



Original/*Valoración nutricional*

Longitudinal study: lifestyle and cardiovascular health in health science students

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Abstract

Background: Changing lifestyle habits is considered the principal measure for the control of blood pressure and obesity. The aim of this study was to characterize the eating habits, anthropometric characteristics, physical fitness and blood pressure of students of health science degrees during the first three academic years and to explore the relation between the aforementioned parameters.

Methods: This was a longitudinal study conducted over three years on the eating habits and physical fitness of health science students (n=366) and the influence of these factors on blood pressure and obesity.

Results: The mean food group intakes of both female and male participants corresponded to a high consumption of lean and fatty meat, sweets and pastries and a low consumption of cereals, fruits, vegetables, olive oil, fish, nuts and vegetables. Blood pressure and obesity-related parameters were within normal ranges and did not change over the study period. Aerobic capacity values increased in men from the beginning to the end of the study, while $\dot{V}O_{2max}$ decreased in women between the first and second years.

Conclusion: We note that, in both women and men, blood pressure values were lower when diet was high in vegetables, legumes, nuts, fish and olive oil. In both sexes, we found a negative correlation between aerobic capacity and systolic and diastolic blood pressure and a positive correlation between obesity and blood pressure.

The pattern of the eating habits and changes therein were different in young women and men, the former being focused on improving their diet and the latter on improving their physical fitness.

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Key words: *Nutritional habits. Physical fitness. Anthropometry. Cardiovascular indicators. Students of health sciences.*

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ESTUDIO LONGITUDINAL: ESTILOS DE VIDA Y SALUD CARDIOVASCULAR DE ESTUDIANTES DE CIENCIAS DE LA SALUD

Resumen

Objetivo: Cambiar los hábitos de vida se considera la principal medida para el control de la presión arterial y la obesidad. El objetivo de este estudio fue caracterizar los hábitos alimentarios, características antropométricas, condición física y la presión arterial de los estudiantes de grados de ciencias de la salud durante los tres primeros años académicos y analizar la relación entre los parámetros antes mencionados.

Métodos: El estudio fue un estudio longitudinal llevado a cabo durante los tres primeros años de universidad, donde se midieron los hábitos alimenticios y la condición física de los estudiantes de grados de ciencias de la salud (n = 366) y la influencia de estos factores sobre la presión arterial y la obesidad.

Resultados: El consumo de alimentos tanto de mujeres como de hombres, se correspondió con un consumo excesivo de carne magra y grasa, dulces y pasteles; y un bajo consumo de cereales, frutas, verduras, aceite de oliva, pescado, frutos secos y legumbres. Los parámetros de la presión arterial y de la obesidad se sitúan dentro de la normalidad y no varían a lo largo del periodo de estudio. Los valores de la capacidad aeróbica aumentaron en los hombres desde el principio hasta el final del estudio, mientras que $\dot{V}O_{2max}$ disminuyó en las mujeres entre el primer y segundo año.

Conclusiones: Observamos que tanto en las mujeres como en los hombres, los valores de presión arterial fueron más bajos cuando la dieta era rica en verduras, legumbres, frutos secos, pescados y aceite de oliva. En ambos sexos, se encontró una correlación negativa entre la capacidad aeróbica y la presión arterial sistólica y diastólica y una correlación positiva entre la obesidad y la presión arterial. El patrón de los hábitos alimentarios y los cambios a lo largo de los tres años, fueron diferentes en las mujeres y los hombres. Las mujeres se centran más en la mejora de su dieta y los hombres en la mejora de su condición física.

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Palabras claves: *Hábitos nutricionales. Condición física. Antropometría. Indicadores cardiovasculares. Estudiantes de grados de ciencias de la salud.*

Introduction

Hypertension is a major public health problem, affecting approximately 1 billion individuals¹, causing 7.6 million premature deaths and 6% of disability-adjusted life years worldwide². It results from an interaction between genetic and environmental factors: diet, physical fitness and psychosocial variables³. Obesity is also a cardiovascular risk factor and it is known that there is a close positive relationship between obesity and hypertension, people with obesity having a higher risk of developing hypertension⁴.

