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Nutritional habits and eating attitude in university students during the last wave of COVID-19 in Spain

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Emotional Eating is eating in response to negative emotional states, such as boredom, loneliness, or anxiety. For some young people, both food and alcohol are a source of pleasure in their social life. A cross-sectional study was conducted in 2022-23 in the Health Sciences Faculty. Mediterranean Diet Adherence Test, alcohol use disorders identification test (AUDIT), Emotional Eater Questionnaire (EEQ), Pittsburgh Sleep Quality Index, Yale Food Addiction, Perceived Stress Scale, and Anxiety Questionnaire STAI, were employed. Emotional eater (EE) regarding to no emotional eater (NEE) presented a mild food addiction, a significantly high intake of carbohydrates, fat, and alcohol. Energy intake is dependent on saturated fat, also they are not conscious of their intake of calories, had worse sleep quality, high perceived stress, and worse healthy eating index (HEI) due to their intake of sweets and soft drinks. The diet quality could be affected by the stress of the pandemic. The association of emotional eating with the intake of sweet foods and alcoholic drinks maybe is a remaining situation of COVID-19. We suppose that maladaptive eating behaviors have improved over time during this pandemic. Even though it is necessary to promote healthier eating among university students, it is also necessary to improve healthy habits.

Keywords University students, Perceived stress, Habits, Emotional balance, COVID-19

Because of the last COVID-19 pandemic, something was changed in some of our daily routines, as the increase in social distancing, and confinement due to the quarantine may constitute stressors triggering coping mechanisms characterized by different psychological-behavioral-eating habits responses, caused by the alteration of individual emotional state[1].

Young adulthood is an important period to establish good habits and healthy eating patterns to prevent the risk of chronic diseases that will affect their quality of life[2]. University students seem to be influenced both by some individual factor and their social networks[3].

University is a critical and stressful period, regarding unhealthy changes in eating behaviors in students, due to university characteristics, such as living arrangements or academic schedules, influence the relationships between individuals and their eating behaviors[3,4]. The university period is characterized by the abandonment of a healthy dietary pattern and uncontrolled food intake[5]. The oscillations of ovarian hormones could have a close link with emotional hunger and the desire for more palatable food rich in sugars[6]. It has been observed in girls that high levels of leptin in the blood are related to high stress[7] with more carbohydrate intake per day after ovulation[8]. Depending on socioeconomic status some individual habits were affected in different ways. The combination of stress, anxiety, and depression due to this pandemic situation had an impact also on eating behaviors[9].

Emotional Eating (EE) is eating in response to negative emotional states, such as boredom, loneliness, or anxiety[10]. Emotional distress and anxiety seem to be important when the quality and quantity of food are selected, and that could provoke an increase in BMI and lead to greater consumption of unhealthy foods and the association between diet and mental health is complex and bidirectional[10–12]. Depending on the motivation to eat, emotional eaters regulate their emotions through an increased consumption of comfort foods[10]. A study in adult women reported that women with high trait anxiety showed more unhealthy eating and food cravings[12]. It seems that female students appeared to have lower susceptibility to their internal bodily signal signals of hunger

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	NEE (N = 53) (Median + IQR)	*EE (N = 138) (Median + IQR)*	U Mann-Whitney	*p*	ES
BMI (kg/m2)	19.7 ± 3.1	20.8 ± 3.7	3513	0.67	0.06
Waist (cm)	69.5 ± 9	70 ± 9	3230	0.21	0.18
WHR	0.76 ± 0.06	0.76 ± 0.09	3634	0.94	0.01

Table 1. Anthropometric measurements of participants in the stud. IQR, Interquartile range; WHR, waist/hip ratio; NEE, no emotional eater; EE, emotional eater.

