Report of Empirical Study

HEALTH PSYCHOLOGY OPEN

Health Psychology Open
July-December 2020: 1–15

DOI: 10.1177/2055102920975274
journals.sagepub.com/home/hpo
SAGE

Unhealthy eating and academic stress: The moderating effect of eating style and BMI

Daniela Caso[1], Capasso Miriam[1], Fabbricatore Rosa[1] and Conner Mark[2]

Abstract

This study aimed to evaluate the relationship between stress and unhealthy eating among undergraduate students, considering the moderation effects of BMI, eating style, and nationality. A total of 748 Italian and French students completed self-report measures of academic stress, emotional eating, restrained eating, BMI, and unhealthy eating intake. Results showed that academic stress increased unhealthy food consumption in Italian students, whereas it reduced junk food consumption in French students. Negative emotional eating and BMI moderated, respectively, the impact of academic stress on sweet food intake and snacking. Finally, no clear support was found for the moderation role of restrained eating.

Keywords

BMI, eating behaviour, emotions, stress, students

Introduction

For many students attending university can be a source of considerable stress. Generally, stress occurs when a subject perceives that environmental demands exceed their coping skills (Lazarus and Folkman, 1984), and the stress response depends on both the characteristics of the stressful event and individual characteristics (Elshurbjy and Ellulu, 2017).

Research has shown that most of the university students experience academic stress (Elias et al., 2011). In a study on the cardiovascular health of university students, Nguyen-Michel et al. (2006) found that more than half of students rate their stress level as high or very high. Exams have been identified as the primary source of academic stress for many university students (Chapell et al., 2005). Furthermore, high levels of examination anxiety can lead to delay or abandonment of university studies (Schaefer et al., 2007). Other potential sources of academic stress include work overload, organisational problems, inadequate teaching supervision, teacher-students conflictual interactions, and poor health habits (Pozos-Radillo et al., 2014; Zurlo et al., 2020). Moreover, high levels of academic stress have been associated with lower well-being, anxiety, depression, changes in appetite, sleeping difficulty, and poorer academic performance (Baste and Gadkari, 2014; Brown et al., 2016; Capone et al., 2020; Hudd et al., 2000; Rania et al., 2014; Sohail, 2013).

An extensive body of literature (e.g. Amato et al., 2019; Hill et al., 2018; Reichenberger et al., 2018; Wallis and Hetherington, 2009; Zellner et al., 2006) has pointed out that stress can affect an individual's health in two different ways: first, stress can act through direct physiological processes, for example by increasing the activity of the hypothalamic-pituitary-adrenal axis (HPA) and, consequently, the release of cortisol (Weekes et al., 2006); second, stress can have an impact on health behaviours, including eating behaviour. In this regard, humans studies have shown in some cases an increase and, in others, a reduction in eating in response to stressful cues, depending on the severity of the stressor and personality characteristics (Torres and Nowson, 2007). As noted by Greeno and Wing (1994), stress reduces the salience of internal physiological states,

[1]University of Naples Federico II, Italy
[2]University of Leeds, UK

Corresponding author:
Daniela Caso, Department of Humanities, University of Naples Federico II, Via Porta di Massa 1, 80138 Napoli, Italy.
Email: daniela.caso@unina.it

such as hunger, while increases the salience of external signals related to food (e.g. food taste), explaining why people typically eat more in stressful situations.

In addition to overall quantity, several studies have shown that stressed people tend to eat more snacks and foods high in sugar and fat (Conner et al., 1999; Grunberg and Straub, 1992; Torres and Nowson, 2007), which in the long run may culminate in weight gain and obesity (Laitinen et al., 2002). Similarly, the few studies conducted on university students have highlighted that academic stress typically increases the consumption of unhealthy foods, particularly snacks and sweet foods, and decreases the consumption of healthy foods, such as fruit and vegetables (Errisuriz et al., 2016; Penaforte et al., 2016; Serlachius et al., 2007; Unusan, 2006; Zellner et al., 2006).

However, academic stress does not seem to have the same impact on male and female students. For example, Economos et al. (2008) showed that female students reporting high levels of academic stress, compared to males, tended to eat more in response to stress. In turn, Mikolajczyk et al. (2009) found an association between academic stress and unhealthy food consumption, but only in female students. In general, it would seem that the influence of stress on eating is more significant for women than for men and that it concerns more the food choice than the amount of food eaten (Conner and Armitage, 2002).

Other studies have also highlighted the moderating role of eating style in the relationship between stress and eating, for example, restrained eating and emotional eating (Shukri et al., 2018). Research has also identified a relationship between these eating styles and some eating disorders (Delinsky and Wilson, 2008; Gluck, 2006).

The leading theory used to explain restrained eating is the Restraint Theory (Herman and Polivy, 1975). Following this theory, restrained eating can be defined as the constant tendency to reduce food consumption in order to lose weight, through self-control processes that require considerable cognitive effort. However, these processes can be compromised when the individual faces a stressor; in fact, the discomfort associated with hunger, combined with that deriving from the stressor, makes any effort of self-control over food intake useless, leaving room for food disinhibition. For this reason, restrained eaters, compared with non-restrained eaters, should present a higher propensity to respond to stress by eating (Conner and Armitage, 2002). The results of the studies conducted in this area have generally confirmed that restrained eaters are likely to eat more when stressed than when unstressed (Greeno and Wing, 1994; Lattimore and Caswell, 2004; Tanofsky-Kraff et al., 2000; Wallis and Hetherington, 2004). In addition, it has been shown that women, generally, report higher levels of dietary restraint than men (Conner and Armitage, 2002; Wardle et al., 2000), which in turn has been associated to media pressure, thin-ideal internalisation, and body dissatisfaction (Chang et al., 2013; Kong et al., 2013). In fact, women, compared to men, have a greater tendency to internalise cultural body standards (Boursier et al., 2020; Caso et al., 2020; Gioia et al., 2020), in particular the thin-ideal.

Emotional eating was instead explained by the Psychosomatic Theory of Obesity (Kaplan and Kaplan, 1957), which states that individuals with an emotional eating style use food as a dysfunctional coping strategy to reduce stress. Furthermore, having not learned to distinguish between hunger and negative emotions, they would respond to stress as if it were hunger and, consequently, by eating. However, as reported by Cardi et al. (2015), also positive emotions (e.g. happiness) can change food consumption, leading people to eat more than usual. Moreover, it has also been observed that emotions and stress can reduce food consumption (Van Strien et al., 2012). For this reason, it is necessary to analyse the impact of both positive and negative emotions on food consumption, considering that emotions can both increase and reduce it. Anyhow, it is still unclear whether emotional eating is a significant factor in the relationship between stress and eating habits. Some studies showed that emotional eating is associated with perceived stress (Nguyen-Rodriguez et al., 2008), increased consumption of sweets (Konttinen et al., 2010), and high-fat snacks (Wallis and Hetherington, 2009). In contrast, others reported no impact of emotional eating on the relationship between stress and snacking (Conner et al., 1999).

The psychosomatic hypothesis of obesity has also suggested that overweight or obese individuals, compared to lean people, have a greater tendency to use food as a way to cope with stress and negative emotions (Kaplan and Kaplan, 1957). However, studies on the relationship between BMI and stress have produced conflicting results. For example, Nishitani and Sakakibara (2006) found an association between obesity and job stress in a sample of male Japanese workers, while Kouvonen et al. (2005) reported only a weak association between work stress and BMI. On the other hand, several studies found a consistent relationship between BMI and eating style (Diggins et al., 2015; Lazarevich et al., 2016; Lluch et al., 2000; Porter and Johnson, 2011).

Finally, the link between stress and eating has been investigated mostly in single countries. In such studies, participants usually share the same eating habits and other psychological and environmental characteristics that could be linked to stress, making it difficult to compare studies conducted in different nationalities. In this regard, in a cross-sectional study among university students from three European countries, Mikolajczyk et al. (2009) found that the relationship between stress, depressive symptoms, and unhealthy eating significantly differed by country, showing that eating patterns depend not only on the individual but also social and political factors. In light of these results, it could be useful to compare individuals from different nationalities and to examine whether nationality moderates the relationship between stress and food choice.

