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Studying biological science does not lead to adoption of a healthy lifestyle

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Studying biological science does not lead to adoption of a healthy lifestyle

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Short title: studying science and keeping fit at university

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Abstract

Aims: Lifestyle and physical activity (PA) in the young play a key role in the prevention of cardiovascular and metabolic diseases at older ages. The current generation of biological science students at university holds promise for better future medicine and medical technology. However, their physical fitness and lifestyle are often ignored.

Methods: Lifestyle, physical activities and common risk factors for cardiovascular disease before and at university were collected from 408 students using self-completed, anonymous surveys between the academic years of 2017 to 2019 from the School of Biological Sciences, University of Reading. Statistical analysis was performed using SAS® 9.4 software.

Results: Among the 408 participants, 134 were male and 274 were female with a mean (SD) age of 19.6 (2.24). Approximately 19% of participants consumed alcohol beyond the safe limit of <14 units/week (112g/week). Among them, 65% were males. Before university 47% of students failed to meet the UK National Physical Activity Guidelines (NPAG) which increased to 56% during university with males exhibiting a steeper incline. Compared to their lifestyles before university, more students had insufficient sleep and displayed greater sedentariness during university. Moreover, 16% of students declared no engagement in PA which was greater than the value of 12% before university. Fitness perceptions worsened by 11% during university particularly for females. Statistical analysis revealed that gender, BMI and fitness perceptions were significantly correlated with PA levels. The most prevalent explanation for inadequacy in meeting NPAG was insufficient time.

Conclusions: Compared to their pre-university lifestyles, biological science students at university are more likely to adopt unhealthier behaviours with less time for exercise and prolonged sedentary behaviours, which increases the risk for cardiovascular diseases. It is important to raise awareness of their fitness perceptions and to encourage health-promoting programs at university.

Introduction

Starting a university life and becoming freed from parental or familial constraints presents an important lifestyle change for young students. Ever-advancing digital technologies and wide-spread sedentary lifestyles are known to increase the risk of cardiovascular disease (CVD).[1] Global trends in the rates of premature CVD deaths have instigated concern[2] and obesity in childhood and adolescence has been described as the pivotal crux of this encumbrance.[3-4] Recently, adolescent obesity has been reported to substantially increase risk of CVD mortality in middle-aged people.[5] A plethora of studies clarify the notion that unhealthy lifestyles and inadequate physical activity (PA) in the young have a major impact in the development of long-term cardiometabolic complications.[6-9]

Each year, a significant proportion of the young generation in the UK attend university courses with 85% aged 18-20 years.[10] Recent studies have indicated that the transition into university plays a prevailing role in the establishment of negative lifestyle modifications and is a determinant of overall health.[11-14] It is suggested that a disconcerting proportion of this population exemplify poor dietary habits, insufficient PA, excess sedentariness, greater smoking habits and greater levels of alcohol consumption[15] – that are all risk factors for the development of CVDs, type 2 diabetes, cognitive irregularities and cancer. Addressing these risk factors using population-wide strategies could reduce the risk of CVDs and premature mortality rates.[16]

The value of integrating PA into daily routine has been widely acknowledged; high levels of regular exercise has been shown to encourage health enhancement and improve quality of life. [17, 18,19] In essence, as well as physical health benefits, a recent study has shown that aerobic fitness and motor skills are independently associated with enhanced executive function and academic performance.[20] Thus, advocating PA into student lifestyles has manifold health benefits that not only minimises disease risk but also enhances mental well-being and function. The UK government National Physical Activity Guidelines (NPAG) recommend a minimum of 150 min of moderate intensity PA or 75 minutes of vigorous PA accumulated throughout the week.[19] However, in general, university students spend around 8 h/day on sedentary activities including studying, computing and gaming.[21]

Science is the driving force that sustains the nation's wealth and advancements in technology. The young generation of biological science students holds promise for better future medicine and

medical technology. However, their physical fitness and lifestyle are often ignored. People assume that this particular population should have the knowledge of how to maintain a fit and healthy lifestyle whilst also being aware of the risks of diseases. In keeping with this assumption, a study in nutritional science students report a healthier lifestyle change in students' eating behaviours as they progress through their nutrition studies.[22] Conversely, the inability of many medical students to correctly identify NPAG and their uncertainty in identifying these guidelines raises concern.[23]

There is inadequate information regarding the factors that influence the lifestyle and fitness of biological science students before and during university. In this study, we investigated changes in student lifestyles, including diet, sedentary behaviours, smoking/alcohol and time spent on sleeping and exercising upon going to university. We also examined factors that promote or limit students in satisfying NPAG and the risk factors for cardiovascular and metabolic complications. Information and findings from our study can be used for planning and developing a holistic approach to promote healthy physical fitness levels of young science students at university and to improve their life expectancy after leaving university.

