Progress in Nutrition 2025; Vol. 27, N. 4: 17371 DOI: 10.23751/pn.v27i4.17371

Original article

Evaluation of the Relationship Between Nutritional Habits, Seasonality Score and Eating Attitudes Among University Students

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Abstract. *Background and Aim:* Seasonal changes influence individuals' emotional states and physiological behaviors, including eating patterns. These shifts may be particularly pronounced among university students, who are undergoing developmental and lifestyle transitions. This study aimed to evaluate the relationship between seasonality, nutritional habits, and eating attitudes in university students. *Methods:* A cross-sectional study was conducted among 284 university students aged 19–25 years. The Seasonal Pattern Assessment Questionnaire (SPAQ) was utilized to assess the influence of seasonal variations on affect and behavior, while the Eating Attitudes Test-26 (EAT-26) was administered to screen for disordered eating behaviors and attitudes. Anthropometric measurements and self-reported nutritional behaviors were also collected. *Results:* The mean seasonality score (SS) was 12.24±4.66, and the mean EAT-26 score was 12.00±9.97. A statistically significant association was observed between higher seasonality scores and the presence of disordered eating attitudes (EAT-26 ≥20) ($p<0.05$). However, no significant correlations were found between seasonality or EAT-26 scores and anthropometric measurements. Additionally, most self-reported nutritional habits did not significantly differ based on seasonality or eating attitude scores, except those individuals who reported dieting had significantly higher EAT-26 scores ($p<0.05$). *Conclusions:* Seasonal affective changes appear to influence eating attitudes among university students. Given that disordered eating behaviors are more common in individuals with higher seasonality scores, it is crucial to raise awareness and implement preventive strategies. Future research should examine these relationships longitudinally across different seasons and populations.

Key words: eating attitude, nutritional habits, seasonal change, university students

Introduction

Seasonal changes influence all living organisms to varying degrees and through diverse mechanisms. These changes have been shown to affect the endocrine system, emotional state, sleep duration, appetite, eating behaviors and attitudes, body weight (with fluctuations of ±5% within a month), physical activity levels, and aspects of social life (1–3). In healthy individuals, the physiological, psychological, and physical impacts of seasonal variations have been reported to range from 1% to 10% (4). The effects of seasonal changes are thought to begin most prominently between the ages of 18 and 30 years (5). Some changes occur in the nutritional status, eating habits, and food preferences, which are the essential physiological needs of university students. The main reasons for these changes include beginning life away from their families,

eating out more frequently, limited financial resources, changes in social circles, disrupted sleep patterns due to stressful exam periods, and environmental, climatic, and seasonal influences (6–8). As seasonal changes affect emotional states, corresponding differences in eating habits and food preferences are also observed. Eating behavior associated with emotional states is commonly referred to as "emotional eating" (9). Seasonal variations in eating habits may lead to frequent weight fluctuations, recurrent dieting, inadequate and unbalanced nutrition, impaired immune function, alterations in waist circumference, meal skipping, loss of appetite, deficiencies in macro- and micronutrients, and reduced academic performance (8,10). According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), eating attitude and eating behavior disorders are characterized by the progressive deterioration of eating behaviors and changes in food consumption or absorption. Such changes compromise both physical health and psychosocial well-being (11). Eating attitudes are influenced by biological, environmental, and cultural factors and are closely related to mental health. Seasonal changes, as a key environmental factor, can drive individuals toward foods that enhance mood, thereby shaping food preferences, eating attitudes, and eating behaviors (12). In light of this evidence, the present study was designed to evaluate the relationship between nutritional status, seasonality scores, and eating attitudes among university students.

