003552 | 0,586221 |

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

**Graphic 3: Statistics indicators of the high jumpers height in final at the last 4 Olympics**



**Graphic 4: Statistics indicators of the high jumpers weight in final at the last 4 Olympics**
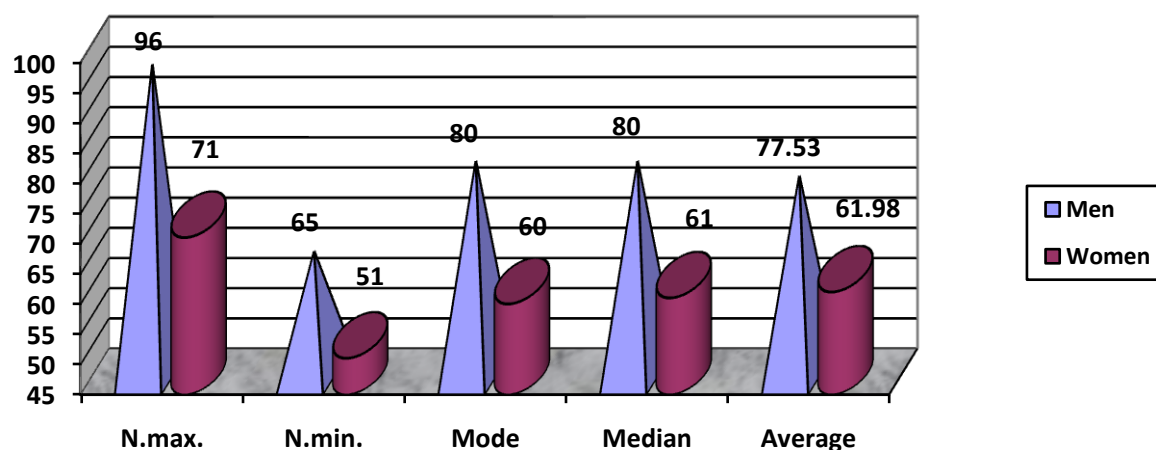


**Discussions**

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

- Compared with the 1993 data [7] the best female performance in study it is 3 cm bigger, and in men we have the same result.
- The number of cases for women (184) is lower than that of men (192) with 8.
- The amplitude of results in the high jump final for women (0.21 m) is greater than that of men (0.18 m) with 0.03 m.
- The mode of performances in the high jump final to the women is 1.93 m and for men 2.29.
- The median of performances in the high jump final to the women is 1.96 and for men 2.29.
- The average of performances in the high jump final to the women is 1.96 and for men 2.29.
- The middle interval (half of cases) in the high jump final for women is lower than that of men, as follows: 0.06 m between 1.99 m and 1.93 m at the women and 0.07 m between 2.32 m and 2.25 m at the men.
- We have a very good homogeneity both women (2.51%) and men (2.02%).

- 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 [7] for best performance, age of women in study is 8 years lower (22 years as compared to 30 years), and in men is 2 years bigger (26 years as compared to 24 years).
- The number of cases for women (184) is lower than that of men (192) with 8.
- Maximum age in the high jump final for women (37 years) is greater than that for men (36 years) with 1 year.
- Minimum age in the high jump final for women and men is 20 years.
- The amplitude of age in the high jump final for women (17 years) is greater than that for men (16 years) with 1 year.
- The mode of age in the high jump final to the women (26 years) is greater than that for men (24 years) with 2 years.
- The median of age in the high jump final to the women (26.5 years) is greater than that for men (26

years) with 0.5 years.

- The average of age in the high jump final to the women (27.12 years) is greater than that for men (26.29 years) with 0.83 years.

- The middle interval (half of cases) in the high jump final for women is bigger than that of men, as follows: 6 years between 30 and 24 years at the women and 4.5 years between 28.5 and 24 years at the men.

- We have a medium homogeneity both women (13.81%) and men (14.31%).

- 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 [7], for the best female performance, the height of women in our study is equal (178 cm), and in men is lower with 10 cm (192 cm compared to 202 cm).

- The number of cases for women (183) is lower than that of men (190) with 7.

- The amplitude of height in the high jump final for women (24 cm) is greater than that for men (22 cm) with 2 cm

- The mode of height in the high jump final to the women is 180 cm and for men 193 cm

- The median of height in the high jump final to the women is 181 cm and for men 193 cm

- The average of height in the high jump final to the women is 181.81 cm and for men 192.78 cm

- The middle interval (half of cases) in the high jump final for women is bigger than that of men, as follows: 8 cm between 186 and 178 cm at the women and 6 cm between 196 and 190 cm at the men.

- We have a very good homogeneity both women (2.99%) and men (2.55%).

**-** We have a good positive correlation between the height and weight for women (0.82), and a lower positive correlation for men (0.58).

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

- Compared with the 1993 data [7], for the best female performance, the weight of women in our study is bigger with 1 kg (60 kg compared to 59 kg), and in men is lower with 13 kg (67 kg compared to 80 kg).

- The number of cases for women (183) is lower than that of men (190) with 7.

- The amplitude of weight in the high jump final for women (20 kg) is lower than that for men (31 kg) with 11 kg

- The mode of weight in the high jump final to the women is 60 kg and for men 80 kg

- The median of weight in the high jump final to the women is 61 kg and for men 80 kg

- The average of weight in the high jump final to the women is 61.98 kg and for men 77.53 kg

- The middle interval (half of cases) in the high jump

final for women is lower than that of men, as follows: 7 kg between 66 kg and 59 kg at the women and 9 kg between 82 kg and 73 kg at the men.

- We have a good homogeneity both women (7.15%) and men (7.96%).

**Conclusions**

- There is not an increasing trend of performance from one Olympics to the next. To have chances for medals women athletes must achieve at over 2 m and men athletes over 2.30 m.

- The average age of high jumpers is between 26 and 27 years.

- It confirms the hypothesis about the height and weight of athletes.

- We have a slight positive correlation between the height and weight of athletes.

- It confirms the hypothesis regarding trend on statistical indicators.

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