

## ARAŞTIRMA / RESEARCH

**Exam Stress in Dietetics Freshmen: Changes in Stress, Sleep Quality, and Nutritional Status***Diyetetik Birinci Sınıf Öğrencilerinde Sınav Stresi: Stres, Uyku kalitesi ve Beslenme Durumundaki Değişiklikler*Gülen SUNA<sup>1</sup>, Nilgün SEREMET KÜRKLÜ<sup>1</sup>, Hülya KAMARLI ALTUN<sup>1</sup><sup>1</sup>Department of Nutrition and Dietetics, Faculty of Health Sciences, Akdeniz University, Antalya, Turkey

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**Öz****Amaç:** Stresli olmak, bireylerin yaşam tarzlarını etkileyerek, birçok aktivitede değişikliklere yol açmaktadır. Bu çalışma, Beslenme ve Diyetetik 1. sınıf öğrencilerinin eğitim ve sınav dönemlerindeki stres düzeylerini ve uyku kalitelerini belirlemeyi ve beslenme durumlarını, iştah ve yaşadıkları fiziksel değişiklikleri karşılaştırmayı amaçlamaktadır.**Gereç ve Yöntem:** Kesitsel olarak planlanan bu çalışmada, Beslenme ve Diyetetik birinci sınıf öğrencilerinin (n = 74; % 93'ü kadın) eğitim ve sınav dönemlerinde, Depresyon Anksiyete Stres Ölçeği-21 ile stres düzeyi ve Pittsburgh Uyku Kalitesi İndeksi ile uyku kaliteleri değerlendirilmiştir. Öğrencilerin besin alımları ve fiziksel aktiviteleri 24 saatlik geriye dönük hatırlama yöntemi kullanılarak değerlendirilmiştir.**Bulgular:** Sınav döneminde öğrencilerin stres, anksiyete ve depresyon düzeyleri daha yüksek bulunmuş ve uyku kalitelerinin daha kötü olduğu saptanmıştır (p<0.05). Öğrencilerin sınav döneminde toplam enerji harcamalarının ve fiziksel aktivite düzeylerinin eğitim dönemine göre istatistiksel olarak anlamlı düzeyde azaldığı belirlenmiştir (p<0.05). Mikro-besin öğeleri alımında anlamlı bir azalma bulunmuştur (p <0.05). Ayrıca öğrencilerin sınav döneminde eğitim dönemine göre daha az miktarda süt ürünleri, meyve ve sebze tükettiği belirlenmiştir (p<0.05).**Sonuç:** Beslenme ve Diyetetik birinci sınıf öğrencilerinde sınav dönemi strese neden olmaktadır ve besin tüketimi ile fiziksel aktivite düzeylerini değiştirmektedir. Sınav döneminde aşırı yemek yeme isteğinin artmasına rağmen besin tüketim kayıtlarında enerji ve makro besin öğeleri alımında değişiklik olmaması, öğrencilerin besin tüketimini kısıtlamasından kaynaklanıyor olabilir. Beslenme ve Diyetetik birinci sınıf öğrencileri, özellikle stresli dönemlerde sağlıklı beslenme davranışlarını sürdürmelerine yardımcı olmak için stres yönetimi konusunda bilgilendirilmeli ve sağlıklı beslenmeye teşvik edilmelidir.**Anahtar Kelimeler:** Besin tüketimi, sınav stresi, birinci sınıf öğrenciler, uyku, beslenme ve diyetetik.**Abstract****Objective:** Feeling under stress affects the individuals' lifestyles and leads to changes in their various activities. This study aims to determine the stress level and sleep quality of the nutrition and dietetics freshmen during the education and exam periods and compare their nutritional status with their appetite and physical changes.**Material and Method:** In this cross-sectional study, the stress level of the first-years of the nutrition and dietetics (n=74; 93% were female) was determined by the Depression Anxiety Stress Scale-21, and their sleep qualities were evaluated using the Pittsburgh Sleep Quality Index. The 24-hour recall method was used to evaluate students' dietary intake and physical activity during education and exam periods.**Results:** In the exam period, the students experienced higher stress, anxiety, and depression levels, and they had a bad sleep quality (p<0.05). The students' total energy expenditure and physical activity levels during the exam period decreased statistically significantly compared to the education period (p<0.05). A significant decrease was found in micronutrient intake (p<0.05). In addition, the students consumed fewer dairy products, fruits, and vegetables in the exam period than they did in the education period (p<0.05).**Conclusion:** The exam period causes stress for the dietetics freshmen and changes their food consumption and physical activity levels. The fact that there was no change in energy and macronutrients in their food consumption records, despite their increasing desire to overeat during the exam period, may be due to the students restricting their food consumption. Dietetics freshmen should be informed about stress management and encouraged to eat healthily, especially during stressful periods, to help them maintain their healthy eating behaviours.**Keywords:** Nutritional intake, exam stress, freshmen, sleep, nutrition and dietetics.

