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Determination of the Relationship Between Three-Factor Eating Scale and Chronotypes in Healthcare Workers

Sağlık Çalışanlarında Üç Faktörlü Yeme Ölçeğiyle Kronotipleri Arasındaki İlişkinin Saptanması

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ABSTRACT

Aim: *The aim of this study was to determine the relationship between nutritional status and chronotypes of healthcare workers.*

Materials and Method: *This study was conducted between April and May 2023 on 261 healthcare workers. An online questionnaire form consisting of a general information section, Three-Factor Nutrition Questionnaire and Morning and Evening Questionnaire questions was applied to the participants via Google Forms.*

Results: *The age and body mass index of the morning people was found to be significantly higher ($p<0.05$). The cognitive restraint behaviour sub-score of the evening individuals was found to be significantly lower than the morning and intermediate types ($p<0.05$).*

Conclusion: *The chronotypes of healthcare workers were similar to the general population. In addition, it was observed that healthcare workers exhibited nutritional attitudes such as uncontrolled eating and cognitive restriction, which may cause eating behaviour disorder.*

Keywords: *Chronotype, Healthcare workers, Morningist-Evening scale, Three-Factor eating scale*

ÖZET

Amaç: *Bu araştırmada sağlık çalışanlarının beslenme durumları ve kronotipleri arasındaki ilişkinin saptanması amaçlanmıştır.*

Gereç ve Yöntem: *Bu çalışma Nisan-Mayıs 2023 tarihleri aralığında 261 sağlık çalışanı üzerinde gerçekleştirilmiştir. Katılımcılara; Google Forms aracılığıyla genel bilgiler bölümü, Üç Faktörlü Beslenme Anketi ve Sabahçıl-Akşamcıl Anketi sorularından oluşan bir online anket formu uygulanmıştır.*

Bulgular: *Sabahçıl kişilerin yaşları ve beden kütle indeksleri anlamlı olarak daha yüksek bulunmuştur ($p<0.05$). Akşamcıl bireylerin bilişsel kısıtlama davranış alt puanı sabahçıl ve ara tipe göre anlamlı olarak daha düşük bulunmuştur ($p<0.05$).*

Sonuç: *Sağlık çalışanlarının kronotipleri toplumun geneli ile benzerlik göstermektedir. Ayrıca sağlık çalışanlarının kontrolsüz yeme, bilişsel kısıtlama gibi yeme davranış bozukluğuna sebep olabilecek beslenme tutumları sergiledikleri görülmüştür.*

Anahtar Kelimeler*: Kronotip, Sabahçıl-Akşamcıl ölçeği, Sağlık çalışanları, Üç faktörlü yeme ölçeği*

INTRODUCTION

In order to maintain the continuity of services in hospitals, duty and shift pattern are used. It is thought that working in shifts may cause psychological or biological health problems after a certain period of time, as it conflicts with the circadian rhythm of individuals (Demir, Elkin, Barut, Bayram & Averi, 2017). It is stated that individuals' physical activity and nutritional habits also change with shift pattern (Guerrero-Vargas, Espitia-Bautista, Buijs & Escobar, 2018). It has been found that the waist-hip ratio and body mass index of individuals working late hours are higher than those working early hours (James, Honn, Gaddameedhi & Van Dongen, 2017). In addition, shift pattern is associated with chronic diseases such as metabolic syndrome, dyslipidemia, hypertension, diabetes, cardiovascular diseases, cancer and obesity (Reid & Abbott, 2015; Manohar, Thongprayoon, Cheungpasitporn, Mao & Herrmann, 2017). The activity and sleep times chosen by the individual may vary depending on the individual's circadian rhythm. This situation is stated by the concept of chronotype (Adan et al., 2012). Individuals who are active early in the day are called 'morningness', and individuals who are active late in the day are called 'eveningness'. In addition, individuals who do not fit both types and show intermediate qualities are classified as intermediate types (Montaruli et al., 2021). Eating disorder is defined by the timing of mealtime, energy intake during the day, and eating late at night. It has been shown that it may cause nutrition-related disorders by altering metabolic homeostasis. This situation is explained by chrononutrition (Silva et al., 2016). It has been found that night shift increases the risk of type 2 diabetes in individuals with the morningness chronotype while the opposite is true in individuals with the eveningness chronotype (Hulsegge et al., 2019). It is thought that the current working patterns of healthcare workers affect their nutritional status and this increases their health risks (Demir et al., 2017). In the light of this information, the aim of our study is to examine the relationship between the nutritional status and chronotypes of healthcare workers.