Methods

Study design

The study was approved by the procedures laid down by the University Research Ethics Committee of the University of Reading, UK. Participants were provided with the study information and consent documents prior to recruitment. The survey was designed in a multiple-choice format to address key health-related lifestyle behaviours and PA levels both prior to and during university.[24] The major measures were: (1) demographic information of age, gender, ethnicity, height, weight, disability and home country of residence; (2) health-related lifestyle behaviours both before and during university including smoking, alcohol consumption, hours of PA, sleeping and sedentary behaviours; and (3) perceived fitness levels and obstacles to PA. Body mass index (BMI) was used to assess students' weight status according to guidelines established by the National Institutes of Health:[25,26] BMI was calculated and participants were grouped into underweight (BMI <18.5 kg/m^2); normal weight, (BMI 18.5 - 24.9 kg/m^2) and overweight/obese (BMI ≥ 25/≥30 kg/m^2).

Participant recruitment and data collection

Volunteers (both male and female) were recruited randomly during the years of 2018 and 2019 from the School of Biological Sciences, University of Reading, UK. The inclusion criteria were undergraduate students under the age of 35 within two years of university life without documented disabilities. Exclusion criteria were students above the age of 35 and evidence of any disability. Survey data were entered electronically for statistical analysis.

Statistical analysis

The statistical analysis was performed using SAS software, Version 9.4 (SAS Institute Inc., Cary, NC, USA). A generalised linear model using a multinomial distribution for an ordered categorical outcome was used with a generalised estimating equations (GEE) approach to analyse the aspects of repeated measurements within respondents. The model included all predictors of interest to the study objectives, operating at 5% statistical significance.[27] Anthropometric parameters recorded by students are expressed as mean (SD, standard deviation). *p*-values and odds ratios to explore parameter influence on PA levels were investigated using the same model. PA data were dichotomised, and a binomial model was conducted to investigate the proportion of respondents

satisfying NPAG. The chi-square test was used to measure the statistical significance adjusted for all other prognostics in the model. The results were present with adjusted odds ratios (OR) and their 95% confidence intervals (CI) for each explanatory/independent variable.

Results

Participant demographics and attributes to risk factors of cardiometabolic diseases

A total of 408 undergraduate students between 18-24 years of age were recruited for the study. Among them, 32.8% were males and 67.2% were females. Demographic information of participants is provided in Table 1. The majority of participants (60.5%) were of a Caucasian ethnicity and 91.9% had a European home residency (Table 1). Smokers are defined as individuals smoking 7 or more cigarettes per week according to a previous published paper.[28] Among the participants, 91.9% described themselves as being non-smokers and the rest (8.1%) resided within the smoking category. Approximately 19.4% of participants consumed alcohol beyond the safe limit of <14 units/week (112g/week)[29] with males occupying the greatest proportion of drinking beyond the limit. Around 35.0% of students were abstinent from alcohol.

Although the average value of BMI for all participants fell within the normal range (Table 1), detailed analysis showed that 73.2% of total participants fall within the normal weight category, 10.8% were underweight and 16.0% were overweight/obese (Figure 1). In the category of underweight, there were more females (13.2%) than males (6.2%). In the category of overweight, there were more males (28.0%) than females (10.0%).

