

The Relationship Between Hedonic Hunger, Chronotype and Anhedonia in Adults

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ABSTRACT

Objective: Although nutrition is quite complex, it is well known that be controlled by homeostatic and hedonic regulations. Anhedonia, on the other hand, is a symptom of depression, but is also associated with excessive and uncontrolled eating. Chronotype reflects individual differences in timing preference for daily activities and their underlying circadian rhythms, individuals who feel the best in the morning are morning, those who sleep late and those who feel best in the evening are evening chronotype. The aim of this study is to determine relationships between hedonic hunger, anhedonia levels and chronotypes of individuals.

Method: The study was conducted with 402 participants between the ages of 18-65, studying and working at İzmir Bakırçay University between December 2020 and March 2021. This research was carried out online with "Google Forms". In the applied questionnaire, along with the questions determining the sociodemographic characteristics and International Physical Activity Questionnaire (IPAQ), The Power of Food Scale (PFS), Morningness-Eveningness Questionnaire (MEQ), and the Snaith-Hamilton Pleasure Scale (SHAPS) were used. Ethics Committee Approval was taken from Acıbadem University and Acıbadem Healthcare Institutions Medical Research Ethics Committee with decision number 2020/25-24.

Results: Mean age of individuals with hedonic hunger (25.6±9.2 years) was lower than the mean age of individuals without hedonic hunger (31.9±12.4 years) (p=0.000). The rate of hedonic hunger in women was 79.6%, and the rate of hedonic hunger in men is 68.6% (p=0.014). The rate of being anhedonic was higher in males than females, and this was statistically significant (p=0.015). A linearly negative correlation was found between the chronotypes and the hedonic hunger (r=-0.238, p=0.000). Individuals were found to be more prone to eveningness chronotype as the level of hedonic hunger increased.

Conclusion: In this study, it was determined that hedonic hunger and chronotype were affected by each other, but this situation was not related to anhedonia. As a result, the state of having hedonic hunger should be evaluated by considering the chronotypes of the individuals. The chronotype of the individual, which is an important factor in minimizing hedonic hunger, should be tried to be regulated in order to ensure healthy food consumption.

Keywords: Hunger, Anhedonia, Hedonic Hunger, Chronotype, Circadian Rhythm

Yetişkin Bireylerde Hedonik Açlık, Kronotip ve Anhedoni İlişkisi

ÖZET

Amaç: Beslenmenin nasıl programlandığı oldukça karmaşık olsa da, homeostatik ve hedonik düzenlemeler ile kontrol edildiği bilinmektedir. Anhedoni ise depresyonun bir semptomu olmakla beraber, aşırı ve kontrolsüz yeme ile de ilişkilidir. Kronotip, günlük aktiviteleri ve bunların altında yatan sirkadiyen ritimleri zamanlama tercihindeki bireysel farklılıkları yansıtmakta olup, sabah saatlerinde kendilerini en iyi şekilde hissedenen bireyler sabahçı, geç uyumayı ve akşam saatlerinde kendilerini en iyi şekilde hissedenen ise akşamcı kronotiptir. Bu çalışmada amaç, yetişkin bireylerin hedonik açlık, anhedoni düzeyleri ve kronotipleri arasındaki ilişkiyi belirlemektir.

Yöntem: Çalışma, Aralık 2020-Mart 2021 tarihleri arasında, İzmir Bakırçay Üniversitesi'nde okuyan ve çalışan 18-65 yaş arası 402 katılımcı ile çevrimiçi olarak uygulanan anket, içeriğinde katılımcıların sosyodemografik özelliklerini ve beslenme alışkanlıklarını belirleyen sorularla birlikte; Uluslararası Fiziksel Aktivite Anketi (IPAQ), Besin Gücü Ölçeği (BGÖ), Sabahçı-Akşamcı Anketi (SAA), Snaith-Hamilton Hoşnuttuk Değerlendirme Ölçeği (SHHDÖ) kullanılmıştır. Araştırmanın Etik Kurul Onayı 03.12.2020 tarihinde Acıbadem Üniversitesi ve Acıbadem Sağlık Kuruluşları Tıbbi Araştırma Etik Kurulu'ndan 2020/25 sayılı, 2020/25-24 karar numarası ile alınmıştır.