MATERIAL AND METHOD

Research Type

This is a cross-sectional descriptive study.

Study Population and Sample

Our study, which we carried out examining the relationship between nutritional status and chronotypes of healthcare workers, was conducted between April 2023 and May 2023, using the online survey method with 261 healthcare professionals working in private and public hospitals in Istanbul.

Sample size of the study was calculated in G*Power 3.1.9.4 power analysis program (Faul, Erdfelder, Lang & Buchner, 2007). In a similar study (Leung et al., 2016) it was calculated that 214 people should be included with a 95% confidence level ($\alpha = 0.05$) and 80% power. 261 healthcare workers participated in the research.

The sample of our study consists of healthcare workers of different genders and ages, who approved the informed consent form via the online platform. The participants of our study were reached through announcements made through social media. Healthcare workers who did not accept the informed consent form and were diagnosed with eating disorders were not included in the study.

Data Collection Tools

The survey form we applied to the participants consists of general information section of the participants, Three-Factor Eating Questionnaire and Morningness – Eveningness Questionnaire. Anthropometric measurements of the participants were obtained based on their statements. The survey form was applied via Google Forms. Informed consent forms were obtained from the participants.

Three-factor Eating Scale: In 2015, TFEQ (Three factor eating questionnaire) was translated into Turkish by Kıraç et al. and its reliability and validity were checked. This survey form included 18 questions and the answers to questions 1 to 13 were scored as 4 to 1 from top to bottom, and the answers to questions 14 to 17 were scored as 4 to 1 from bottom to top. In Questions 4 and 18, the scores for options 1 and 2 were 1, the scores for options 3 and 4 were 2, the scores for options 5 and 6 were 3, the scores for options 7 and 8 were 4. Questions 1, 7, 13, 14, 17 measure individuals' uncontrollable eating attitude. Questions 3, 6, 10 measure individuals' emotional eating attitude. Questions 2, 11, 12, 15, 16, 18 measure individuals' cognitive restraint attitude and questions 4, 5, 8 and 9 measure sensitivity to hunger. The total score is in the range of 18-72

(Kıraç et al., 2015).

Morningness-Eveningness Scale: Morningness-Eveningness Questionnaire was created by Horne and Ostberg in 1976. This scale, consisting of 19 questions, evaluates the sleep and wakefulness patterns, lifestyles of individuals, their performances. Chronotype types of individuals are determined according to the score obtained in the questionnaire. If the total score is between 59 and 86, it is categorized as 'morningness', if it is between 42 and 58, it is categorized as 'intermediate type', and if it is between 16 and 41, it is categorized as 'eveningness'. A reliability study of the Turkish translation of the scale was carried out in 2005 (Pündük, Gür & Ercan, 2005).

Ethical Consideration

Ethics committee approval for this study was obtained from a university's ethics committee (Date: 25.01.2023, Approval Number: 2023/01) and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Analysis

The data were analyzed using SPSS 21.0 package program. In all analysis, statistical significance was set at $p<0.05$. Conformity of data to normal distribution was tested with Kolmogorov-Smirnov method. Numbers, percentages, mean, standard deviation, median, minimum and maximum values were included in descriptive statistics. Chi square test was used to analyze qualitative variables. For the reason that continuous variables do not show normal distribution, Mann Whitney U test was used for comparisons between two groups while the Kruskal Wallis test was applied for comparisons of more than two groups. Spearman analysis was performed for the relationship between continuous variables.

