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Comparison of Strength and Jumping Ability Characteristics Between Female Soccer Players and Female Non Players

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ABSTRACT

The purpose of this study was to evaluate and compare the jumping ability and strength of lower limbs between female soccer players and female non players. Participants were 16 students (n = 16) of Exercise Physiology Serres AUTH. The participants were divided into two groups based on their sporting activity. Group 1 were soccer players (n = 8) and group 2 were non-soccer players (n = 8). To measure the ground reaction forces used a force platform KISTLER (9281CA) and for recording the maximum isometric force the legs to the knee joint angle in the 120 degree used AMTI force platform. Participants in both groups performed a series of tests by performing maximum vertical jumps SJ, CMJ and DJ30. Finally maximum isometric force of the lower limbs tests was held. For the statistical analysis of the results used the independent t test with an index of significance p ≤ 0, 05. Also the correlation coefficient Pearson (r) used to calculate the correlations between the results (variables). The results showed that there was a statistically significant difference between groups at the maximum height of fall vertical jump, the reaction force ratio, the maximum isometric force. The results also showed that there is a statistically significant correlation, the F100 with the maximum power of the jump with no negative acceleration, the F100 with the maximum vertical jump height of fall, the F100 with touch time vertical jump fall of Fmax the maximum power and end between Fmax with the height of the vertical jump without negative acceleration.

KEYWORDS : jumping ability, maximal isometric strength, explosive power, female soccer players

INTRODUCTION

The female soccer is in bloom and there is limited research on physiological requirements and physical characteristics of soccer female athletes. There is an increased demand for scientific research on the female soccer in terms of athletes and soccer matches.

Women seem to cover similar distance during the game with this of men. For someone to succeed today in modern soccer, must have a high level of fitness and be able to meet the requirements of the game to be able to apply the technical and tactical skills in an entire match (Reilly, 1997).

Few studies have described the requirements of the female soccer (Krustrup et al., 2005; Mohr et al., 2008; Andersson et al., 2010). Furthermore, some studies have examined the activity profile during the match (Bangsbo, 1994). However, the main focus of the research was the total distance traveled, which is believed not the words that represent the physical condition of the athletes in the race because the majority of the game is covered by walking and running medium intensity and is not considered physically demanding.

The requirements of female soccer in this context, seems to be very similar to those of the game of men with high levels of aerobic capacity (Mohr et al., 2003) muscular strength and endurance (Wisløff et al., 1998), speed endurance, and agility (Little & Williams, 2003) that that seems to be essential for success in high level and the other men and women players.

METHODS

Sample

The participants were 16 students (n = 16) of Exercise Physiology Serres AUTH. The participants were divided into two groups based on their sporting activity. Group 1 were soccer athletes (n = 8) and group 2 were non-soccer athletes (n = 8). The age of participants ranged from 20-23 years (mean = 21,37 ± 0,05). The height of the participants for the group 1 (soccer players) were mean = 1,62 ± 6.6cm and group 2 (non-soccer players) were mean = 1,60 ± 5,1cm. Their weight, as regards the group 1 were 53,4 ± 10.60kg, while in group 2 were 51,4 ± 9.76kg.

Measuring Instruments

In this study used a custom-built multi-joint isokinetic machine (Ydro-

michaniki SA) of the biomechanics laboratory of the Physical Education and sports sciences department AUTH Serres with a forceplate AMTI (ADVANCED MECHANICAL TECHNOLOGY INSTRUMENTS-model number OR 6-6-4000, Serial number 5157, sampling 1000Hz).

For the assessment of jumping ability, the subjects performed a series of jumps on a force platform (Kistler 9281CA, Instrumente AG, Winterthur, Switzerland) sampling at 1000 Hz

Procedure
Vertical jump
The jumps were performed without the help of hands (to mediate) and examinees were trying to achieve the best possible performance. The series of jumps and breaks conducted to avoid effects of fatigue and negative impact on performance.

a) Maximum vertical jumps, (SJ). The number of attempts was 2 and the interval between 2-3 min.
b) Maximum vertical jump (CMJ). The number of attempts was 2 and the interval between 2-3 min.
c) Maximum f vertical jumps (DJ). The drop height was set at 30 cm. The number of attempts for each height was two and the interval between attempts 2-3 min.

Fmax Isometric
The measurement of the maximum isometric force of the lower limbs took place on the custom-built multi-joint isokinetic machine (Fmax-iso) angle 120^0 to the knee joint (3 attempts, during about 3sec, intermission between them 1min)

Variables
Vertical jump variables

Symbol	Unit of measurement	Variable
Fmax	N	Maximum vertical force
Tstir	ms	Touch time
Vmax	m/s	Maximum velocity
Vap	m/s	Take off velocity
Hmax	cm	Jump height

Table 1: Variables of (SJ)

Symbol	Unit of measurement	Variable
Fmax	N	Maximum vertical force
Tstir	ms	Touch time
Vmax	m/s	Maximum velocity
Vap	m/s	Take off velocity
Hmax	cm	Jump height

Table 2: Variables of (CMJ)

Symbol	Unit of measurement	Variable
Fmax	N	Maximum vertical force
Tstir	ms	Touch time
Vmax	m/s	Maximum velocity
Vap	m/s	Take off velocity
Hmax	cm	Jump height

Table 3: Variables of (DJ_{30}).