Bulgular: Hedonik açlığı sahip olan bireylerin yaş ortalamasının (25,6±9,2 yıl), hedonik açlığa sahip olmayan bireylerin yaş ortalamasına (31,9±12,4 yıl) göre daha düşük olduğu belirlenmiştir (p=0,000). Kadınlarda (%79,6) erkeklerde (%68,6) göre hedonik açlık görülme oranı anlamlı olarak daha yüksektir (p=0,014). Erkek bireylerde kadınlara göre anhedonik olma oranı daha fazladır (p=0,015). Bireylerin kronotip durumu ile hedonik açlık durumu arasında doğrusal negatif yönde anlamlı bir ilişki tespit edilmiştir (r=-0,238, p=0,000). Hedonik açlık düzeyi arttıkça bireylerin akşam kronotipine daha yakın oldukları saptanmıştır.

Sonuç: Bu çalışmada, hedonik açlık ile kronotipin birbirlerinden etkilendiği ancak bu durumun anhedoniyle ilişkili olmadığı belirlenmiştir. Sonuç olarak, hedonik açlığa sahip olma durumu bireylerin kronotipleri de göz önüne alınarak değerlendirilmelidir. Hedonik açlığı minimuma indirmek için önemli bir etken olan bireyin kronotipi sağlıklı besin tüketiminin sağlanabilmesi için düzenlenmeye çalışmalıdır.

Anahtar Sözcükler: Açlık, Anhedoni, Hedonik Açlık, Kronotip, Sirkadiyen Ritim

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One of the reasons for the health problems seen in today's societies is the consumption of bad foods. Especially the easy and cheap access to delicious foods triggers a pleasure-based food consumption in addition to the need for calories (1). Although how nutrition is programmed is quite complex, food intake is controlled by homeostatic regulation for energy balance and by hedonic regulation for pleasure (2). Hunger that is independent of taste is called "homeostatic hunger" because there is an energy deficit in the absence of food for at least 8 hours. Hedonic hunger is an impulse that causes the consumption of delicious foods for pleasure rather than the feeling of hunger caused by energy deficit (1,2).

Food intake is rhythmic and it has been reported that the individual's food intake times may be affected by the chronotypes expressed as personal preferences of daily activities (3). Chronotypes of individuals are divided into three categories as morningness, middle and eveningness. The chronotypes of individuals are determined as morningness and eveningness chronotypes according to the times when they feel most productive and best. It has been reported that individuals with the eveningness chronotype tend to have more unhealthy behaviors (4). In addition, individuals with morningness chronotype generally have a healthier lifestyle compared to eveningness chronotypes, and studies have shown that they have higher life satisfaction (4,5). Anhedonia is an important symptom of depression; it is also associated with excessive and uncontrolled eating (6). This suggests that anhedonic individuals can use foods to increase their level of pleasure.

In this study, it was aimed to determine the hedonic hunger, anhedonia levels and chronotypes of adult individuals and to evaluate the relationship between them.

MATERIALS AND METHODS

This study was carried out on 402 participants between the ages of 18-65 who voluntarily agreed to participate in the study and studied or worked at İzmir Bakırçay University between December 2020 and March 2021. The sample size of the study was found to be at least 378 people with the G-Power power analysis program. Individuals who received psychiatric treatment and/or medication, and who took a special diet due to their illness were excluded from the study. This research was carried out online with "Google Forms" and the study started with the approval of the "Informed Voluntary Consent Form for Scientific Research". In the first part of the questionnaire, a questionnaire consisting of 11 questions determining the

sociodemographic characteristics of the individuals participating in the research was applied, and in the second part, a questionnaire consisting of 6 questions to question the nutritional habits of the individuals. In the third part of the questionnaire, the short version of the International Physical Activity Questionnaire (IPAQ) was used to determine the physical activity levels of individuals (7). In the fourth part of the questionnaire, The Power of Food Scale (PFS) was used to determine the hedonic hunger levels of individuals (8). In the fifth part of the questionnaire, the Morningness-Eveningness Questionnaire (MEQ) was used to determine the chronotypes of individuals (9). Finally, in the sixth part of the questionnaire, the Snaith-Hamilton Pleasure Scale (SHAPS), which determines the anhedonia levels according to the pleasure levels of the individuals, was used (10). In order to carry out the study, "Ethics Committee Approval" was obtained from Acibadem University and Acibadem Healthcare Institutions Medical Research Ethics Committee (ATADEK) on 03.12.2020 with the decision numbered as 2020/25-24. In addition, institutional permission was obtained from İzmir Bakırçay University in order to collect the data of the research.

