



The Relationship of Depression and Stress with Tryptophan Consumption among University Youth

Üniversite Öğrencilerinde Triptofan Tüketim Düzeyleri ile Depresyon ve Stres Arasındaki İlişki

İ Müge ARSLAN¹, İ İshak AYDEMİR², İ Nurcan YABANCI AYHAN³

¹İstanbul Aydın University Faculty of Health Sciences, Department of Nutrition and Dietetics, İstanbul, Turkey

²Sivas Cumhuriyet University Faculty of Literature, Department of Social Work, Sivas, Turkey

³Ankara University Faculty of Health Sciences, Department of Nutrition and Dietetics, Ankara, Turkey

ABSTRACT

Objective: The most common psychological health problems are depression and stress. Depressive symptoms and stress are increasing day by day in university youth. Since depression and stress negatively affect the health of the young population, it is important that it contribute to the increase of the healthy population. The objective of the study was to evaluate the relationship of depression and stress with tryptophan consumption among university students.

Methods: A questionnaire which included descriptive questions, amounts of tryptophan consumption, “Beck depression” inventory and “perceived stress (PS) scale” were conducted voluntarily to 900 undergraduate students studying at İstanbul Aydın University in this correlation study.

Results: There was no statistically significant difference was found between students’ depression levels and tryptophan consumption levels ($p>0.05$). A statistically significant difference was found between the perceived coping level and the mean tryptophan consumption level ($p<0.05$). As tryptophan consumption increases, stress decreases and coping with PS increases.

Conclusion: There was no relationship between tryptophan consumption and depression, but there was a relationship between tryptophan consumption and stress.

Keywords: Tryptophan, depression, students, nutritional status, anxiety

ÖZ

Amaç: En yaygın psikolojik sağlık sorunları depresyon ve strestir. Her geçen gün üniversite gençliğinde depresif belirtiler ve stres artmaktadır. Depresyon ve stres genç nüfusu sağlık bakımından olumsuz etkilediği için, sağlıklı popülasyonun artmasına katkı sağlaması açısından önemlidir. Çalışmanın amacı, üniversite öğrencilerinde depresyon ve stres ile triptofan tüketimi arasındaki ilişkiyi değerlendirmektir.

Yöntemler: Bu korelasyon çalışmasında İstanbul Aydın Üniversitesi’nde okuyan 900 lisans öğrencisine gönüllü olarak tanımlayıcı sorular, triptofan tüketimi miktarları, “Beck depresyon” envanteri ve “algılanan stres ölçeği” içeren bir anket uygulandı.

Bulgular: Öğrencilerin depresyon düzeyleri ile triptofan tüketim düzeyleri arasında istatistiksel olarak anlamlı bir fark bulunmamıştır ($p>0,05$). Algılanan başa çıkma düzeyi ile ortalama triptofan tüketim düzeyi arasında istatistiksel olarak anlamlı fark bulunmuştur ($p<0,05$). Triptofan tüketimi arttıkça, stres azalmakta ve algılanan stresle başa çıkma artmaktadır.

Sonuç: Triptofan tüketimi ile depresyon arasında bir ilişki yoktur, ancak triptofan tüketimi ile stres arasında bir ilişki vardır.

Anahtar Sözcükler: Triptofan, depresyon, öğrenciler, beslenme durumu, anksiyete

Address for Correspondence: Müge ARSLAN, İstanbul Aydın University Faculty of Health Sciences, Department of Nutrition and Dietetics, İstanbul, Turkey

E-mail: dyt_muge@hotmail.com **ORCID ID:** orcid.org/0000-0003-1305-5126

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Introduction

The nutritional status of university students; many factors such as body perceptions, genetic factors, lifestyle changes, difficulties in adapting to the school, environment and dormitory environment, and unconscious nutrition and fast-food feeding tendencies on top of economic inadequacies constitute the nutritional status of university students and the psychological health problems they bring (1-3). Stress is quite common among university students due to intense processes such as insomnia, exams, homework, presentations and situations in which they can not cope sufficiently with psychological-social pressures. The most common psychological health problem is depression (4,5).