As a whole, the current literature highlights the influence of stress on eating behaviour, both in relation to the amount of food consumed and the choice of specific foods. However, few studies have specifically analysed the impact of academic stress on eating behaviour, and we have not found any studies that have simultaneously examined all the variables discussed above. Therefore, the present study was conducted to understand the relationship between academic stress and unhealthy eating among undergraduate students also focusing on the moderation effects of BMI, eating style, and nationality in a convenience sample of Italian and French university students, as a basis for the development of future interventions aimed to reduce stress and unhealthy eating among undergraduate students.

Starting from the above, in the present study, we tested the following hypotheses.

Hypothesis 1. Academic stress, emotional eating, and restrained eating are positively associated with unhealthy eating.

Hypothesis 2. Overweight participants, unlike normal-weight ones, show higher levels of academic stress, negative emotional eating, and increased consumption of unhealthy foods.

Hypothesis 3. Eating style moderates the relationship between academic stress and unhealthy eating.

Hypothesis 4. BMI moderates the relationship between academic stress and unhealthy eating.

Hypothesis 5. Nationality moderates the relationship between academic stress and unhealthy eating.

Materials and methods

Participants

The participants included $N = 748$ university students, of which $n = 574$ came from Italy and $n = 174$ from France. The age of the sample ranged from 19 to 30 years ($m = 22.84$, $SD = 3.28$).

Eligibility criteria were age $\leqslant 30$ years, BMI $\leqslant 18.5$ (the cut-off point for normal weight), and enrollment in a university course of study. Participants were predominantly women (79.7%) with an average BMI of 23 and came from different degree courses. The data were collected through an online self-report questionnaire, implemented on the Google Forms platform.

Students were recruited by sharing the link to the questionnaire on Italian and French Facebook groups dedicated explicitly to university students enrolled in various degree courses. Specifically, they were invited to take part (voluntarily and free of charge) in a study on the psychological factors associated with university students' eating habits. The questionnaire was linked in such Facebook groups only after having explained to its administrators the research's purpose and have consequently received their approval. Participants were informed about the anonymity of data collection and the confidential nature of participation and signed the informed consent for data on the first page of the questionnaire, which took approximately 20 minutes to complete. It required a mandatory answer to each item, so no respondents had missing values.

This study was conducted following receipt of ethical approval by the Department of Humanities of the University of Naples "Federico II."

Measures

Academic stress. Academic stress was assessed using the 18-item *Perception of Academic Stress Scale* (Bedewy, 2015). Items are divided into three subscales representing different sources of academic stress: stresses related to academic expectations (e.g. "The unrealistic expectations of my parents stresses me out"; $\alpha = 0.48$), stresses related to faculty work and examinations (e.g. "I believe that the amount of work assignment is too much"; $\alpha = 0.71$) and stresses related to students' academic self-perceptions (e.g. "I think that my worry about examinations is a weakness of character"; $\alpha = 0.74$). The participants responded on 5-point Likert scales: strongly disagree (1) to strongly agree (5).

Eating style. Our attention focused on two eating styles: emotional eating and restrained eating. To evaluate emotional eating, we used the 20-item *Salzburg Emotional Eating Scale* (Meule et al., 2018). Items evaluated any alteration in food intake (which can include eating less or eating more than usual) in response to affective states (both positive and negative), resulting into four subscales of five items each: happiness (e.g. "When I am happy, I eat much less than usual"), sadness (e.g. "When I feel lonely, I eat more than usual"), anger (e.g. "When I am furious, I eat just as much as usual"), and anxiety (e.g. "When I am nervous, I eat much more than usual"). Participants were asked to indicate on a 5-point Likert scale how much they eat in response to the positive and negative emotions listed: "much less than usual" (1) to "much more than usual" (5). As will be better explained later, we merged subscale scores referred to negative emotions. The reliability of the emotional eating measures is good: $\alpha = 0.81$ for positive emotional eating (happiness), $\alpha = 0.9$ for negative emotional eating. To evaluate restrained eating, instead, we used the single-item question "Are you trying to lose weight in the last period?" (yes or not).

Unhealthy eating. About unhealthy eating, we assessed the frequency of intake of different types of food that had been indicated in the literature as mainly related to the increase in consumption under stress conditions (Cartwright et al., 2003; Errisuriz et al., 2016; Hill et al., 2018; Jenkins et al., 2005;

Table 1. Descriptive analysis and *t*-test results.

	Mean (SD)		
	Total sample ($N = 741$)	Normal weight sample ($n = 550$)	Overweight sample ($n = 191$)
Food consumption			
Junk food*	1.93 (0.56)	1.90 (0.57)	2.01 (0.52)
Sweet food	2.5 (0.60)	2.07 (0.61)	2.01 (0.58)
Snacking**	3.23 (1.18)	3.16 (1.18)	3.47 (1.16)
Emotional eating			
Happiness***	3.09 (0.51)	3.13 (0.49)	2.95 (0.53)
Sadness***	3.15 (0.89)	3.05 (0.88)	3.46 (0.84)
Anger***	2.64 (0.77)	2.55 (0.73)	2.90 (0.84)
Anxiety***	2.77 (1.02)	2.60 (0.99)	3.25 (0.96)
Academic stress			
Full scale*	3.12 (0.59)	3.09 (0.59)	3.21 (0.61)
Academic expectations*	2.73 (0.77)	2.69 (0.76)	2.85 (0.79)
Faculty work and examinations	3.32 (0.69)	3.30 (0.67)	3.37 (0.74)
Academic self-perceptions**	3.12 (0.75)	3.08 (0.75)	3.25 (0.75)

A significant difference between normal weight and overweight samples: *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Michels et al., 2017; O'Connor and O'Connor, 2004; Penaforte et al., 2016; Tate et al., 2015). A list of unhealthy foods was presented to the participants, and they were asked to rate "How often have you eaten this food in the last 2 weeks?" on a 5-point Likert scale from "never" (1) to "more than once a day" (5). In the analyses, we have grouped the foods into three categories: junk food (e.g. fried foods, mayonnaise, fast food), sweet food (e.g. chocolate, cookies, cakes), and snacks (both sweet and savoury).

BMI. Self-reported height and weight were used to determine BMI. It was calculated using the standard calculation of weight in kilograms divided by height in meters squared (kg/m^2). Participants with scores above 25 were considered overweight or obese (Cole et al., 2000). We grouped them into a single category. A total of 73.5% of the participants were classified as having a normal weight, and 26.5% were classified as overweight.

Nationality. Two identical versions of the questionnaire were developed, one in Italian and the other in French. The Italian version was administered via Italian Facebook groups, while the French version was administered via French Facebook groups, in order to distinguish the nationality of the respondent.

Statistical analyses

Statistical analyses were conducted using SPSS version 22. Firstly, descriptive analyses were carried out on all study variables, and independent samples *t*-test was used to examine group differences by weight (normal vs overweight). The associations between variables were evaluated by bivariate correlations. Then hierarchical multiple regression analyses were performed to test the significance of predictors and moderation effects on junk food, sweet food, and snack consumption. After standardising the quantitative variable scores, factors were entered in the procedure in the following order: age, sex, BMI, and nationality (Step 1); academic stress, restrained eating, and emotional eating (Step 2); interaction terms (Step 3). A stepwise procedure was used in Step 3 to select only the interactions that had significant coefficients. The interaction terms involved was stress × emotional eating, stress × BMI, stress × restrained eating, stress × nationality (two-way interactions); stress × emotional eating × nationality, stress × restrained eating × nationality, stress × BMI × nationality, stress × BMI × emotional eating, stress × BMI × restrained eating (three-way interactions). It is worth noting that concerning emotional eating in the regression analyses, the subscale scores referred to negative emotions (sadness, anger, and anxiety) were merged because of their high correlations. So, we had two variables related to emotional eating: positive emotional eating and negative emotional eating. Finally, simple slope analyses (Dawson, 2014) were performed to interpret the significant interactions.

