SEASONAL VARIATION IN FITNESS VARIABLES IN PROFESSIONAL SOCCER PLAYERS

José Antonio Casajús, MD, PhD

Institute: Facultad de Educación
Universidad de Zaragoza

Adress: San Juan Bosco 7
50009 Zaragoza
SPAIN

Phone: 34 976 761301

e-mail: joseant@posta.unizar.es
Abstract

BACKGROUND: There have been many studies on soccer, but few evaluations of the physiological function of professional soccer players. The aim of this work was to evaluate seasonal variation -from September to February- in anthropometric and physiological variables in a Spanish professional soccer team (n=15). METHOD: anthropometric measurements were obtained following the standarised techniques adopted by the International Society for the Advancement of Kinanthropometry (ISAK). A maximal treadmill test with breath-by-breath gas analysis was carried out to evaluate the aerobic condition and a Jump test was used to measure muscle performance and strength in the lower limbs. RESULTS: There were no significant variations in body mass, although a statistically significant decrease (p<0.05) in fat percentage and sum of six skinfolds was observed. The somatotype (Heath-Carter) was mesomorphic without any change observed throughout the season. The mean \( \dot{V}O_2 \) max in the first test (65.5 ml.kg\(^{-1}\).min\(^{-1}\)) had not changed by the second one (66.4 ml.kg\(^{-1}\).min\(^{-1}\)). There were no significant differences in maximal heart rate (185 vs 185 beats.min\(^{-1}\)) and treadmill speed at \( \dot{V}O_2 \) max (16.1 vs 15.8 km.h\(^{-1}\)). At the anaerobic threshold, there were significant differences (p<0.05) in speed (12.4 vs 13.1 km.h\(^{-1}\)) and heart rate (164 vs 168 beats.min\(^{-1}\)) as the season progressed. When the data were expressed as a percentage of maximal values obtained, we observed that the speed in the first test was 77% and 83% in the second test. For heart rate, values were 89% and 91%, and for oxygen uptake 77% and 79%. The Jump test did not show any significant change during the season. CONCLUSIONS: We can conclude from these results that professional soccer players have good fitness from the beginning of the Spanish League -with a high \( \dot{V}O_2 \) max- and the changes observed depend on the initial values.

Keywords: Soccer, seasonal variation, anthropometry, physiology.
**Introduction**

Soccer is, from a physiological view, an activity demanding of each of the energy systems. As several authors have described (1,2,3) soccer is a sport characterised by high intensity short-term actions, with pauses of varying length in between. The duration of the match, 90 minutes, implies a large provision of energy by the aerobic system. It has been estimated, through measurement of heart rate, that the energy provision of the aerobic system during a match is between 70% and 80% (2,3,4). In laboratory conditions, this metabolic pathway is assessed mainly by measurement of the maximal aerobic power (\( \dot{V}O_2\max \)) and the “anaerobic threshold”. On the other hand, decisive actions are explosive and so anaerobic power is fundamental.

Although in recent years many studies on soccer have been published, very few focused on repeated measurements in professional soccer perhaps because professional soccer players are not frequent visitors to the laboratory for physiological capacity tests, except for health or contract reasons at the begining of the season.

As in all team sports where a ball is involved, it becomes rather difficult to propose physical tasks in a laboratory context that could be relevant to real action. Cycle ergometry lacks specificity for soccer players, but it has been pointed out (5) that the treadmill provides the appropriate mode of exercise for testing these athletes. Although there are some proposals of specific protocols for soccer (6,7), our experience is that soccer players adapt themselves perfectly to a progressive protocol, whether it is continuous or not.

In those sports where the competitive season lasts from 8 to 9 months, it becomes rather difficult to maintain an optimal physical fitness throughout, although maintaining fitness is a target for all the teams at the beginning of the championship. In that sense, very few studies deal with the changes of different training parameters in the laboratory during the soccer season (8).

The purpose of this study was to evaluate the changes in different anthropometric and physiological parameters, obtained in two separated stages during the league championship (September and February) in a Spanish professional, high level, soccer team.
Materials and Methods

Subjects
The sample consisted of 15 male soccer players from the Spanish First Division (La Liga) with excellent national and international results. The first test session was conducted at the beginning of the championship (in September, after five weeks of training), and the second session at the beginning of the second round of the championship (in February). During that time, players trained daily as usual and played one or two official matches weekly (national and/or international).