At the end of the research, the data obtained through the questionnaire were evaluated in the Statistical Package for the Social Sciences (SPSS) version 22.0 statistical package program. Number, percentage, mean value and standard deviation were used for descriptive statistics in statistical analysis. Pearson Chi-Square, Mann-Whitney U, Student t, One Way ANOVA analyzes were used to compare the hedonic hunger, chronotype and anhedonia status according to the sociodemographic characteristics, chronic disease status, smoking, alcohol and dietary habits, and physical activity levels of the participants. If the One Way ANOVA test statistic result was found to be significant, the Post hoc test was used to identify the groups that caused the difference. Pearson correlation analysis was used to determine whether there was a relationship between hedonic hunger and anhedonia and chronotype status. In statistical analyses, p-values less than 0.05 were considered significant.

RESULTS

Of the individuals participating in the research, 265 (65.9%) were female and 137 (34.1%) were male. The mean age of the participants was 27.1 ± 10.4 years. When body mass indexes were evaluated according to the WHO classification, 10.2% of the participants were underweight, 59.7% were normal, 23.6% were overweight and 6.5% were obese. In addition, 69.4% of the participants

skip meals. Of the participants who skip meals, 62.7% do not consume lunch, 33.7% do not consume morning meals and 3.6% do not consume evening meals. 87.1% of the participants want to snack between meals. It was determined that the participants who consumed snacks preferred mostly fruit with 51.1%, and dairy products such as milk, yogurt, ayran and kefir the least with 0.6%. The mean MET score of the participants was found to be 903.9 ± 1495.4 MET-minutes, and 59.2% of the individuals were classified as inactive, 33.3% as minimally active and 7.5% as very active. (Table 1).

The relationship between hedonic hunger status of individuals and sex is given in Table 2. The rate of hedonic hunger was observed to be higher in women (79.6%, $n=211$) than in men (68.6%, $n=94$), and a statistically significant difference was found between the groups ($p=0.014$). When the relationship between the sex of the participants and their anhedonia status is examined; it was observed that the rate of being anhedonic was higher in males (10.9%, $n=15$). A statistically significant difference was found between the groups ($p=0.015$) (Table 2).

The mean age of the participants without hedonic hunger (31.9 ± 12.4 years) compared to those with hedonic hunger (25.6 ± 9.2 years) ($p=0.000$); The mean age of the participants with morningness chronotype (31.9 ± 1.2 years) was significantly higher than the participants with middle and eveningness chronotype (26.2 ± 0.6 years, 23.8 ± 0.9 years, respectively) ($p=0.000$) (Table 3).

It was observed that the rate of weakness (underweight) was higher in those with the eveningness type chronotype, and the obesity rate was higher in those with the morningness type chronotype, which is statistically significant ($p=0.003$). It was observed that the rate of hedonic hunger among the participants who had a snack between meals was significantly higher than those who did not snack between meals, and the rate of snacking between meals was significantly higher in those with the eveningness type chronotype than those with the middle and morningness type chronotype; not shown in the tables ($p=0.018$).

The relationship between hedonic hunger and chronotype status of individuals is given in Table 4. It was observed that there was a linear negative significant relationship between the participants' chronotype total score and hedonic hunger total score ($r=-0.238$ $p=0.000$), and between the chronotype total score and hedonic hunger subgroup

scores (Food Availability, Food Present, Food Tasted). ($r=-0.154$, $p=0.002$; $r=-0.218$, $p=0.000$; $r=-0.270$, $p=0.000$).

There was no statistically significant relationship between the participants' hedonic hunger and anhedonia; not shown in the tables ($p>0.05$). No statistically significant correlation was found between the anhedonia status and chronotypes of the participants, it was not shown in the tables ($p>0.05$).