Results

Descriptive analysis

In Table 1, descriptive analysis and *t*-test results about unhealthy food consumption and the related psychological variables are shown. Students' snack consumption was higher than junk food and sweet food consumption: students stated that they had eaten junk food and sweet food about once a week, while their snack consumption had been

about more than once a week. Students affirmed that their food consumption slightly decreases when they are angry or anxious while it is close to the average when they are happy or sad. About academic stress, faculty work and examinations represented the main source, followed by academic self-perceptions and academic expectations. Analyses by BMI highlighted a statistically significant difference between normal weight and overweight students in all considered variables except for sweet food consumption and stress related to faculty work and examinations. As displayed in Table 1, overweight students reported higher scores in negative emotional eating (sadness: $t_{(739)}=-5.69$, $p<0.001$; anger: $t_{(296.78)}=-5.07$, $p<0.001$; anxiety: $t_{(739)}=-7.79$, $p<0.001$), snacking ($t_{(739)}=-3.14$, $p<0.01$), junk food consumption ($t_{(739)}=-2.27$, $p<0.05$), stress related to academic expectations ($t_{(739)}=-2.46$, $p<0.05$), and academic self-perceptions ($t_{(739)}=-2.70$, $p<0.01$). These results partially confirmed Hypothesis 2. In Table 2, correlations among the variables are displayed. About the relationship between food intake and emotional eating, it emerged a positive correlation between (1) junk food consumption and emotional eating related to happiness and anger, (2) sweet food consumption and emotional eating related to sadness and anxiety, (3) snacking and emotional eating in the presence of all the negative emotions (i.e. sadness, anger, and anxiety). Concerning BMI, it was positively correlated with restrained eating and negative emotional eating (sadness, anger, and anxiety) as well as junk food consumption and snacking; instead, a negative correlation was found between BMI and emotional eating related to happiness. Finally, stress due to academic self-perceptions was positively correlated with snacking and junk food intake, while stress related to academic expectation was correlated with sweet food consumption and snacking.

Regression analysis: predictors of junk food, sweet food, and snack consumption

Hierarchical multiple regression analyses with moderation effects were carried out to test our hypotheses. The results will be divided according to the food category: junk food, sweet food, and snacks.

Junk food. The demographic variables in Step 1 accounted for a statistically significant proportion of the variance, $R^2=0.017$, $F_{(4,732)}=3.22$, $p<0.05$. In particular, age and BMI were significant predictors with $\beta=-0.78$ ($p<0.05$) and $\beta=0.082$ ($p<0.05$) coefficient, respectively. In Step 2, the addition of the main effects of the restrained eating, academic stress, and emotional eating (positive and negative) contributed significantly to the explained variance ($\Delta R^2=0.028$, $F_{(8,728)}=4.30$, $p<0.001$). Age, BMI, positive emotional eating, and restrained eating were significant predictors in this step. Finally, in Step 3, the stepwise method identified a significant interaction between academic stress and nationality ($\beta=-0.162$, $p<0.001$), indicating that the nationality significantly moderated the impact of academic stress on junk food consumption. According to the R^2 adjusted the best model was the third ($R^2=0.062$, $F_{(9,727)}=5.31$, $p<0.001$). About the main effects at this step, BMI ($\beta=0.093$, $p<0.05$), positive and negative emotional eating ($\beta=0.130$, $\beta=0.124$, $p<0.01$), and academic stress ($\beta=0.127$, $p<0.01$) predicted positively the junk food consumption, whereas age ($\beta=-0.095$, $p<0.05$), nationality ($\beta=-0.102$, $p<0.05$) and restrained eating ($\beta=-0.106$, $p<0.01$) negatively predicted it. These results (showed in Table 3) were consistent with Hypothesis 1. Contrary to what we expected, junk food consumption was higher in non-restrained eaters. Regarding nationality, results showed that, on average, Italian students ate more junk food than French ones in the presence of academic stress. To interpret the moderation effect of the nationality on junk food consumption in relation to academic stress, simple slope analysis (Dawson, 2014) was conducted. As it can be seen in Figure 1, academic stress significantly predicted junk food consumption for both Italian and French students, but differently: when academic stress increased, junk food intake increased in Italian students ($\beta=0.12$, $p<0.01$) but decreased in the French ones ($\beta=-0.21$, $p<0.05$). This result confirmed Hypothesis 5.

Sweet food. The Step 1 model explained a statistically significant proportion of variance ($R^2=0.060$, $F_{(4,732)}=11.75$, $p<0.001$) but only the variable nationality ($\beta=0.24$, $p<0.001$) was a significant predictor of sweet food consumption among the demographic variables (Table 4). The addition of the main effects in Step 2 caused a significant increase of the explained variance ($\Delta R^2=0.025$, $F_{(8,728)}=8.42$, $p<0.001$): sex, nationality, negative emotional eating, and academic stress had a significant effect on sweet food intake. Finally, in Step 3 the following two significant interactions were identified by the procedure: academic stress × nationality ($\beta=-0.98$; $p<0.05$) and academic stress × negative emotional eating ($\beta=0.078$; $p<0.05$). According to the R^2 adjusted the latter model was the best one ($R^2=0.098$, $F_{(10,726)}=7.92$, $p<0.001$). The main effects of negative emotional eating ($\beta=0.14$, $p<0.01$) and academic stress ($\beta=0.14$, $p<0.01$) predicted positively sweet food consumption, whereas BMI ($\beta=-0.08$; $p<0.05$) predicted it negatively. Moreover, being French was associated with higher sweet food intake ($\beta=0.20$; $p<0.001$). Simple slope analysis tests showed that academic stress significantly predicted sweet food consumption only for the Italian students ($\beta=0.14$; $p<0.05$) and for moderate ($\beta=0.14$; $p<0.05$) and high levels (+1SD; $\beta=0.20$; $p<0.01$) of negative emotional eating. These latter results (depicted in Figures 2 and 3) were consistent with Hypotheses 4 and 5 about the moderating effect of nationality and BMI on the relationship between academic stress and sweet food consumption.

Table 2. Correlations among the variables.

	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17
1. Nationality	1															
2. Age	–0.32**	1														
3. Sex	0.09*	–0.03	1													
4. BMI	–0.15**	0.21**	–0.15**	1												
5. Restrained eating	–0.13**	0.04	0.05	0.37**	1											
6. Emotional eating_happiness	–0.01	–0.08*	–0.06	–0.21**	–0.19**	1										
7. Emotional eating_sadness	–0.05	0.08*	0.07	0.30**	0.15**	–0.29**	1									
8. Emotional eating_anger	–0.04	0.04	–0.01	0.27**	0.11**	–0.15**	0.55**	1								
9. Emotional eating_anxiety	0.01	0.07	–0.021	0.38**	0.16**	–0.34**	0.67**	0.62**	1							
10. Junk food	–0.06	–0.03	–0.07	0.08*	–0.05	0.11**	0.03	0.07*	0.06	1						
11. Sweet food	0.24**	–0.07*	–0.02	–0.07	–0.07	0.03	0.09*	0.07	0.11**	0.32**	1					
12. Snacking	–0.24**	0.09**	–0.07	0.11**	–0.01	–0.02	0.21**	0.15**	0.16**	0.29**	0.23**	1				
14. Academic stress (full scale)	–0.10**	0.11**	0.18**	0.09*	0.16**	–0.01	0.04	0.03	0.03	0.06	0.07*	0.11**	1			
15. Academic expectations	–0.03	0.10**	0.10**	0.08*	0.12**	0.01	0.05	0.07	0.06	0.01	0.10**	0.07*	0.73**	1		
16. Faculty work and examinations	–0.06	0.09*	0.12**	0.06	0.12**	0.01	0.01	0.01	0.01	0.04	0.06	0.06	0.87**	0.51**	1	
17. Academic self-perceptions	–0.13**	0.06	0.21**	0.08*	0.14**	–0.03	0.04	0.01	0.03	0.08*	0.04	0.12**	0.80**	0.42**	0.50**	1

*$p < 0.05$. **$p < 0.01$.