RESULTS

The study was completed with 261 volunteer healthcare workers, 190 (72.8%) of whom were women and 71 (27.2%) of whom were men. Of individuals, 65.5% are single and 34.5% are married. While 38.7% of the individuals participating in the study have an undergraduate degree, 25.3% have an associate degree, 19.2% have a high school degree, and 16.9% have a postgraduate degree. While the majority of participants (87.0%) do not have any chronic diseases, 39.5% work in shift pattern. According to the result of Morningness-Eveningness Questionnaire, 196 (75.1%) of the individuals have an intermediate chronotype, 42 (16.1%) of them have a morningness choronotype and 23 (8.8%) have an eveningness chronotype. Descriptive information about the participants is shown in Table 1.

Table 1. Descriptive Information About Participants (n=261)

	Mean ± Standart Deviation	
Age	29.7 ± 8.2	
	N	**%**
Gender		
Woman	190	72.8
Male	71	27.2
Educational status		
High school	50	19.2
Associate degree	66	25.3
Undergraduate	101	38.7
Postgraduate	44	16.9
Marital status		
Married	90	34.5
Single	171	65.5
Shift working status		
Yes	103	39.5
No	158	60.5
Chronic disease		
Yes	34	13.0
No	227	87.0
Chronotype category		
Evening type	23	8.8
Intermediate type	196	75.1
Morning type	42	16.1

Scores and categories of the participants from the morningness-eveningness scale and the three-factor eating scale are given in Table 2. The median total score of individuals for morningness and eveningness was found out to be 51 (30-69). 8.8% of the participants had an evening chronotype; 75.1% had an intermediate chronotype and 16.1% had a morning chronotype. Additionally, when their scores from the three-factor eating scale were examined, the median score for uncontrolled eating was 12 (5-19), the median score for emotional eating was 7 (3-12), the median score for cognitive restraint behavior was 14 (6-24), the median score for hunger sensitivity was 9 (4-16) and the total median score was 42 (21-63).

Table 2. Participants' Scale Scores

Parameters	Average	Standard deviation	Median	Minimum	Maximum
Morningness-Eveningness Scale					
Total score	50.99	7.33	51.00	30.00	69.00
Three-FactorEating Scale					
Uncontrolled eating score	11.84	3.11	12.00	5.00	19.00
Emotional eating score	7.07	2.96	7.00	3.00	12.00
Cognitive restraint behavior score	14.09	3.21	14.00	6.00	24.00
Hunger sensitivity score	9.41	3.37	9.00	4.00	16.00
Total score	42,42	7.93	42.00	21.00	63.00

Participants' age and anthropometric measurement values according to choronotype categories are shown in Table 3. Age and body mass index showed significant differences between categories ($p<0.05$). It was found that the morning types are significantly older than the other groups in addition, body mass indexes of them were significantly higher. Body weights did not differ between categories ($p>0.05$).

Table 3. Age and Anthropometric Measurements According to Chronotype Categories

	Median (Minimum-Maximum)				
	Morningness (1)	**Intermediate type (2)**	**Eveningness (3)**	**P**	**Intergroup Differences**
Age (years)	32.5 (23-52)	26 (20-66)	25 (20-43)	**0.002**	1.3; 1.2
Weight (kg)	70.5 (50-110)	62 (43-130)	62 (45-100)	0.084	-
Body mass index (kg/m²)	25,25 (18.69-39.25)	22.50 (16.90-44.98)	22.03 (17.93-28.08)	**0.021**	1.3;1.2

***** *Mann Whitney U test was performed for two group comparisons and Kruskal Wallis test was performed for more than two group comparisons*

Table 4 shows the three-factor eating scale scores by chronotype categories. The cognitive restraint behavior subscore of evening individuals was found to be significantly lower than morning people and intermediate types ($p<0.05$). There were no significant differences in other scores ($p>0.05$).