## 1. Introduction

Attending a university for the first time and getting involved in a new social environment brings about economic difficulties, adaptation problems, anxiety about career paths for students, leads to an increase in psychological stress, and negatively affects their lifestyle (1, 2). Students are known to become more stressed during the exam period, a critical stress source (2, 3). Stress can lead to unhealthy eating habits such as skipping meals, forgetting to eat, consuming fast foods with a high amount of energy and low nutritional value (4). Stress-induced increasing cortisol levels may cause individuals to prefer foods with high sugar and fat content and increase the amount of carbohydrates consumed (5).

Stress also plays a critical role in the aetiology of sleep disorders and the continuity of sleep problems. Sleep quality depends on the stressful events experienced in daily life (6). Mental stress activates the hypothalamic-pituitary-adrenal (HPA) axis and causes increased cortical arousal, leading to sleep problems such as light sleep and waking up more frequently at night. Stress can negatively affect sleep patterns, food intake, weight gain, abdominal obesity, and weight-loss interventions as well. However, the findings support that nutrition and sleep improvement can reduce experienced stress and prevent other mental disorders (7).

Studies on the stress level of students from various departments have revealed that the stress level is higher in healthcare departments (8, 9). A dietitian is a health professional who is engaged in the food and nutrition area to protect and improve the health of individuals and society (10). It is known that eating habits can change unhealthily due to the stress students experience during the exam periods (5). With their increasing knowledge on nutrition, Nutrition and Dietetics students can develop healthier eating habits (11). Based on this suggestion, this study aims to determine the stress level and sleep quality of the Nutrition and Dietetics Department first-year students during the education and exam period and compare the nutritional status and food preference with appetite and physical changes.

## 2. Materials and Methods

2.1. The type of the research and place where the research was conducted:

This cross-sectional study was conducted in the 2019-2020 fall term on the students of Akdeniz University, Faculty of Health Sciences, Nutrition and Dietetics Department in Antalya, Turkey.

2.2. The population of the research:

Eighty-nine first-year nutrition and dietetics students were included in the study. The subjects' exclusion criteria were as follows: having a chronic disease, using a regular drug, having psychiatric illness diagnosed by a doctor, not giving written consent. Two of the students had psychiatric illnesses, three had cardiovascular diseases, three had gastrointestinal diseases, and two had rheumatic diseases, and five students did not want to participate in the study. A total of seventy-four freshmen who agreed to participate in the study (participation rate 83%) were recruited.

2.3. Ethical Disclosure:

Approval was obtained for this study from the Akdeniz University School of Medicine Clinical Research Ethics Committee (Approval no: 70904504/547). Participants received no compensation or incentive for participating.

2.4. Procedure:

The first step of the research was conducted during the first two months of the fall term, on the middle day of the 6th week of the 2019-20 academic year, which is before the midterm week. In the first step, students who agreed to participate in the study filled in a questionnaire containing information about their sociodemographic characteristics, health status, nutritional habits, subjective appetite, and physical symptoms. Subjective appetite was evaluated with the question of "How is your appetite generally?", and the answers were classified as good, normal, and bad. The body weight and height measurements of the participants were measured. Body Mass Index (BMI) was calculated by body weight (kg) divided by height squared (m<sup>2</sup>). The dietary intakes of the participants were assessed using the 24-hour dietary recall while their physical activities using the 24-hour physical activity recall methods. The stress level of the participants was assessed with the Depression Anxiety Stress Scale-21 (DASS-21) questionnaire and their sleep quality was evaluated with the Pittsburgh Sleep Quality Index (PSQI). The second step of the research was applied during the fall term finals week on the middle day of the 14th week of the academic year. To determine the changes in the stress level and sleep quality, the participants were subjected to re-evaluation respectively with the DASS-21 and the PSQI. The changes in participants' nutritional status were assessed using the 24-hour dietary recall method while their physical activities using the 24-hour physical activity recall method. Participants did not know the interview days.

2.5. Data Collection Tools

A photographic atlas was used to record the type and portion size of the foods and beverages while the 24-hour dietary recall was assessed (12). The recalls were performed via interviews, and the dietary data such as total energy, macro, and micronutrient intake were calculated using the Nutrition Information System (BeBIS) 8.1 software program (13) by trained dietitians. The food groups were categorized by recommendations of the Turkey Dietary Guidelines (14).

The basal metabolic rates (BMR) of individuals were calculated based on a joint FAO/WHO/UNU expert consultation (15). The physical activity of the participants was assessed by the 24-hour physical activity recall method. The total energy expenditure (TEE) was calculated by summing up the energy spent for each activity. The physical activity levels (PAL) of the participants were determined with the TEE/BMR formula. The PAL of the participants was assessed and classified as sedentary (PAL: 1.40-1.69), active (PAL: 1.70-1.99), vigorous (PAL: 2.00 – 2.40) by WHO/FAO/UNU expert committee (15). The body weight and height of the participants were measured in bare feet and light clothes by using respectively TANITA BC-418 and stadiometer. The body mass index (BMI, kg/m<sup>2</sup>) of the participants was calculated, too. The BMI of the participants was categorized into four groups in accordance with WHO's classification (16).

Both in the education period and later in the exam period, the changes in appetite and sleep patterns and physiological symptoms were evaluated with the question of "Which physiological symptoms do you have on your body right now?"