Table 3. Hierarchical multiple regression analysis of junk food consumption.

	Step 1 β	Step 2 β	Step 3 β	ΔR^2	ΔF
Step 1: Demographic variables				0.017	3.22*
Age	–0.078*	–0.08*	–0.095*		
BMI	0.082*	0.116**	0.093*		
Nationality	–0.066	–0.073	–0.102*		
Sex	–0.051	–0.049	–0.049		
Step 2: Main effects				0.028	5.30***
Emotional eating_positive		0.114**	0.13**		
Emotional eating_negative		0.065	0.124**		
Academic stress		0.06	0.127**		
Restrained eating		–0.102*	–0.106**		
Step 3: Interaction effects				0.034	12.85***
Academic stress × nationality			–0.162***		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

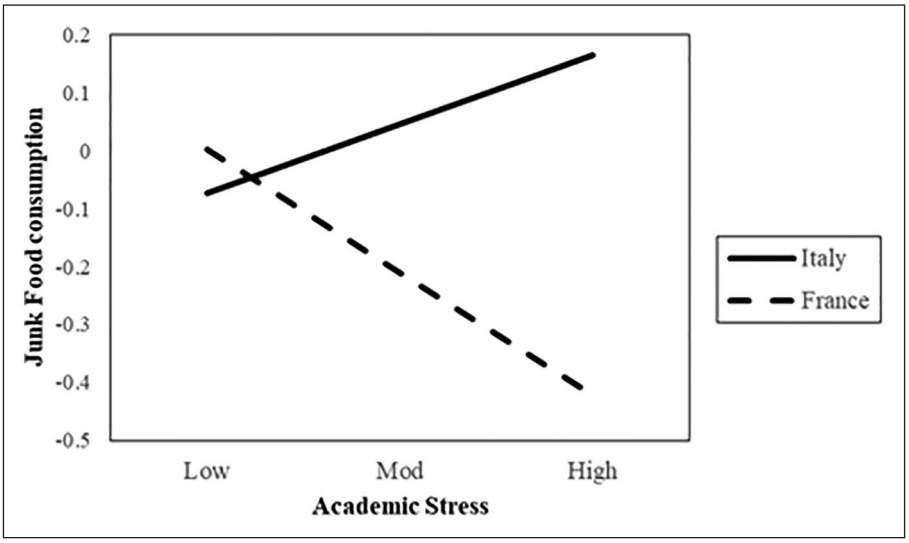

Figure 1. The moderating effect of nationality on the relationship between academic stress and junk food consumption.

Snacking. For snacking, only the nationality, among the demographic variables included in Step 1, affected snack consumption (Table 5). This model accounted for a statistically significant proportion of the variance, $R^2 = 0.061$, $F_{(4,731)} = 11.9$, $p < 0.001$. In Step 2, the entrance of the main effects contributed significantly to the variance explained ($\Delta R^2 = 0.040$, $F_{(8,727)} = 10.26$, $p < 0.001$): nationality, negative emotional eating, and restrained eating were significant predictors. About interaction terms, the stepwise methods in Step 3 identified the following as significant: academic stress × nationality, academic stress × BMI, academic stress × restrained eating. According to the R^2 adjusted, the latter model was the best one ($R^2 = 0.124$, $F_{(11,724)} = 9.28$, $p < 0.001$). In Step 3, the main effects of negative emotional eating and academic stress predicted snacking positively (β = 0.22, β = 0.18, respectively). Moreover, results showed that snack consumption was higher in non-restrained eaters (β = −0.08; $p < 0.05$), men (β = −0.07; $p < 0.05$) and Italian students (β = −0.25; $p < 0.001$). Simple slope analyses about moderation effects showed that academic stress predicted snacking only for the Italian students (β = 0.05, $p < 0.001$), non-restrained eaters (β = 0.05, $p < 0.001$) and for moderate (β = 0.05, $p < 0.001$) and high (+1SD; β = 0.07; $p < 0.001$) levels of BMI. These latter results are shown in Figures 4 to 6. It is worth noting that, for snacking, almost all the Hypotheses were confirmed.

Discussion and conclusion

The aim of the present study was to evaluate the association between academic stress and unhealthy eating among undergraduate students, also considering the moderation role of eating style, BMI, and nationality. Although many studies have explored the relationship between stress and

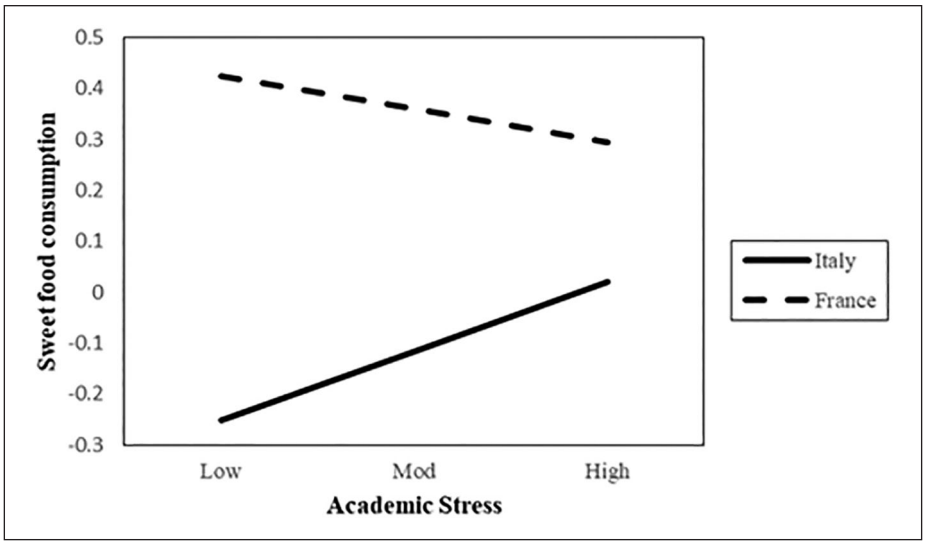

Figure 2. The moderating effect of nationality on the relationship between academic stress and sweet food consumption.

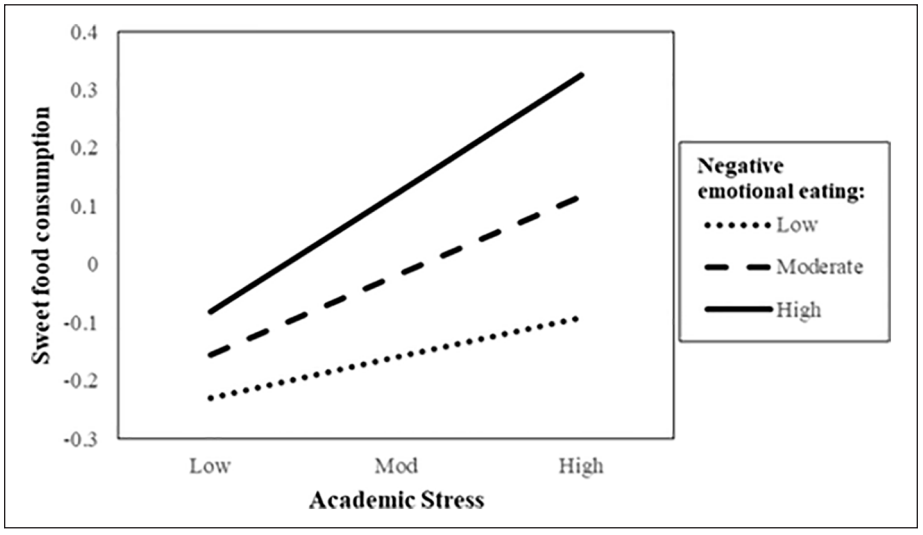

Figure 3. The moderating effect of negative emotional eating on the relationship between academic stress and sweet food consumption.

eating behaviour among university students, few studies have specifically measured academic stress, preferring generic measures of stress. Besides, we found no studies that simultaneously analysed the impact of eating style, BMI, and nationality on the relationship between stress and eating. The present study aims to fill this gap in the literature.

