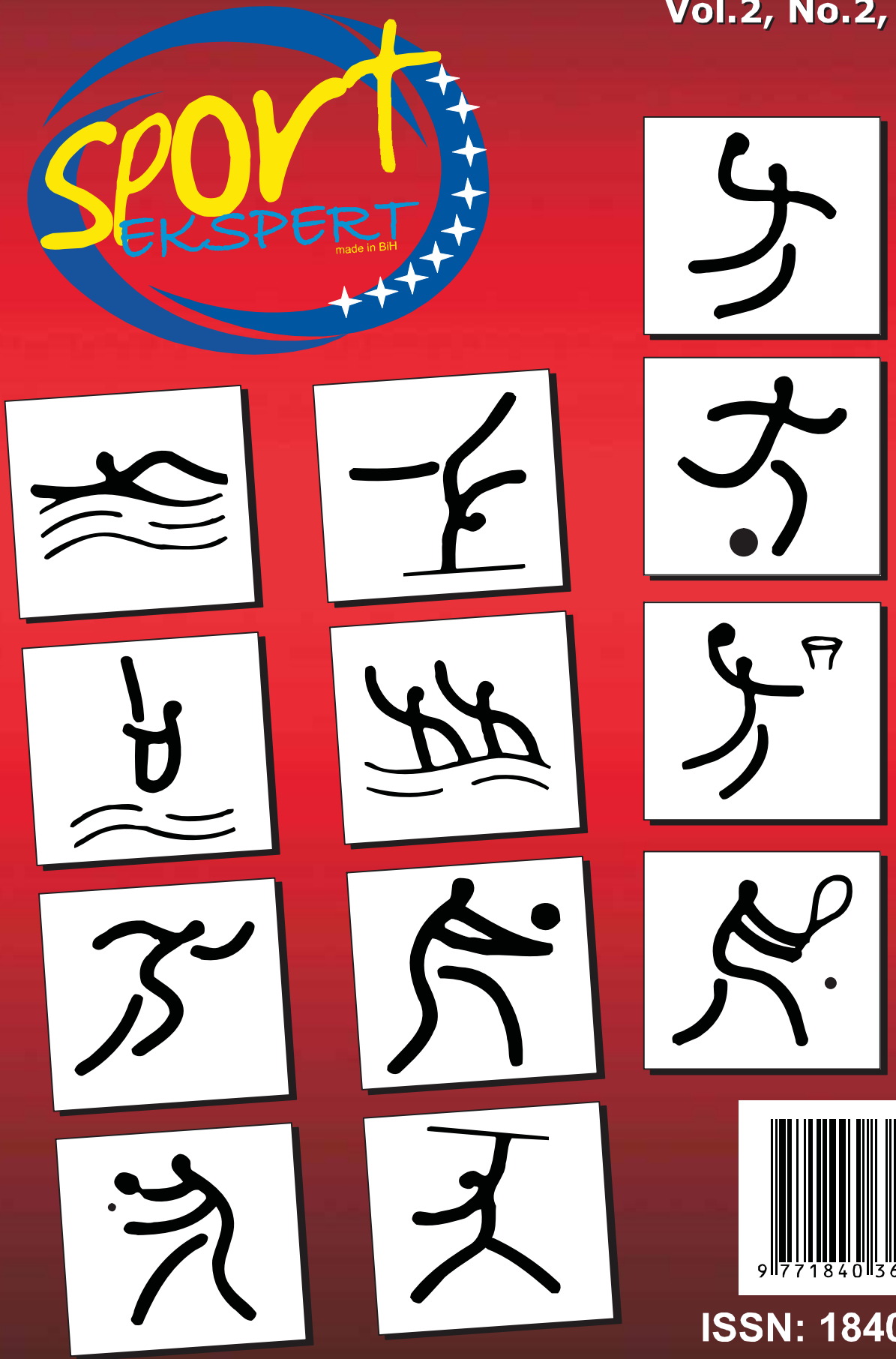
# SportEkspert

Stručni časopis iz oblasti tjelesnog odgoja i sporta

Vol.2, No.2, 2009



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ISSN: 1840 - 3638

STRUČNI ČASOPIS IZ OBLASTI TJELESNOG ODGOJA I SPORTA
JOURNAL OF APPLIED PHYSICAL EDUCATION AND SPORT

www.sportekspert-upfk.com


ISSN: 1840 – 3638 (print)
ISSN: 1840 – 4553 (online)
COBISS.BH – ID 16802310
Indexed in: COBISS.BH (http:// www.cobis.ba)
Indeks Copernicus (http:www.journals.indexcopernicus.com)
EBSCO (http://www.ebscohost.com)