DISCUSSION

In our study, 65.9% of the participants were women and 34.1% were men. In similar studies on chronotype, hedonic hunger and/or anhedonia, female participants were more common than male participants, as in our study (11-12). Of the individuals participating in our study, 10.2% were underweight, 59.7% were normal, 23.6% were slightly overweight and 6.5% were obese. In a study on chronotype, eating behavior and depression, it was determined that 12% of individuals were underweight, 68.2% were normal, 15.7% were slightly obese and 3.9% were obese and the body mass index distributions of this study are similar to the distribution in our study (13). In our study, 69.4% of the participants skipped meals. In Şarahman's study on hedonic hunger, similar to our study, most of the participants (73.7%) skip meals (14).

It is thought that many factors such as age, sex and BMI may affect hedonic hunger (11-14). In our study, hedonic hunger was observed in 79.6% of women and 68.6% of men. The rate of hedonic hunger was higher in female participants, and the difference between hedonic hunger states by sex was statistically significant. In studies, hedonic hunger was found to be higher in women than in men, and this difference between the sexes was found to be statistically significant (27,28). In a study conducted by Lowe et al. with 466 university students between the ages of 18-42, it was found that the mean PFS score was higher in women than in men, albeit with a small difference, but this difference between them was not statistically significant (15). In a study by Schüz et al. examining the eating habits of 53 participants aged 18-60 through social media advertisements, the PFS scores were found to be slightly higher in women than in men, but this difference was not statistically significant (17). When all these studies are examined, it can be seen that women have more hedonic hunger than men. Although the levels of estradiol, which is one of the sex hormones that are effective on the homeostatic control of nutrition, are higher in women than in men and provide partially less hunger and longer satiety, women may be more affected by environmental food cues because of higher hedonic hunger levels in women (17).

Table 1. Sociodemographic Characteristics, Nutritional Habits and Physical Activity (n=402)

Age (years) $\bar{X} \pm SS$	Participants	
	27.1 ± 10.4	
	n	%
Sex		
Woman	265	65.9
Man	137	34.1
Body Mass Index		
< 18.5 kg/m ² underweight	41	10.2
18.5-24.9 kg/m ² normal	240	59.7
25-29.9 kg/m ² overweight	95	23.6
≥ 30 kg/m ² obese	26	6.5
Meal Skip Status		
Yes	279	69.4
No	123	30.6
Which Meal is Skipped the Most?		
Breakfast	94	33.7
Lunch	175	62.7
Dinner	10	3.6
Between-Meal Snack Status		
Yes	350	87.1
No	52	12.9
Snacks		
Fruits	179	51.1
Biscuits, Crackers, etc.	116	33.1
Wafers, Chocolate, etc.	157	44.9
Confectionery	50	14.3
Cheese-bread-style snacks	61	17.4
Nuts	154	44
Hot beverages such as tea, coffee.	4	1.1
Herbal tea		
Dairy products such as milk, yogurt.	2	0.6
Ayran, kefir		
Total MET Score $\bar{X} \pm SS$	903.9 ± 1495.4	
	n	%
Physical Activity Level		
Inactive	238	59.2
Minimal Active	134	33.3
Very Active	30	7.5

Table 2. Relationship between Hedonic Hunger and Anhedonia Conditions and Sex

	Women	Men	p
	n (%)	n (%)	
Hedonic Hunger			0.014*
Available	211 (%79.6)	94(%68.6)	
None	54 (%20.4)	43(31.4)	
Anhedonia			0.015**
Not anhedonic	253 (%95.5)	12 (%4.5)	
Anhedonic	122 (%89.1)	15 (%10.9)	

* Pearson Chi-Square test was used. The column percentage is taken.

** Pearson Chi-Square test was used. Row percentage is taken.

Table 3. Relationship between Hedonic Hunger and Chronotype Conditions and Age

	Age (years) $\bar{X} \pm SS$	p
Hedonic Hunger		0.000*
Available	25.6 $\pm$ 9.2	
None	31.9 $\pm$ 12.4	
Chronotype		0.000*
Morningness	31.9 $\pm$ 1.2	
Middle Type	26.2 $\pm$ 0.6	
Eveningness	23.8 $\pm$ 0.9	

* One Way Anova test was used.