Overall, our results showed that students reported above-average scores of academic stress, considering the mid-point of the scale. Notably, the main source of stress was related to faculty work and examinations, consistent with the results of numerous studies in the literature (Harikiran et al., 2012; Nandamuri and Gowthami, 2011; Pfeiffer, 2001).

Student scores related to emotional eating ranged around the mid-point of the scale. The emotion associated with higher food consumption was sadness. In contrast, those associated with lower food intake were anger and anxiety, consistent with the results of Meule et al. (2018), who found that the higher food consumption was related with sadness, followed, in decreasing order, by anger and anxiety, while food intake in response to the emotion of happiness tended to remain unchanged. As pointed out by the authors, the different physiological mechanisms that underlie the different emotions (e.g. physiological activation levels) would justify a specific impact of the type of emotion on the pattern of assumption (a low arousal emotion like sadness would increase food consumption,

Table 4. Hierarchical multiple regression analysis of sweet food consumption.

	Step 1 β	Step 2 β	Step 3 β	ΔR^2	ΔF
Step 1: Demographic variables				0.06	11.75***
Age	0.008	0.006	–0.004		
BMI	–0.038	–0.067	–0.083*		
Nationality	0.24***	0.235***	0.197***		
Sex	–0.051	–0.077*	–0.072		
Step 2: Main effects				0.025	4.84**
Emotional eating_positive		0.031	0.043		
Emotional eating_negative		0.116**	0.14**		
Academic stress		0.093*	0.135**		
Restrained eating		–0.043	–0.045		
Step 3: Interaction effects				0.013	5.49**
Academic stress × EE_negative			0.078*		
Academic stress × nationality			–0.098*		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 5. Hierarchical multiple regression analysis of snacking.

	Step 1 β	Step 2 β	Step 3 β	ΔR^2	ΔF
Step 1: Demographic variables				0.056	11.9***
Age	0.004	0,004	–0.002		
BMI	0.070	0.032	–0.016		
Nationality	–0.21***	–0.23***	–0.25***		
Sex	–0.044	–0.07	–0.07*		
Step 2: Main effects				0.036	8.16***
Emotional eating_positive		0.003	0.013		
Emotional eating_negative		0.18***	0.22***		
Academic stress		0.06	0.18**		
Restrained eating		–0.09*	–0.08*		
Step 3: Interaction effects				0.018	6.06***
Academic stress × restrained eating			–0.11*		
Academic stress × BMI			0.11**		
Academic stress × nationality			–0.11*		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

whereas high arousal emotions as anger and anxiety would reduce it; Macht, 2008).

Regarding unhealthy eating, reported snack consumption was higher than junk food and sweet food consumption. Eating snacks between meals can represent a particular way of dealing with stress (Oliver et al., 2000). As pointed out by Conner et al. (1999), this is an interesting eating behaviour to investigate, since some empirical evidence has suggested that snacking between meals is associated with long-term weight gain (Conner and Norman, 1996; Grogan et al., 1997).

Consistent with Hypothesis 1, stress related to academic expectations was positively associated with sweet food consumption and snacking, while stress related to academic self-perceptions was positively related to junk food consumption and snacking. These results are consistent with the studies that reported, in stressed university students, a greater consumption of snacks and foods high in sugar and fat (Mikolajczyk et al., 2009; Serlachius et al., 2007; Zellner et al., 2006). As proposed by Macht et al. (2005), the increased consumption of unhealthy food in response to academic stress could be explained by at least three different mechanisms: (1) eating to control negative emotions; (2) eating to elicit positive emotional reactions; (3) eating to get a feeling of body relaxation. Their results supported the hypothesis that students used food to distract themselves from negative emotions, particularly fear, tension, and emotional stress, an explanation that would seem to be valid also in our case. Furthermore, Macht and Mueller (2007) pointed out that stress-induced negative emotions produce a preference for high-sugar and high-fat foods. Especially regarding sweet foods, Al'Absi et al. (2012) observed that stress could affect sweet food consumption indirectly, attenuating sweet taste perception, which in turn

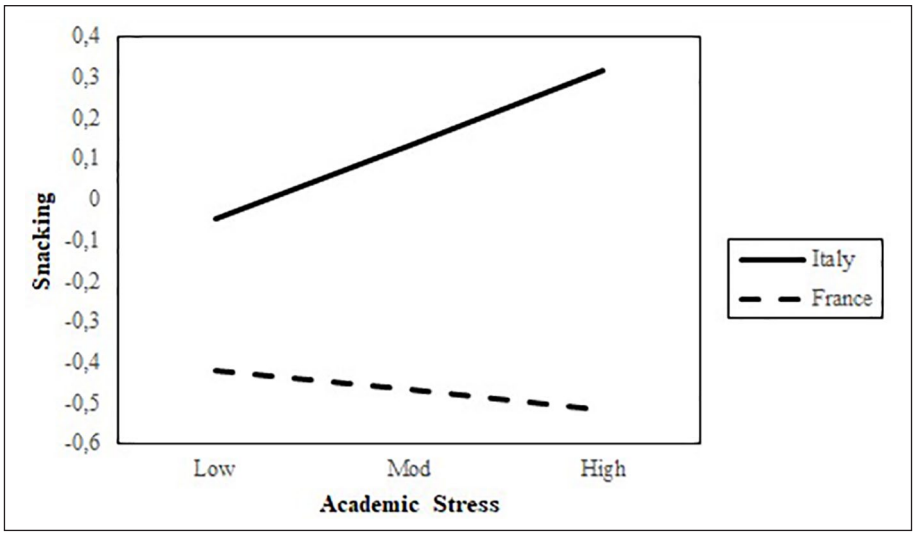

Figure 4. The moderating effect of nationality on the relationship between academic stress and snacking.

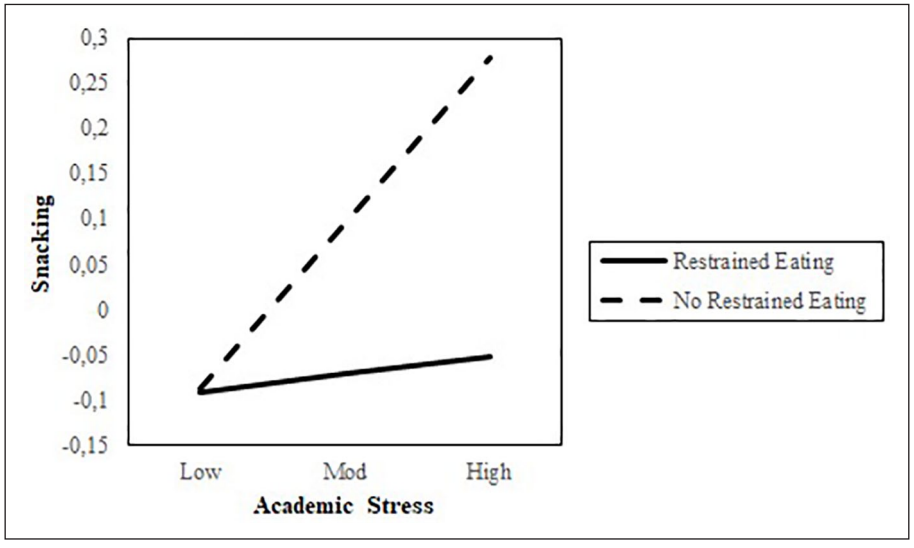

Figure 5. The moderating effect of restrained eating on the relationship between academic stress and snacking.

could cause compensatory consumption, such as an increased intake of high-sugar foods. Clearly, biological and psychological explanations are not mutually exclusive. Also, the association found between academic stress and snack consumption leads us to suppose that the intake of snacks between main meal could represent the primary source of unhealthy food consumption among stressed students. However, high consumption of snacks could also be due to their easy availability (e.g. in the vending machines at the university) and, as noted before, to the fact that snacking in itself constitutes a form of diet commonly reported as a reaction to stress (Oliver et al., 2000).