The Depression, Anxiety, Stress Scale-21 (DASS-21) is a simple, self-reported, and validated questionnaire that measures the core symptoms of psychological stress, anxiety, and depression. It was developed by Lovibond and Lovibond (17), and its shorter version was validated by Henry and Crawford (18). Furthermore, its validity and reliability study in Turkish was performed by Yılmaz, Boz, and Arslan (19). The DASS-21 is a 21-item questionnaire consisting of psychological stress, anxiety, and depression subscales with seven items each. The total scoring of the DASS-21 can range between 0-63 (18, 19).

The Pittsburgh Sleep Quality Index (PSQI) is a self-reported screening and assessment questionnaire that details information on the type and severity of sleep quality and disorders within the last month. It was developed by Buysse et al. (20), and its validity and reliability study in Turkish was performed by Agargün et al. (21). The total PSQI score can range between 0-21 (20, 21).

## 2.5. Statistical Analysis

Descriptive statistics are given in frequency, percentage, mean (M), and standard deviation (SD) values. Fisher's Exact Test or Pearson's chi-square test was used to analyse the relationships between categorical variables. The participants' daily energy and nutrient intake were analysed using the BeBiS (BeBiS, Ebispro for Windows, Germany; Turkish Version/BeBiS 7)(13) program, based on their daily food consumption records. The paired sample t-test was used to analyse the differences in the stress level, sleep quality, energy level and nutrient and food consumption of the students in the education and the exam periods. SPSS (Statistical Package for Social Sciences, SPSS Company, Chicago, IL, USA) 23.0 packaged software was used for all statistical analyses. Statistical significance was accepted as  $p < 0.05$ .

## 3. Results

Table 1 shows the sociodemographic characteristics of the students. A total of 74 freshmen participated in the study, the majority of females (93%). The majority of participants lived in dormitory (66.2%), did not use the nutritional supplements (87.8%), did not smoke (89.2%), did not consume alcohol (74.3%), had a good appetite (64.9%), and had normal BMI (70.3%).

**Table 1. Sociodemographic Characteristics (n=74)**

Sociodemographic characteristics	M (SD)
Mean age	19.2 (1.49)
Body Mass Index	21.7 (3.27)
	n (%)
Gender, Women	69 (93.2)
Living situation	
Dormitory	49 (66.2)
At home with family	16 (21.6)
At home with friends	9 (12.2)
Using nutritional supplements	9 (12.2)
Smoking status (Currently smoker)	8 (10.8)
Alcohol consumption	19 (25.7)
Body Mass Index Classification	
Underweight	9 (12.2)
Normal weight	52 (70.3)
Overweight	13 (17.6)
Subjective appetite	
Good	48 (64.9)
Normal	22 (29.7)
Bad	4 (5.4)
Physical Activity Level	
Sedentary (1.40 - 1.69)	44 (59.5)
Active (1.70 - 1.99)	16 (21.6)
Vigorous (2.00 - 2.40)	14 (18.9)

M= Mean, SD=standard deviation, %=percentage

Table 2 shows the evaluation of changes in the DASS-21 scales and its subscales, PSQI, TEE, and PAL, during the exam period. It was observed that the total PSQI and DASS-21 scores were significantly higher in the exam period (all  $p < 0.001$ ) compared to the education period. It was also observed that there was a significant increase in the DASS-21 subscale scores (stress, anxiety, and depression) ( $p < 0.01$ ). When the physical activity status of the students was examined, the TEE and PAL of the students during the exam period decreased statistically significantly compared to the education period (respectively;  $p = 0.002$  and  $p = 0.003$ ). We have observed in our study that the students became physically active in the education period while while they became sedentary in the exam period.

**Table 2. Changes in DASS-21 and Its Subscales, PSQI, Total Energy Expenditure and Physical Activity Level in the Education and Exam Periods**

Scales and subscales scores	Education Period M (SD)	Exam Period M (SD)	Difference	p
Total PSQI score	8.6 (2.0)	10.2 (2.4)	-1,3	0.001*
Total DASS-21 score	19.1 (12.3)	25.4 (12.5)	-6,3	0.001*
Stress	7.3 (4.9)	9.8 (4.9)	-2,5	0.001*
Anxiety	4.0 (3.9)	5.7 (4.2)	-1,7	0.001*
Depression	7.7 (5.0)	9.9 (5.2)	-2,2	0.001*
Total Energy Expenditure (kcal)	2416.1 (571.3)	2224.6 (464.6)	-191,5	0.002*
Physical Activity Level	1.7 (0.3)	1.6 (0.3)	+0,1	0.003*

PSQI: Pittsburgh Sleep Quality Index, DASS-21: Depression, Anxiety, Stress Scale-21, M= Mean, SD=standard deviation \*Paired sample t-test; ( $p < 0.05$ )

The changes in appetite, sleep, and physical symptoms during the exam period are summarized in Table 3. Overeating, lack of sleep, and fatigue significantly increased in the exam period compared to the education period (respectively;  $p=0.007$ ,  $p=0.001$ , and  $p=0.004$ ).