Changes in diet and physical activity habits are considered the principal lifestyle measures for the control of blood pressure (BP) and obesity⁵. In this context, growing epidemiological and clinical evidence is pointing to the traditional Mediterranean diet as a good dietary pattern for BP control⁶. It is well established that being sedentary during leisure time is associated with an increased risk of hypertension and obesity^{7,8} and also that physical fitness is strongly negatively related to both conditions⁹.

Youth is a decisive period in human life because of the multiple physiological and psychological changes that take place. These changes could determine health-related habits in adulthood. Students of health sciences are a relevant target group for health promotion because in addition to their youth and high level of education in the field of health, they will be responsible for health promotion in the general population.

Therefore, it is important to assess the health status of these students. Given all this, the aim of our study was to characterize the eating habits, anthropometric characteristics, physical fitness and blood pressure of students of health science degrees during their first three years at university and to analyze the relationships between the aforementioned parameters.

Methods

Study design

This study was a longitudinal study conducted over three years on the life habits of health science students.

Study population

All first-year students ($n=550$) taking health science degrees at the University of the Basque Country were sent a letter inviting them to participate in this study; of these, 66.5% ($n=366$) voluntarily agreed. All the candidate students received verbal and written information about the purpose and procedures of the study before giving informed consent to participate. The participants had a mean age of 19.13 ± 1.35 years at the beginning of the study and the group was made up of 271 women and 95 men, the sex ratio being con-

sistent with the pattern of enrollment in health science degrees.

During the three years, 11 participants gave up their health science degree at this university and 70 participants dropped out of the study, meaning that 285 individuals completed the study (78%). The Human Research Ethics Committee of the University of the Basque Country approved the study.

Dietary assessment

The quantitative food-frequency questionnaire included 58-item and had previously been validated in Spain¹⁰.

Anthropometric measurements

Height was measured to the nearest millimeter using a stadiometer (Año Sayol, Spain), with the subject's head in the Frankfurt plane, and body weight to the nearest 100 g using a scale (Año Sayol). The subjects were weighed barefoot and in light underwear. The skinfolds were measured using a Harpenden skinfold caliper, the four joint diameters with a caliper (Wrist, Bicipital humerus[®], Bicipital femur[®] and Ankle) and the four circumferences (Arm relaxed[®], Arm flexed and tensed[®], Thigh and Calf[®]) breadths were measured using a non-stretchable measuring tape. These measurements were used to calculate body composition, following the procedures and formulas accepted by the International Society for the Advancement of Kinanthropometry (ISAK)¹¹.

Blood pressure measurements

Automated BP measurements were taken (with an M4-1 monitor, Omron Healthcare, Japan) to the nearest 1 mmHg in seated participants with their right arm resting and palm facing upward.

Submaximal test for the prediction of VO_2 max

The Astrand-Rhyming test was used to estimate aerobic capacity. The initial power was set at 50 watts. Depending on the heart rate obtained, the load was increased in order to reach a heart rate between 125 and 175 beats per minute. Finally, from the heart rates and powers reached, both absolute and relative (to the body weight) values were calculated for VO_2 max, using the Astrand-Rhyming nomogram¹².

Statistical analyses

Analyses were performed with IBM SPSS Statistics for Windows (version 19.0). All tests were stratified

by sex. Differences between two groups were assessed using the Student's t-test. For comparisons between more than two groups, ANOVA was conducted followed by the Scheffe test. Finally, Pearson's correlation coefficients were calculated to analyze the relationship between the different variables. The level of significance was set at 5%.

Results

Table I shows the anthropometric characteristics, blood pressure, and aerobic capacity of the students analyzed over the course of the three-year study period. The mean weight, height and body mass index (BMI) and waist-hip ratio of the students were within the recommended ranges and they did not change significantly during three years. However, the body fat percentage in the women decreased ($p < 0.05$) from the first to the third year. The mean blood pressure also remained steady over the three years. The aerobic capacity values were within the normal range, but absolute VO_2max decreased from the first to the second year ($p < 0.05$).