Also defined as variable the index reaction force SDS = (DJmax- SJ) / SJ x 100).

Variables assessing maximal isometric force
For analysis of maximal isometric force of the lower limbs were used the following variables.

Symbol	Unit of measurement	Variable
Fmaxiso	N	Maximum isometric force
tFmaxiso	N	Time of maximum isometric force
F30	N	Isometric force of 30ms
F60	N	Isometric force of 60ms
F100	N	Isometric force of 100ms
RFD	index	rate of force development index
Fmaxiso/BW	index	Relative strength index

Table 4: Variables of maximum isometric force

Statistical analysis
To investigate the quantitative characteristics of all testing methods used the descriptive statistics (mean, standard deviation and standard error of the mean). For the statistical analysis of the results used the independent t test. We used post hoc analysis, the index Tukey's, to see which averages pairs of groups differ significantly from the others. Finale the statistical inference used to calculate the correlations between the results (variables). Correlations were made using the correlation coefficient Pearson (r). Correlations between variables were calculated at a significance level of $p < 0,05$.

RESULTS
Vertical jumps
(DJ30hmax) a statistically significant difference between group 1 compared with group 2, $F = 17.515$ and $p = .017$.

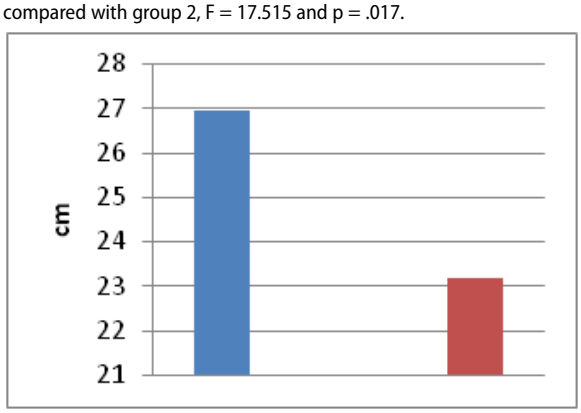

Figure 1 : Results of maximum vertical jump DJ30

Multi-joint isokinetic machine
(Fmaxiso) a statistically significant difference between Group 1 compared to Group 2, with $F = 17.515$ and $p = 0.50$.

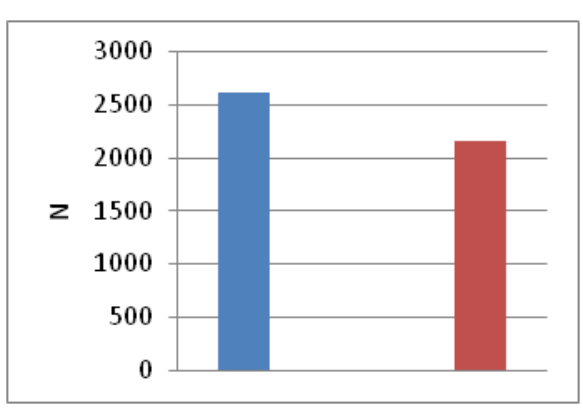

Figure 2: Fmax iso results

Results of correlation analysis

Correlations were made using the correlation coefficient Pearson (r). Correlations between variables were calculated at a significance level of p <0,05. The results showed a statistically significant correlation:

a) Between F100 and the maximum power of the jump SJ, with r = .704 p = .001

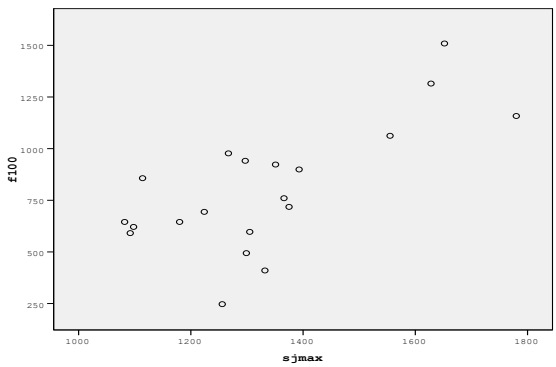

Figure 3: Correlation between F100 and maximum force of SJ

b) Between the F100 with the maximum vertical height of DJ30, with r = .474 p = .035