	NEE (N = 53) (Median + IQR)	*EE (N = 138) (Median + IQR)*	U Mann-Whitney	*p*	ES
Energy (kcal)	1885 ± 667.9	1667 ± 719.8	3328	0.34	0.14
%E P	18 ± 5.4	18 ± 4.9	3313	0.32	0.15
%E CH	34.9 ± 10.5	36.7 ± 9.3	2892	**0.03**	**0.33**
fibre	18.8 ± 11.1	17.7 ± 8.7	3160	0.15	0.21
%E F	36.4 ± 15.5	39.5 ± 9.1	3105	0.11	0.23
%E SFA	13.8 ± 8.7	12.5 ± 4.7	3356	0.38	0.13
cholesterol	312 ± 114.4	308 ± 130	3391	0.44	0.11
alcohol (g)	40 ± 80	64 ± 120	2963	**0.04**	**0.30**

Table 2. Energy, macronutrients, dietetic cholesterol, and alcohol intake according to the emotional eating scale (NEE and EE). M, median; NEE, no emotional eater; EE, emotional eater; %E P, CH, F, SFA, % Energy of proteins, carbohydrates, fat and saturated fatty acids; IQR, Interquartile Range; p, p-value; ES, Effect Size.

and satiety and higher reliance on emotions to initiate or end eating[13]. In Spain, there have been reported more emotional changes in women and an association between alcohol consumption and the perception of apathy and anxiety related to food cravings between meals[14]. State anxiety is more associated with specific external situations and is more susceptible to change than trait anxiety[15]. Gonçalves et al. observed that in their study only females reported food addiction[16].

Due to globalization, the importation of Western habits and shifts in lifestyle, probably are among the potential drivers away from the traditional Mediterranean diet (MD). There are different indexes to measure Mediterranean diet adherence, those indexes are generally food groups traditionally consumed by Mediterranean populations. However other foods from non-Mediterranean areas and locally consumed may be inappropriately computed with these indexes[17]. Gonçalves et al. recommended to consider that after the pandemic situation it's very important to promote healthier or unhealthier eating habits in university students[16].

Alcohol consumption broadly described the risk of important health implications with neuropsychological repercussions due in part to the consumption pattern of individuals during the university period[18]. For some young people, both food and alcohol are a source of pleasure in their social lives[19].

The study aimed to compare eating attitudes, nutritional habits, adherence to the Mediterranean diet, sleep quality, food addiction, and anxiety, during the last wave of COVID-19 in Spain in female Health Science students.

Results

Applying the criteria explained before, participants were divided into two groups: NEE ($n = 53$) and EE ($n = 138$).

Table 1 shows anthropometric measures of NEE and EE students and we observed that she was normal in weight. According to waist and WHR, both NEE and EE were according to the normal weight of the students. No significant differences were observed between groups in any of the variables.

Due to Cronbach's α and KMO values, mYFAS 2.0 and PSQI were not included in the results.

In Table 2 we observed macronutrient intake and we observed that EE has more intake of %E, % E of F, and %E of SFA than NEE. In the case of %E of CH and alcohol intake (g), the differences observed were significant between groups.

AUDIT test in both groups according to emotional scale with significant differences between groups (U de Mann-Whitney = 3469.5; $p = 0.4$; ES = 0.08). Concerning the scoring of the AUDIT test, alcohol education is needed by 84.9% of NEE and 79% of EE. Finally need simple advice 11.3% of NEE and 21% of EE.

Concerning Adherence to the Mediterranean diet (MEDAS) we observed no significative differences ($X^2 = 0.06$; $p = 0.97$; Cramer´s V = 0.02) differences between groups (Fig. 1).

According to the eating habits of nursing students (Table 3), it has been observed that according to breakfast no significant differences were observed between groups, and nearly 70% have breakfast every day. Concerning HEI (healthy eating index), we observed significant differences in NEE and EE, and 50% of NEE had good-very good HEI. On the other hand, significant differences were detected when we asked the students, how they considered their weight, and we showed that individuals considered themselves overweight at 15.1% of NEE and 32.6% of EE. No significant differences were observed between groups in meals per day, both groups eat 3–4 meals.