Table 4. The Relationship between Hedonic Hunger and Chronotype Status of Participants

	Chronotype Total Score	
	r	p
Hedonic Hunger Total Score	-0.238	0.000
Hedonic Hunger Subgroup 1: Food Availability	-0.154	0.002
Hedonic Hunger Subgroup 2: Food Present	-0.218	0.000
Hedonic Hunger Subgroup 3: Food Tasted	-0.270	0.000

* Pearson correlation analysis was used.

In the Turkish adaptation study of the Snaith Hamilton Pleasure Scale Clinician Administered Form (SHAPS-C), no difference was found in the total scores of the scale according to sex (33). Again, in a study conducted with 697 adult participants between the ages of 18-82, no relationship was found between the level of anhedonia and sex (34). In another study examining the participants in three groups as non-anhedonic, acute anhedonic and chronic anhedonic, no difference was found between the groups in the levels of anhedonia according to sex (35). In the development study of the Snaith-Hamilton Pleasure Scale, no significant relationship was found between scale scores and sex (18). In the Chinese adaptation study of the Snaith-Hamilton Pleasure Scale by Zhang et al., men in the healthy group were found to be more anhedonic than women (19). In this study, too, in support of Zhang et al. and Yang et al. (18,19), the rate of being anhedonic was higher in men (10.9%) compared to women (4.5%), and a statistically significant difference was found between the level of satisfaction by sex.

In some studies, hedonic hunger is higher in the younger age group than in the older age group, and this difference is statistically significant (2,14). In our study, the mean age of individuals with hedonic hunger was 25.6 ± 9.2 years, and the mean age of those without hedonic hunger was 31.9 ± 12.4 years. The mean age of those with hedonic hunger was lower than those without hedonic hunger, and this difference was statistically significant. In a study conducted by Kremer et al. on 46 elderly and 36 young individuals, losses in taste-smell and sensitivity to trigeminal stimuli, as well as reductions in chewing efficiency were observed in the elderly compared to young people on average. In addition, it has been determined that adding a flavor enhancer, texture change and irritant nutrient in the elderly causes an increase in food liking (20). When all these are examined, it is thought that hedonic hunger may decrease due to loss of taste and smell as age progresses.

In a population-based study investigating health behaviors, health-related quality of life, and sleep across chronotypes, subjects with the eveningness chronotype were significantly younger than 2,976 participants (21). Many studies support that those with the eveningness chronotype are younger individuals (5,22,23). In this study, supporting the literature, the mean age of the participants with morningness chronotype was found to be significantly higher than the participants with the middle and eveningness chronotype, and a statistically significant difference was found between the groups in terms of

the mean age of the participants.. However, there are different results in the literature. In some studies conducted on university students, no significant difference was observed between age and chronotype (24,25). The reason why these studies are different from our study and other studies supporting our study may be that they were conducted on individuals from the same age group.

In a study evaluating the differences in BMI and eating behaviors of obese and overweight individuals with and without anhedonic during an intervention study for weight loss, anhedonia was associated with uncontrolled eating, emotional eating, and overeating (6). Again, in a study by Davis et al., it was found that individuals with anhedonia may try to use foods to increase their level of pleasure (26). In a study conducted on rats and mice, it has been found that those exposed to a high-fat diet have depression with more anhedonia, the elimination of these foods increases stress, and the tendency to high-fat foods increases with increasing stress, so this situation is a vicious circle (27). In this study, a linear positive relationship was observed between hedonic hunger and anhedonia status, and it was determined that those with high hedonic hunger levels were more prone to being anhedonic. However, this situation is not statistically significant. There are some studies in the literature that show the opposite of all these studies. In a study conducted in adolescents, low levels of anhedonia were associated with an increase in hedonic hunger (11). The reason why these studies differ from the general literature may be that they were conducted on mice, rats or individuals of different age groups.

In a study conducted on a large sample, it was found that individuals with the eveningness chronotype had 1.3 times higher rate of stress-related eating and had more difficulty in controlling the amount of food eaten (54). A study on rats reported that sucrose uptake and preference were rhythmic, with higher intake at night. It has also been shown that hedonic feeding behaviors can be controlled by brain circadian clocks (28). When this study was compared with similar studies in the literature, it was observed that there was a linear negative correlation between hedonic hunger and chronotype status, and it was determined that individuals with high hedonic hunger levels were prone to eveningness.