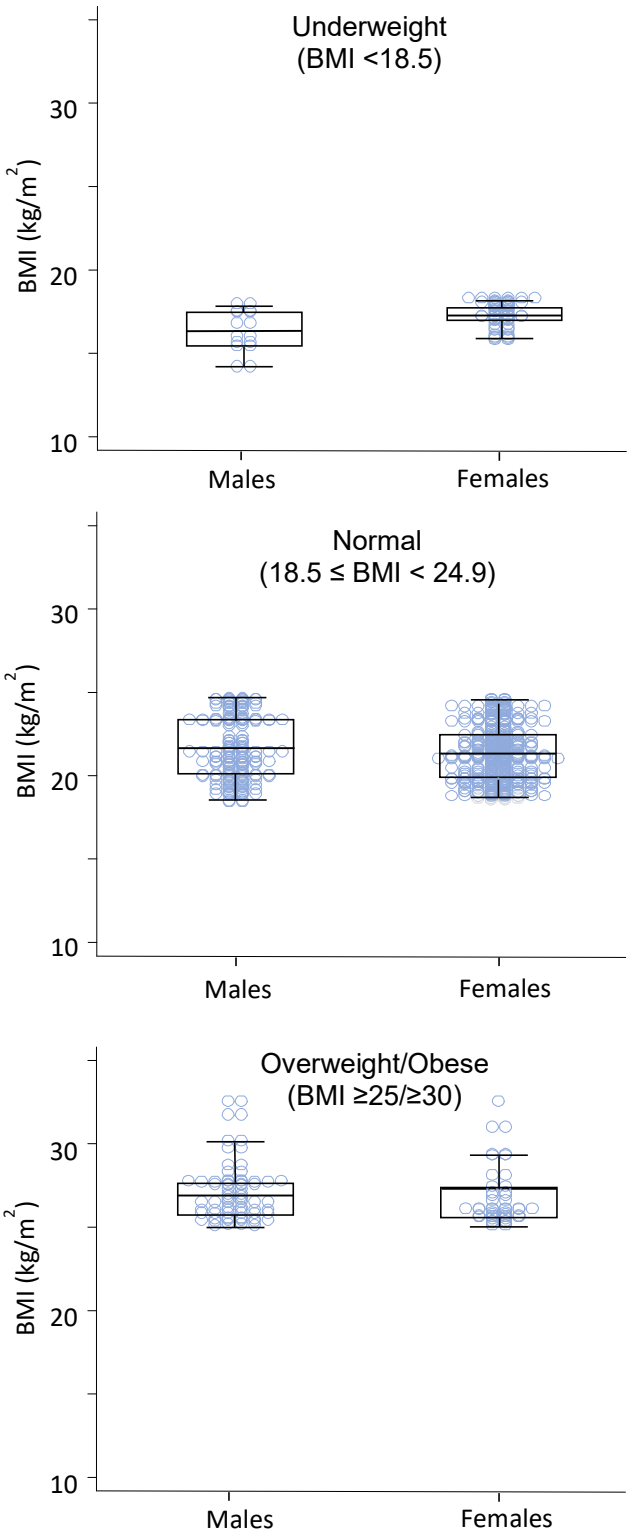

Figure 1. Distribution of participants according to their BMI. Scatter dot plots representing the distribution of BMI of 408 participants separated by gender. Data were classified into underweight (upper panel), normal weight (middle panel) and overweight/obese (lower panel) according to their BMI (body mass index) and conforming to National Health Institute BMI categories. Data are presented as mean (SD).

Table 1. Demographics and lifestyle factors of participants against the levels of PA

	Males		Females		Total		*p*-value[a]
Gender	134		274		408		.0480
Age (years), Mean (SD)	19.5 (2.00)		19.7 (2.36)		19.6 (2.24)		.0639
BMI (kg/m^2), Mean (SD)	22.9 (3.42)		21.5 (3.15)		22.0 (3.31)		.0015
Ethnicity	***n***	%	***n***	%	***n***	%	
Caucasian	89	66.4	158	57.7	247	60.5	
Asian	19	14.2	64	23.4	83	20.3	
Black African	6	4.5	14	5.1	20	4.9	.1557
Mixed	8	6.0	7	2.6	15	3.7	
Other Ethnic Group	12	9.0	31	11.3	43	10.5	
Country of Residence (%)							
Europe	124	92.5	251	91.6	375	91.9	.6262
Outside Europe	10	7.5	23	8.4	33	8.1	
Smoking Status (%)							
Non-smoker	119	88.8	256	93.4	375	91.9	
Below Limit (<7/week)	8	24.2	9	27.3	17	51.5	.8553
Above Limit (≥7/week)	7	21.2	9	27.3	16	48.5	
Alcohol Consumption (%)							
No alcohol	34	25.4	109	39.8	143	35.0	
Below Limit (<112g/week)	49	36.6	137	50.0	186	45.6	.5956
Above Limit (≥112g/week)	51	38.1	28	10.2	79	19.4	