There are many definitions of depression; according to Beck's (6) model, depression occurs with emotions, thoughts, motivation, and symptoms of a physiological nature and depression starts with thought distortions first, emotional depression comes as a secondary condition. For this reason, Beck states that the depressed person perceives reality by distorting it, and depression arises as a result of the thought system of "negative thought structure towards oneself, negative perception of the world and a negative future perception", which he describes as "cognitive triad". It is possible to group the symptoms and clinical appearance of depression as behavioural, emotional, cognitive, somatic and motivational symptoms (7). A study has pointed out that the depressive symptoms seen in university youth are increasing day by day and young people face many different situations, events and expectations that require reintegration after starting university. In other words, life changes are serious sources of stress (8,9). Studies show that perceived stress (PS) situations in university students differ (10-12). Stress, which is an important part of daily life, occurs as a result of a person's reactions to events arising from her environment or herself (13). Scientific studies on stress show that stress has a strong relationship with mental health (14). Scientific data indicate a strong causal relationship between exposure to stressful events and major depression (15).

Tryptophan has also been associated with depression, as it has a calming effect. The content of the diet affects the amount of tryptophan in the blood and consequently ensures the secretion of serotonin. Serotonin plays a role in regulating anxiety and mood, and low serotonin levels can cause an increase in anxiety and depression (16,17). Tryptophan is taken into the body through diet and is essential for humans. Tryptophan taken into the body affects protein synthesis in the brain and increases serotonin release. In a study conducted from the data of NHANES (2001-2012), it was observed that as the amount of tryptophan intake increased, the severity of depression decreased (16). Another study reported that tryptophan supplementation is as effective as tricyclic antidepressant drugs in the treatment of depression (18). In a similar study, individuals on a diet rich in tryptophan and low in tryptophan were administered for 4 days, and after a 2-week break, it was observed that anxiety and depression symptoms decreased according to the other kinds of diet. The anxiety scale in those who consumed a diet rich in tryptophan (17) determines the relationship of tryptophan consumption of university students with depression and stress.

There are many studies showing that tryptophan consumption has an effect on depression and stress. Studies have shown that low consumption of tryptophan has an increasing effect on depression and stress (13,19,20) (Figure 1).

Methods

This research utilizes the relational (correlation) scanning model, which is a type of scanning model. The term "relational scanning model" refers to a method for determining the existence of covariance between two or more variables. Whether the variables change concurrently or not, the relational survey model attempts to determine how the change occurred (21).

Universe and Sample

This study's universe is comprised of students enrolled at the University of İstanbul Aydın. The universe of this study consists of 25,000 students studying at İstanbul Aydın University. For the purpose of the study, stratified sampling method was used. 384 students would be sufficient in the calculation of the sample volume within the range of 0.05 sample error and 95% confidence. Study was concluded to 900 students. Written informed consent was obtained from the participants.

Tools for Data Collection

Procedure

A questionnaire including sociodemographic questions, amounts of tryptophan consumption (for determining the frequency of tryptophan consumption, one week food frequency record was taken), the Beck depression inventory (BDI) and PS scale were applied to the students.

Inclusion and Exclusion Criteria

Criteria for inclusion in the study; having undergraduate education at İstanbul Aydın University, is not using psychological drugs and nutritional supplements.

Criteria for Exclusion

Those with not having other comorbid mental disorders (e.g., attention-deficit/hyperactivity disorder, obsessive-compulsive disorder, and seizure disorder), pregnant women.