Mean food group intakes of female participants presented in table II indicate a high consumption of lean and fat meat, sweets, and pastries and low consumption of cereals, fruits, vegetables, olive oil, fish, nuts and vegetables, while their intake of dairy products met the recommendation. Analyzing consumption from the first to the third year, we observed that the intakes of olive oil, nuts and lean meat increased from the beginning to the end of the study ($p < 0.05$). By contrast, the intakes of cereals ($p < 0.05$), fruit ($p < 0.05$) and sweets ($p < 0.01$) decreased as the study progressed. Fiber intake was lower and cholesterol intake higher than recommended by the Spanish Society of

Community Nutrition (SENC) and US Food and Nutrition Board¹³.

Table III shows the evolution over the three years in non-dietary parameters in men. Anthropometric and blood pressure values did not change in the men during the study period. The aerobic capacity values were found to be initially and to remain within the normal range, although values were significantly higher in the third than first and second years ($p < 0.01$).

As can be seen in table IV, the mean food consumption and macronutrient profiles of male participants were similar to those found in women, with dairy products being the only food group in which recommendations were met. Analyzing the evolution of in consumption over the study period, we observed that their intakes of olive oil and nuts increased ($p < 0.05$) and of legumes ($p < 0.05$) and fiber decreased ($p < 0.01$).

A comparison between food group intake, macronutrient intake and blood pressure is presented in table V. We noted that men who consumed more fruits, vegetables, nuts and olive oil had lower blood pressure levels ($p < 0.05$). We found similar correlations in women, though the trend was only significant for olive oil ($p < 0.05$). The opposite pattern was seen with saturated fats and cholesterol, higher intakes being correlated with higher blood pressure both in men and women ($p < 0.05$ and $p < 0.01$). Analyzing the relation between the changes over the three years, there was a negative correlation ($p < 0.05$) between variations in fish consumption and differences in blood pressure in women. In men, we found a positive correlation ($p < 0.01$) between changes in meat consumption and systolic blood pressure.

Table VI illustrates the relation between aerobic capacity, obesity indicators and blood pressure. In both men and women, we found a negative correlation ($p < 0.05$ and $p < 0.01$ respectively) between aerobic capacity and values of systolic and diastolic blood

Table I
Anthropometric characteristics, blood pressure and aerobic capacity of the females and evolution over three years

	2009-2010	2010-2011	2011-2012
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Weight (kg)	59.2 \pm 8.64	59.1 \pm 8.27	58.6 \pm 7.77
Height (cm)	164 \pm 6.19	164 \pm 6.21	164 \pm 6.01
BMI (kg/m ²)	22 \pm 2.83	21.9 \pm 2.67	21.7 \pm 2.62
Total body fat (%)	21.9 \pm 5.27 ^{bb}	21.4 \pm 5.36 ^c	20.1 \pm 5.11
Total body muscle (%)	43 \pm 4.45	43.3 \pm 4.59	43.6 \pm 4.53
Waist-hip index	0.71 \pm 0.39	0.70 \pm 0.41	0.71 \pm 0.42
Systolic blood pressure (mmHg)	123 \pm 12.8	122 \pm 12.5	122 \pm 12.8
Diastolic blood pressure (mmHg)	71.9 \pm 9.15	69 \pm 8.22	69.3 \pm 8.15
Absolut VO_2 Max (l/min)	2.25 \pm 0.47 ^{ab}	2.15 \pm 0.38	2.15 \pm 0.34
Relative VO_2 Max (ml/kg/min)	40.3 \pm 8.86	39.1 \pm 7.58	39.4 \pm 7.02

Values are expressed as mean \pm SD.

Note: Scheffe multiple comparison test comparing: ^athe 1st and the 2nd year $P < 0.05$, ^{aa}the 1st and the 2nd year $P < 0.01$, ^bthe 1st and the 3rd year $P < 0.05$, ^{bb}the 1st and the 3rd year $P < 0.01$, ^cthe 2nd and the 3rd year $P < 0.05$, and ^{cc}the 2nd and the 3rd year $P < 0.01$.