Prior to each exercise test the soccer players had to undergo medical examination, which included blood analytical screening, ECG at rest, basal lung function tests and blood pressure measurements.

Anthropometric measurements
Fourteen anthropometric variables (stature, body mass, biepicondylar humerus and femur width, arm flexed and tensed and calf girths, and triceps, subscapular, supraspinale, abdominal, front thigh and medial calf skinfolds) were obtained on all subjects by the author, following the standardised techniques adopted by the International Society for the Advancement of Kinanthropometry (ISAK) (9,10,11). The Technical Error of Measurement (TEM) was lower than 5% for skinfolds and lower than 2% for the other measurements. Anthropometric instruments used in this study included a stadiometer, balance, small sliding caliper (Rabonne Chesterman. Silverflex.U.K.), anthropometric tape (GPM Siber-Hegner Maschinen. Switzerland) and skinfold caliper (Holtain. Holtain LTD. Crymych U.K.). Percentage fat was estimated according to Carter’s equation (12) used in the study of body composition in the Montreal Olympic Games Anthropological Project. The Heath-Carter anthropometric method was used for somatotyping (13,14,15).

Aerobic test
Each subject performed an incremental (ramp pattern) exercise test on a treadmill (Jaeger Laufergotest) for determination of exercise capacity, lactate threshold (Tlac, by means of V-Slope method) (16,17) and peak oxygen uptake (peak \( \bar{VO}_2 \), defined as the \( \bar{VO}_2 \) averaged over the last 30 seconds of exercise). After a 10 or 15 minutes warm-up, the test began at a 3% grade and a speed of 8 km.h\(^{-1}\). The grade was held constant and the speed increased 1
km.h\(^{-1}\) every minute until exhaustion. The heart rate was monitored electrocardiographically and displayed simultaneously on the screen of the oscilloscope (Hellige Servimed). Gas exchange measurements were made breath-by-breath during the test and for three minutes of the recovery (Medical Graphics- Cardiopulmonary Exercise System CPX).

**Jump test**

Four performance tests according to Bosco (18,19) were included to evaluate the explosive power of the leg extensor muscles on a force platform connected with a digital timer (0.001 s.) (Ergo-jump Bosco System, Made by Globus.). The tests used were Squat Jump (SJ), Counter-Movement Jump (CMJ), “With Arms Movement Jump”(WAMJ) and the 15-seconds test. For the squat jump the subject jumped vertically from a squatting position, legs bent at 90°, without using his arms. In the CMJ the subject jumped vertically from a standing position, without using his arms (arms at both sides, on the hip). In the WAMJ the player jumped vertically from a standing position, using his arms helping to increase the height of the jump. Finally in the 15- seconds jumping test, the player jumped as in CMJ for 15 seconds to allow estimation of the maximal mechanical power of the leg extensor muscles during jumping.

All subjects went through two training sessions to familiarise themselves with the tests. The tests were completed three times and the best technically performed was recorded for the SJ, CMJ and WAMJ. The 15-seconds test was performed only on a single occasion.

**Statistical methods**

The results are given as means ± SD. Differences between the first and second tests were determined by tests-t for paired data. A probability level of 0.05 was chosen.
Results

The characteristics of the players in age, stature, body mass, body composition and somatotype are given in the Table 1. The significant differences in age reflected the time that had passed between the tests, whilst values in stature and mass remained unchanged. The sum of the six skinfolds showed a remarkable decrease, statistically significant, by the second test occasion. The analysis of single skinfold thickness values showed significant differences in supraspinale and medial calf. This decrease in the sum of skinfolds accorded with a lowering of body fat percentage. The mean somatotype in both occasions was mesomorphic, without significant differences in the components, although a clear drop in endomorphy was evident at the second test. Fourteen players did the treadmill test on the first occasion and eleven on the second occasion (two goalkeepers and one forward dropped out). The statistical analysis of the exercise test data was made with eleven pairs.