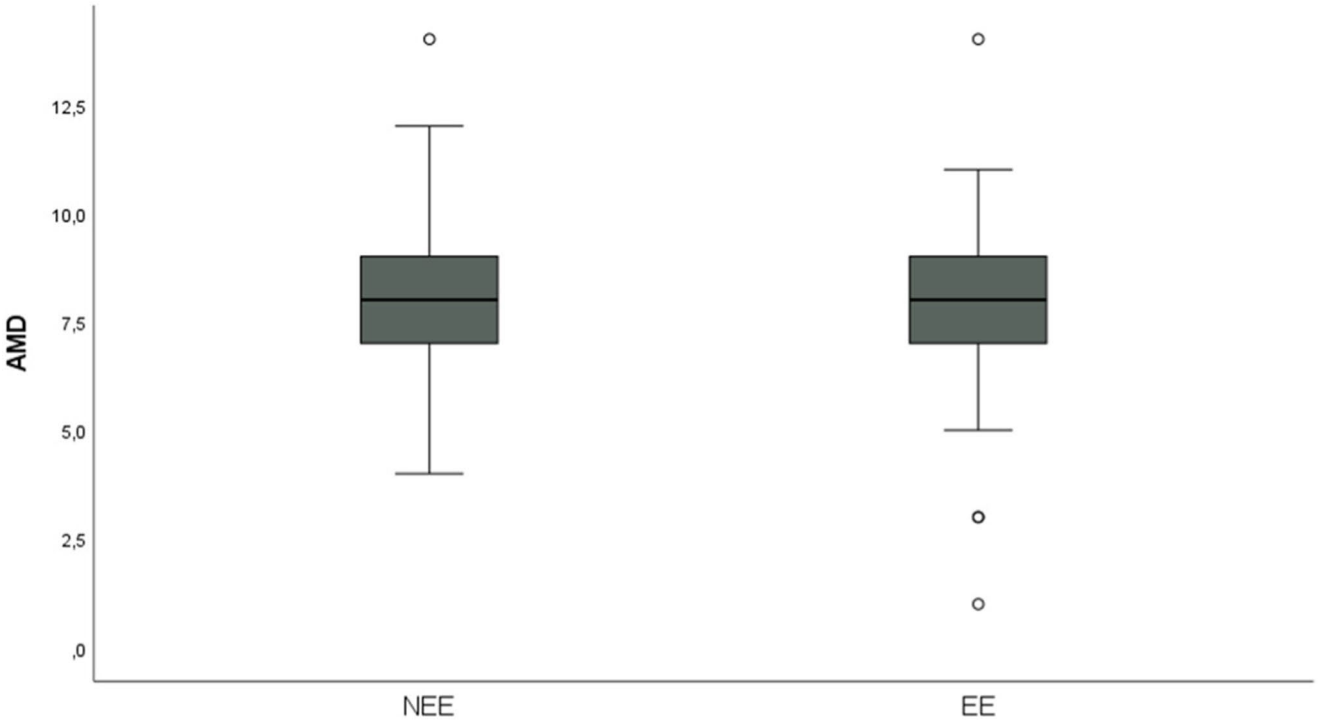

Figure 1. Adherence to the Mediterranean diet (MEDAS) according to the emotional eating scale. AMD: adherence to Mediterranean diet, NEE: no emotional eater, EE: emotional eater.

		NEE (%)	EE (%)	X^2	*P*	ES
Do you have breakfast?	yes	66	69.6	4.15	0.12	0.15
	no	3.8	10.9			
	sometimes	30.2	19.6			
How many calories do you take?	< 1500	13.2	25.4	5.51	0.24	0.17
	1500–2000	60.4	58.7			
	2001–2500	18.9	13			
	2501–3000	7.5	2.9			
How do you consider your weight?	overweight	15.1	32.6	**12.12**	**0.03**	**0.25**
	adequate	64.2	51.4			
	slim	20.8	15.2			

Table 3. Eating habits in students according to emotional eating scale. NEE, non-emotional eater; EE, emotional eater.

		NEE (%)	EE (%)	X^2	*P*	ES
HEI	Bad	28.8	20.3	**12.18**	**0.016**	**0.25**
	Acceptable	21.2	37.7			
	Good-very good	50	41.9			

Table 4. Healthy eating index in EE and NEE eaters. *HEI, healthy eating index; NEE, non-emotional eater; EE, emotional eater.

In Table 4 we observed data of HEI in emotional and no-emotional eaters, with significative differences between both groups in young university women.

According to Table 5, in all foods, the intake was less than one serving per day. No significant differences were observed in weekly food intake. Only significative differences were shown in dairy intake, meat, fish and eggs, fruits, and light soft drinks, which were higher in emotional eaters.