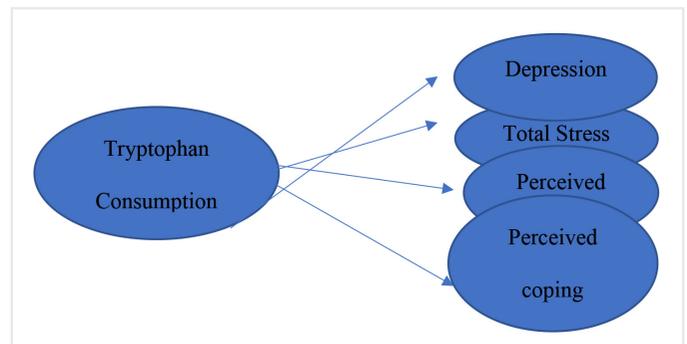


Figure 1. Conceptual model of the effects of tryptophan consumption on depression total stress, perceived stress, and perceived coping

Measures

For determining the frequency of tryptophan consumption, foods with high, normal and low tryptophan content were listed according to the average amount of tryptophan in 100 g of foods using the Turkish Food Composition Database (22). According to the data from EFSA, 250-500 mg (average 5 mg/kg) tryptophan intake from the foods consumed daily by healthy individuals has been recommended. In this report, it is also recommended that the individual should take at least 3 mg/kg tryptophan daily in order to protect her mental health. It has been stated that there is no harm in consuming tryptophan up to 750 mg as the upper limit. Based on this data, students' tryptophan consumption is classified as low tryptophan consumption of 0-250 mg, normal tryptophan consumption of 251-750 mg, and high tryptophan consumption of >751 mg (23).

Beck Depression Inventory

BDI was developed by Beck in 1961. BDI is used to determine the risk of depression and to measure the level and severity of depressive symptoms (24). The validity and reliability study in Turkey was carried out by Hisli (25) in 1989. Each item of BDI determines a depression-specific behavioral pattern in the past week and includes 21 self-assessing sentences with four options, going from low to high (0-3). The total score that can be obtained from the scale varies between 0-63. Evaluation; 1-10: normal, 11-16: mild mood changes, 17-20: clinical depression at the border, 21-30: moderate depression, 31-40: severe depression, >40: very severe depression. It takes about 15 minutes to complete the test (25).

Perceived Stress Scale (PSS-10)

Developed by Cohe et al. (26) in 1983, the Cronbach's alpha value was found at 0.86 in the reliability study. In 2007, the scale adapted into Turkish by Bilge et al. (27) was used, and the Cronbach's alpha value was found 0.81 in the reliability study. The PSS-10 has 10 items on a 5-point Likert scale (0= never, 1= almost never, 2= sometimes, 3= fairly often, 4= very often) indicating how often they have felt or thought a certain way within the past month. Four positively stated items (item 4,5,7, and 8) are reversely scored (0= very often, 1= fairly often, 2= sometimes, 3= almost never, 4= never). It has two subscales: PS (items 1,2,3,7,8) and perceived coping (PC) (items 4,5,6). The scale is evaluated on both total score and subscale scores (26,27).

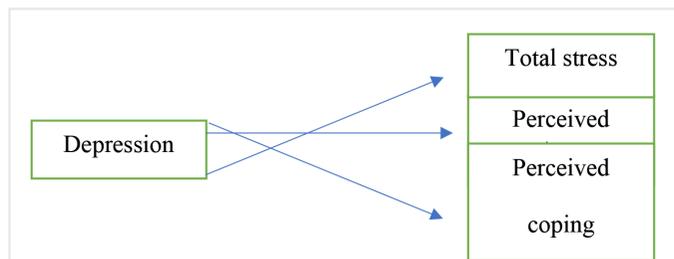


Figure 2: Conceptual model of the effects of tryptophan consumption on depression, total stress, perceived stress, and perceived coping.

Acquiring Data

This study is not sponsored by any institution and is not governed by any authority.

The study was completed with 900 students; 391 male, 509 female who agreed to participate in the study between February and March 2020 in İstanbul Aydın University.

Statistical Analysis

SPSS 22.0 program was used for data analysis. Number, percentage, average, standard deviation, minimum, maximum values are shown in a Table 1. The data showed normal distribution according to the normality test results. Independent sample t-test, Annova (one way variance analysis), Pearson's correlation test analyzes were performed in the analysis of the data providing parametric test assumptions (Figure 3). The hypothesis tests that reveal the relationship between variables were analyzed in this study, which is based on the relational screening model.