At the “anaerobic threshold”, there were significant differences in speed (12.4 ±1.5 km.h⁻¹ in the first test and 13.1±1.4 km.h⁻¹ in the second) and heart rate (164 vs 168 beats.min⁻¹) (Table 2). There was also an increase in oxygen uptake in the second test, though without reaching significance. If these data are expressed as a percentage of maximal values, the speed in the first test was 77% and in the second 83%. For heart rate, values were 89% and 91%, and for oxygen uptake 77% and 79%. Maximal speed at \( \dot{V}O_2\text{max} \) was 16.1±1.4 km.h⁻¹ in the first test and 15.8±1.2 km.h⁻¹ in the second (Table 2). More or less the same maximal heart rate was observed on both occasions (185 beats.min⁻¹), and the slight increase in maximal oxygen uptake (65.5 vs 66.4 ml.kg⁻¹.min⁻¹) was not significant. There were no significant differences in any of maximal measures.

The jump tests (Table 3) did not show any significant differences either between both test occasions. There was a small increase of 1.7 watts.kg⁻¹ in the 15-second jump test at the second test occasion.
Discussion

The regular and periodic testing of professional soccer players has proved to be rather difficult as the present results show. From the 21 members of the team, 18 came to the first test, 17 to the second, 15 performed both, but only 11 went through all the tests in both phases. An excessive number of matches, frequent injuries, the continuous travelling and the lack of habit in professional players of going through physiological tests in laboratory conditions, made this task difficult.

The stature and body mass of the soccer players in this study (1.80±0.07 m and 78.5±6.6 kg) are similar to those reported in the literature, only being a little heavier than those described as typical (20).

The study of body composition is important in those sports where body weight must be moved repeatedly against gravity. Among the various methods of assessing body composition, the bicompartimental anthropometric method is most frequently used in soccer. Although there is no specific formula to estimate fat percentage in soccer players (probably Faulkner’s being the most frequent), Carter’s method was chosen because it uses six skinfold thicknesses -triceps, subscapular, supraspinale, abdominal, front thigh and medial calf- and also because it has been employed in different anthropometric projects concerned with Olympic athletes. The mean percentage body fat in this sample (8.2%) was slightly above that reported by us for the Spanish Soccer team participating in the 1990 World Cup (21).

The profile or sum of the six skinfolds thickness is another simple technique to evaluate body composition and fat distribution. International soccer players have values of 50 mm (22), a sum which is similar to the present value. Novack (23), cited by Carter and Yuhasz (24), reported a sum of 46.4 mm in Olympic soccer players in Munich 1972. The results of this study are similar to those obtained for other team sports such as field hockey, 55.1 mm (24). The mean somatotype was mesomorphic (2.4-4.8-2.3). Comparing this with other soccer teams (Table 4) the somatotypes are similar, only slightly different from the English team, which appears to be more ectomorphic and less mesomorphic. A soccer player’s typical somatotype is characterized by a muscular make up, a fact that could be connected with great muscle power, and whose morphological configuration is nearer to that of sprinters (1.7-5.1-1.9) than to long distance runners (1.4-4.2-3.7) (12). From the first to the second tests, the training influence upon body composition is notable in a fat reduction and increase in fat free
mass, with hardly any variation in body mass. There was a significant reduction in the sum of six skinfolds and in fat percentage. These data show that body mass gives incomplete information with respect to body composition.

The treadmill is the most appropriate ergometer in the evaluation of soccer players. The results referring to the speed reached on the treadmill at $\dot{V}O_2_{\text{max}}$ (maximum speed) and “anaerobic threshold” speed, can hardly be compared to other studies as the protocols differ. In this study the grade was held constant (3%) and the speed increased 1 km.h$^{-1}$ every minute until exhaustion.