Table 4. Results of the Three-Factor Eating Scale According to Chronotype Categories

	Median (Minimum-Maximum)				
	Morningness (1)	**Intermediate type (2)**	**Eveningness (3)**	**P.**	**Intergroup differences**
Uncontrolled eating score	12 (5-16)	12 (5-9)	13 (5-18)	0.359	
Emotional eating score	6.5 (3-12)	7 (3-12)	7 (3-12)	0.953	
Cognitive restraint behavior score	14.5 (8-24)	14 (6-23)	12 (9-18)	**0.003**	1.3; 2.3
Hunger sensitivity score	9 (4-16)	9 (4-16)	10 (4-16)	0.891	
Total score	43 (25-60)	42 (24-63)	43 (21-58)	0.916	

***** *Mann Whitney U test was performed for two group comparisons and Kruskal Wallis test was performed for more than two group comparisons.*

Table 5 shows the scores of the morningness-eveningness scale and the three-factor eating scale according to body mass index categories. The total score of the morningnes-eveningness scale of overweight participants was found to be significantly higher than that of normal weight individuals ($p <0.05$). Uncontrolled eating, hunger sensitivity and total scores of underweight individuals were found to be significantly lower

than normal, overweight and obese individuals ($p<0.05$). Additionally, cognitive restraint behavior scores of underweight individuals were found to be lower than normal weight individuals ($p<0.05$). Emotional eating score did not show a significant difference ($p>0.05$).

Table 5. Results of Morning-Evening and Three-Factor Eating Scale According to Body Mass Index Categories

	Median (Minimum-Maximum)					
	Weak (1)	**Normal (2)**	**Overweight (3)**	**Obese (4)**	**p**	**Intergroup differences**
Morningness-Eveningness Scale						
Total score	50 (39-58)	50 (30-69)	54 (30-68)	52.5 (43-62)	**0.001**	2.3
Three-Factor Eating Scale						
Uncontrolled eating score	10 (5-18)	12 (5-19)	12 (5-18)	12 (8-17)	**0.041**	1.2; 1.3; 1.4
Emotional eating score	5 (3-11)	7 (3-12)	8 (3-12)	8.5 (3-12)	0.152	
Cognitive restraint behavior score	12 (8-23)	14 (8-23)	14 (7-21)	15 (6-24)	**0.018**	1.2
Hunger sensitivity score	6 (4-16)	9 (4-16)	10 (4-16)	9 (4-16)	**0.017**	1.2;1.3;1.4
Total score	36 (21-55)	42 (25-60)	44 (27-60)	45 (30-63)	**0.031**	1.2;1.3;1.4

DISCUSSION

The studies of chronotype and its relationship with health are interesting. In this context, this study investigated the relationship between nutritional status and chronotypes of healthcare workers using the Three-Factor Eating Questionnaire and the Morningness-Eveningness Questionnaire.

16.10% of our study sample had morning type (n=42), 75.10% of them (n=196) had intermediate type, 8.80% of them (n=23) had evening type. The intermediate type was the most common chronotype type in the study population (Table 2). In study performed in healthcare workers, it was found that 45.2% of the participants were in the intermediate type chronotype; chronotypes differed according to age and shift work systems (Silva et al., 2017). In another the study conducted by Adan et al. in 2012, it was determined that nearly 60% of the sample had the intermediate type and that it was the most commonly observed chronotype type in adult individuals. In cross-sectional studies on the relationship between chronotype and age, chronotype classification has been observed to vary throughout life. It has been found that the evening chronotype is most common in people in their 20s while the morning choronotype is more common in children and elderly individuals (Fischer, Lombardi, Marucci-Wellman & Roenneberg, 2017; Randler, Faßl & Kalb, 2017). It was found that there was a significant improvement only in the 25-29 age range according to the statistics of chronotype classifications when the age ranges were examined in a cohort study conducted between the ages of 19-68. Therefore, before becoming more stable later in life, a significant improvement in chronotype classification was observed in the 25-29 age group after peaking in the 20s. As a result, it was determined that the chronotype moved to earlier hours as life progressed, and the chronotype classification was observed to be related to age (Druiven et al., 2021). The resent study conducted on a sample between the ages of 20-66, the ages of morning people were seen to be significantly older, supporting previous studies in the literature ($p<0.05$).