In a study conducted by Maukonen et al. in 1097 adults with a 7-year follow-up period, it was determined that evening-hungry individuals are more prone to depression (29). In a study with a large sample, a relationship was

determined between having an eveningness chronotype and severe depressive symptoms (30). In a meta-analysis by Au et al., being coast to the eveningness chronotype was found to be associated with severe mood symptoms (5). In this study, in accordance with the literature, it was observed that there was a linear negative relationship between anhedonia status and chronotype status, and it was determined that individuals with high anhedonia levels were prone to eveningness. However, this situation is not statistically significant.

CONCLUSION

In this study, which was conducted to evaluate the relationship between adult individuals by determining hedonic hunger, anhedonia levels and chronotypes; it was determined that hedonic hunger and chronotype were affected by each other, but chronotype and hedonic hunger were not associated with anhedonia. Relationship between anhedonia, chronotype and hedonic hunger, which is one of the main criteria of depression, was investigated, but no relationship was found between anhedonia and these factors, except for the relationship between chronotype and hedonic hunger. In future studies, not only anhedonia but also major depression can be discussed in all its lines and its relationship with hedonic hunger and chronotype can be examined again.

Limitations of this study; due to the Covid-19 epidemic, it may be that the anthropometric measurements of the study were accepted according to the declaration and carried out in a limited universe.

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Ethics approval: The protocol of the study was approved by the Ethical Committee of the Acibadem Mehmet Aydınlar University with the number of 2020/25-24.

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REFERENCES

1. Cahyani A, Setyorini A, Ispurwanto W. Hedonic eating among female students: A descriptive study. *Soc Econ Ecol Int J.* 2018;2:129–34.
2. Lowe MR, Butryn ML. Hedonic hunger: A new dimension of appetite? *Physiol Behav.* 2007;91:432–9.
3. Mendoza J. Circadian clocks: Setting time by food. *J Neuroendocrinol.* 2007;19:127–37.
4. Kanerva N, Kronholm E, Partonen T et. al. Tendency toward eveningness is associated with unhealthy dietary habits. *Chronobiol Int.* 2012;29:920–7.
5. Au J, Reece J. The relationship between chronotype and depressive symptoms: A meta-analysis. *J Affect Disord.* 2017;218:93–104.
6. Keränen AM, Rasinaho E, Hakko H et. al. Eating behavior in obese and overweight persons with and without anhedonia. *Appetite.* 2010;55:726–9.
7. Öztürk M. Üniversitede eğitim-öğretim gören öğrencilerde Uluslararası Fiziksel Aktivite Anketinin geçerliliği ve güvenilirliği ve fiziksel aktivite düzeylerinin belirlenmesi. H.Ü. Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara, 2005 (Danışman: Prof. Dr. H Arıkan).
8. Hayzaran M. Üniversite Öğrencilerinin Hedonik Açlık Durumlarının Farklı Ölçekler ile Belirlenmesi. B.Ü. Sağlık bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara, 2018 (Danışman: Prof. Dr. MA Ok).
9. Pündük Z, Gür H, Ercan İ. Sabahçıl-Akşamcıl Anketi Türkçe uyarlamasında güvenilirlik çalışması. *Türk Psikiyatr Derg.* 2005;16:40–5.
10. Kesebir S, Yıldız H, Yıldız H ve ark. Snaith-Hamilton Hoşnutluk Değerlendirme Ölçeği: Geçerlik, güvenilirlik, toplumumuzda psikometrik özellikleri. *Cukurova Medical Journal.* 2015;40:252-7.
11. Mason TB, Dunton GF, Gearhardt AN et. al. Emotional disorder symptoms, anhedonia, and negative urgency as predictors of hedonic hunger in adolescents. *Eat Behav.* 2020;36:101343.
12. Vidafar P, Cain SW SA. Relationship between sleep and hedonic appetite in shift workers. *Nutrients.* 2020;12(9):2835.
13. Gövez NE. Üniversite Öğrencilerinde Sosyal Jetlag Ve Kronotipin Yeme Davranışı, Depresyon, Akademik Başarı Ve Beslenme Durumu Üzerine Etkisinin Değerlendirilmesi. G.Ü. Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara, 2020 (Danışman: Prof. Dr. NA Tek).
14. Şarahman C. Yetişkin Bireylerin Hedonik Açlık Durumlarını Etkileyen Faktörlerin İncelenmesi. B.Ü. Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara, 2019 (Danışman: Prof. Dr. MA Ok).
15. Lowe MR, Butryn ML, Didie ER, Annunziato RA, Thomas JG, Crerand CE, et al. The Power of Food Scale. A new measure of the psychological influence of the food environment. *Appetite.* 2009;53:114–8.
16. Schüz B, Schüz N, Ferguson SG. It's the power of food: Individual differences in food cue responsiveness and snacking in everyday life. *Int J Behav Nutr Phys Act.* 2015;12:1–8.
17. Gregersen NT, Møller BK, Raben A, Kristensen ST, Holm L, Flint A, et al. Determinants of appetite ratings: The role of age, sex, BMI, physical activity, smoking habits, and diet/weight concern. *Food Nutr Res.* 2011;55:1–10.
18. Snaith RP, Hamilton M, Morley S HAHD and TP. A Scale for the Assessment of Hedonic Tone The Snaith-Hamilton Pleasure Scale. *Br J Psychiatry.* 1995;167:99–103.
19. Zhang P, Zhang N, Fang S, He J, Fan L, Luo X, et al. Factor Structure and Measurement Invariance of the Chinese version of the Snaith-Hamilton Pleasure Scale (SHAPS) in Non-clinical and Clinical populations. *J Affect Disord.* 2021;281:759–66.
20. Kremer S, Bult JHF, Mojet J, Kroeze JHA. Food perception with age and its relationship to pleasantness. *Chem Senses.* 2007;32:591–602.