**Table 3. The Appetite and Sleep Pattern Changes and Other Physical Symptoms in the Education and Exam Periods**

Symptoms	Education Period	Exam Period	p
	n (%)	n (%)	
Loss of appetite	18 (24.3)	10 (13.5)	0.096
Overeating	11 (14.9)	25 (33.8)	0.007*
Dyspepsia	6 (8.1)	3 (4.0)	0.458
Lack of sleep	15 (20.3)	34 (45.9)	0.001*
Fatigue	22 (29.7)	40 (54.0)	0.004*
Headache	35 (47.3)	36 (48.6)	1.000
Nausea/Diarrhea	12 (16.2)	5 (6.7)	0.065

\*Chi-square test; ( $p<0.05$ )

However, between the education and examination period, students' daily energy, macronutrient intake, and the percentage of the macronutrients from energy did not show a significant difference ( $p>0.05$ ) (Table 4). Nevertheless, it was apparent that students' intake of micronutrients (vitamins and minerals), except for vitamin B12, iron, and zinc were significantly lower in the exam period (all  $p<0.05$ ).

Table 5 presents the differences in the consumed food groups in the education and examination period. The consumption of dairy products, vegetables, and fruits were significantly lower in the exam period compared to the education period ( $p=0.001$ ). Surprisingly, the consumption of confectioneries, pastries, or sugar-sweetened beverages did not change in the exam period ( $p>0.05$ ).

#### 4. Discussion

Students starting university may have to cope with various stress sources while trying to adapt to a new social environment and fulfil the "success" criteria to graduate. The academic success expectation puts a lot of pressure on the students during the exam periods and increases the stress level. This study shows that academic stress on the nutrition and dietetics students, who have just started university, increases their stress, anxiety, and depression levels. It also negatively affects their sleep quality, leads to changes in nutritional status and preferred food groups, and causes a decrease in physical activity levels.

The studies conducted on university students showed that the first-year students experience stress problems to a higher extent (22-24). In a study conducted in Turkey, the overall prevalence of student stress was 27%, while the stress level of the first-years was higher than that of the junior and the senior students (24). We found that our results had a lower mean of stress, anxiety, and depression scores in the education period than other studies in the literature (23-25). Studies have shown that the exam period affects students psychologically, increases their stress (26, 27), anxiety and depression levels (27), and decreases sleep quality (28, 29). Likewise, our study results indicated that stress, anxiety, and depression scale scores which are the DASS-21 subscales,

significantly increased during the exam period. Despite the increase in the scores, it is seen that the scores in the DASS-21 subscales are within normal limits except the depression score. Depression symptoms altered from normal to mild in the exam period. It is believed that this increase does not require any clinical intervention, and counselling can help students cope with the problems they experience due to exam stress in this period. The fact that dairy products, fruits, and vegetables consumption are lower during the exam period than the education period may negatively affect some vitamin, mineral, and fibre intake; the increased depression levels may also be caused by the insufficient consumption of these nutrients in the exam period (30, 31).

Studies have reported that exam stress has many physical and psycho-social effects on individuals (26, 29, 32, 33). Zunhammer et al. (33) found that the students had higher rates of anorexia, diarrhea, fatigue, headache, abdominal pain, and nausea during the exam period. Similarly, in our study, a significant increase was observed in the frequency of insomnia and fatigue symptoms. However, while the desire to eat increased, there was no significant difference in anorexia, dyspepsia, headache, and nausea/diarrhea symptoms. Stress-induced physical symptoms may affect food intake.

There was a significant decrease in fibre, vitamins, and minerals taken except for vitamin B<sub>12</sub>, iron, and zinc in our study. This decrease in fiber and micronutrients seemed to be parallel with the decrease in dairy products, fruits and vegetables consumption. The vitamin content of fruits and vegetables is higher than other food groups, and a decrease in these groups can cause a reduction in vitamin intake. In cross-sectional studies examining stress and food consumption in students, it has been observed that as the stress level increases, students prefer more delicious foods (foods with high fat and sugar content), and the consumption frequency of fruits, vegetables, and salads decreases (4, 30, 34). The behavioural changes experienced in stressful periods are explained with different theories. One of these theories is that the unhealthy foods are easily accessible and preferable in that the ready-made foods is easier than preparing healthy foods such as vegetable dishes and salads (30, 31). The relationship between vitamins and stress shows that decreased intake of vitamin B group may worsen stress, depressive mood, and anxiety. Vitamin B group is found in the structure of many dopaminergic and serotonergic enzymes. The body uses vitamin B reserves to continue its functions during stressful periods. The decrease in the consumption of foods rich in vitamin B (folate, vitamin B<sub>6</sub>, and B<sub>12</sub>) like fruits, vegetables, and dairy products may increase vitamin B deficiencies (5, 35). In our study, a significant decrease was observed in B group vitamins except for vitamin B<sub>12</sub>. There was no significant change in vitamin B<sub>12</sub> intake since there was no significant reduction in meat and meat product consumption which are the primary vitamin B<sub>12</sub> sources. Vitamins A, E, and C reduce oxidative stress through their antioxidant functions and affect mental health positively (35). The students' intake of these vitamins was found to decrease significantly during the exam period. The decrease in these vitamins may also negatively affect the psychological states of the students. However, the fact that most of the students (49%) stays in dormitories, experiences separation from their family or loved ones for the first time, and economic reasons may have also affected their food consumption.