# SPORTEKSPERT


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| **Tiraž**<br>**Copies** | **250 primjeraka**<br>**250 copies** |
| **Štampa**<br>**Printed by** | **TOP LIDER d.o.o. Sarajevo** |

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**Sportekspert is journal of applied sport and physical education published twice a year in Bosnian language with English abstract. Journal publishes physical education and sport applied articles.**

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# Sadr aj/contents

# EXERCISE PRACTICE, FOOD INTAKE HABITS AND CARDIOVASCULAR RISK FACTORS IN COLLEGE STUDENTS. A PRELIMINARY STUDY.

**Inmaculada C Martínez Díaz[1], Luís Carrasco Páez[1], Borja Sañudo Corrales[1], Moisés de Hoyo Lora[1], Nicolae Ochiana[2]**
**[1]Department of Physical Education and Sport. University of Seville. Spain.**
**[2]Faculty of Sport, Movement and Health Science. University of Bacau. Romania.**

## *Abstract*

The aim of this investigation were to determine the level of physical activity practice and to define the presence of cardiovascular risk factors associated with body composition and caloric intake in college students. A total of 81 college students (38 and 41 females and males, respectively) were submitted to a complete evaluation that consisted of an analysis of food-intake behavior, measures of several body composition variables (height, weight, body mass index, fat and muscle mass, waist and hip circumferences, waist-hip ratio, and sum of 6 skinfolds), blood pressure assessment, and physical activity level calculation. The results show sex differences in blood pressure and body composition variables; although an optimal food-intake patterns, a high level of physical activity practice and the absence of cardiovascular risk factors seem to generate healthy profiles in this population.

**Keywords:** cardiovascular risk factors, food-intake patterns, physical activity, college students.

## *INTRODUCTION*

Cardiovascular diseases are growing at an alarming way[1], representing the leading cause of death worldwide and is thus also one of the most important causes of disability. These diseases have a complex etiology and, in general, they are not due to a single risk factor[2] being prevented by controlling them[3].

It is considered a cardiovascular risk factor[4] to any property or condition that occurs most often in people with certain diseases than those who do not suffer. Provides information related to the kind of conditions associated directly or indirectly to a particular disease or disorder.

Hypertension, hypercholesterolemia, diabetes, obesity, smoking and physical inactivity are considered major risk factors for development of such cardiovascular disorders[1]. In this sense, risk factors can be classified as: inherent (the result of genetic or physical conditions that cannot be modified through changes in lifestyle, age, family history or sex), psychosocial (anxiety, educational level and incomes), physiological and psychophysiological (hypertension, cholesterol level in blood, cardiovascular reactivity to perceived stress, elevated heart rate), and behavioral (these are alterable, so they are those that indicate the individual's lifestyle: smoking, diet, physical inactivity)[5]. These last factors can have a direct effect on body composition, which represents a new added risk factor. In this regard, several studies have established a relationship between body mass index (BMI) and various epidemiological factors that mark the lifestyles of the population; in fact, it has found a direct relationship between BMI and sedentary jobs, and also with alcohol consumption. BMI has also been linked, but conversely, to physical exercise, educational level, consumption of tobacco and socioeconomic status[6,7].

In contrast, a healthy lifestyle is an important factor in shaping the security profile. Speaking of healthy lifestyle, we refer to behaviors that reduce the risk of disease, ie. protective factors, such as proper control and management of stress and negative emotions, sleep and recreation; the control and avoidance abuse of substances such as caffeine, nicotine and alcohol; nutrition according to calorie requirements, regular exercise, and so on5. The latter is particularly important since it is one of the habits most influential in controlling obesity: a practice level of 300 min per week (60 min per day for 5 days) is generally recommended for population[8,9,10.]

These positive lifestyles should be formed from the earliest ages of the individual and to extend it throughout his life. However, and although this statement seems obvious, studies show that the reality is quite different, for example, in the case of college students. In this population in which certain habits and

lifestyles have been consolidated, it has suggested that smoking habits may be related to the intention of losing weight, unhealthy diets and sedentary attitudes that generate obesity11. In this same vein, and in relation to the notion that these subjects has about positive habits that impact favorably on health, it has been observed that increased knowledge in nutrition does not necessarily mean changes to diet and healthy lifestyles12. Similarly, Martínez13 points out how about half of the subjects participating in his investigation did not recognize his inactivity as a disease or as a factor conducive to disease development, while recognizing that they find themselves in a situation of no willingness to change attitudes regarding their level of physical activity practice. In addition, and consistent with all previously mentioned aspects, it seems that there are clear differences between sexes related to behavioral patterns in this population13-15.