According to the CFA performed, the PS scale is divided into two factors: PS and PC. PS; it shows distribution according to 1, 2, 3, 7 items and PC; it shows distribution according to 4, 5, 6 items. Item loads of PC and PS factors are shown in Figure 1. The factor loads of all the items are high, the scale questions are sufficient to measure the desired sub-factors. As a result, it was established through fit indices of CFA that the Turkish version PTS comprised 8 items and two factors and this model was found to be appropriate theoretically and statistically.

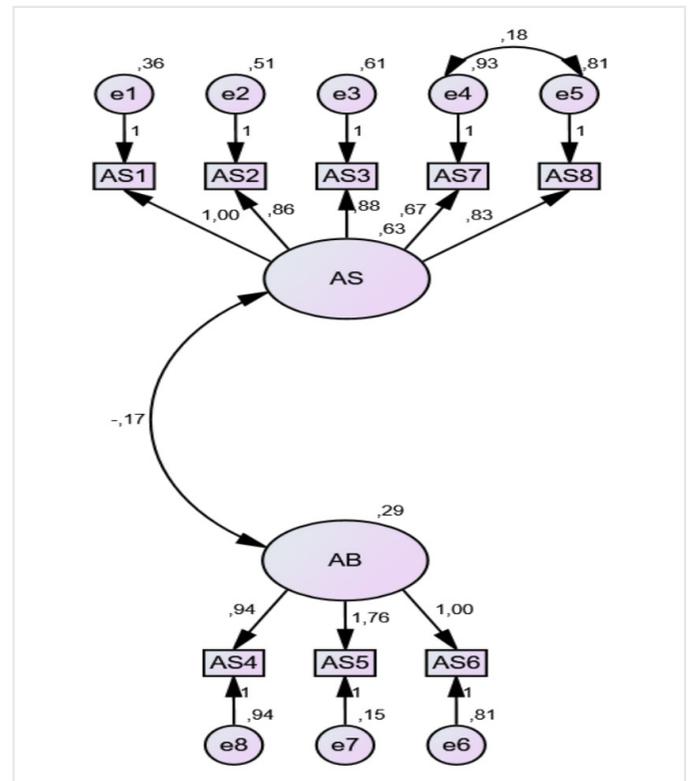


Figure 3: Standardized factor loadings of items in confirmatory factor analysis.

Results

Nine hundred students participated in the study. 78% of the students are female and 76.5% are male; 97.0% of them are single and 2.4% are married. 77.3% of the students are between 19-22 years old, 22.1% are between 23-25 years old and 0.6% are between 26 years old and above. 34.8% of the students smoke, 56.5% do not smoke and 8.7% quit smoking. 41.6% of the students use alcohol, 54.1% do not use alcohol, and 4.3% stopped using alcohol (Table 1).

The average daily tryptophan consumption of male students is $1,395.6 \pm 750.01$, while the average consumption of females is 1611.5 ± 967.35 . A statistically significant difference was found between the levels of tryptophan consumption of female and male students ($p < 0.05$), and female students consume higher levels of tryptophan than males. No statistically significant difference was found between the age distribution of the students and the tryptophan consumption rates ($p > 0.05$). The highest tryptophan consumption is between the ages of 19-22 with 78% (Table 2).

The average depression of male students is 11.17 ± 10.4 , while the average of females is 13.10 ± 11.08 . A statistically significant difference was found between the depression levels of the students according to gender ($p < 0.05$). Female students have a

higher level of depression than male students. No statistically significant difference was found between the age distributions of the students and their depression levels ($p > 0.05$). The extreme depression rate is in the group between the ages of 19-22 with 94.4% (Table 3).

There is no statistically significant difference was found between students' depression levels and tryptophan consumption levels ($p > 0.05$). 53% of those with normal depression consume high amounts of tryptophan, 22.0% of those with mild mood depression consume high amounts of tryptophan, 7.3% of those at the border depression consume high amounts of tryptophan, 9.6% of those with moderate depression. 5.3% of those with severe depression consume high amounts of tryptophan, 2.2% of those with very severe depression consume high amounts of tryptophan (Table 4).