Table II
Food group intake and macronutrient intake of the females and changes therein over three years

	2009-2010	2010-2011	2011-2012
	Mean ± SD	Mean ± SD	Mean ± SD
Cereals (4-6 rations/day)	2.90 ^{aa}	2.46	2.19
Vegetables (>2 rations/day)	0.90	0.76 ^c	1.0
Fruits (> 3 rations/day)	1.92 ^a	1.59	1.67
Olive oil (3-6 rations/day)	1.84 ^a	1.49 ^{cc}	2.33
Dairy (2-4 rations/day)	2.69	2.70	2.47
Fish (3-4 rations/week)	2.78	2.70	2.73
Lean meat (3-4 rations/week)	5.45 ^b	5.73	6.24
Nuts (3-7 rations/week)	0.89 ^b	1.36 ^c	1.40
Legumes (3-4 rations/week)	1.50	0.73	1.59
Fat meat (occasionally)	0.60	0.64	0.63
Sweets (occasionally)	3.48 ^{bb}	3.07	2.56
Pastries (occasionally)	0.71	0.57	0.74
Energy (Kcal/day)	2376 ± 687	2178 ± 624	2023 ± 718
Proteins (g/day)	97.6 ± 34	92.4 ± 36	86.7 ± 49
Lipids (g/day)	107 ± 38,5 ^a	103 ± 36	97,1 ± 48,2
Carbohydrates (g/day)	244 ± 91	210 ± 68	190 ± 63
Fiber (g/day)	11.9 ± 7,7	10.7 ± 3,5	9.61 ± 5
Cholesterol (mg/day)	368 ± 181	370 ± 175	345 ± 209

Values are expressed as mean ± SD.

Note: Scheffe multiple comparison test comparing: ^athe 1st and the 2nd year P < 0.05, ^{aa}the 1st and the 2nd year P < 0.01, ^bthe 1st and the 3rd year P < 0.05, ^{bb}the 1st and the 3rd year P < 0.01, ^cthe 2nd and the 3rd year P < 0.05, and ^{cc}the 2nd and the 3rd year P < 0.01.

Table III
Anthropometric characteristics, blood pressure and aerobic capacity of the males and evolution over three years

	2009-2010	2010-2011	2011-2012
	Mean ± SD	Mean ± SD	Mean ± SD
Weight (kg)	70.5 ± 10	72.0 ± 9.86	72.5 ± 9.55
Height (cm)	175 ± 6.43	176 ± 6.71	176 ± 6.99
BMI (kg/m ²)	22.7 ± 2.66	23.1 ± 2.45	23.3 ± 2.51
Total body fat (%)	13.5 ± 3.75	13.7 ± 3.96	13.4 ± 3.50
Total body muscle (%)	47.1 ± 3.36	47.3 ± 4	47.7 ± 2.96
Waist-hip ratio	0.78 ± 0.39	0.78 ± 0.39	0.78 ± 0.03
Systolic blood pressure (mmHg)	140.9 ± 14.2	139.3 ± 17.4	141 ± 13.8
Diastolic blood pressure (mmHg)	73.1 ± 9.46	71.6 ± 10.1	70.3 ± 7.20
Absolut VO ₂ Max (l/min)	2.95 ± 0.64 ^{bb}	2.77 ± 0.44 ^{cc}	3.30 ± 0.64
Relative VO ₂ Max (ml/kg/min)	44.8 ± 9.41 ^{bb}	41.8 ± 7.88 ^{cc}	50.1 ± 9.56

Values are expressed as mean ± SD

Note: Scheffe multiple comparison test comparing: ^athe 1st and the 2nd year P < 0.05, ^{aa}the 1st and the 2nd year P < 0.01, ^bthe 1st and the 3rd year P < 0.05, ^{bb}the 1st and the 3rd year P < 0.01, ^cthe 2nd and the 3rd year P < 0.05, and ^{cc}the 2nd and the 3rd year P < 0.01.