Studies in the literature results on food consumption differ from one another (26, 36). Barker et al. (36) indicated that students who had high energy and nutrient intake during the education period developed hypophagia during the exam period; conversely, those with low energy and nutrient intake demonstrated hyperphagia. In another study, the group which did not receive any social support and had high exam stress and anxiety levels had higher total energy, fat, and saturated fat intake during the exam period (26). When the students' food consumption was reviewed, no difference was found in their energy intake. Despite their desire to overeat, the students' energy intake remained the same, which made us think that they limit their food intake.

Stress, anxiety, and depression affect students' personal and social lives and are also associated with insufficient sleep (7). Studies have shown that the vast majority of students' sleep quality is poor (37, 38). Similar to other studies, our study revealed that the sleep quality score of the students was high during the education period while it was higher in the exam period. This finding suggests that exam stress has a negative effect on students' sleep quality. Combined with studying until late at night and being sleep deprived during the exam period, academic stress could impact students' sleep quality (29, 39). Poor sleep quality can have negative physical, cognitive and emotional effects on students. These unfavourable situations may decrease the academic success of the students (39). However, it should be noted that environmental factors like temperature, light, ventilation, noise, etc., and consumption of high-caffeine beverages may also negatively affect sleep quality (40). Thus, further studies on sleep quality in the exam period may shed light on the topic. Sleep has a two-way interaction with stress, anxiety, and

depression. The sleep deprivation experienced while studying for the exams may cause an increase in stress, anxiety, and depression levels. On the other hand, the sleep quality may decrease due to the increase in stress, anxiety, and depression levels. Adopting a sedentary style while studying for the exams decreases the time spent standing and being active and the value of the energy spent. Having a negative effect on the stress-health relationship, the reduction in physical activity can trigger the detrimental effects of stress on physical and mental health (28). A recent intervention study showed that mindfulness and individual relaxing exercises effectively reduce exam-induced stress and anxiety (41). Supporting students to maintain their physical routines can help reduce their stress, anxiety, and depression levels during the exam period.

The limitations of our study are that it is a cross-sectional study with a small sample size and a low number of male students. However, other studies on nutrition and dietetics departments were reviewed, and it was seen that the number of male students was low (42, 43). The 24-hour dietary and physical activity recalls were obtained based on the students' statements. This subjectivity can cause bias and reduce the validity of the relationships. However, this method has an elevated response rate. Future studies will evaluate the relationship between academic stress, nutritional status, and physical activity, enabling an assessment with more precise results using objective methods. The advantages of this study are that it allows the evaluation of exam stress, anxiety, and depression on nutrition and dietetic students, which is a sensitive group about nutrition. We believe that this study will set an example for future clinical studies related to dietitians' psychological health.

**Table 4. The Daily Energy and Nutrients Intake Changes of The Students in the Education and Exam Periods**

Energy and nutrients	Education Period M (SD)	Exam Period M (SD)	Difference	p
Energy (kcal/day)	1825.3 (667.3)	1714.5 (538.3)	+110,8	0.222
Total Protein (g/day)	66.0 (27.7)	59.5 (21.6)	+6.5	0.087
Protein (%)	15.0 (3.9)	14.4 (3.3)	+0.7	0.215
Total Fat (g/day)	81.8 (36.2)	77.9 (31.2)	+3.8	0.481
Fat (%)	39.5 (6.8)	39.9 (7.6)	-0.3	0.748
Total Carbohydrate (g/day)	200.4 (76.3)	190.6 (64.9)	+9.8	0.395
Carbohydrate (%)	45.1 (7.39)	45.8 (8.1)	-0.7	0.518
Fibre (g/day)	21.2 (10.6)	17.1 (8.18)	+4.0	0.005*
Soluble fibre (g/day)	7.0 (3.5)	5.6 (2.9)	+1.4	0.003*
Non-soluble fibre (g/day)	13.5 (7.4)	10.6 (5.4)	+2.85	0.004*
Vitamin A (mcg/day)	895.4 (767.6)	684.9 (478.4)	+210.5	0.038*
Vitamin E (mg/day)	18.2 (10.9)	14.8 (10.6)	+3.3	0.028*
Vitamin B <sub>1</sub> (mg/day)	0.9 (0.4)	0.7 (0.3)	+0.1	0.018*
Vitamin B <sub>2</sub> (mg/day)	1.2 (0.6)	0.9 (0.4)	+0.2	0.002*
Vitamin B <sub>3</sub> (mg/day)	13.8 (8.4)	10.9 (5.9)	+2.8	0.009*
Vitamin B <sub>6</sub> (mg/day)	1.3 (0.6)	1.0 (0.5)	+0.3	0.003*
Folate (mcg/day)	267.4 (136.7)	219.9 (122.0)	+47.5	0.029*
Vitamin B <sub>12</sub> (mg/day)	3.7 (2.6)	3.2 (2.5)	+0.4	0.245
Vitamin C (mg/day)	94.2 (64.7)	63.7 (56.4)	+30.5	0.001*
Calcium (mg/day)	673.6 (308.9)	547.4 (253.9)	+126.2	0.003*
Magnesium (mg/day)	271.4 (115.4)	237.4 (100.1)	+33.9	0.039*
Iron (mg/day)	10.9 (4.4)	9.9 (4.2)	+1.0	0.082
Zinc (mg/day)	9.1 (4.3)	8.1 (3.3)	+1.0	0.061