There was no statistically significant difference between the genders of the students and total stress, PS ($p > 0.05$), and the average PS was higher in females than in males. A statistically significant difference was found between gender and PC levels ($p < 0.05$) The average of male students in the sub-dimension of coping with PS is higher than that of women. There is no statistically significant difference between students' age and total stress, PS and PC levels ($p > 0.05$) (Table 5).

Table 1. Demographic information of students

Variables	Male		Female		Total (n=900)	
	n	%	n	%	n	%
Age (years)						
19-22	299	76.5	397	78.0	696	77.3
23-25	91	23.3	108	21.2	199	22.1
26≤	1	0.2	4	0.8	5	0.6
Total	391	100.0	509	100.0	900	100.0
Mean ± SD/min. max	Mean: 21.18 SD: 1.79				Min:19 Max:39	
Marital status						
Married	14	3.6	8	1.6	22	2.4
Single	377	96.4	501	98.4	878	97.0
Total	391	100.0	509	100.0	900	100.0
Chronic disease status						
Yes	18	4.6	38	7.5	56	6.2
No	373	95.4	471	92.5	844	93.8
Total	391	100.0	509	100.0	900	100.0
Smoking status						
Yes	175	44.8	138	27.1	313	34.8
No	163	41.7	346	68.0	509	56.5
Quitting smoking	53	13.6	25	4.9	78	8.7
Total	391	100.0	509	100.0	900	100.0
Drinking alcohol						
Yes	177	45.3	197	38.7	374	41.6
No	188	48.1	299	58.7	487	54.1
Quitting drinking alcohol	26	6.6	13	2.6	39	4.3
Total	391	100.0	509	100.0	900	100.0

SD: Standard deviation

Table 2. Tryptophan consumption amount-levels of students according gender and age

Gender		Tryptophan consumption amount (mg/day)				
		n	Min.	Max.	Mean	SD
Male		509	243.40	4,629.10	1,395.6	750.01
Female		391	122.25	6,084.50	1,611.5	867.35
t-test: -3.996, p-value: ,000						
Gender		Tryptophan consumption levels				
		Low (<250 mg)	Normal (251-750 mg)	High (>751 mg)		
Male	n	4	55	332		
	%	66.7	35.7	44.9		
Female	n	2	99	408		
	%	33.3	64.3	55.1		
Total	n	6	154	740		
	%	100.0	100.0	100.0		
Chi-square: 5.670, p value: .05						
Age (years)		Tryptophan consumption levels				
		Low (<250 mg)	Normal (251-750 mg)	High (>751 mg)		
19-22	n	6	113	577		
	%	100.0	73.4	78.0		
23-25	n	0	40	159		
	%	0.0	26.0	21.5		
26 ≤	n	0	1	4		
	%	0.0	0.6	0.5		
Total	n	6	154	740		
	%	100.0	100.0	100.0		
Chi-square: 3,307, p value: .508						
SD: Standard deviation, Max: Maximum, Min: Minimum						

The averages of total stress, perceived stress, PC and depression according to the tryptophan consumption levels of the students; a statistically significant difference was found between the PC level and the mean tryptophan consumption level ($p < 0.05$). According to the post hoc Tukey test result, it was determined that this significant difference ($p < 0.05$) was due to the difference between the averages of those with normal and high tryptophan consumption levels (Table 6).

A negative and insignificant relationship was found between tryptophan consumption level and total stress. ($r = -0.019$, $p = 0.575 < 0.05$); a negative and insignificant relationship was found between tryptophan consumption level and PS. ($r = -0.021$, $p = 0.522 < 0.05$); a positive and insignificant relationship was found between tryptophan consumption level and PC. ($r = -0.008$, $p = 0.815 < 0.05$); a negative and insignificant relationship was found between tryptophan consumption level and depression. ($r = -0.005$, $p = 0.892 < 0.05$); a positive and significant relationship was found between total stress and perceived stress. ($r = 0.791$, $p = 0.001 < 0.01$); a negative and significant relationship was found with perceived coping. ($r =$

0.348 , $p = 0.001 < 0.01$); a positive and significant relationship was found with depression. ($r = 0.243$, $p = 0.001 < 0.01$); there is a positive and significant relationship between depression and perceived stress. ($r = 0.473$, $p = 0.001 < 0.01$); there is a negative and significant relationship between depression and PC ($r = -0.333$, $p = 0.001 < 0.01$) (Table 7). That is, as the level of depression increases in students and the level of stress increases, depression and stress nourish and increase each other. Between the PC and depression and stress in a negative way, that is, as the PC increases, the level of depression and stress decreases. In this case, hypotheses 4, 5, 6, 7, 8 and 9 have been accepted.