Table IV
Macronutrient intake of the males and evolution over three years

	2009-2010	2010-2011	2011-2012
	Mean ± SD	Mean ± SD	Mean ± SD
Cereals (4-6 rations/day)	2.77	3.00	3.24
Vegetables (>2 rations/day)	0.74	0.65	0.89
Fruits (> 3 rations/day)	2.15	1.90	2.07
Olive oil (3-6 rations/day)	2.19 ^a	1.49 ^{cc}	2.63
Dairy (2-4 rations/day)	2.87	2.77	2.96
Fish (3-4 rations/week)	2.76	2.33	2.67
Lean meat (3-4 rations/week)	6.42	6.78	7.10
Nuts (3-7 rations/week)	1.57	1.26 ^c	2.14
Legumes (3-4 rations/week)	2.0 ^a	1.55	1.91
Fat meat (occasionally)	0.76	0.70	0.75
Sweets (occasionally)	4.06	3.59	3.11
Pastries (occasionally)	0.79	0.69	0.70
Energy (Kcal/day)	3154 ± 952 ^{aabb}	2617 ± 806	2492 ± 797
Proteins (g/day)	123 ± 42,9	107 ± 38,6	99.9 ± 40,2
Lipids (g/day)	138 ± 54 ^{bb}	125 ± 42,7	111 ± 42,7
Carbohydrates (g/day)	343 ± 137 ^{aabb}	248 ± 101	256 ± 110
Fiber (g/day)	16.5 ± 9,9 ^{aabb}	12.1 ± 3,5	12.6 ± 7,9
Cholesterol (mg/day)	500 ± 240	470 ± 221	442 ± 225

Values are expressed as mean ± SD.

Note: Scheffe multiple comparison test comparing: ^athe 1st and the 2nd year P < 0.05, ^{aa}the 1st and the 2nd year P < 0.01, ^bthe 1st and the 3rd year P < 0.05, ^{bb}the 1st and the 3rd year P < 0.01, ^cthe 2nd and the 3rd year P < 0.05, and ^{cc}the 2nd and the 3rd year P < 0.01

Table V
Correlations (R) between food group intake, macronutrient intake, systolic blood pressure (mmHg) and diastolic blood pressure (mmHg)

	Female students		Male students	
	SBP	DBP	SBP	DBP
Olive oil	R = -0.104*	R = -0.113*	R = -0.150*	R = 0.137
Fruit	R = -0.031	R = -0.056	R = -0.155*	R = -0.137
Legume	R = -0.057	R = -0.043	R = -0.156*	R = -0.138
Lean meat	R = 0.034	R = 0.011	R = 0.158*	R = 0.091
Nuts	R = -0.015	R = -0.007	R = -0.140	R = -0.202**
% Proteins	R = -0.026	R = 0.019	R = -0.090	R = 0.033
% Carbohydrates	R = -0.025	R = 0.021	R = -0.055	R = -0.062
% Lipids	R = 0.125*	R = 0.136**	R = 0.105	R = 0.145*
Saturated fats (g/day)	R = 0.122*	R = 0.137**	R = 0.067	R = 0.147*
Monounsaturated fats (g/day)	R = 0.100	R = 0.089	R = 0.118	R = 0.101
Polyunsaturated fats (g/day)	R = 0.095	R = 0.022	R = 0.080	R = 0.117
Cholesterol (mg/day)	R = 0.146**	R = 0.125*	R = 0.124*	R = 0.074
	Δ SBP	Δ DBP	Δ SBP	Δ DBP
Δ Fish	R = -0.160*	R = -0.177*	R = 0.097	R = -0.112
Δ Lean Meat	R = -0.028	R = 0.005	R = 0.357**	R = 0.256

Note: Pearson's correlations coefficient to analyze correlations between food group intake and macronutrients intake and blood pressure. *P<0.05 **P<0.01.

Δ = Evolution over the three years.