The average values of $\dot{V}O_2_{\text{max}}$ for top-level players tend to be high, as they allow a high intensity of exercise throughout the match. Several studies have determined the $\dot{V}O_2_{\text{max}}$ for top level players as between 51-69 ml.kg$^{-1}$.min$^{-1}$ (Table 5). In a study by Bangsbo (3) of Danish top-class players, no differences in $\dot{V}O_2_{\text{max}}$ were observed between regular and non-regular first team members. In that case players obtained mean values of 60.4 and 60.5 ml.kg$^{-1}$.min$^{-1}$ respectively which, according to the author, indicates that this variable is not crucial to high performance in soccer. Furthermore, Faina et al. (25) found that amateur soccer players had a higher aerobic power than professionals (64.1 and 58.9 ml.kg$^{-1}$.min$^{-1}$, respectively), and Roi et al. (26) did not find a significant relation, in an Italian team, between the $\dot{V}O_2_{\text{max}}$ and the final position obtained in the league. Nevertheless, data for Hungarian players (27) showed a high rank-order correlation between mean $\dot{V}O_2_{\text{max}}$ of the team and finishing position in the Hungarian First Division Championship. In this study the $\dot{V}O_2_{\text{max}}$ (65.5 ml.kg$^{-1}$.min$^{-1}$, range: 44.6-80.0) is within the expected values in international soccer players, being, in the case of a midfielder, nearer to the values of middle distance runners tested in our laboratory (88.1 ml.kg$^{-1}$.min$^{-1}$ -Gold Medal in Barcelona 1992-). The mean values found in the literature vary between 50-65 ml.kg$^{-1}$.min$^{-1}$, showing a large variation according to differences in standard of play and positional role (usually the midfielders have higher aerobic power values than the players in other positions, 25,28). The maximal heart rate of 185 beats.min$^{-1}$ is similar to that reported by Malomski (29) in a laboratory test on the treadmill. In competition, maximal heart rates of 185-190 beats.min$^{-1}$ are reached (30,31,32).

No significant differences in maximal values were found throughout the season. These results disagree with those of Nowacki et al. and others (4,6,33), where an increase in $\dot{V}O_2_{\text{max}}$ was observed. Possibly, the $\dot{V}O_2_{\text{max}}$ on the first occasion was so high that it was difficult to effect
an improvement during the season. Roi et al. (26) did not observe significant differences in Italian soccer players for several years. Also, Bangsbo and Mizuno (34) did not find significant changes in oxygen uptake in four soccer players who alternated rest and training periods (3 weeks detraining vs 4 weeks retraining), but they did find significant variations in 20 Danish players who had a 7-week training before a European Cup tournament (3).

Anaerobic threshold may be defined as the work-load just below the point where steady-state exercise can continue for a prolonged time. In this study the speed at the ventilatory anaerobic threshold was 12.4 km.h\(^{-1}\) in the first test and 13.1 km.h\(^{-1}\) in the second. Some authors locate the anaerobic threshold between 13.5 and 15 km.h\(^{-1}\) (3,4,33,35). Bangsbo (4) established a blood lactate accumulation of 3 mmol.l\(^{-1}\), at 11.77 km.h\(^{-1}\) with a 5% grade. This discrepancy between results could be due to the grade used in the protocol. As a percentage of maximal values, oxygen uptake, heart rate and speed were higher than in other Spanish soccer players (33) and 77% \(\dot{VO}_2\)\(_{max}\) in English League First Division players (36). These values, as a percentage at the anaerobic threshold, should be at the same level of or above the means obtained during a soccer match, 75-80% \(\dot{VO}_2\)\(_{max}(2,5)\) and 85-90 % maximal heart rate (31,37,38).

There were significant differences in speed and heart rate at the “anaerobic threshold” between the first and second tests and a slight, statistically non-significant, increase in oxygen uptake. These results may be related to low initial fitness and a positive influence of training upon aerobic fitness. At the beginning of the second round of the championship the team’s aerobic profile was highly satisfactory, gaining third place and winning the King Cup. These results showed modifications at the anaerobic threshold during the championship as has been reported by several authors previously (3,4,6,33,39).

The mean values of anaerobic power were similar to those reported by Bosco (40) and Faina et al. (25) in Italian professional soccer players. Faina et al. and Bosco (40) reported mean values of 34.2±4 cm in squat jump and 38.4 cm respectively. In a Finnish study (41) values of 42.5±2.5 cm in CMJ and 49.3±4.3 cm in the WAMJ were reported. The elastic component of this performance (6.44%) was slightly lower than that reported in other sports (42) and in soccer (25). For the 15-second jump test the results were similar to those obtained in other studies, being around 26-27 watts.kg\(^{-1}\) (42). Taïna and colleagues observed in this type of exercise higher values for anaerobic power (SJ=45±2.16, SCM=53.3±1.24, WAMJ=65.3±2.05) but they did not use the Ergo-Jump Bosco System (43).
There were no significant differences between the first and second jump tests. Lack of seasonal variations in vertical jumping was also shown by Reilly (44) in English professional soccer players, whose performance in this test improved as soon as the competitive season was underway, after which no further changes were noted.