Similarly, negative emotional eating was positively associated with unhealthy eating, particularly sweet food consumption and snacking. According to the literature, emotional eaters eat more sweets (Konttinen et al., 2010) and high-fat snacks (Wallis and Hetherington, 2009) than non-emotional eaters. A possible explanation of why emotional eaters consume a higher amount of fat and carbohydrate-rich foods was proposed by Macht (2008). He found that the intake of such foods, on the one hand, stimulates the release of serotonin into the brain, which is responsible for feelings of pleasure and is involved in mood regulation. On the other hand, it reduces the activity of the hypothalamic-pituitary-adrenal axis, implicated in the regulation of negative emotions and stress.

Positive emotional eating was, instead, positively associated only with junk food consumption, in line with the hypothesis that even positive emotions can increase food consumption (Cardi et al., 2015; Evers et al., 2013). Future

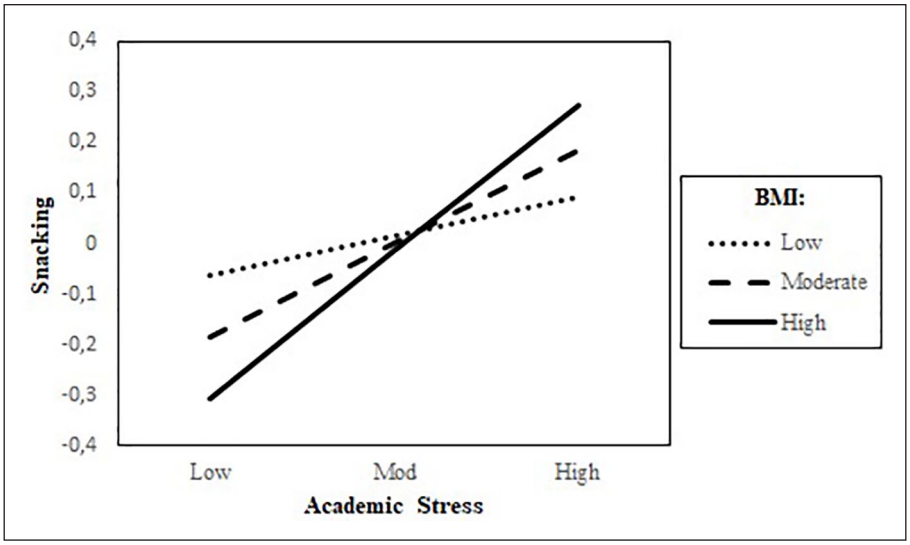

Figure 6. The moderating effect of BMI on the relationship between academic stress and snacking.

research should better investigate the impact of positive emotions on food consumption.

Regarding restrained eating, contrary to what has been hypothesised, we found no positive association between this eating style and unhealthy eating. This data could be in line with the results of Oliver et al. (2000), who found that stressed emotional eaters (and not restrained eaters) eat more unhealthy foods than unstressed and non-emotional eaters.

As hypothesised (Hypothesis 2), overweight people showed higher levels of negative emotional eating, academic stress (specifically, stress related to academic expectations, and stress related to academic self-perceptions), and unhealthy eating (specifically, junk food consumption, and snacking). Furthermore, academic stress predicted snacking only in students with a higher BMI, also confirming the moderation role of BMI in the relationship between academic stress and unhealthy eating (Hypothesis 4). As suggested by Torres and Nowson (2007), since stress increases the desire to eat high-calorie foods, chronic stress levels could lead to significant weight gain over the long term, thus explaining the association between stress and overweight. Also, from a physiological point of view, the HPA axis hyperactivity induced by stress stimulates the release of insulin, which in turn contributes to abdominal fat deposit (Galvao-Teles et al., 1976). Ozier et al. (2008) found that emotional eaters are often overweight or obese; therefore, they could not be able to adopt functional coping strategies to cope with daily stressors and, consequently, eat more unhealthy food as a maladaptive way of coping.

Consistent with the hypothesis that eating style moderates the relationship between academic stress and unhealthy eating (Hypothesis 3), our results showed that academic stress predicted sweet food consumption only in the mean and high negative emotional eating groups. In contrast, no effect was found in those in the lower group, consistent with the results of a laboratory study conducted by Oliver et al. (2000), in which stress led to increased consumption of sweets and fatty foods only in emotional eaters. According to Psychosomatic Theory (Kaplan and Kaplan, 1957), emotional eaters are unable to differentiate between hunger and negative feelings and, as a result, respond to stress by overeating. In this regard, Markus et al. (1998) found that the intake of carbohydrate foods can help some individuals to reduce negative mood through serotonergic mechanisms, specifically favouring the absorption in the brain of the amino acid tryptophan, which is the primary precursor of serotonin.

On the other hand, we found no clear support for the moderation effect of restrained eating on the stress-eating relationship, since academic stress predicted the consumption of snacks in non-restrained eaters, rather than in restrained ones. The way we operationalised the construct could partially explain this unexpected result. In fact, the mere question related to the state of the diet could be insufficient to detect all the facets of the restrained eating, for example, that relating to disinhibition (Habhab et al., 2009). Moreover, students that we have classified as "restrained" may be merely making healthy attempts to control their weight. Therefore, their eating behavior could be regulated by a strong motivation to lose weight and be less susceptible to the impact of stress or negative emotions. It could explain the reason why the participants we have instead classified as "non-restrained"—thus probably not engaged in a healthy attempt to lose weight—show increased consumption of snacks in response to stress.

Finally, as hypothesised (Hypothesis 5), results showed that nationality moderated the impact of academic stress on unhealthy eating. Specifically, stress increased the consumption of unhealthy food (all three categories

considered) only in Italian students, while it reduced the consumption of junk food in the French ones. It is interesting to note that regardless of stress levels, French students ate more sweet foods than Italians. However, they showed similar levels of junk food consumption at low levels of academic stress. Although food consumption reported by students is somewhat consistent with those reported in the EFSA Comprehensive European Food Consumption Database (European Food Safety Authority, 2018), these results remain difficult to explain. The differences found between Italian and French students could also reflect the different cultural backgrounds of the two countries. However, since we have in no way evaluated the racial and cultural origins of participants, this remains only one of the possible explanations that could be explored in future studies.

The present study has several limitations. First, because of the cross-sectional design, we cannot conclude that the relationship found between academic and unhealthy food is causal. Second, we are fully aware that the sample size was disproportionately larger in Italy than France and that this might affect the quality and generalisability of our results. As far as we know, this is the first study in which the relationship between academic stress and unhealthy eating has been analysed in two countries; therefore, ours represents a first attempt to explore how the considered relationships can change across two cultural groups. Third, the participants were not equally distributed by gender (79.7% were women), preventing us from also studying the moderation role of gender in the stress-eating relationship. Finally, since we used a *self-report* questionnaire, students may have provided socially desirable answers; for example, they may have underestimated the consumption of unhealthy foods or reported inaccurate weight and height. Future research should include more precise measures of eating behavior, for example, using food diaries apps (Carfora et al., 2016). In addition, since the literature suggests that academic stress reduces the consumption of healthy foods as well as increases the consumption of unhealthy foods, it would be useful for future studies to consider more food categories, including the healthiest ones. In fact, it is necessary not only to reduce unhealthy eating behaviors but also to understand the predictors of healthier food choices (e.g. high consumption of fruit and vegetables) and promote them among young people (Canova and Manganelli, 2016; Canova et al., 2020).