21. Suh S, Yang HC, Kim N, Yu JH, Choi S, Yun CH, et al. Chronotype differences in health behaviors and health-related quality of life: A population-based study among aged and older adults. *Behav Sleep Med*. 2017;15:361–76.
22. Merikanto I, Kronholm E, Peltonen M, Laatikainen T, Vartiainen E, Partonen T. Circadian preference links to depression in general adult population. *J Affect Disord*. 2015;188:143–8.
23. Haraszti RÁ, Purebl G, Salavecz G, et al. Morningness-eveningness interferes with perceived health, physical activity, diet and stress levels in working women: A cross-sectional study. *Chronobiol Int*. 2014;31:829–37.
24. Tarhan R. Üniversite Öğrencilerinde Sabahçıl-Akşamcıl Sirkadiyen Ritim Özellikleri ve Sabahçıl-Akşamcılığın Mizaç ile İlişkisi. G.Ü. Psikiyatri Anabilim Dalı, Uzmanlık Tezi, Ankara, 2014 (Danışman: Prof. Dr. S Aslan).
25. Sato-Mito N, Shibata S, Sasaki S, Sato K. Dietary intake is associated with human chronotype as assessed by both morningness-eveningness score and preferred midpoint of sleep in young Japanese women. *Int J Food Sci Nutr*. 2011;62:525–32.
26. Davis C, Fox J. Sensitivity to reward and body mass index (BMI): Evidence for a non-linear relationship. *Appetite*. 2008;50:43–9.
27. Sharma S, Fernandes MF, Fulton S. Adaptations in brain reward circuitry underlie palatable food cravings and anxiety induced by high-fat diet withdrawal. *Int J Obes*. 2013;37:1183–91.
28. Bainier C, Mateo M, Felder-Schmittbuhl MP et. al. Circadian rhythms of hedonic drinking behavior in mice. *Neuroscience*. 2017;349:229–38.
29. Maukonen M, Kanerva N, Partonen T et. al. Chronotype and energy intake timing in relation to changes in anthropometrics: a 7-year follow-up study in adults. *Chronobiol Int*. 2019;36:27–41.
30. Merikanto I, Lahti T, Kronholm E et. al. Evening types are prone to depression. *Chronobiol Int*. 2013;30:719–25.