Mean, SD=standard deviation, Difference= Education period - Exam Period; a positive value indicates that decreasing in daily energy and nutrients, \*Paired sample t-test; (p<0.05)

**Table 5. The Food Group Intake Changes of The Students in the Education and Exam Periods**

Dietary intake of food groups	Education Period	Exam Period	Difference	p
	M (SD)	M (SD)		
Dairy products (g)	205.8 (200.2)	142.7 (147.5)	+63.1	0.001*
Eggs, meats, fishes and legumes (g)	130.8 (102.5)	119.3 (82.2)	+11.6	0.428
Nuts (g)	14.2 (24.7)	14.4 (23.4)	-0.2	0.943
Vegetables (g)	277.5 (197.2)	188.2 (160.4)	+63.1	0.001*
Fruits (g)	148.7 (126.8)	86.2 (139.9)	+62.6	0.001*
Grains (g)	160.9 (77.3)	157.6 (90.3)	+3.3	0.791
Fats and oils (g)	40.1 (20.7)	38.3 (24.4)	+1.8	0.052
Confectioneries (g)	25.4 (36.0)	26.9 (28.3)	-2.9	0.785
Pastries (g)	23.5 (6.2)	33.5 (6.4)	-9.9	0.282
Sugar-sweetened beverages (mL)	18.0 (75.6)	15.9 (33.2)	+2.1	0.186

M= Mean, SD=standard deviation, Difference= Education period – Exam Period; a positive value indicates that decreasing in daily energy and nutrients, \*Paired sample t-test; (p<0.05)

## 5. Conclusion and Recommendations

Behaviours acquired in young adulthood continue along adulthood. Unhealthy eating behaviours and habits are associated with the risk of developing chronic diseases later in life. The decrease in the consumption of fruits, vegetables and dairy products and macro and micronutrient intake of dietetics freshmen during the exam period suggests that students prefer unhealthy food during the exam period. It is important to manage stress, anxiety, and depression, improve sleep quality, and raise awareness of healthy food selection to maintain adequate and balanced eating habits during the exam period. However, this study was conducted only with nutrition and dietetics freshmen; the study results cannot be generalized to other university students. For this reason, it is recommended to examine the psychological and nutritional changes experienced by university students during their exam periods in different undergraduate groups and with a larger sample.

## 6. Contribution to the Field

This study revealed that nutrition and dietetics freshmen psychological stress, anxiety, depression, sleep quality, food intake, and physical activity were different in the exam period than the education period. The results of this study are thought that it will contribute to the literature in terms of revealing the change in the nutritional status of students during the exam period.

## Ethical Aspect of the Research

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study protocol was approved by the Akdeniz University, School of Medicine, Clinical Research Ethics Committee (Approval date and no: 04.11.2019 and 70904504/547). Students gave their written informed consent.

## Conflict of Interest

This article did not receive any financial fund. There is no conflict of interest regarding any person and / or institution.

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## Authorship Contribution

**Concept:** GS; **Design:** GS, HKA; **Supervision:** GS, NSK, HKA; **Funding:** GS, NSK, HKA; **Materials:** GS, NSK, HKA; **Data Collection/Processing:** GS, NSK, HKA; **Analysis / Interpretation:** NSK; **Literature Review:** GS; **Manuscript Writing:** GS, NSK, HKA; **Critical Review:** GS, NSK, HKA.

## References

- Arslan SA, Daşkapan A, Çakır B. Üniversite öğrencilerinin beslenme ve fiziksel aktivite alışkanlıklarının belirlenmesi. TAF Prev Med Bull. 2016;15(3):171-80. doi: 10.5455/pmb.1-1436432564.
- Robotham D, Julian C. Stress and the higher education student: a critical review of the literature. Journal of Further and Higher Education. 2006;30(02):107-17. doi: 10.1080/03098770600617513.
- Ekpenyong CE, Daniel NE, Aribo E. Associations between academic stressors, reaction to stress, coping strategies and musculoskeletal disorders among college students. Ethiop J Health Sci. 2013;23(2):98-112. PubMed Central PMCID: PMC23950626.
- Zellner DA, Loaiza S, Gonzalez Z, Pita J, Morales J, Pecora D, et al. Food selection changes under stress. Physiol Behav. 2006;87(4):789-93. doi: 10.1016/j.physbeh.2006.01.014.; PubMed Central PMCID: PMC16519909.
- Gonzalez MJ, Miranda-Massari JR. Diet and Stress. Psychiatr Clin North Am. 2014;37(4):579-89. doi: 10.1016/j.psc.2014.08.004.; PubMed Central PMCID: PMC25455067.
- Barclay NL, Eley TC, Rijdsdijk FV, Gregory AM. Dependent negative life events and sleep quality: an examination of gene-environment interplay. Sleep Medicine. 2011;12(4):403-9. Epub 2011/03/12. doi: 10.1016/j.sleep.2010.09.009. PubMed PMID: 21393059.
- Geiker NRW, Astrup A, Hjorth MF, Sjödin A, Pijls L, Markus CR. Does stress influence sleep patterns, food intake, weight gain, abdominal obesity and weight loss interventions and vice versa? Obes Rev. 2018;19(1):81-97. doi: 10.1111/obr.12603. PubMed Central PMCID: PMC28849612.
- Al-Dabal BK, Koura MR, Rasheed P, Al-Sowielem L, Makki SM. A Comparative Study of Perceived Stress among Female Medical and Non-Medical University Students in Dammam, Saudi Arabia. Sultan Qaboos University Medical Journal. 2010;10(2):231-40. Epub 2011/04/22. PubMed PMID: 21509235; PubMed Central PMCID: PMC21509235.
- Saipanish R. Stress among medical students in a Thai medical school. Medical teacher. 2003;25(5):502-6. Epub 2003/10/03. doi: 10.1080/0142159031000136716. PubMed PMID: 14522672; PubMed Central PMCID: PMC14522672.