In addition, according to the results of the regression analysis, the relationship between tryptophan consumption level between depression, total stress, PS and PC. The effect of tryptophan consumption level between depression, total stress, PS and PC was not significant. In other words, a significant effect of the increase in tryptophan consumption levels of students in this study on depression, total stress, PS and PC was not determined (Table 8).

Table 3. Depression scores and levels of students by gender and age

Gender		Depression scores						
	n	Min.	Max.	Mean	SD			
Male	391	1	63.00	11.17	10.24			
Female	509	1	63.00	13.10	11.08			
t-test : 2,681			P value: .007					
Depression levels								
Gender	Normal		Slight	At the border	Moderate	Severe	Extreme	Total
Male	n	225	87	21	31	24	3	391
	%	47.3	43.5	33.9	33.0	48.0	16.7	43.4
Female	n	251	113	41	63	26	15	509
	%	52.7	56.5	66.1	67.0	52.0	83.3	56.6
Total	n	476	200	62	94	50	18	900
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Chi-square: 15,012			p value: .010					
Age (years)	Normal		Slight	At the border	Moderate	Severe	Extreme	Total
19-22	n	369	158	43	74	35	17	696
	%	77.5	79	69.4	78.7	70	94.4	77.3
23-25	n	103	41	19	20	15	1	199
	%	21.6	20.5	30.6	21.3	30	5.6	22.1
26≤	n	4	1	0	0	0	0	5
	%	0.8	0.5	0	0	0	0	0.6
Total	n	476	200	62	94	50	18	900
	%	100	100	100	100	100	100	100
Chi-square: 9,581			p value: .478					
SD: Standard deviation, Max: Maximum, Min: Minimum								

Table 4. Distribution of tryptophan consumption level by depression level

Depression level	Tryptophan consumption level				
		Low (<250 mg)	Normal (251-750 mg)	High (>751 mg)	Total
Normal	n	4	80	392	476
	%	66.7	51.9	53.0	52.9
Slight	n	2	30	168	200
	%	33.3	19.5	22.7	22.2
At the border	n	0	8	54	62
	%	0.0	5.2	7.3	6.9
Moderate	n	0	23	71	94
	%	0.0	14.9	9.6	10.4
Severe	n	0	23	39	94
	%	0.0	14.9	5.3	10.4
Extreme	n	0	11	16	50
	%	0.0	7.1	2.2	5.6
Total	n	6	154	740	900
	%	100.0	100.0	100.0	100.0
Chi-square: 8,255, p value: .604					

Table 5. Distribution of perceived stress scale sub-factors by gender and age and the relationship between total stress, perceived stress, perceived coping and total beck according to tryptophan level

Stress scale sub-factors	Gender	N	Mean	SD	t-test	p
Total stress	Women	509	15.58	3.86	-.984	.325
	Male	391	15.85	4.08		
Perceived stress	Women	509	9.06	3.71	.785	.433
	Male	391	8.86	3.87		
Perceived coping	Women	509	6.65	2.31	-2.555	.011
	Male	391	7.05	2.42		
	Age (years)				F	p
Total stress	19-22	696	15.64	3.93	1.774	.170
	23-25	199	15.98	4.00		
	26≤	5	13.00	5.38		
Perceived stress	19-22	696	8.97	3.76	.850	.428
	23-25	199	9.03	3.87		
	26 ≤	5	6.80	3.56		
Perceived coping	19-22	696	6.79	2.42	.448	.639
	23-25	199	6.93	2.15		
	26 ≤	5	6.20	2.94		