Table VI
Correlations (R) between aerobic capacity and obesity indicators and systolic blood pressure (mmHg) and diastolic blood pressure (mmHg)

	Female students		Male students	
	SBP	DBP	SBP	DBP
Relative VO ₂ Max (ml/kg/min)	R = -0.195**	R = -0.228**	R = -0.170*	R = -0.105*
	Δ SBP	Δ DBP	Δ SBP	Δ DBP
Δ Relative VO ₂ Max (ml/kg/min)	R = -0.060	R = -0.207*	R = -0.061	R = -0.188
	SBP	DBP	SBP	DBP
BMI (Kg/m ²)	R = 0.239**	R = 0.154**	R = 0.150*	R = 0.097
Total body fat (%)	R = 0.214**	R = 0.161**	R = 0.072	R = 0.095
Total body muscle (%)	R = -0.199**	R = -0.132**	R = -0.086	R = -0.089
Waist circumference (cm)	R = 0.203**	R = 0.085*	R = 0.222**	R = 0.075
Sum of 6 skinfolds	R = 0.214**	R = 0.161**	R = 0.081	R = 0.102
Sum of 4 skinfolds	R = 0.204**	R = 0.157**	R = 0.072	R = 0.095
Sum of extremity	R = 0.208**	R = 0.155**	R = 0.091	R = 0.097
Sum of trunk	R = 0.191**	R = 0.145**	R = 0.064	R = 0.093

Note: Pearson's correlations coefficient to analyze correlations between aerobic capacity and blood pressure. *P<0.05 **P<0.01.
 Δ = Evolution over the three years.

pressure. Moreover, there was a negative association between aerobic capacity changes and blood pressure changes, this being statistically significant in the case of women and diastolic blood pressure (p<0.05). Positive correlations were found between blood pressure and obesity indicators (BMI, total body fat, waist circumference, and skinfold thicknesses). The correlation was statistically significant (p<0.05 or p<0.01) for all indicators in women and in the case of men, the positive correlation was statistically significant for BMI and waist circumference (p<0.05 and P<0.01 respectively).

Table VII shows the correlations between food group, macronutrient intake and obesity indicators. In the case of women, it was observed that a higher degree of obesity correlated with eating less fat and more carbohydrates and nuts. This tendency was not the same in men, however, those who consumed more proteins and fats and fewer carbohydrates having the highest degree of obesity. We also observed that in women the greatest decrease in obesity indicators (BMI, waist-hip ratio and total body fat percentage) over the three years occurred in those with the highest values in the first year (p<0.01 for BMI and p<0.05 for body fat percentage). However, in men, no statistically significant trend was found.

Analyzing the relation between changes in food group intake and obesity indicators over the three years, the trends in women and men were similar, an increasing consumption of fruits and olive oil being related to a lower degree of obesity (p<0.05) and increasing consumption of pastries to higher degree of obesity p<0.01).

Discussion

The eating habits of the students revealed certain common characteristics consistent with those reported in other studies of similar populations^{14,15,16,17,18}. Nevertheless, our findings indicate that health science students have, on average, better eating habits than the general population, as has been noted by other authors^{19,20} perhaps attributable to their great knowledge and concern about health issues. In parallel with their progression through health science degrees, their eating habits improved in various respects, such as intakes of nuts and olive oil increasing and of sweets decreasing, this being reflected in a decrease in fat percentage in women.

It is well known that poor eating habits in the youth can cause health problems throughout life, but our results also identify associations between eating habits and current health parameters²¹. Specifically, male students with higher intakes of olive oil, fruit and legumes had lower values of systolic blood pressure; and, in female students, olive oil consumption was inversely correlated with systolic and diastolic blood pressure. We also found that students of both sexes who consumed more total fats, more saturated fats and more cholesterol had higher values of blood pressure. This trend was also reported previously²².

Analyzing changes in eating habits and blood pressure data over three years, on the one hand, systolic and diastolic blood pressure fell in women who increased their fish intake. This agrees with previous studies which have reported that the intake of the oils in fish may protect against hypertension^{23,24}. On the other hand,

Table VII
Correlations (R) between macronutrient intake and food groups and obesity indicators