Subjects and Methods

This study was conducted between May 2019 and October 2019 on University students who voluntarily agreed to participate in the study. A total of 284 individuals recruited on voluntary basis, including 184 females and 100 males, between the ages of 19 and 25 were included in the study. The inclusion criteria of the study were being between 19-25 years of age, being a university student, while the exclusion criteria of the study were being under 19 years of age, over 25 years of age, being pregnant or breastfeeding, having a psychological disorder, and using psychiatric medication. A questionnaire consisting of multiple choice and open-ended questions regarding socio-demographic characteristics and eating habits was applied to all students participating in the study through face-to-face interviews. The first part of the survey collected data on participants' sociodemographic characteristics, including gender, age, educational attainment, marital status, total years of education, place of residence, and perceived socioeconomic status, as well as general health status, exercise habits, current body weight perception, and whether they were following a specific diet, along with the type of diet, if applicable. The second section assessed participants' basic eating habits—such as appetite and emotional state—and whether these factors influenced their dietary behaviors. The final section included anthropometric measurements taken by the researcher, including body weight, height, waist circumference, hip circumference, and mid-upper arm circumference. All individuals participating in the study were given the Seasonal Pattern Assessment Questionnaire (SPAQ) to assess seasonal changes in emotions and behaviors and the Eating Attitudes Test-26 (EAT-26) to determine possible disorders in eating behaviors.

The Seasonal Pattern Assessment Questionnaire

The Seasonal Pattern Assessment Questionnaire (SPAQ) was developed by Rosenthal et al. (13). It is a self-administered diagnostic tool that was developed to evaluate the effects of seasonal changes on affect and behavior retrospectively. The validity and reliability study of the form in Turkey was conducted by Noyan, Elbi, and Korukoğlu upon the approval of the authors (14). The total score at the end of the scale is determined as the "Seasonality Score". It is assumed that those who score below 11 on the six questions on the form are not affected by seasonal changes and that those who score 11 and above (maximum score is 24) are impacted by seasonal factors causing changes in their affect and behavior. It is stated that as the scale score increases, the degree of impact increases, as well.

The Eating Attitude Test

The Eating Attitude Test (EAT-26) was used to measure possible disorders in eating attitudes and

behaviors. This scale can be applied to all individuals between the ages of 11 and 70. The Eating Attitude Test-40, which EAT-26 was based on, was developed by Garner et al. in 1979 (15). The validity and reliability study of the form in Turkey was conducted by Savasır and Erol (16). EAT-26 is a six-point Likert-type scale. The cut-off value for the test is 20 points. As the score obtained from the scale increases, the presence of an eating attitude disorder becomes more evident. The scale has 3 sub-scores: dieting behavior, bulimic behavior, and oral control behavior. Of these sub-scores, dieting score is calculated by summing up the scores of the items 1, 6, 7, 10, 11, 12, 14, 16, 17, 22, 23, 24, and 26; bulimic behavior score is obtained by summing up the scores of the items 3, 4, 9, 18, 21, and 25; oral control behavior score is obtained by summing up the scores of the items 2, 5, 8, 13, 15, 19, and 20. A score of 20 or above points to 'unhealthy and abnormal eating behavior', and scores below 20 show 'normal eating behavior' (16).

Statistical analysis

The SPSS 24.0 data analysis software package was used for the statistical analysis of the data in the study. Continuous variables (quantitative variables) obtained by measurement were presented using mean (X), standard deviation (SD), median, and minimum and maximum values. Number and percentage (%) values were used for the presentation of categorical variables (qualitative variables). The Kolmogorov-Smirnov test was employed to evaluate the normality of the data set for the hypothesis tests used in the study, and the Mann-Whitney U test was used to compare the independent variables. The correlation coefficients and statistical significance were calculated by using the Spearman test. The significance level was taken as $p<0.05$ in the analyses of all hypothesis tests.

Results

This study was conducted with the participation of a total of 284 university students, including 184 females (64.79%) and 100 males (35.21%), whose mean age was 20.85±1.61 years. No statistically significant difference was found between the mean seasonality scores according to gender ($p>0.05$). Among female students, 65.76% had seasonality scores below the cut-off value of 11, while 34.24% had scores equal to or above this threshold. In male students, 65.00% had scores below the cut-off of 11, whereas 35.00% had scores equal to or above this value (Figure 1).

The students' EAT-26 mean score was 12.00±9.97, while it was determined that women's 11.22±7.79 and men's 13.00±13.45. No statistically significant difference was found between gender and EAT-26 mean scores ($p>0.05$). It was determined that 17% of the total students had eating attitude disorder (EAT-26 ≥20 points), 83% had normal eating attitude (EAT-26 <20 points). It was identified that 25% of male students and 13% of female students had eating attitude disorder (Figure 2).