- 10.** Kutluay Merdol T. Past, Present and Future of Nutrition and Dietetics Science. İzmir katip çelebi univ sağlık bilim derg. 2016;1(1):1-5.
- 11.** Korinth A, Schiess S, Westenhoefer J. Eating behaviour and eating disorders in students of nutrition sciences. Public health nutrition. 2010;13(1):32-7. Epub 2009/05/13. doi: 10.1017/s1368980009005709. PubMed PMID: 19433007; PubMed Central PMCID: PMC19433007.
- 12.** Rakicioğlu N, Acar Tek N, Ayaz A, Pekcan G. Yemek ve Besin Fotoğraf Kataloğu: Ölçü ve Miktarlar 3. ed. Ankara: Ata Ofset Matbaacılık; 2012.
- 13.** BEBIS. Bebis Nutrition Data Base. The German Food Code and Nutrient Data Base (BLS II.3, 1999) with additions from USDA-sr and other sources, Istanbul, Turkey, 2004. . 2017.
- 14.** Ministry of Health of Turkey. Turkey Dietary Guidelines (TUBER). Ankara: 2016 Contract No.: 1031.
- 15.** FAO/WHO/UNU. Human Energy Requirements: Report of a Joint FAO/WHO/UNU Expert Consultation: Rome, 17-24 October 2001. 2004.
- 16.** World Health Organization. Obesity: Preventing and Managing The Global Epidemic. Geneva: 2000 894.
- 17.** Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther. 1995;33(3):335-43. Epub 1995/03/01. doi: 10.1016/0005-7967(94)00075-u. PubMed PMID: 7726811.
- 18.** Henry JD, Crawford JR. The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. Br J Clin Psychol. 2005;44(2):227-39. doi: 10.1348/014466505X29657. PubMed Central PMCID: PMC16004657.
- 19.** Yılmaz Ö, Boz H, Arslan A. Depresyon Anksiyete Stres Ölçeğinin (DASS 21) Türkçe kısa formunun geçerlilik-güvenilirlik çalışması. Finans Ekonomi ve Sosyal Araştırmalar Dergisi. 2017;2(2):78-91.
- 20.** Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research. 1989;28(2):193-213. doi: 10.1016/0165-1781(89)90047-4
- 21.** Ağargün M, Kara H, Anlar O. Pittsburgh uyku kalitesi indeksinin geçerliliği ve güvenilirliği. Turk Psikiyatri Derg. 1996;7(2):107-15.
- 22.** Papier K, Ahmed F, Lee P, Wiseman J. Stress and dietary behaviour among first-year university students in Australia: Sex differences. Nutrition. 2015;31(2):324-30. doi: 10.1016/j.nut.2014.08.004. . PubMed Central PMCID: PMC25442361.
- 23.** Wong JGWS, Cheung EPT, Chan KKC, Ma KKM, Tang SW. Web-based survey of depression, anxiety and stress in first-year tertiary education students in Hong Kong. Australian and New Zealand Journal of Psychiatry. 2006;40(9):777-82. doi: 10.1111/j.1440-1614.2006.01883.x.
- 24.** Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. Soc Psychiatry Psychiatr Epidemiol. 2008;43(8):667-72. doi: 10.1007/s00127-008-0345-x. PubMed Central PMCID: PMC18398558.
- 25.** Shamsuddin K, Fadzil F, Ismail WS, Shah SA, Omar K, Muhammad NA, et al. Correlates of depression, anxiety and stress among Malaysian university students. Asian J Psychiatr. 2013;6(4):318-23. Epub 2013/07/03. doi: 10.1016/j.ajp.2013.01.014. PubMed PMID: 23810140.
- 26.** Pollard TM, Steptoe A, Canaan L, Davies GJ, Wardle J. Effects of academic examination stress on eating behavior and blood lipid levels. Int J Behav Med. 1995;2(4):299. doi: 10.1207/s15327558ijbm0204\_2. PubMed Central PMCID: PMC16250770.
- 27.** Singh R, Goyal M, Tiwari S, Ghildiyal A, Nattu SM, Das S. Effect of examination stress on mood, performance and cortisol levels in medical students. Indian J Physiol Pharmacol. 2012;56(1):48-55. PubMed Central PMCID: PMC23029964.
- 28.** Wunsch K, Kasten N, Fuchs R. The effect of physical activity on sleep quality, well-being, and affect in academic stress periods. Nat Sci Sleep. 2017;9:117-26. doi: 10.2147/NSS.S132078. PubMed PMID: 28490911; PubMed Central PMCID: PMC28490911.