Considering all above mentioned, the objectives of this study were to determine the level of physical activity practice and to define the presence of cardiovascular risk factors associated with body composition and caloric intake in college students.

## MATERIALS AND METHODS

### Subjects

The total sample consists of 257 subjects, all students at the Faculty of Educational Sciences, University of Seville (Spain). In this preliminary study and respecting the proportional distribution used in the total sample, it has been selected 81 subjects, 38 females (age, mean ± sd: 22.24 ± 4.73 years) and 43 males (21.74 ± 3.36 years).

### Procedures

In the first instance and once in the laboratory, subjects rested seated for 10 min, whereas they were informed, orally and in writing about the nature, purpose and possible social benefits of the study, obtaining informed consent for all of them. After that and in the position described above, we proceeded to the taking of blood pressure (OMRON MX3PLUS) in dominant arm. Seguidely Then we conducted anthropometric measurements: height and body mass (Seca mod. D400), and the corresponding body mass index (BMI) according to the formula proposed by Faulkner (1968)16; waist and hip circumferences (Holtain anthropometric tape), and the corresponding waist-hip ratio, and finally we calculated the sum of 6 skinfolds (Holtain skinfold caliper) (triceps, subscapular, supraspinal, abdominal, thigh and leg). For the recording of all these anthropometric measurements we followed the protocol proposed by ISAK and GREC17. Furthermore, in a self-administered format, subjects completed two questionnaires: the Short-Form International Physical Activity Questionnaire (IPAQ)18 and the Short-Form Frequency and Food Consumption Questionnaire (CFCA)19.

The data obtained were subjected to basic descriptive analysis, expressing all them as mean ± standard deviation (sd). Moreover, and after verifying normal distribution of each variable through the Kolmogorov-Smirnov test, T test for independent samples was carried out considering sex variable as a factor. Also, we calculated Pearson correlation coefficients between the variables under study. In any case, the confidence interval was set at 95%.

## RESULTS

Descriptive data obtained from this study are shown in Table 1. As is reflected in it, and considering the sex of the subjects as independent variable, significant differences were found in the following variables: systolic blood pressure (120.4 vs. 134.28 mmHg for females and males, respectively), diastolic blood pressure (73.67 vs. 77.02 mmHg for females and males, respectively), weight (59.05 vs 72.9 kg for females and males, respectively), height (163.61 vs 177.5 cm for females and males, respectively), sum of 6 skinfolds (103.48 vs 76.58 mm for females and males, respectively), percentage of fat mass (15,49 vs 13.56%, for females and males, respectively), percentage of muscle mass (48.09 vs 44.5% for females and males, respectively), waist-hip ratio (0.75 vs. 0.83 for females and males, respectively) and waist circumference (70.16 vs. 78.62 cm for females and males, respectively).

Moreover, as it can be seen in Table 2, significant relationships were observed between study variables common in female and male students, while exclusive relationships have been noted taken into account the sex factor. Thus, in the case of female students we can observe remarkable relationships such as those between diastolic blood pressure and waist circumference ($r = 0.404$, $P \leq 0.05$) and BMI ($r = 0.337$, $P \leq 0.05$); between age and percentage of fat mass ($r = 0.453$, $P \leq 0.01$), between BMI and age ($r = 0.456$, $P \leq 0.01$), BMI and fat intake ($r = 0{,}428$, $p \leq 0.05$), and BMI and waist-hip ratio ($r = 0.453$, $P \leq 0.01$). For male students the relationship established between the sum of 6 skinfolds and waist-hip ratio showed statistical significance ($r = 0.370$, $P \leq 0.05$).