The seasonality scores of the students according to their EAT-26 scores are presented in Table 1. The mean seasonality score of the female students with eating attitude disorder was found as 14.13±4.92, and the mean seasonality score of those who did not have the disorder was determined as 12.26±3.99. The seasonality score of female students with EAT-26 score above 20 (showing eating attitude disorder) was significantly higher than female students with EAT-26 score below 20 (showing normal eating attitude) ($p<0.05$). When all students were considered, it was determined that the seasonality scores of the students whose EAT-26 score was above 20 were significantly higher ($p<0.05$) (Table 1). The correlations between the students' anthropometric measurements and seasonality scores are given in Table 2. No statistically significant correlations

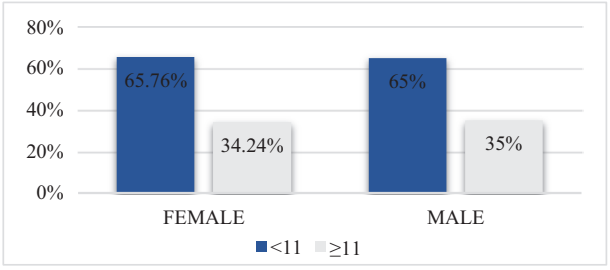

Figure 1. Distribution of students' seasonality scores according to the 11 cut-off points and gender (%). N=284 (184 females, 100 males). Cut-off value for seasonality score = 11.

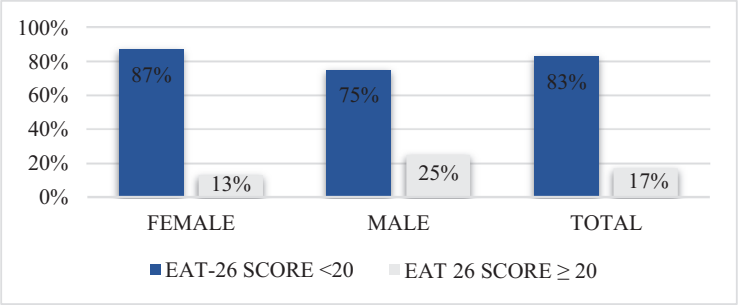

Figure 2. Distribution of students' Eating Attitudes Test (EAT-26) scores according to the 20 cut-off points and gender (%). N=284 (184 females, 100 males). Cut-off value for EAT-26 = 20.

Table 1. Evaluation Of Seasonality Scores According to Students' EAT-26 Scores

	Female		**p**	**Male**		**p**	**Total**		**p**
	EAT-26 <20	EAT-26 ≥20	**0.004***	EAT-26 <20	EAT-26 ≥20	0.643	EAT-26 <20	EAT-26 ≥20	**0.027***
SS ($\bar{X}$±SD)	12.26±3.99	14.13±4.92		11.43±5.52	12.76±5.24		11.99± 4.54	13.43±5.08	

Abbreviations: SS: Seasonality score, Mann-Whitney U test. SD: Standart deviation. *Significantly different p<0.05.

Table 2. Distribution status between anthropometric measurements and Seasonality & EAT-26 Score

Anthropometric Measurements	**Seasonality Score**						**EAT-26 Score**					
	Female		**Male**		**Total**		**Female**		**Male**		**Total**	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**
Body weight (kg)	0.099	0.182	0.012	0.909	0.019	0.748	0.106	0.152	0.158	0.099	0.099	0.097
Height (cm)	-0.007	0.922	-0.107	0.288	-0.049	0.415	-0.033	0.654	-0.011	-0.023	-0.023	0.702
BMI (kg/m^2)	0.051	0.492	0.079	0.437	0.021	0.721	0.055	0.462	0.168	0.089	0.089	0.133
Waist circumference (cm)	0.046	0.535	0.074	0.463	-0.003	0.958	0.060	0.418	0.090	0.064	0.064	0.284
Hip circumference (cm)	0.077	0.299	0.131	0.195	0.037	0.536	0.054	0.463	0.174	0.086	0.086	0.148
Waist/Hip ratio	-0.015	0.838	-0.047	0.639	-0.035	0.560	0.003	0.965	-0.147	-0.044	-0.044	0.457
Waist/Height ratio	0.061	0.413	0.076	0.455	-0.007	0.587	0.051	0.492	0.055	0.066	0.066	0.271
Mid-upper arm circumference (cm)	-0.012	0.871	0.117	0.245	0.032	0.907	0.059	0.428	0.216	0.074	0.074	0.214