Food	*NEE (N = 53) (Median + IQR)*	*EE (N = 138) (Median + IQR)*	U Mann-Whitney	*p*	ES
dairy	0.20 ± 0.21	0.29 ± 0.3	**2597**	**> 0.01**	**0.46**
meat, fish, and eggs	0.57 ± 0.14	0.51 ± 0.14	**4658**	**0.02**	**0.43**
processed meat	0.5 ± 0.21	0.5 ± 0.42	3411	0.51	0.10
vegetables	0.71 ± 0.42	0.71 ± 0.42	3219	0.17	0.19
fruits	0.29 ± 0.42	0.71 ± 0.42	**2862**	**0.01**	**0.34**
legumes	0.29 ± 0.42	0.29 ± 0.42	3169	0.13	0.21
cereal	0.71 ± 0.42	0.71 ± 0.42	3040	0.05	0.26
sweets	0.29 ± 0.18	0.29 ± 0.18	3610	0.88	0.02
fast-food	0.29 ± 0.42	0.29 ± 0.57	3262	0.22	0.17
soft drinks	0.29 ± 0.6	0.29 ± 0.6	3162	0.13	0.21
light soft drinks	0.11 ± 0.18	0.29 ± 0.6	**2817**	**> 0.01**	**0.36**

Table 5. Conversion of Food frequency questionnaire (FFQ) responses to equivalent frequencies according to emotional and non-emotional eaters. NEE, non-emotional eater; EE, emotional eater; IQR, Interquartile Range; Test is adjusted for all pairwise comparisons within a row of each innermost suitable using the Bonferroni correction; Bold indicates statistical significance ($p < 0.05$).

Concerning stress and anxiety, perceived stress (data not shown) with significative differences between both groups (Mann-Whitney U = 2780; $p = 0.01$; ES = 0.38). This value does not coincide with STAI values. No significant differences were found between groups (STAI-T: Mann-Whitney U = 3648; $p = 0.98$; ES < 0.01. STAT-S: Mann-Whitney U = 3637; $p = 0.95$; ES < 0.01).

Table 6 shows bivariate correlations of the most important variables of the study in NEE and EE. Concerning NEE, we observed significant correlations between MEDAS with waist-hip ratio and %E of carbohydrates. Stai-T was significantly correlated with %E of saturated fatty acids. Stai-S was correlated with %E of fat. WHR was inversely correlated with MEDAS correlated with %E of fat and %E of P. Finally, BMI was correlated with %E of Proteins and inversely correlated with %E of Fat.

Concerning EE, Stai-T was correlated with BMI. %E of saturated fatty acids. Stai-S was correlated with %E of fatty acids, saturated fatty acids, and inversely with %E of proteins. E intake (kcal) was correlated with %E of Fatty acids and SFA and inversely with %EP.

Discussion

The purpose of this cross-sectional study was to identify emotional and non-emotional eating habits, adherence to the Mediterranean diet, anxiety and emotional eating, and sleep quality, during the last wave of COVID-19 in female Health Science students.

In the present study, an imbalance of % energy of macronutrients was detected: higher %E of proteins and fat and low in carbohydrates, and HEI is unhealthy in EE. Those results were consistent with previous studies carried out among other populations of university students [20–22]. Carbohydrate consumption is closely linked to mood, women with altered mood, psychological alterations, and eating behavior increase their carbohydrate intake[6]. The oscillations of ovarian hormones could have a close link with emotional hunger and the desire for more palatable food rich in sugars[68].

In our study, we observed significant differences of %E of CH, %E of F, and g of alcohol intake, according to the emotional eating scale. Similar result as obtained in other studies, in which high-protein meals were correlated with saturated fatty acids[23] and emotional eaters often prefer energy-dense foods with abundant saturated fat[24]. As it is known dietary intakes are a modifiable risk factor and is the first step toward developing feasible prevention strategies[25]. According to HEI only 41.9% of EE had good HEI. Scores for both monitoring and healthy eating guidance subscales were not predictors of diet quality index (DQI) in early adulthood[26]. As Pokorski et al. pointed changes in food consumption during university education correlated positively with DQI and only 10% of the respondents reported negative changes in their diet and food intake during university studies are associated with lower diet quality, nevertheless further research is needed to identify that relationship[26]. Other showed that the overall diet quality of European students became lower during their time spent at the university, with worse DQI[27].

Regarding alcoholic intake, significant differences are observed between NEE and EE, with a higher intake of alcohol in EE students. Concerning the scoring of the AUDIT test 70.6% of EE need alcohol education and 83,4% of EE students need simple advice. López-Moreno et al. observed in university students that 62.6% of female students had a lower risk of alcohol consumption[26]. These results, while worrying, are not as alarming as those obtained by Marchena et al.[27] who justify this result because, during the last pandemic situation of COVID-19, students generally spent less time at the university, due to the use of online platforms for many activities and virtual class attendance.