PA: physical activity; *SD*: standard deviation; BMI: body mass index; NPAG: National Physical Activity Guidelines.

a: *p*-value assessing the overall effect of each prognostic listed in the table, as output by the logistic model on the binary outcome ('level of PA meeting NPAG' shown in Figure 2), accounting for repeated measures within respondents.

b: Values for below limit and above limit are expressed as a percentage of those who smoke

c: The limits adhered to are defined by the Department of Health's Alcohol guidelines review

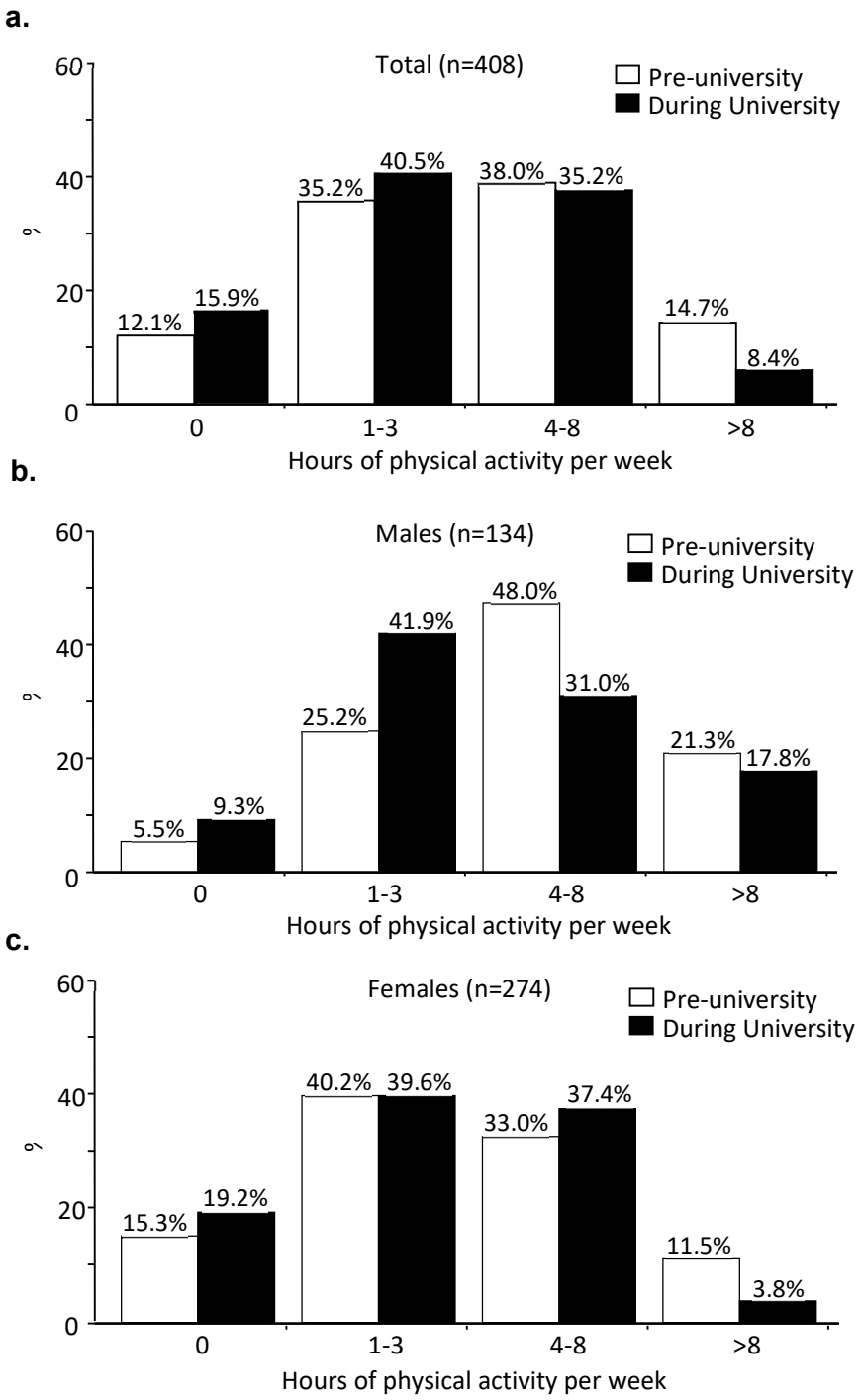

Figure 2. Physical activity pre-university and during university. Bar graphs representing: (a) % of total students (n=408), (b) % of Male and (c) Female students participating in physical activity (hours/week) before and during university, Males OR= 0.6; 95% CI = 0.223-0.831; *p* = 0.01, Females OR= 0.4; 95% CI = 0.371-1.056; *p* = 0.08. Odds Ratio: OR.