SD: Standard deviation

Table 6. The relationship between total stress, perceived stress, perceived coping and total beck according to tryptophan level

Variables	Tryptophan consumption level	n	Mean	SD	F	p
Total stress	Low	6	14.8	4.02	2.140	.118
	Normal	154	15.1	4.31		
	High	740	15.8	3.87		
Perceived stress	Low	6	9.3	3.72	.178	.837
	Normal	154	8.8	3.58		
	High	740	9.0	3.83		
Perceived coping	Low	6	5.5	1.64	4.078	.017
	Normal	154	6.4	2.50		
	High	740	6.9	2.33		
Beck depression	Low	6	7.6	4.17	.568	.567
	Normal	154	12.1	11.22		
	High	740	12.3	10.70		

SD: Standard deviation

Table 7. Descriptive statistics and correlations for study variables

	n	Mean	SD	1	2	3	4	5
1. Tryptophan	900	1,489.4	809.74	-	-	-	-	-
2. Beck depression	900	12.26	10.76	.485*	-	-	-	-
3. Total stress	900	15.70	3.96	.355*	.000**	-	-	-
4. Perceived stres	900	8.98	3.78	.941*	.000**	.000**	-	-
5. Perceived coping	900	6.82	2.37	.045*	.000**	.000**	.000**	-

*p<.05., **p<.01.

SD: Standard deviation

Table 8. A simple regression analysis was conducted to determine the effect of total tryptophan consumption on depression and stress

Depression	B	Standard error	Beta	t	Sig.
Constant*	11,806	.752		15,703	.000
Total tryptophan	.000	.000	.023	.699	.485
Total stress					
Constant*	15,479	.277		55,951	.000
Total tryptophan	.000	.000	.031	.924	.355
Perceived stress					
Constant	8,997	.264		34,019	.000
Total tryptophan	-1,159E-005	.000	-.002	-.074	.941
Perceived coping					
Constant	6,536	.165		39,558	.000
Total tryptophan	.000	.000	.067	2.004	.045
Total depression: *R: .23 R ² : .001. Total stress: *R: .31 R ² : .001. Perceived stress: *R: .002 R ² : .000. Perceived coping: *R: .067 R ² : .004					

Each factor was tested for goodness-of-fit and the criterion for goodness. The statistics used to evaluate the confirmatory factor analysis (CFA) models are shown in Figure 3. According to the fit values examined, the first-order multi-factor model, except for chi-square/degrees of freedom, shows good acceptable fit to the data. CFA was not performed for the Beck depression scale. Because, when scoring the scale, it is divided into 6 sub-factors and there is no specific scale item revealing each factor. Each sub-factor of the scale is determined according to the total score. Therefore, factor analysis was not done. Cronbach's alpha value was found to be 0.889.

Discussion

The main finding of this content is to reveal the levels and amounts of the nutrients that can have an effect on the stress and depression level of university students on depression and stress. In this study, the majority of the students consume high levels of tryptophan. Similarly; in a study conducted by Gracia-Marco et al. (19) on university students in 2017, it was reported that the vast majority of students consumed tryptophan at high levels. This situation can be explained by the fact that foods rich in tryptophan are easily accessible and liked by students and are found in foods that are sources of protein (milk, chicken, meat, legumes, etc.).

In this study, a difference was found in tryptophan consumption according to gender, and female students have more tryptophan consumption than males. Differently, in the study conducted by Gracia-Marco et al. (19) on university students in 2017, it was observed that male students had more tryptophan consumption than female students. This situation can be explained by the fact that this situation may be due to differences in food preferences among students.

When tryptophan consumption and age groups were examined in this study, the group with the highest tryptophan consumption was students in the 19-22 age group. This may be due to the fact that the younger students consume more foods rich in tryptophan or the individual selection differences among the students.

In this study, when the students' level of depression was examined, the depression level of the majority of students was found to be normal. Similarly, the majority of students' depression levels were found to be normal in many studies (28,29,30). This situation can be explained by the fact that university students can easily adapt to the new system they are in, and they can manage negative events and processes well and overcome their psychological effects.