Food addiction was associated with %E of F and cholesterol, and the group with food addiction problems reported unhealthier eating habits, like other studies[16]. In our study, food addiction was not associated with BMI or WHR, similar as observed in Portuguese college students[16], who were mostly normal weight as in our study. As Javadi et al.[28] reported that EE and the intake of sweetener-food and drinks which initially were strongly associated with psychological distress and are reducing after pandemic situation.

		1	2	3	4	5	6	7	8	9	10	11
NEE	1. STAI-T	--										
	2. STAI-S	0,182	--									
	3. MEDAS	0,058	-0,009	--								
	4. %E F	0,155	,**312***	0,050	--							
	5. %E SFA	,**290***	0,230	-0,113	,**353****	--						
	6.Cholesterol	0,258	-0,045	-0,025	-0,153	0,112	--					
	7. %E CH	0,034	-0,079	,**279***	0,135	-0,112	-0,223	--				
	8. %E P	0,099	0,096	-0,174	-,472**	-0,028	,**277***	-,462**	--			
	9. E (kcal)	0,011	0,039	-0,090	-0,084	0,198	0,119	-0,187	-0,150	--		
	10. WHR	0,179	-0,197	,-**310***	0,021	-0,094	-0,102	,310*	,**274***	-0,092	--	
	11. BMI	0,077	-0,151	-0,049	-,**287***	0,105	-0,001	0,217	,**323***	-0,112	,331*	--
EE	1. STAI-T	--										
	2. STAI-S	0,111	--									
	3. MEDAS	-0,017	-0,106	--								
	4. %E F	,**181***	,**171***	-0,086	--							
	5. %E SFA	,**296****	,**225****	-0,167	,268**	--						
	6.Cholesterol	-0,164	0,082	0,018	0,124	0,084	--					
	7. %E CH	0,134	0,066	0,125	-,266**	-0,060	-,239**	--				
	8. %E P	-0,088	-,**189***	-0,068	-,253**	-0,078	-0,005	-,**504****	--			
	9. E (kcal)	-0,126	0,095	0,059	0,102	,**175***	,**581****	0,005	-,**197***	--		
	10. WHR	-,231**	-0,105	0,150	0,009	-0,125	0,103	-0,041	0,087	0,057	--	
	11. BMI	,**272****	0,048	0,138	0,150	0,045	0,045	-0,016	-0,079	-0,007	0,136	--

Table 6. Bivariate correlations concerning emotional eating scale (NEE and EE). NEE, non-emotional eater; EE, emotional eater; WHR, waist-hip ratio; STAI-T, Anxiety measured with Trait Anxiety Inventory; STAI-S, Anxiety measured with State Anxiety Inventory; MEDAS, adherence to Mediterranean diet; E, energy; %EP, CH, F, SFA, % Energy of proteins, carbohydrates, fat, and saturated fatty acids. * = p-value < 0.05; ** = p-value < 0.01.

Another finding of this study is that nearly 50% had low adherence to the Mediterranean diet (AMD), a higher value than that obtained by Marchena et al.[29] in Spanish nursing students. The health benefits of the Mediterranean across the Mediterranean basin have been demonstrated and are important to promote AMD among future health professionals [30–32]. The Mediterranean diet is moving away from the traditional diet across the Mediterranean basin, in this study EE has worse adherence to the Mediterranean diet than NEE. Those results are worrying but in line with others observed in Greece and Spain that showed a large proportion of students with low adherence to the Mediterranean diet [26,33].

It has been reported changes in dietary habits during the last pandemic period, changes that occurring worldwide, and maintaining a balanced diet is essential to mental health and well-being[34]. In this study, 17.4% of the students presented mild food addiction, and these students have more consumption of sweets and alcohol, like the previously cited study in Portuguese students who presented 31% of moderate food addiction and eat food rich in sugars[16].