	Female students			Male students		
	BMI	Waist-hip index	Total body fat%	BMI	Waist-hip index	Total body fat%
Energy (Kcal/day)	R = -0.01	R = -0.007	R = 0.029	R = -0.237**	R = -0.147*	R = -0.259**
Proteins %	R = 0.019	R = 0.025	R = -0.050	R = 0.143*	R = -0.023	R = 0.091
Carbohydrates%	R = 0.054	R = 0.081*	R = 0.066	R = -0.163*	R = -0.102	R = -0.121
Lipids %	R = -0.031	R = -0.111**	R = 0.028	R = 0.118	R = 0.073	R = 0.126*
Fruits	R = 0.049	R = 0.088*	R = 0.017	R = -0.214**	R = -0.006	R = -0.211**
Olive oil	R = 0.098*	R = -0.037	R = -0.081	R = -0.055	R = -0.075	R = -0.063
Nuts	R = -0.079	R = -0.048	R = -0.111*	R = -0.102	R = -0.054	R = -0.066
Pastries	R = 0.006	R = -0.008	R = 0.080	R = -0.149*	R = -0.156*	R = -0.038
	Δ BMI	Δ Waist-hip index	Δ Total body fat%	Δ BMI	Δ Waist-hip index	Δ Total body fat%
Δ Olive oil	R = -0.146*	R = -0.160*	R = -0.116	R = -0.145	R = -0.212	R = -0.162
Δ Fruits	R = -0.191*	R = -0.035	R = -0.050	R = -0.149	R = -0.208	R = 0.045
Δ Pastries	R = 0.234**	R = 0.225**	R = 0.225**	R = 0.277**	R = 0.245*	R = 0.312*
	Δ BMI	Δ Waist-hip index	Δ Total body fat%	Δ BMI	Δ Waist-hip index	Δ Total body fat%
BMI	R = -0.315**	R = 0.081	R = -0.169*	R = -0.196	R = -0.084	R = -0.042
Total body fat%	R = -0.222**	R = 0.115	R = -0.328**	R = -0.125	R = -0.067	R = -0.139

Note: Pearson's correlations coefficient to analyze correlations between aerobic capacity and blood pressure. *P<0.05 **P<0.01.
 Δ = Evolution over the three years.

we found a positive correlation between lean meat intake and blood pressure values in men. Several different patterns of association between lean meat intake and blood pressure have been previously reported²⁵. Our findings may be of particular concern, as almost all male students analyzed exceed recommendations for meat.

The relation between eating habits and obesity was different in the two sexes. In men, we observed an inverse correlation between certain good eating habits and obesity indicators, as has been previously reported²⁶. On the contrary, women with higher BMI had lower intakes of lipids. However, it is noticeable that if we analyze the changes in the diet, improving habits, such as increasing fruit and olive oil or decreasing intakes of pastries were related to a reduction in obesity-related parameters in both sexes. Indeed, our results showed that greatest decreases in obesity over the three years were observed in women with most severe obesity in the first year. This could be explained by the better eating habits of women with higher BMI, such as lower fat and higher fruit intakes that, in turn, may be due to a concern about being overweight among this group.

Likewise, the pattern of changes in physical fitness differed between men and women. The aerobic capacity of the men increased during the course of the study but in the women there was a decrease in absolute VO_2 max. These results are consistent with the

finding that women are more prone to give up sport when they arrive at university than their male counterparts²⁷. Aerobic capacity of the students was inversely correlated with systolic and diastolic blood pressure and these results are consistent with other studies of Spanish university students^{28,29} and international research, in which a strong inverse association has been found between aerobic capacity and systolic and diastolic blood pressure²⁸. There was also an association between degree of obesity and blood pressure. Specifically, individuals classed as overweight in terms of BMI and with an excess fat percentage had a higher risk of hypertension, as has been described previously in general populations and middle-aged people^{29,30,31}. These results suggest that a good aerobic capacity together with an adequate weight and body fat content have a significant impact on blood pressure and due to the fact that many young women become sedentary from when they start university, physical activity should be strongly recommended at this age³².

Conclusions

In summary, this research described eating habits, physical fitness and obesity and blood pressure-related parameters in health science students. The pattern of

habits and their changes in women and men was different, the former being focused on improving their diet and the latter on improving their physical fitness. Students of health sciences had better habits than the general population and they improved some of them during the study. Overall, our results confirm the importance of health education for improving habits among young people.

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