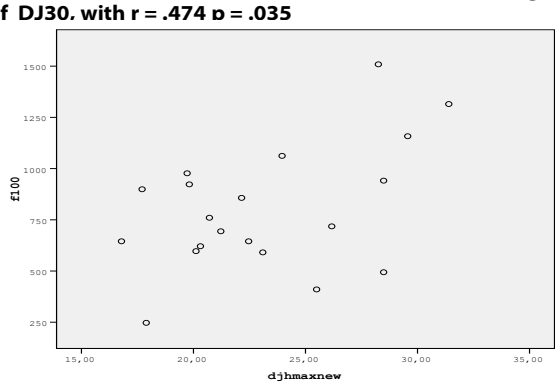

Figure 4: Correlation between F100 and maximum height of DJ30

c) Between the F100 and the touch time of DJ30, with r = .455 p = .044

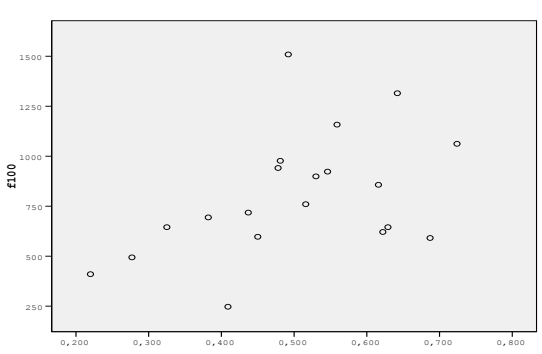

Figure 5: Correlation between F100 and touch time of DJ30

d) between Fmax and the maximum vertical height of SJ, with r = .602 and p = .005

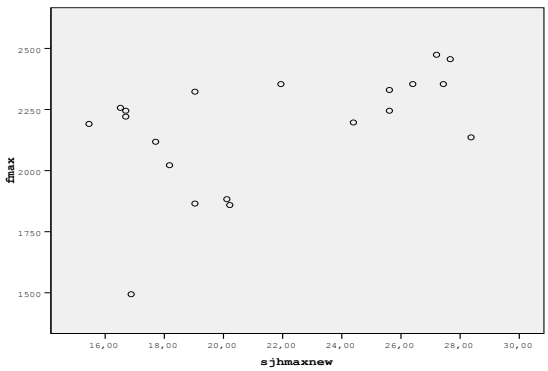

Figure 6: Correlation between F100 and maximum height of SJ

DISCUSSION

In the present study the level of performance characteristics related to jumping ability and strength between female soccer players and no players.

Vertical jumps

The results showed that there was statistically significant difference in the maximum vertical jump DJ30.

Jumping ability is influenced by the type of athletic activity (Kyrolainen & Komi, 1995; Vitasalo et al., 1998), the hardness of muscletendon system (Bojsen et al., 2005).

Soccer is a sport that the maximum power of the extensor muscles of the lower limbs and vertical jumping ability are very important parameters in the performance of athletes and their development has a very important part of the training of athletes from the early years of involvement with the sport.

The jumping ability of soccer players estimated 48-58 cm when measured by vertical jump (Foehrenbach et al. 1991; Islegen & Akguen 1988).

Geese (1990) found a positive correlation between the level of coaching and the height of the vertical jump without wobbling (increasing altikotitas rose as the competitive level) and takes values greater than 45 cm for satisfactory professional soccerers. However in Greek players found low values for jumping ability 38.9 ± 3.9 cm (Pylianidis and al., 1996).

The survey results are consistent with those of Mujika et al. (2009), who showed that the CMJ in relation to gender and competitive level was related to professional soccer athletes.

Maximum isometric strength

Regarding the maximum isometric force of the lower extremities, found a statistically significant difference between the two groups, which is observed in the literature in sport performance, place a long term increase in power up to 300%. The maximum power is qualitatively important to the performance of power because power is a product of force and velocity. Consequently an increase in 1RM (maximum output power) is normally associated with an increase in power.

Hollmann & Hettinger, 1990 reports an increase in isometric strength training. As a criterion used to control the performance on the dynamometer and not increase strength in a particular athletic movement. Isometric exercises do not meet the requirements of the more athletic moves put the mobility of the force. Only positive effect is to stabilize the level of force.

The maximum isometric strength and rate of force development are of great importance in various athletic populations. Among the coaches and sports scientists, there is a lack of agreement on how much power is needed to improve performance.

Correlation analysis
The results showed a statistically significant correlation, the F100 with the maximum power of the jump with no negative acceleration, the F100 with the maximum vertical jump height of fall, the F100 with time support vertical jump fall of Fmax the maximum power and finally between Fmax with the height of the vertical jump without negative acceleration.

By the above literature causality ought to RFD. The rate of force development (RAD), which is the ability to develop strength in a short time, is very important for athletes to their sport contains explosive movements (tae kwon do, sprinting, jumping, etc.) (Hakinnen & Komi, 1981).

CONCLUSION
From the present investigation it was found that women, who participate as athletes in soccer teams, greatly outweigh indicators of strength and jumping ability compared with women who do not participate in such sports.

The power output in a very short time and spot jumps occur very often in a soccer match and therefore subject to training women soccer for this reason greater than against those not involved in the sport of soccer.

The results of this study could not be generalized because the population sample was small and specific and needs further exploration and research to discover the mechanisms that led to adjustments in the present investigation.

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