In the literature there are findings that evening people are associated with a higher body mass index than morning people (Lucassen et al.,2013; Arora &Taheri, 2015). In the study conducted by Maukonen et al. (2019), they observed 1097 adult individuals for 7 years and it was observed that the weight of people with the evening chronotype and accordingly their body mass index tended to increase. After 7-year observation, the body mass index of people with the evening chronotype was seen to increase more than people with the

morning chronotype. However, when depression cases were included in the study data and the data were renewed, individuals with evening chronotype were thought to be more prone to depression and accordingly an increase in weight was observed. In a cohort study (Xiao, Garaulet & Scheer, 2019) in which 872 people participated, it was seen that food intake after sleep was associated with high body mass index while food intake before sleep were associated with low body mass index, but this relationship varied with chronotype types. In another study, high body mass index in individuals with evening choronotype was associated with a decrease in fruit and vegetable consumption and an increase in ready-made food consumption and alcohol consumption (Beaulieu et al., 2020). As a result of a different study, evening chronotypes tended to lose more weight than morning chronotypes, and this was probably attributed to evening chronotypes showing more changes in meal timing and indirectly shifting more calorie intake to earlier hours of the day (Mazri et al., 2022). Sleep and chrono-nutrition are interrelated, as short sleepers have been shown to be associated with longer eating windows, suggesting that this may cause more food intake (Garcez, de Castro, Cesar, Goldbaum & Fisberg, 2021). The relationship between chronotype and body mass index is not yet clear in the literature and the studies seem inconsistent. Despite the general trend that evening chronotypes are associated with higher body mass (de Punder, Heim & Entringer, 2019; Anothaisintawee, Lertrattananon, Thamakaison, Thakkinstian & Reutrakul, 2018) studies may differ. This is thought to be due to the fact that the research was conducted in healthcare workers and their working and eating habits were different. For a comprehensive understanding, it is important to evaluate these studies in the context of wider research findings.

As a result of the disruption of biological rhythms, some differences occur in the eating behavior of individuals. In addition to hedonic and metabolic pathways, eating behavior is provided through genes and biological clock (Mendoza, 2019). Considering the chronotype classification, people with morning chronotype are more prone to regular and healthy eating behaviors. Also, they can control their eating attitudes better than individuals with evening chronotype (Kivelä, Papadopoulos & Antypa, 2018). The present study, the connection between the Three-Factor Eating Scale and chronotype categories was examined. The median of uncontrolled eating scores of individuals with morning chronotype is 12 (5-16), it is 12 (5-9) in intermediate type and 13 in evening chronotype (5-18). Similar to our study, it has been observed that individuals with evening choronotype have higher uncontrolled eating scores than individuals with morning chronotype (Aoun et al., 2019). Evening chronotype is thought to be linked to the factor of uncontrolled eating (Walker, Christopher, Wieth &Buchanan, 2015). This relationship is explained by irregular eating habits, emotional and social influences, hormonal imbalances, sleep deprivation and lower sleep quality (Loef et al., 2019; Yang et al., 2024). In another study, it was found that morning chronotypes had lower uncontrolled eating scores. It has been observed that individuals with morning chronotype have a more stable life and are better at keeping their eating habits under control during the day (Schubert & Randler, 2008).