In our study, we did not observe differences according to the intake daily number of meals, but other authors showed that the increase in the number of meals had an impact on the scores of emotional eating and coping with stress, because women tend to eat more in stressful conditions[35,36]. Oliveira et al. pointed out that students with higher stress levels had higher scores for emotional eating and uncontrolled eating, and higher frequency of fast-food type nutrition, in our study we only observed more intake of dairy, meat, fish and eggs and soft drinks in emotional eaters, but not in fast-food or fatty foods[37,38]. There is a lack of significant association in the consumption of healthy foods such as vegetables, and legumes in both studied groups (NEE and EE), but the intake of alcoholic drinks as an example of an unhealthy habit, increased in EE. Javadi et al. in a Norway population during COVID-19 pointed out that the degree of the maladaptive eating behaviors reduced over time with less emotional eating probably due to the students adapted to the situation and gradually returning to a more normalized life after COVID-19 pandemic, nevertheless there are still sub-groups who need improvements[28], maybe the same occurred in our students because we performed the study at the end of the pandemic situation in Spain in December 2022.

We detected that emotional eaters increased their perceived stress and more stressed female students were emotional eaters and intake more saturated fat and unhealthy foods. Pal et al. reported stress negatively affects emotional regulation and may promote unhealthy eating behavior and hedonic eating[39]. Stress generally has been reported to affect the quantity of food consumed and food choices but its impact on eating misalignment is not well-established; women have worse perceived stress, and this daily stress was significantly associated with trajectories of desire to eat motives and hunger-eating motives[33,37,39–43].

Some limitations should be considered because of the study group is a non-clinical population preponderance of female students, and was certainly a limitation of this study because difficult to generalize between both sexes. The study took part during the examination period, and it is possible that the students were in a stressful situation. Also, we didn't ask the students in which moment of menstrual period they were (premenstrual, postmenstrual or menstrual period). Another limitation was that the study was conducted at the end of the last COVID-19 pandemic situation in Spain, and we did not compare it with the pre-pandemic situation of the students.

Materials and methods

Participants

The analysis is reported according to the STROBE checklist[44]. This cross-sectional study was conducted in Health Sciences university students after last wave of COVID-19 in Spain at the end of 2022 and the beginning of 2023. The participation was voluntary and anonymity was ensured. The median age of students was 19 years. Individuals were excluded if they did not finish properly the questionnaires. Consent informed and tests were completed online, and data were collected only during scholar hours, with any incidents and all the results were analysed anonymously. The "snowball" sampling method was used to recruit more participants. The inclusion criteria were that they must be Health Science students ≤ 24 years old. A priori sample size was calculated in 132 participants (group 1 = 78; group 2 = 54). Participants were 350 students of both sexes, but finally, the total sample studied was only 91 females. The exclusion criteria is to be older than 24 years, to be pregnant or to present some pathologies: hypothyroidism, diabetes, cardiovascular diseases, among others.

Before the start of the study, the participants were informed of the purpose of the research, and the study protocol and design were approved by the Ethics Committee of the University Francisco de Vitoria (2022-26), and it fully complied with the 1964 Helsinki Declaration and its later amendments.

Anthropometrics measurements

Anthropometric measurements (Table 1) were carried out using calibrated digital scales SECA® 840 and 877 (SECA Vogel & Halke, Hamburg) as well as portable stadiometers SECA® 214 and 217 (SECA Vogel & Halke, Hamburg). Students 'weight was measured barefoot and wearing light clothes in kilograms, to the nearest 100-gram unit (0.1 kg), and stature was measured with the subject standing fully erect with feet together, head in the Frankfort plane, and arms hanging freely to the nearest millimetre (0.1 cm). Body mass index (BMI) was calculated using the formula weight (kg)/ [height (m)2]. Subjects were classified as underweight (BMI < 18.5 kg/m^2), normal weight (BMI 18.5–24.9 kg/m^2), overweight/obese (BMI > 25 kg/m2), based on the World Health Organization (WHO) criteria [45,46]. Waist circumference was measured using an anthropometric measuring tape, at a horizontal plane midway between the lowest rib and the iliac crest. As cut-off points for risk identification for metabolic diseases waist-to-hip ratio > 0.85 for females[47].