Despite the limitations, the relationship found between academic stress and unhealthy eating appears to be particularly relevant, since the consumption of unhealthy food to cope with stress has a considerable impact on the risk of negative health outcomes, especially in groups of people (such as university students) that can experience chronic high levels of stress. From a theoretical point of view, most of the studies about stress and eating involved undergraduate students, but only a few explicitly focused on academic stress. In this regard, our study seems to be noteworthy because of its focus. Finally, a relevant aspect also concerns the distinction between positive and negative emotional eating, since most of the studies analyse only the impact of negative emotions on eating behavior.

Regarding practical implications, findings from this study highlight the factors that should be taken into consideration in future interventions to promote healthy eating addressed to university students. Since the dietary pattern of university students is already of low quality in itself regardless of stress (factors such as the cost and accessibility of food may have a high impact on the food choices of many students), there is a clear need for initiatives to promote healthy eating specifically aimed at this population. Furthermore, considering that university students are also particularly vulnerable to stress, further interventions are necessary to teach them to use more effective coping strategies—and not related to food—for stress management, starting from the awareness of the existence of a possible association between stress, eating styles, and food choices. Finally, our findings related to the differences between nationalities encourage future studies to explore more in-depth the impact of cultural characteristics on the relationship between stress and eating, in order to consider these differences also in the planning of effective interventions to promote healthy eating.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD


Daniela Caso https://orcid.org/0000-0002-6579-963X

References

Al'Absi M, Nakajima M, Hooker S, et al. (2012) Exposure to acute stress is associated with attenuated sweet taste. *Psychophysiology* 49(1): 96–103.

Amato M, Fasanelli R and Riverso R (2019) Emotional profiling for segmenting consumers: The case of household food waste. *Quality-Access to Success* 20(S2): 27–32.

Baste VS and Gadkari JV (2014) Study of stress, self-esteem and depression in medical students and effect of music on perceived stress. *Indian Journal of Physiology and Pharmacology* 58: 298–301.

Bedewy D and Gabriel A (2015) Examining perceptions of academic stress and its sources among university students: The Perception of Academic Stress Scale. *Health Psychology Open* 2(2): 1–9.

Boursier V, Gioia F and Griffiths MD (2020) Objectified body consciousness, body image control in photos, and problematic social networking: The role of appearance control beliefs. *Frontiers in Psychology* 11: 147.

Brown K, Anderson-Johnson P and Mcpherson AN (2016) Academic-related stress among graduate students in nursing in a Jamaican school of nursing. *Nurse Education in Practice* 20: 117–124.

Canova L and Manganelli AM (2016) Fruit and vegetables consumption as snacks among young people. The role of descriptive norm and habit in the theory of planned behavior. *TPM: Testing, Psychometrics, Methodology in Applied Psychology* 23(1): 83–97.

Canova L, Bobbio A and Manganelli AM (2020) Predicting fruit consumption: A multi-group application of the theory of planned behavior. *Appetite* 145: 104490.

Capone V, Caso D, Donizzetti AR, et al. (2020) University student mental well-being during COVID-19 outbreak: What are the relationships between information seeking, perceived risk and personal resources related to the academic context? *Sustainability* 12(17): 7039.

Cardi V, Leppanen J and Treasure J (2015) The effects of negative and positive mood induction on eating behaviour: A meta-analysis of laboratory studies in the healthy population and eating and weight disorders. *Neuroscience & Biobehavioral Reviews* 57: 299–309.

Carfora V, Caso D and Conner M (2016) Randomized controlled trial of a messaging intervention to increase fruit and vegetable intake in adolescents: Affective versus instrumental messages. *British Journal of Health Psychology* 21: 937–955.

Cartwright M, Wardle J, Steggles N, et al. (2003) Stress and dietary practices in adolescents. *Health Psychology* 22(4): 362–369.

Caso D, Schettino G, Fabbricatore R, et al. (2020) "Change my selfie": Relationships between self-objectification and selfie-behavior in young Italian women. *Journal of Applied Social Psychology* 50(9): 538–549.

Chang FC, Lee CM, Chen PH, et al. (2013) Association of thin-ideal media exposure, body dissatisfaction and disordered eating behaviors among adolescents in Taiwan. *Eating Behaviors* 14(3): 382–385.

Chapell MS, Blanding ZB, Silverstein ME, et al. (2005) Test anxiety and academic performance in undergraduate and graduate students. *Journal of Educational Psychology* 97(2): 268–274.

Cole TJ, Bellizzi MC, Flegal KM, et al. (2000) Establishing a standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal* 320: 1240–1243.

Conner M and Armitage CJ (2002) *The Social Psychology of Food*. Buckingham: Open University Press.

Conner M and Norman P (1996) Body weight and shape control: Examining component behaviors. *Appetite* 27(2): 135–150.

Conner M, Fitter M and Fletcher W (1999) Stress and snacking: A diary study of daily hassles and between-meal snacking. *Psychology & Health* 14(1): 51–63.

Dawson JF (2014) Moderation in management research: What, why, when, and how. *Journal of Business and Psychology* 29(1): 1–19.

Delinsky SS and Wilson GT (2008) Weight gain, dietary restraint, and disordered eating in the freshman year of college. *Eating Behaviors* 9: 82–90.

Diggins A, Woods-Giscombe C and Waters S (2015) The association of perceived stress, contextualized stress, and emotional eating with body mass index in college-aged Black women. *Eating Behaviors* 19: 188–192.

Economos C, Hildebrandt L and Hyatt R (2008) College freshman stress and weight change: Differences by gender. *American Journal Health Behavior* 32(1): 16–25.

Elias H, Ping WS and Abdullah MC (2011) Stress and academic achievement among undergraduate students in Universiti Putra Malaysia. *Procedia - Social and Behavioral Sciences* 29: 646–655.

Elshurbjy AJ and Ellulu MS (2017) Association between stress and dietary behaviors among university students: Mini-review. *Medical and Clinical Archives* 1(2): 1–3.

Errisuriz VL, Pasch KE and Perry CL (2016) Perceived stress and dietary choices: The moderating role of stress management. *Eating Behaviors* 22: 211–216.

European Food Safety Authority (2018) The EFSA Comprehensive European Food Consumption Database. Available at: http://data.europa.eu/euodp/data/dataset/the-efsa-comprehensive-european-food-consumption-database (accessed 1 July 2019).

Evers C, Adriaanse M, De Ridder DT, et al. (2013) Good mood food. Positive emotion as a neglected trigger for food intake. *Appetite* 68: 1–7.

Galvao-Teles A, Graves L, Burke CW, et al. (1976) Free cortisol in obesity; effect of fasting. *Acta Endocrinologica (Copenhagen)* 81(2): 321–329.

Gioia F, Griffiths MD and Boursier V (2020) Adolescents' body shame and social networking sites: The mediating effect of body image control in photos. *Sex Roles* 83: 773–785.

Gluck ME (2006) Stress response and binge eating disorder. *Appetite* 46(1): 26–30.

Greeno CG and Wing RR (1994) Stress-induced eating. *Psychological Bulletin* 115(3): 444–464.

Grogan SC, Bell R and Conner M (1997) Eating sweet snacks: Gender differences in attitudes and behaviour. *Appetite* 28(1): 19–31.

Grunberg NE and Straub RO (1992) The role of gender and taste class in the effects of stress on eating. *Health Psychology* 11(2): 97–100.

Habhab S, Sheldon J and Loeb R (2009) The relationship between stress, dietary restraint, and food preferences in women. *Appetite* 52(2): 437–444.

Harikiran A, Srinagesh J, Nagesh KS, et al. (2012) Perceived sources of stress amongst final year dental under graduate students in a dental teaching institution at Bangalore, India: A cross sectional study. *Indian Journal of Dental Research* 23(3): 331.

Herman CP and Polivy J (1975) Anxiety, restraint, and eating behavior. *Journal of Abnormal Psychology* 84(6): 666–672.

Hill DC, Moss RH, Sykes-Muskett B, et al. (2018) Stress and eating behaviors in children and adolescents: Systematic review and meta-analysis. *Appetite* 123: 14–22.