- 29.** Zunhammer M, Eichhammer P, Busch V. Sleep Quality during Exam Stress: The Role of Alcohol, Caffeine and Nicotine. PLoS One. 2014;9(10):e109490. doi: 10.1371/journal.pone.0109490. PubMed Central PMCID: PMC25279939.
- 30.** Liu C, Xie B, Chou CP, Koprowski C, Zhou D, Palmer P, et al. Perceived stress, depression and food consumption frequency in the college students of China Seven Cities. Physiol Behav. 2007;92(4):748-54. Epub 2007/06/26. doi: 10.1016/j.physbeh.2007.05.068. PubMed PMID: 17585967; PubMed Central PMCID: PMC17585967.
- 31.** Mikolajczyk RT, El Ansari W, Maxwell AE. Food consumption frequency and perceived stress and depressive symptoms among students in three European countries. Nutr J. 2009;8(1):31. doi: 10.1186/1475-2891-8-31. PubMed Central PMCID: PMC19604384.
- 32.** Šimić N, Manenica I. Exam experience and some reactions to exam stress. Fiziol Cheloveka. 2012;38(1):67-72. doi: 10.1134/S0362119712010161. PubMed Central PMCID: PMC22567840.
- 33.** Zunhammer M, Eberle H, Eichhammer P, Busch V. Somatic Symptoms Evoked by Exam Stress in University Students: The Role of Alexithymia, Neuroticism, Anxiety and Depression. PLoS One. 2013;8(12):e84911. doi: 10.1371/journal.pone.0084911. PubMed Central PMCID: PMC24367700.
- 34.** Choi J. Impact of Stress Levels on Eating Behaviors among College Students. Nutrients. 2020;12(5):1241. doi: 10.3390/nu12051241. PubMed PMID: doi:10.3390/nu12051241; PubMed Central PMCID: PMC32349338.
- 35.** Rooney C, McKinley MC, Woodside JV. The potential role of fruit and vegetables in aspects of psychological well-being: a review of the literature and future directions. Proc Nutr Soc. 2013;72(4):420-32. Epub 2013/09/12. doi: 10.1017/s0029665113003388. PubMed PMID: 24020691; PubMed Central PMCID: PMC24020691.
- 36.** Barker ME, Blain RJ, Russell JM. The influence of academic examinations on energy and nutrient intake in male university students. Nutr J. 2015;14(1):98. doi: 10.1186/s12937-015-0088-y. PubMed Central PMCID: PMC26408322.
- 37.** Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. J Adolesc Health. 2010;46(2):124-32. doi: 10.1016/j.jadohealth.2009.06.016.; PubMed Central PMCID: PMC20113918.
- 38.** Araújo MFMD, Freitas RWJFd, Lima ACS, Pereira DCR, Zanetti ML, Damasceno MMC. Health indicators associated with poor sleep quality among university students. Revista da Escola de Enfermagem da USP. 2014;48(6):1085-92. doi: 10.1590/S0080-623420140000700017. PubMed Central PMCID: PMC25626509
- 39.** Campbell R, Soenens B, Beyers W, Vansteenkiste M. University students' sleep during an exam period: the role of basic psychological needs and stress. Motiv Emot. 2018;42(5):671-81. doi: 10.1007/s11031-018-9699-x.
- 40.** Aysan E, Karaköse S, Zaybak A, Ismailoğlu EG. Üniversite öğrencilerinde uyku kalitesi ve etkileyen faktörler. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi. 2014;7(3):193-8.
- 41.** Gallego J, Aguilar-Parra JM, Cangas AJ, Langer ÁI, Mañas I. Effect of a Mindfulness Program on Stress, Anxiety and Depression in University Students. Span J Psychol. 2014;17:E109. Epub 2015/01/13. doi: 10.1017/sjp.2014.102. PubMed Central PMCID: PMC26055051.
- 42.** Grammatikopoulou MG, Gkiouras K, Markaki A, Theodoridis X, Tsakiri V, Mavridis P, et al. Food addiction, orthorexia, and food-related stress among dietetics students. Eat Weight Disord. 2018;23(4):459-67. doi: 10.1007/s40519-018-0514-1. PubMed Central PMCID: PMC29779146.
- 43.** Rocks T, Pelly F, Slater G, Martin LA. Eating attitudes and behaviours of students enrolled in undergraduate nutrition and dietetics degrees. Nutr Diet. 2017;74(4):381-7. doi: 10.1111/1747-0080.12298. PubMed Central PMCID: PMC28901702.