In summary, although physiological testing in laboratory conditions enables an evaluation of soccer players’ fitness to be conducted, monitoring throughout the season is quite complicated because of the championship’s demands. From the beginning of the season, professional soccer players seem to have a good fitness level, with a high $\text{VO}_2\text{max}$, which is maintained for 6-8 months. The changes observed during the season show a great dependence on the initial values. In this study variations were observed only in body composition and in “anaerobic threshold”.
References


**Table 1** - Age, stature, body mass, body composition and somatotype.

<table>
<thead>
<tr>
<th></th>
<th>First test</th>
<th>Second test</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>25.8 ± 3.19</td>
<td>26.3 ± 3.15</td>
<td>*</td>
</tr>
<tr>
<td>Stature (m)</td>
<td>1.80 ± 0.07</td>
<td>1.80 ± 0.08</td>
<td></td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>78.6 ± 6.60</td>
<td>78.5 ± 6.45</td>
<td></td>
</tr>
<tr>
<td>Σ 6 Skinfolds (mm)</td>
<td>57.0 ± 8.67</td>
<td>52.9 ± 8.61</td>
<td>*</td>
</tr>
<tr>
<td>Body fat %</td>
<td>8.6 ± 0.91</td>
<td>8.2 ± 0.91</td>
<td>*</td>
</tr>
<tr>
<td>LBM (kg)</td>
<td>71.9 ± 6.01</td>
<td>72.1 ± 5.77</td>
<td></td>
</tr>
</tbody>
</table>

**Somatotype:**
- Endomorphy: 2.6 ± 0.54, 2.4 ± 0.52
- Mesomorphy: 4.9 ± 0.85, 4.8 ± 0.88
- Ectomorphy: 2.3 ± 0.72, 2.3 ± 0.73

Values are means ± SD
* Significant differences (p<0.05) between first and second test

**Table 2** - Maximal data and ventilatory anaerobic threshold

<table>
<thead>
<tr>
<th></th>
<th>First test (n=14)</th>
<th>Second test (n=12)</th>
<th>N=1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximal data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (km.h⁻¹)</td>
<td>16.1 ± 1.4</td>
<td>15.8 ± 1.2</td>
<td></td>
</tr>
<tr>
<td>Heart rate (beats.min⁻¹)</td>
<td>185 ± 4.0</td>
<td>185 ± 7.0</td>
<td></td>
</tr>
<tr>
<td>VO₂ (ml.kg⁻¹.min⁻¹)</td>
<td>65.5 ± 8.0</td>
<td>66.4 ± 7.6</td>
<td></td>
</tr>
<tr>
<td>VO₂ (l.min⁻¹)</td>
<td>5.1 ± 0.4</td>
<td>5.20 ± 0.76</td>
<td></td>
</tr>
<tr>
<td><strong>Anaerobic threshold</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (km.h⁻¹)</td>
<td>12.4 ± 1.5</td>
<td>13.1 ± 1.0</td>
<td>*</td>
</tr>
<tr>
<td>Heart rate (beats.min⁻¹)</td>
<td>164 ± 6.0</td>
<td>168 ± 6.0</td>
<td>*</td>
</tr>
<tr>
<td>VO₂ (ml.kg⁻¹.min⁻¹)</td>
<td>50.2 ± 8.0</td>
<td>52.7 ± 8.5</td>
<td></td>
</tr>
</tbody>
</table>

Values are means ± SD
* Significant differences (p<0.05) between first and second test (n=11)
### Table 3- Jump test.