Abbreviations: r: Spearman test. BMI: Body Mass Index. *Significantly different p<0.05.

were found between the seasonality scores and the body weight, height, body mass index (BMI), waist circumference, hip circumference, waist/hip ratio, waist/height ratio and mid-upper arm circumference measurements of the students participating in the study ($p>0.05$). Table 2 shows the correlations between the students' anthropometric measurements and their EAT-26 scores. No statistically significant correlations were found between the body weight, height, BMI, waist circumference, hip circumference, waist/hip ratio and waist/height ratio measurements of the female and male students and their EAT-26 scores ($p>0.05$). No significant correlation was found between the mid-upper arm circumference of the female students and their EAT-26 scores ($p>0.05$). Table 3 shows the comparison of seasonality scores of students participating in the study according to some nutritional habits. It was observed that there was no statistically significant difference between the seasonality scores of students according to their current body weight evaluation, diet application ($p>0.05$). Table 3 shows the comparison of EAT-26 scores of students according to some of their eating habits. It was observed that the difference between the scores of students in EAT-26 according to their current body weight evaluation characteristics was statistically significant ($p<0.05$). The difference is due to the group that evaluated their current body weight as very thin/underweight. The EAT-26 scores of students who evaluated their current body weight as very thin/underweight were higher than those who evaluated their current body weight as normal and lower than those who evaluated their current body weight as fat/very fat. It was determined that there was a statistically significant difference between the EAT-26 scores of the students according to their dieting characteristics ($p<0.05$). The EAT-26 scores of the students who were on a diet were significantly higher than those of the students who were not on a diet (Table 3). No significant difference was found between the seasonality scores and EAT-26 scores of the students according to the number of daily snacks, skipping main meals, eating outside the home, general appetite status and the effect of emotional state on nutrition ($p>0.05$).

Discussion

All living things in nature are affected by seasonal changes to a certain extent, and this effect manifests itself physiologically, psychologically, and socially. Seasonal changes influence appetite, metabolism, body weight, food consumption, food preferences, physical activity levels, and emotional states (17,18). The present study was planned to examine the relationship between the seasonality score, which expresses the extent to which university students are affected by seasonal changes, and their eating attitudes, nutritional habits, and anthropometric measurements. Young adults, who are often university students, constitute the age group most affected by seasonal variations. At this stage of life, individuals typically live away from their families, form new social relationships, and adapt to changes in lifestyle and dietary habits. A previous study including a wider age range reported that younger individuals were more affected by seasonal changes compared to older adults (19). Since developing adequate and balanced eating habits early in life can positively affect academic performance, eating attitudes, and quality of life, identifying the factors influencing these habits is of particular importance. In the current study, the mean seasonality score of participants was higher in females than in males, although this difference was not statistically significant ($p>0.05$). Similar results have been reported in Greenland, where females were found to have higher seasonality scores than males (20). Eating attitudes are shaped by a combination of individual, genetic, cultural, psychological, familial, and environmental factors, including seasonal changes (21). Consistent with this, significant correlations have been observed between EAT-26 and seasonality scores (22). In the present study, seasonality scores were significantly higher among students with disordered eating attitudes ($p<0.05$). Supporting this finding, a study conducted in the United States on individuals with eating disorders reported greater impacts of seasonal changes on social activity, weight loss, sleep, energy levels, and eating habits compared with controls (23). It was observed that there was no statistically significant difference between the seasonality scores and the characteristics of the students participating in the study such as evaluating their current body

Table 3. Seasonality and EAT-26 score averages of students according to some nutritional habits