Levels of exercise and daily sedentary and sleeping hours of participants

The levels of PA were analysed in accordance with the NPAG.[19] The percentage of participants not engaging in any PA was 12.1% pre-university which was increased to 15.9% during university for both genders (Figure 2). In total, 47.3% of participants did not meet NPAG before university and that number raised to 56.4% after entering university (Table 2). When considering gender, 51.2% of males are not satisfying the NPAG during university, which is a 20.5% increase than the number before university, whereas females exhibited a smaller increase of 3.3% (males OR = 0.4; 95% CI = 0.206-0.647; $p = 0.00$, females OR = 0.7; 95% CI = 0.0.463-1.160; $p = 0.18$). A detailed breakdown of weekly PA hours prior to and during university are presented in Figure 2.

Of the total 408 participants, 35.2% and 40.5% undertook 1-3 h/week of PA before and after entering university, respectively, which was below the NPAG. Further in this category (PA 1-3 h/week), there was an 16.7% increase in male students in university in comparison to their level of PA before university. Along with this rise, there was an 17.0% drop in number of male students performing 4-8 h/week PA during university. Compared to male students, female students were well in keeping with the PA levels pre- and during university for both categories. Collectively, there was a 6.3% decrease in the number of students undertaking >8 h/week PA during university, more so for females than males from pre-university levels, 7.7% and 3.5%, respectively, $p = 0.0021$ (males OR = 0.6; 95% CI = 0.223-0.831; $p = 0.01$, females OR = 0.4; 95% CI = 0.371-1.056; $p = 0.08$) (Figure 2).

Regarding sleeping and sedentary behaviours, we found an alarming proportion (88.5%) of the participants at university spent ≥ 4 h/day (not including hours sitting in lectures) sedentary on computing, or watching TV, gaming or on social media. However, this number was slightly less (81.9%) before university. Along with prolonged sedentariness at university, students spent less time in sleep as the results show 45.6% of the participants slept less than 7 h/day.

Perceptions of fitness and factors associated with PA levels

The self-completed information for perception of physical fitness for both genders is given in Table 2. More than half of the participants (53.9%) perceived themselves as being physically unfit during university, which rose by 10.8% as compared to before university (Table 2). We found that

fitness perceptions were significantly associated with PA levels ($p = 0.0001$). Overall, 37.6% of respondents who stated they were unfit failed to meet NPAG – (40.0% for females and 32.6% for males). Only a low proportion (17.0%) of participants who perceived themselves to be fit failed to meet NPAG. We also found that BMI is negatively associated with the levels of PA ($p = 0.0015$). Interestingly, a greater percentage of overweight males (15.5%) appeared to take initiative to engage in PA yet still fail to meet NPAG. The ordered regression model revealed that gender, BMI and fitness perceptions significantly correlated with the level of PA of participants (Table 1).

When asked for the reasons behind failing to satisfy NPAG, the explanations given by the majority of students were “No time” or “No reason” (75.7%), followed by “No motivation” (19.8%) and “No facility” (4.5%).