*Table 1. Results obtained on each variable analyzed*

| Variables | Mean (sd) | |
|---|---|---|
| | Females | Males |
| AGE (years) | 22,24(4,73) | 21,74(3,36) |
| IPAQ (METs-min/week) | 3963,04(3351,77) | 4870,52(3860,7) |
| CAL (Kcal/day) | 1841,51(777,74) | 1657,46(465,31) |
| PR (g/day) | 74,33(27,12) | 72,69(24,71) |
| FT (g/day) | 91,14(32,56) | 81,04(27,56) |
| CH (g/day) | 177,86(119,12) | 149,00(52,51) |
| **SYSTÓLIC P.**(mmHg) | 120,4(10,4) | ***134,28****(11,17) |
| **DIASTÓLIC P.**(mmHg) | 73,67(7,63) | ***77,02****(7,86) |
| **WEIGHT** (Kg) | 59,05(8,64) | ***72,9****(8,14) |
| **HEIGHT** (cm) | 163,61(6,30) | ***177,5****(6,2) |
| **SKINFOLDS** (mm) | ***103,48****(23,27) | 76,58(23,47) |
| **FAT MASS** (%) | ***15,49****(2,16) | 13,56(3,05) |
| **MUSCLE MASS** (%) | ***48,09****(3,3) | 44,5(7,02) |
| **WAIST-HIP RATIO** | 0,75(0,1) | ***0,83**** (0,1) |
| **WAIST** (cm) | 70,16(7,77) | ***78,62****(5,87) |
| BMI (kg/m$^2$) | 22,0(3,19) | 23,13(2,24) |

**p≤ 0,05; **p≤ 0,01; ***p≤0,001.*

*Table 2. Correlation coefficients between common variables for female and male students.*

| Variables | | $r_f$ | $r_m$ |
|---|---|---|---|
| **Age** | Waist | 0,488** | 0,544*** |
| **Weight** | Skinfolds | 0,604*** | 0,663*** |
| | Fat mass | 0,608*** | 0,609*** |
| | Waist | 0,743*** | 0,777*** |
| **Skinfolds** | Waist | 0,425** | 0,740*** |
| | BMI | 0,710*** | 0,721*** |
| **Fat mass** | Waist | 0,431** | 0,642*** |
| | BMI | 0,717*** | 0,612*** |
| **Waist** | BMI | 0,698*** | 0,818*** |

*$r_f$ and $r_m$: Pearson correlation coefficients for female and male students, respectively.*
**p≤ 0,05; **p≤ 0,01; ***p≤0,001.*

## DISCUSSION

One of the aspects to highlight in this study is that it has been conducted with college students, who have consolidated certain eating and physical activity habits that impact on their health and quality of life. In any case, and if not, these subjects are exposed to different factors that can cause changes in both feeding behaviors and physical activity practice.

The descriptive results are in line with other previous papers, such as those published by MacMillan20 and Martinez et al.21, where participants' BMI values are under normal classification (BMI: 18.5-24.9 Kg/m2; SEEDO22). Moreover, similar results (under a normal range of reference interval) were found in waist-hip ratio, body fat percentage (although a greater percentage of body fat was observed in females)21 and waist circumference.

According to the normal blood pressure values proposed by the European Society of Arterial Hypertension23, our subjects showed an optimal diastolic blood pressure in both sexes, whereas in the case of the systolic blood pressure, we registered statistical differences between them, since although females showed normal values, males students showed values that can be classified as normal-high (range: 80-84 mmHg; Mancia et al.23).

On the other hand, and attending to the dietary pattern of our subjects we observed that the total calories per day consumed by female and male students was 1841.51 ± 777.74 and 1657.46 ± 465.31 kcal, respectively, and the macronutrient intake was 21.65% and 24.01% for proteins, 26.54% and 26.77% for lipids, and 51.80% and 49.22% for carbohydrates, respectively. In this case, our data differ with those of other investigations21,24-26, in which the highest energy intake of macronutrients was represented by lipids, proteins and in last place by carbohydrates.

Regarding the level of physical activity practice, subjects in our study showed an average of 3963.04 ± 3351.77 METs-

min/week for females and 4870.52 ± 3860.7 METs-min/week for males, a results that implies a high level of physical activity practice18, especially if they are compared to those reported by Martínez et al.21 who registered a light-moderate level of physical activity in subjects evaluated. Palomo3 and MacMillan20 noted that a 91.5% and 53% of subjects analyzed were sedentary, respectively- Also, Martínez13 found a presence of sedentary behavior in a 50% of 772 students analyzed. Considering these data, it is necessary to clarify that although the proportional distribution used in the total sample was respected, physical education students took part in our investigation probably leading to overestimate the level of physical activity practice described.

Finally, it can be concluded that despite the sex differences in blood pressure and body composition variables, both female and male Sevillian college students seem to show an optimal food-intake and physical activity balances.

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