<table>
<thead>
<tr>
<th></th>
<th>First test</th>
<th>Second test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squat Jump (cm)</td>
<td>39.0 ± 3.3</td>
<td>39.2 ± 3.1</td>
</tr>
<tr>
<td>Counter-Movement Jump (cm)</td>
<td>41.4 ± 2.7</td>
<td>40.8 ± 2.7</td>
</tr>
<tr>
<td>CMJ-SJ ratio %</td>
<td>6.4 ± 6.8</td>
<td>4.5 ± 8.3</td>
</tr>
<tr>
<td>With Arms Movement Jump (cm)</td>
<td>47.8 ± 2.9</td>
<td>46.7 ± 2.8</td>
</tr>
<tr>
<td>WAMJ-CMJ ratio %</td>
<td>15.8 ± 6.1</td>
<td>14.9 ± 6.7</td>
</tr>
<tr>
<td>15 sec ( watts.kg(^{-1}))</td>
<td>26.1 ± 3.7</td>
<td>27.8 ± 2.9</td>
</tr>
</tbody>
</table>

Values are means ± SD

### Table 4.- Somatotype of soccer teams.

<table>
<thead>
<tr>
<th>Reference</th>
<th>n</th>
<th>Somatotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present work</td>
<td>15</td>
<td>2.4 - 4.8 - 2.3</td>
</tr>
<tr>
<td>Brazilian National Team (45)</td>
<td>20</td>
<td>2.6 - 4.7 - 2.3</td>
</tr>
<tr>
<td>French League, First Division (46)</td>
<td></td>
<td>2.8 - 5.0 - 2.4</td>
</tr>
<tr>
<td>English League, First Division (36)</td>
<td>17</td>
<td>2.6 - 4.2 - 2.8</td>
</tr>
<tr>
<td>Top Hungarian Soccer Players (27)</td>
<td></td>
<td>2.1 - 5.1 - 2.3</td>
</tr>
<tr>
<td>Portuguese League, First Division (47)</td>
<td>24</td>
<td>2.8 - 5.6 - 2.2</td>
</tr>
<tr>
<td>Spanish National Team (21)</td>
<td>17</td>
<td>2.2 - 5.1 - 1.9</td>
</tr>
<tr>
<td>Spanish League, Second Division (22)</td>
<td>17</td>
<td>2.5 - 4.9 - 2.2</td>
</tr>
</tbody>
</table>

Values are means ± SD
Table 5.- Maximal oxygen uptake in top level soccer players testing in treadmill

<table>
<thead>
<tr>
<th>Author</th>
<th>Team</th>
<th>N</th>
<th>Maximal oxygen uptake (ml.kg⁻¹.min⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Work</td>
<td>Spanish First Division</td>
<td>14</td>
<td>65.5 ± 8.0</td>
</tr>
<tr>
<td>Hollman et al. (48)</td>
<td>German National Team</td>
<td>17</td>
<td>62.0 ± 4.5</td>
</tr>
<tr>
<td>Faina et al. (25)</td>
<td>Italian professionals</td>
<td>27</td>
<td>58.9 ± 6.1</td>
</tr>
<tr>
<td>Apor P. (27)</td>
<td>Hungarian First Division</td>
<td>10</td>
<td>66.3 ± 3.8</td>
</tr>
<tr>
<td>Rahkila et al. (41)</td>
<td>Finnish National Team</td>
<td>31</td>
<td>56.3 ± 3.0</td>
</tr>
<tr>
<td>Bangsbo et al. (28)</td>
<td>Danish semi and professionals</td>
<td>14</td>
<td>60.0 ± 1.0</td>
</tr>
<tr>
<td>Puga et al. (49)</td>
<td>Italian First Division</td>
<td>19</td>
<td>59.6 ± 4.5</td>
</tr>
<tr>
<td>Roi et al. (26)</td>
<td>Italian Professionals</td>
<td></td>
<td>51.2 ± 4.1</td>
</tr>
<tr>
<td>Matkovic et al. (50)</td>
<td>Croatian First Division</td>
<td>44</td>
<td>52.1 ± 10.7</td>
</tr>
<tr>
<td>Malomsoki (29)</td>
<td>Hungary</td>
<td>11</td>
<td>62.7 ± 5.2</td>
</tr>
<tr>
<td>Ramos et al. (33)</td>
<td>Spanish First Division</td>
<td>12</td>
<td>61.1 ± 6.7</td>
</tr>
<tr>
<td>Gonzalez-Ruano (51)</td>
<td>Spanish Olympic Team</td>
<td>35</td>
<td>55.9 ± 3.0</td>
</tr>
</tbody>
</table>

Values are means ± SD