Hudd S, Dumlao J, Erdmann-Sager D, et al. (2000) Stress at college: Effects on health habits, health status and self-esteem. *College Student Journal* 34(2): 217–227.

Jenkins SK, Rew L and Sternglanz RW (2005) Eating behaviors among school-age children associated with perceptions of stress. *Issues in Comprehensive Pediatric Nursing* 28(3): 175–191.

Kaplan HI and Kaplan HS (1957) The psychosomatic concept of obesity. *Journal of Nervous and Mental Disease* 125: 181–201

Kong F, Zhang Y, You Z, et al. (2013) Body dissatisfaction and restrained eating: Mediating effects of self-esteem. *Social Behavior and Personality: An International Journal* 41(7): 1165–1170.

Konttinen H, Männistö S, Sarlio-Lähteenkorva S, et al. (2010) Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite* 54(3): 473–479.

Kouvonen A, Kivimäki M, Cox SJ, et al. (2005) Relationship between work stress and body mass index among 45,810 female and male employees. *Psychosomatic Medicine* 67(4): 577–583.

Laitinen J, Ek E and Sovio U (2002) Stress-related eating and drinking behavior and body mass index and predictors of this behavior. *Preventive Medicine* 34(1): 29–39.

Lattimore P and Caswell N (2004) Differential effects of active and passive stress on food intake in restrained and unrestrained eaters. *Appetite* 42: 167–173.

Lazarevich I, Camacho ME, Velázquez-Alva MD, et al. (2016) Relationship among obesity, depression, and emotional eating in young adults. *Appetite* 107: 639–644.

Lazarus RS and Folkman S (1984) *Stress, Appraisal and Coping*. New York, NY: Springer.

Lluch A, Herbeth B, Mejean L, et al. (2000) Dietary intakes, eating style and overweight in the Stanislas Family Study. *International Journal of Obesity* 24(11): 1493–1499.

Macht M (2008) How emotions affect eating: A five-way model. *Appetite* 50(1): 1–11.

Macht M and Mueller J (2007) Immediate effects of chocolate on experimentally induced mood states. *Appetite* 49(3): 667–674.

Macht M, Haupt C and Ellgring H (2005) The perceived function of eating is changed during examination stress: A field study. *Eating Behaviors* 6(2): 109–112.

Markus CR, Panhuysen G, Tuiten A, et al. (1998) Does carbohydrate-rich, protein-poor food prevent a deterioration of mood and cognitive performance of stress-prone subjects when subjected to a stressful task? *Appetite* 31(1): 49–65.

Meule A, Reichenberger J and Blechert J (2018) Development and preliminary validation of the Salzburg Emotional Eating Scale. *Frontiers in Psychology* 9(88): 1–10.

Michels N, Sioen I, Ruige J, et al. (2017) Children's psychosocial stress and emotional eating: A role for leptin? *International Journal of Eating Disorders* 50(5): 471–480.

Mikolajczyk RT, Ansari WE and Maxwell AE (2009) Food consumption frequency and perceived stress and depressive symptoms among students in three European countries. *Nutrition Journal* 8(1): 31.

Nandamuri P and Gowthami C (2011) Sources of academic stress—a study on management students. *Journal of Management and Science* 1(2): 31–42.

Nguyen-Michel ST, Unger JB, Hamilton J, et al. (2006) Associations between physical activity and perceived stress/hassles in college students. *Stress and Health* 22(3): 179–188.

Nguyen-Rodriguez ST, Chou C, Unger JB, et al. (2008) BMI as a moderator of perceived stress and emotional eating in adolescents. *Eating Behaviors* 9(2): 238–246.

Nishitani N and Sakakibara H (2006) Relationship of obesity to job stress and eating behavior in male Japanese workers. *International Journal of Obesity* 30(3): 528–533.

O'Connor DB and O'Connor RC (2004) Perceived changes in food intake in response to stress: The role of conscientiousness. *Stress and Health* 20(5): 279–291.

Oliver G, Wardle J and Gibson EL (2000) Stress and food choice: A laboratory study. *Psychosomatic Medicine* 62(6): 853–865.

Ozier AD, Kendrick OW, Leeper JD, et al. (2008) Overweight and obesity are associated with emotion-and stress-related eating as measured by the eating and appraisal due to emotions and stress questionnaire. *Journal of the American Dietetic Association* 108(1): 49–56.

Penaforte FRO, Matta NR and Japur CC (2016) Association between stress and eating behavior in college students. *DEMETRA: Food, Nutrition & Health* 11(1): 225–237.

Pfeiffer D (2001) *Academic and Environmental Stress among Undergraduate and Graduate College Students: A Literature Review*. Menomonie, WI: University of Wisconsin-Stout.

Porter KN and Johnson MA (2011) Obesity is more strongly associated with inappropriate eating behaviors than with mental health in older adults receiving congregate meals. *Journal of Nutrition in Gerontology and Geriatrics* 30(4): 403–415.

Pozos-Radillo BE, De Lourdes Preciado-Serrano M, Acosta-Fernández M, et al. (2014) Academic stress as a predictor of chronic stress in university students. *Psicología Educativa* 20(1): 47–52.

Rania N, Siri A, Bagnasco A, et al. (2014) Academic climate, well-being and academic performance in a university degree course. *Journal of Nursing Management* 22(6): 751–760.

Reichenberger J, Kuppens P, Liedlgruber M, et al. (2018). No haste, more taste: An EMA study of the effects of stress, negative and positive emotions on eating behavior. *Biological Psychology* 131: 54–62.

Schaefer A, Matthess H, Pfitzer G, et al. (2007) Mental health and performance of medical students with high and low test anxiety. *Psychotherapie Psychosomatik Medizinische Psychologie* 57(7): 289–297.

Serlachius A, Hamer M and Wardle J (2007) Stress and weight change in university students in the United Kingdom. *Physiology & Behavior* 92(4): 548–553.

Shukri M, Jones F and Conner M (2018) Relationship between work-family conflict and unhealthy eating: Does eating style matter? *Appetite* 123: 225–232.

Sohail N (2013) Stress and academic performance among medical students. *Journal of the College of Physicians and Surgeons Pakistan* 23(1): 67–71.

Tanofsky-Kraff M, Wilfley DE and Spurrell E (2000) Impact of interpersonal and egorelated stress on restrained eaters. *International Journal of Eating Disorders* 27: 411–418.

Tate EB, Spruijt-Metz D, Pickering TA, et al. (2015) Two facets of stress and indirect effects on child diet through emotion-driven eating. *Eating Behaviors* 18: 84–90.

Torres SJ and Nowson CA (2007) Relationship between stress, eating behavior, and obesity. *Nutrition* 23(11–12): 887–894.

Unusan N (2006) Linkage between stress and fruit and vegetable intake among university students: An empirical analysis on Turkish students. *Nutrition Research* 26(8): 385–390.

Van Strien T, Herman CP, Anschutz DJ, et al. (2012) Moderation of distress-induced eating by emotional eating scores. *Appetite* 58: 277–284.

Wallis D and Hetherington M (2009) Emotions and eating. Self-reported and experimentally induced changes in food intake under stress. *Appetite* 52(2): 355–362.

Wallis DJ and Hetherington MM (2004) Stress and eating: The effects of ego-threat and cognitive demands on food intake in restrained and emotional eaters. *Appetite* 43: 39–46.

Wardle J, Steptoe A, Oliver G, et al. (2000) Stress, dietary restraint and food intake. *Journal of Psychosomatic Research* 48(2): 195–202.

Weekes N, Lewis R, Patel F, et al. (2006) Examination stress as an ecological inducer of cortisol and psychological responses to stress in undergraduate students. *Stress* 9(4): 199–206.

Zellner DA, Loaiza S, Gonzalez Z, et al. (2006) Food selection changes under stress. *Physiology & Behavior* 87(4): 789–793.

Zurlo MC, Vallone F, Dell'Aquila E, et al. (2020) Teachers' patterns of management of conflicts with students: A study in five European countries. *Europe's Journal of Psychology* 16(1): 112–127.