Table 2. Health-related Lifestyle and Behaviours

	Pre-university (% of total)			**During University** (% of total)		
Meeting NPAG (h/week)	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
Meeting guidelines (≥ 3)	69.3	44.5	52.7	48.8	41.2	43.6
Not meeting guidelines (< 3)	30.7	55.5	47.3	51.2	58.8	56.4
Not Satisfying Guidelines by Ethnicity						
Caucasian	19.0	30.0	26.4	31.0	28.7	29.4
Asian	4.0	15.6	11.7	8.5	18.5	15.2
Other Ethnic Group	4.0	5.8	5.2	6.2	6.0	6.1
Black African	0.8	3.1	2.3	1.5	3.8	3.0
Mixed	2.4	0.8	1.3	4.7	0.8	2.0
Sleeping (h/day)						
Meeting guideline (≥ 7)	71.1	66.8	68.2	53.1	55.0	54.4
Not meeting guideline (< 7)	28.9	33.2	31.8	46.9	45.0	45.6
Sedentary time (h/day)						
< 4	16.8	18.2	18.1	18.5	8.2	11.5
≥ 4	83.2	81.8	81.9	81.5	91.8	88.5
Computer (h/day)						
≤ 3	84.0	86.2	85.5	84.2	82.8	83.3
> 3	16.0	13.8	14.5	15.8	17.2	16.7
Television (h/day)						
≤ 3	96.2	95.6	95.8	98.5	98.9	98.8
> 3	3.8	4.4	4.2	1.5	1.1	1.2
Perception of Physical Fitness (%)						
Fit	58.6	46.7	50.7	53.4	35.8	41.7
Unfit	36.1	46.7	43.1	42.9	59.5	53.9
Don’t know	5.3	6.6	6.2	3.7	4.7	4.4

Discussion

According to University World News, the number of students in higher education globally is estimated to increase to 262 million by 2025.[30] Educated individuals are an important labour resource for the fast-moving, highly technological world. University life is vastly more rigorous than pre-university life wherein students have to face a multiplicity of new pressures to achieve high education standards, to live independently and manage an active social life. Despite the clear guidelines and initiatives of the UK government encouraging the adult population to engage in at least one form of PA,[19] it has become a greater challenge than ever for science students to set aside time for exercise whilst also trying to meet the guidelines. During the past 5 years, the number of students in biological science have risen with a majority of the population being females. However, their fitness and lifestyle are often ignored. In the current study, we found that an alarming proportion of biological science students did not meet NPAG and the number (56.4%) was higher during university than the number (47.3%) before university. Despite some students declaring to engage in some form of PA, 24.6% still failed to satisfy the guidelines. Although the outcome of this study is limited to one university in the UK, the results are supported by studies of other universities around the world. [9, 15, 21, 24, 31]

A sedentary lifestyle is defined as a type of lifestyle wherein an individual does not achieve regular and satisfactory levels of PA. Another important finding from our study is that an alarming proportion (88.5%) of university students spent ≥ 4 h/day (not including hours siting at lectures) sedentary either on computing, gaming, social media, or watching TV. While sitting down most of the day may seem unavoidable for students at university, physical inactivity has been shown to have negative health effects and increases risks for metabolic and cardiovascular diseases. However, when we asked the reason for failing to meet NPAG, the majority answered “No time”.

It is well known that humans spend calories through purposeful exercise and body movement that are associated with the routines of daily life. Being overweight/obese is a risk factor for CVD.[5, 32, 33] In the current study, we found that 73.2% of respondents were within the normal weight range with an average BMI of 22.0 kg/m^2 (SD=3.31 kg/m^2) - a favourable outcome. However, there were still 16.0% of participants classified as overweight/obese, which resembles obesity figures published for

university students across the globe.[34, 35] We also found BMI to be inversely correlated with PA levels, and more males appeared to be in the category of overweight/obese and incorrectly confident about being fit in comparison to females.

Alcohol consumption (volume, pattern of drink and quality) can have profound effects on younger people's life and wellbeing. Drinking alcohol more than the recommended amount can be harmful to the heart, liver and general health.[29] Another worrying outcome from this study is that approximately 19.4% of university students consumed alcohol beyond the safe limit of <14 units/week (<112g/week) with a majority of this percentage being males. Other studies have also found that more male students than females consumed alcohol beyond the limit.[12, 36] It appears that students at this early stage of life may ignore the advice regarding the limits of alcohol consumption. It would be helpful if there was an alcohol limit policy or alcohol-free days/week(s) on university campuses. Sleep restriction (6h or less per day) has been reported to have a negative role in body weight gain due to alterations in hormonal regulation of food intake and extra time available for food consumption.[37] However, we did not encounter any correlation between the average sleep time h/day and the levels of fitness and PA in our samples.

Conclusion

In conclusion, compared to their pre-university lifestyles, biological science students at university effortlessly adopt unhealthy sedentary lifestyles and spend less time in PA, which put them at increased risk of developing cardiometabolic diseases. Gender, fitness perceptions and BMI are statistically correlated in health-related behaviours before and during university. It is important to improve the awareness of alcohol limits, NPAG and encourage healthy lifestyles in university social environments.

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Conflicts of Interest

These authors have declared that no conflict of interest exists.

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