In this study, when the depression status of students according to gender was examined, female students were found to be more depressed than males. Similarly, in a 2007 study by Liu et al. (30) on university students, females were found to be more depressed than males. This situation can be explained by the fact that female students are more emotionally sensitive, act with more emotions and may be more psychologically affected by negative events and situations.

In this study, when the depression status of the students according to age was examined, the students in the younger age group (19-22 years old) were found to be more depressed. Similarly, in a study conducted by Liu et al. (30). In 2007, it was discovered that university students of a younger age group were more depressed. This situation can be explained by the fact that individuals in a younger age group have less life experience, their adaptation to unfavorable events and processes is difficult, and they have psychological difficulties in managing such situations.

In this study, no relationship was found between students' depression level and tryptophan consumption levels. Similarly, Soh and Walter (31) study in 2011 found that no relationship was found between depression level and tryptophan consumption levels. Differently, Grases et al.'s (20) study in 2019 found that those with low depression levels had high tryptophan consumption. Differently, Lindseth et al.'s (17) study found that depression levels were low in those who consumed high amounts of tryptophan. This may be due to individual differences among students. More scientific studies are needed on this subject.

In this study, the PS was found to be higher in females than in males. A statistically significant difference was found between the PC levels and gender ($p < 0.05$). Male students' average coping with PS is higher than girls. Similarly, in the study conducted by Cavallo et al. (11) on university students in 2009, the PS situations were found to be higher for female students than for male students. Similarly, in Almojali et al. (9) study on university students, the PS level of female students was found to be higher than male students. This can be explained by the fact that female students are more emotionally sensitive and are more affected by negative events and situations and get stressed more quickly.

In this study, no relationship was found between students' PS and age ($p > 0.05$). Similarly, in Birks et al's (10) study on university students, no relationship was found between PS and age. This situation can be explained by the different perception of stress in the face of events rather than age.

In this study, a statistically significant difference was found between the PC level and the mean tryptophan consumption level ($p < 0.05$). Those with normal and high tryptophan levels were found to have a high level of coping with perceived stress. This may be due to individual differences among students. More scientific studies are needed on this subject.

Due to the inadequacy of studies on this subject in the literature, this study will shed light on future studies. In addition, by contributing to the formation of a psychologically healthy, happy and peaceful young population, it is important to contribute to the reduction of social burden by reducing health expenditures.

Study Limitations

Though the current study has addressed a gap in the literature, several methodological limitations should be considered when interpreting the findings. One such limitation is that the participants who completed the questionnaires were not fully representative of the school from which they came. Nevertheless, as the population studied came from a very specific demographic group (i.e. 19-26-year-old university students from different nationalities and different cultures from different cities in Turkey and different countries around the world), further research is needed that focuses on more representative samples. Another limitation of the current research was that the chronicity of tryptophan use was not taken into account. For instance, students' tryptophan consumption may differ, especially during exam periods, so the timing of administration of the questionnaire may have been of importance. A further limitation of the current study is that it utilised a cross-sectional design. This means that all effects observed here are correlational, and that causation can not be inferred. Future research should therefore aim to conduct intervention studies in order to investigate the nature of these relationships further.

Conclusion

While the depression status of the students is not affected by the amount of tryptophan consumption, their stress status is affected. The increase in tryptophan consumption increases the

students' ability to cope with stress and reduces their stress levels. In parallel with the result, it can be recommended that students increase their consumption of tryptophan source foods by paying more attention to their nutrition during periods of high stress such as exam periods.

Ethics

Ethics Committee Approval: Our study was approved by Üsküdar University Non-Interventional Research Ethics Committee under the number 61351342-/2020-61 dated 29.01.2020.

Informed Consent: Written informed consent was given to participant.

Peer-review: Externally peer reviewed.

Authorship Contributions

Concept: B.A.U., A.S.G., Design: B.A.U., Data Collection or Processing: B.A.U., Analysis or Interpretation: B.A.U., A.S.G., Literature Search: B.A.U., A.S.G., Writing: B.A.U.

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