Dietary assessment

Food intake was assessed using three-day food records (two weekdays and one weekend day/holiday), after receiving instructions during class time. The dietary intake of a selection of macro and micronutrients was

determined using Spanish DIAL® software. Healthy Eating Index (HEI) consider the variety of food consumption (between ≤6 to ≥16 different foods) for 3 days and give a dietary rating of 0-100 points: assigning 0–16 points to cereals and legumes, 0–3 points to vegetables, 0–2 points to fruit, 0–2 points to dairy products, 0–2 points to meat, fish and eggs. Also, it takes into accounts %E fat (≥45%, ≤,30% E) %E SFA (>15%, <10% E), cholesterol (>450 mg/day, <300 mg/day), diet sodium (>4800 mg/day, <2400 mg/day) and variety of food intake for 3 days (≤. 6 food intake/3 days, ≥ 16 food intake/3 days). The HEI score is: ≤ 50 inadequate, 50–70 acceptable-good and ≥70 very good-excellent[48]. We also considered the alcohol intake of the students, but we considered that this data was underreported or misreported, probably due to personal interviews about the alcohol consumption of the students.

Questionnaires

a) Mediterranean Diet Adherence (MEDAS) which was originally developed for the Spanish population[49]. This questionnaire contains 14 items representing the dietary components of the Mediterranean diet. Each item was scored as 0 (no adherence to a dietary component) or 1 (maximal adherence to a dietary component) and the range of index was 0–14. The cut-offs to classify subjects were high (12–14), moderate (8–11), or low adherers (<7) to the Mediterranean diet. This questionnaire showed a Cronbach's a = 0.553; Kaiser-Meyer-Olkin (KMO) = 0.513; Bartlett's sphericity test, $p < 0.001$.

b) Anxiety measured with State-Trait Anxiety Inventory (STAI) adapted by Guillén-Riquelme and Buela-Casal[50]. This questionnaire is composed of 40 items which evaluate two different concepts: anxiety as a state (a transitory emotional response) and anxiety as a trait (a constant anxious condition). The 20 items of each subsection use a Likert scale of 4 categories from 0 (rarely) to 3 (very often/almost always). This questionnaire showed a Cronbach's a = 0.575; KMO = 0.857; Bartlett's sphericity test, $p < 0.001$.

c) Emotional Eater Questionnaire (EEQ)[51] consists of 10 items on a 4-category Likert scale from 0 (never) to 3 (always). The global score ranged from 0 to 30. Factor structure and psychometric properties of EEQ were studied in Spanish universities, with good internal consistency (α = 0.753)[52]. This questionnaire showed a Cronbach's a = 0.783; KMO = 0.799; Bartlett's sphericity test, $p < 0.001$.

d) Pittsburgh Sleep Quality Index (PSQI) is a 19-item questionnaire based on seven components of sleep (quality, onset latency, duration, efficiency, disturbance, use of sleep medication, and daytime dysfunction). Each component scores from 0 to 3, with higher scores indicating worse sleep. The seven component scores are summed for a global score ranging from 0 to 21 and a score above 5 indicates poor sleep quality[53]. This questionnaire showed a Cronbach's a = 0.592; KMO = 0.629; Bartlett's sphericity test, $p < 0.001$.

e) The Food Frequency Questionnaire (FFQ) included the following options for reporting the frequencies of food intake per week: never, once a week, 1–3 times per week, 4 to 6 times per week, once a day, every day. The data reported in the FFQ were transformed into daily frequencies; the frequency option *once a day* was coded as 1 and the other options were proportionally associated with the unit. For example, for the items for items consumed *1 to 3 times per week*, the daily frequency was 0.29, 2–3 times per day, 4 or more per day (estimated by the formula: $[(1+3)/2]/7$)[54,55]. That refers to the number of times the foods were consumed but not the quantities.

f) Perceived Stress Scale Spanish version (PSS-14) is a 14-item questionnaire with a five-point response scale, from 0 = never to 4 = very often. The total score is obtained by reversing the scores of items 4, 5, 6, 7, 9, 10 and 13 (0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0, respectively), which are positively stated items. A higher score indicates a higher level of perceived stress in the last month, and the range of the scores is 0–56 [56]. This questionnaire showed a Cronbach's alpha = 0.773; KMO = 0.857; Bartlett's sphericity test, $p < 0.001$.