	Seasonality Score						EAT-26 Score					
	S	**$\bar{x}$± SD**	**Median(Q1-Q3)**	**MR**	**Z / χ^2**	**p**	**S**	**$\bar{x}$± SD**	**Median(Q1-Q3)**	**MR**	**Z / χ^2**	**p**
Assess current body weight												
Very thin/Thin	47	12.32±4.76	13.00(0-23)	141.94	1.818	0.403	47	12.26±7.92	10(0-31)	152.2	11.929	**0.003***
Normal	198	12.01±4.71	13.00(0-24)	139.43			198	11.02±9.73	9(0-75)	132.7		
Fat/Very fat	39	13.31±4.24	14.00(4-24)	158.74			39	16.69±12.10	12(2-56)	180.7		
Diet implementation status												
Applied	28	12.07±4.97	13.00(0-24)	136.32	-0.421	0.674	28	15.61±7.90	13.5(4-35)	191.3	-3.317	**0.001***
Non-Applied	256	12.26±4.63	13.00(0-24)	143.18			256	11.61±10.11	9(0-75)	137.2		
Not Affecting	187	12.61±4.24	13.00(0-24)	147.57			187	12.14±10.00	9(0-75)	145.6		
Sometimes Affecting	56	11.82±5.22	12.00(0-24)	131.46			56	11.71±8.43	9.5(0-31)	141.6		

Abbreviations: Z: Mann-Whitney U test, χ2: Kruskal-Wallis H test, MR: Mean Rank. SD: Standart deviation. Q1-Q3: Interquartile range. *Significantly different p<0.05.

weight, applying a special diet, the number of main and snack meals consumed daily, skipping main meals, eating outside the home, general appetite status and the effect of emotional status on nutrition ($p>0.05$). There was no statistically significant correlation between the students' body weight, height, BMI, waist circumference, hip circumference, waist/hip ratio, waist/height ratio and mid-upper arm circumference measurements and seasonality scores ($p>0.05$). A study conducted on university students reported a relationship between students' body weight, appetite and seasonality scores (24). The EAT-26 scores of students on a diet were found to be significantly higher than those who did not diet ($p<0.05$). In a study conducted on university students, it was determined that 51.2% of those on a diet, 11.7% of those who occasionally dieted, and 7.5% of those who never dieted had eating disorders (24). It was found that there was no statistically significant relationship between body weight, height, BMI, waist circumference, hip circumference, waist/hip ratio, and waist/height ratio measurements and EAT-26 scores ($p>0.05$). In one study, significant correlations were found between BMI and eating disorders scores (25). Although no significant associations emerged between seasonality, eating attitudes, and anthropometric characteristics in this study, it is important to emphasize the methodological aspect. The present study was conducted with a cross-sectional design, which restricts the ability to determine causal relationships between seasonality, nutritional habits, and eating attitudes. Longitudinal studies covering different seasons and extended time periods are needed to evaluate these associations more comprehensively and to clarify the directionality of observed relationships. Previous research has shown that individuals more severely affected by seasonal changes are prone to appetite fluctuations, weight variation, and eating disorders (26), highlighting the importance of future longitudinal investigations.

Limitations

Several limitations should be acknowledged in this study. The cross-sectional design prevents drawing causal inferences about the associations between seasonality, nutritional habits, and eating attitudes, and future longitudinal studies are needed to confirm these relationships and track seasonal variations over time. In addition, since the research was conducted within a single university setting, the generalizability of the findings to broader populations remains limited. The use of self-reported measures for dietary habits and lifestyle characteristics also raises the possibility of recall or reporting bias. Nevertheless, these limitations highlight the importance of conducting further research to better understand the complex interplay between seasonality, nutrition, and eating attitudes.

Conclusion

In conclusion, seasonal changes affect the emotional state of individuals and change their anthropometric measurements, eating attitudes and behaviors. There is limited research in this area in the literature. Studies should be conducted where individuals are evaluated separately for each season. Young adult students, who are more affected by this situation, should be made aware of this issue and given the necessary training.

Statement of Ethics: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. And, this study was approved by Baskent University Institutional Review Board and Ethics Committee (Project no: KA19/141). The written informed consent was obtained from the participants.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g., consultancies, stock ownership, equity interest, patent/licensing arrangement, etc.) that might pose a conflict of interest in connection with the submitted article.

Author Contributions: PFT and AÖ were responsible for study design. AÖ was responsible for data collection. PFT and AÖ were responsible for data collection and analysing the data. All authors (AÖ, PFT, EY, BK) contributed to revisions ofthe manuscript and approved the final manuscript. All authors are in agreement with the manuscript and declare that the content has not been published elsewhere.

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Received: 21 July 2025
Accepted: 30 September 2025
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