The results of this study show that the median of cognitive restraint behavior scores of individuals with morning chronotype was 14.5 (8-24). It was 14 (6-23) for individuals with the intermediate type, and 12 (9-18) for individuals with the evening chronotype. The cognitive restraint behavior subscore of evening people was found to be significantly lower than morning people and intermediate types ($p < 0.05$). A study of healthcare workers found that evening chronotypes were more likely to have uncontrolled eating and irregular eating patterns than morning types. This supports the observation that evening chronotypes have lower cognitive restraint scores. It emphasised that evening chronotypes usually skip breakfast and consume more calories later in the day, which may lead to lower cognitive restraint (Loef et al., 2019). In a study examining the effect of chronotype on weight management and eating behaviours, it was found that morning chronotypes were more successful in weight management programmes due to higher cognitive restraint and healthier eating habits. In addition, it was reported that evening chronotypes had problems with diet adherence and portion control, resulting in lower cognitive restraint scores (Yang et al., 2024). In another study, it was reported that evening chronotypes generally have poor sleep quality and experience social jetlag, which leads to lower cognitive restraint and a tendency towards more impulsive eating behaviours (Jiang et al., 2024).

All these results consider that chronotype significantly influences cognitive control over eating.

Another finding is that, the three-factor eating scale scores of the participants differ according to their body mass index categories ($p<0.05$). The increase in body mass index is thought to be related to the uncontrolled eating score and emotional eating score (Aykut, 2018). In a study conducted by Şen and Kabaran (2021), people in the underweight category were seen to have significantly lower uncontrolled eating scores and emotional eating scores than people in other body mass index categories. It has been observed that people whose body weight is within normal values have lower cognitive restraint behavior scores compared to overweight people. In a different study, it turned out that people in the weak category had lower cognitive restraint behavior scores than individuals in the other categories. People with normal weight were also observed to have higher emotional eating scores than obese people (Taş & Kabaran, 2020). When the relationship between the Three-Factor Nutrition Scale and body mass index was examined, it showed that uncontrolled eating, sensitivity to hunger and total scores of underweight individuals were significantly lower than normal, overweight and obese individuals as it supports other studies ($p<0.05$). In the 3-year study conducted by Van Strien et al. (2014), it was found that those with higher cognitive restraint scores showed a greater increase in their body mass index as a result of the study period. Other studies have also found that restrictive eating attitudes and body mass index have a negative correlation (Braet et al., 2008; Snoek, Engels, Van Strien & Otten, 2013). However, in our study, no result was found between cognitive restrictive eating attitude and body mass index. At the same time, similar to the literature, cognitive restraint behavior scores of underweight individuals were found to be lower than normal weight individuals ($p<0.05$).

While the majority of participants were in the normal body mass index group, 'intermediate type' was the most common chronotype in chronotype classification. The relationship between chronotype and body mass index has not yet been clarified in the literature. In our study, it revealed that the body mass indexes of individuals who had morning chronotype were significantly higher. Another finding is that the uncontrolled eating scores of evening people were observed to be higher compared to the uncontrolled eating scores of individuals with morning chronotype. When the literature is reviewed, there are insufficient studies on the relationship between nutritional status of healthcare workers and chronotype. There is a need for studies in which scales related to sleep status, physical activity and depression will be used as a whole in addition to the scales used for chronotype and nutritional status of healthcare workers. This research is important to reveal the links between eating behaviours and chronotypes that affect the general health status of healthcare workers. It may help to develop strategies to reduce the risks of shift work systems of healthcare workers.

Ethics Committe Approval

Ethics committee approval was received for this study from the Istanbul Bahçeşehir University Ethics Committee (Date: 25.01.2023, Approval Number: 2023/01).

Author Contributions

Idea/Concept: M.B.K., E.B.K.; Design: M.B.K., E.B.K.; Supervision/Consulting: E.B.K.; Analysis and/or Interpretation: M.B.K., E.B.K.; Literature Search: M.B.K., E.B.K.; Writing the Article: M.B.K., E.B.K.; Critical Review: E.B.K.

Peer-review

Externally peer-reviewed.

Conflict of Interest

The authors have no conflict of interest to declare.

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