g) Modified Yale Food Addiction 2.0 (mYFAS 2.0) consists of 13 self-report items: 11 for food addiction symptoms and 2 for distress or impairment[57]. Specifically, the mYFAS assesses the experience of addictive eating behavior in the past 12 months. This questionnaire contains an 8-point Likert-type scale, ranging from 0 (never) to 7 (every day). Each question has a different threshold: 0 = did not meet the criterion, 1 = met criterion. All questions on the mYFAS 2.0 are continuous and include two scoring options: a continuous symptom count that reflects the number of diagnostic criteria met by the participant and a diagnosis of FA based on the number of symptoms and clinically significant impairment or distress. The symptom count scoring (score ranging from 0 to 11) does not provide clinical significance to the score while in the diagnostic scoring option, individuals are categorized into: No food addiction (1 or fewer symptoms), Mild food addiction (2 or 3 symptoms and clinical significance), Moderate food addiction (4 or 5 symptoms and clinical significance) and Severe food addiction (6 or more symptoms and clinical significance). This questionnaire showed a Cronbach's a = 0.463; KMO = 0.445; Bartlett's sphericity test, $p < 0.001$.

h) For alcohol consumption, we used the limits established by García-Carretero et al. for the interpretation of the AUDIT (Alcohol Use Disorders Identification Test) score among Spanish university students[58]. The cut-off for females was six and for high-risk consumption, a score of 13 for both males and females to consider probable alcohol dependence syndrome. This questionnaire showed a Cronbach's alpha = 0.731; KMO = 0.729; Bartlett's sphericity test, $p < 0.001$.

Statistical analysis

According to the value of the EEQ questionnaire, we collapsed these categories into No Emotional Eater (NEE) scoring as <=5 and Emotional Eater (EE) scoring >5 to the EEQ, dividing the sample into these two groups.

Based on previous studies[26], with an effect size d = 0.5; an "a" error = 0.05; a "b" error = 0.2; an allocation ratio = 0.7, a priori sample size was calculated using GPower 3.1.

To detect the suitability of our data for structure detection in each questionnaire, Kaiser-Meyer-Olkin, and Bartlett's sphericity tests were performed. Cronbach´s a was calculated to evaluate the reliability and the internal

consistency of all tests. A value below 0.7 indicates relatively low reliability in the internal consistency of the test. This suggests that the test items are not adequately correlated to measure the intended construct. But, although Cronbach's alpha coefficient is less than 0.7, KMO is close or greater than 0.8, and the Bartlett's sphericity test value is less than 0.001. This suggests that, despite the low internal consistency of the test according to Cronbach's alpha coefficient, the data are suitable for conducting a factor analysis, and there is an underlying structure that can be identified. It is important to consider these findings together when interpreting the reliability and validity of the test.

Shapiro-Wilk test was performed to check the normality distribution of each variable. The continuous variables were expressed as the mean ± standard deviation (parametric distribution) or the median and interquartile range (non-parametric distribution). The categorical variables were presented as percentages. Non-parametric data were compared using the Mann–Whitney U test and effect size (ES) was calculated with d Cohen (Small, d = 0.2; Medium, d = 0.5; Large, d = 0.8). The effect size for the Mann- Whitney U test was calculated according to Lenhard and Lenhard (2022).

A chi-square test was performed to test the independence of the variables. Cramer´s V was performed to analyze effect size (Small, V = 0.2; Moderate, between 0.2 and 0.6; Strong, V > 0.6). Data management and statistical analyses were performed using SPSS software (IBM), version 28. P-value was set at 0.05.

Conclusions

The quality of the diet could be also affected by the stress of the pandemic situation. The association of emotional eating with the intake of proteinic foods and alcoholic drinks could be a remaining situation of the COVID-19 pandemic and could be the psychological distress of the examination period.

We suppose that the maladaptive eating behaviors have improved over time in this pandemic situation. Even though it is necessary to promote healthier eating in university students, improving healthy habits.

These findings could help health promoters design and implement educational programs to promote healthy habits among university students. More studies should be performed to better understand the possible relationships between stress quality addiction that help to prevent the future health crisis.

Data availability

The data presented in this study are available on DOI: 10.6084/m9.figshare.26977003.

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Author contributions

MTIL: investigation, conceptualization, methodology, resources, writing original draft, writing, review and editing, visualization, project administration, funding acquisition. GDU: conceptualization, methodology, review and editing, visualization, data curation, formal analysis, writing original draft, software.AR: visualization, resources, review and editing. SHI: resources, Project administration, review. ACC: resources, Project administra-

tion, review, resources. EFM: investigation, conceptualization, review and editing, resources. All authors revised manuscript.

Declarations

Competing interests
The authors declare no competing interests.

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