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ORIGINAL ARTICLE

Is mindful eating higher in individuals with orthorexia nervosa?: a cross-sectional study

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Abstract

Aim The present study aimed to investigate the relationship between mindful eating and orthorexia nervosa (ON) among adults and contribute to establishing ON diagnostic criteria.

Subject and methods In the current cross-sectional study, 105 women and 92 men (aged 19–64 years) were enrolled whose scores on the Orthorexia Nervosa Questionnaire-15 (ORTO-15), the Eating Attitudes Test-26 (EAT-26), and SCOFF scales indicated a prevalence of ON and eating disorder risk. In addition, the Mindful Eating Questionnaire (MEQ) was applied to participants to determine mindful eating. Descriptive and inferential statistics were computed using the Statistical Package for Social Sciences (SPSS) version 25.

Results In participants with ON, the scores of emotional eating and conscious eating scores, which are MEQ sub-factors, and the total score of MEQ are higher than those who do not have ON ($p < 0.05$). There was a negative correlation between MEQ and ORTO-15 scores (r = –0.269; $p < 0.01$). In addition, the one-point increase in the ORTO-15 scores of the participants led to 0.094 decrease in MEQ scores ($B = –0.094$; SE = 0.021; $p < 0.001$) and 0.175 decrease in EAT-26 scores ($B = –0.175$; SE = 0.033; $p < 0.001$).

Conclusions The data obtained from our study show that mindful eating of individuals with ON is higher than those who do not have ON, and this is important in determining the diagnostic criteria of ON.

Keywords Eating disorder · Emotional eating · Mindful · Orthorexia · Nutrition

Introduction

Orthorexia nervosa (ON) was first described in the literature as "an unhealthy obsession with healthy nutrition" by Steve Bratman in 1997 (Bratman 1997). For individuals suffering from ON, the food must be "natural and healthy." In fact, healthy eating anxiety is not a pathological condition. However, this condition has become pathological in individuals with ON (Costa et al. 2017; Koven and Abry 2015). Because it is believed that the focus on healthy eating may turn into an increasingly restricted diet in this population, leading to an obsession with healthy eating (Strahler 2021a).

Mindful eating is about using mindfulness to attain a state of full attention to your experiences, cravings, and physical cues when eating. It has been stated that development of the mindful eating ability in gaining and controlling healthy eating attitudes and behaviors has an important role in increasing the effectiveness of treatment, especially in eating disorders (Kose et al. 2016). Some studies have reported that healthier food choices can be made by increasing the attention paid to eating behavior, internalizing the food consumed, and reducing the sensitivity to thoughts and emotions during food consumption (Baer et al. 2005; Kontinen et al. 2009). It has been reported that increased ability of mindful eating has the power to reduce problematic eating behaviors and difficulties in controlling the food intake of many people (Warren et al. 2017). The link between mindfulness and eating disorders is currently unknown (Alberts et al. 2012; Masuda et al. 2012).

The literature review suggests a potential relationship between mindful eating and ON, which formed the basis of our study. So far, there is no study investigating the link

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between MEQ score and ORTO-15 score. Therefore, the present study aimed to investigate the relationship between mindful eating and ON and contribute to establishing diagnostic criteria for ON. Moreover, two different scales were used to determine the risk of eating disorders.

Materials and methods

Participants

This descriptive cross-sectional study was conducted with the general population between October and November 2019. As there is no similar study in the literature, a prior sample size calculation would not be possible in advance. Therefore, we conducted a pilot study (n = 16). The sample size was calculated with the G-Power analysis method and the Power test using the PS 3.0 software package (Faul et al. 2009). Following the calculation based on these scores, a sample size of 109 was found to provide 90% power with a two-sided type I error (α) = 0.05 and a medium effect size of 0.3 (Cohen's r).

The approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Karabuk University (Decision No: 2019/8).

Data collection

The researchers conducted face-to-face interviews using a questionnaire questioning demographic characteristics. Five results of five scales along with demographic data were analyzed. The sociodemographic form included age, gender, smoking/alcohol use, and marital status. Participants were also asked to indicate whether they have ever suffered from, or been diagnosed with, an eating disorder. Body mass index (BMI) values were calculated by the researcher according to the following formula: body weight (kg)/height $(m)^2$.

The Orthorexia Nervosa Questionnaire-15 (ORTO-15)

The ORTO-15 scale was developed to assess ON. It was first prepared by Bratman and Knight (Bratman and Knight 2000). Donini later revised it in 2004 and developed the ORTO-15 scale consisting of 15 questions (Donini et al. 2004). It is the most frequently used tool for the assessment of ON, even though it is not a diagnostic tool (Heiss et al. 2019; Rogoza 2019). The minimum and maximum scores that can be obtained from the questionnaire are 15 and 60 points, respectively. Validation studies have used different threshold values (<35 and <40). Based on the review of other studies in the literature, it was decided to use 40 points as the cut-off point in the present study. Individuals with a score of 40 or below were considered to have ON. As the test score increases, the eating behavior of the individual approaches normality (Baş 2014).

The Eating Attitudes Test-26 (EAT-26)

The Eating Attitudes Test (EAT) was developed by Garner and Garfinkel in 1979 to measure symptoms of Anorexia Nervosa (Garner and Garfinkel 1979). After the completion of the test, individuals can get a minimum score of 0 points and a maximum score of 53 points. A score of 20 points has been determined as the cut-off point, and individuals with a score of "20 points and above" are classified as individuals with abnormal eating behavior (Devran Sarıdag 2014).

The SCOFF test

The scale was created by Morgan et al. in 2000 (Morgan et al. 2000). The name of the questionnaire was created using the letters chosen from the items of the scale. The questionnaire aims to determine the risk of eating disorders. It consists of a total of 5 items. One point is assigned for every "yes" response, with a total score of "5" points. A score of "2" points has been determined as the cut-off point and those with a score of "2 points or higher" are considered to be at risk of eating disorders (Aydemir et al. 2015).

The Mindful Eating Questionnaire (MEQ)

This questionnaire was developed by Framson et al. in 2009 to obtain information about eating behavior, awareness, and emotional eating (Framson et al. 2009). The sub-factors of the questionnaire are thoughtless eating, emotional eating, eating control, awareness, eating discipline, conscious eating, and interference. The higher the score obtained from the questionnaire, the higher the awareness of eating (Framson et al. 2009).

Statistical analyzes

Statistical Package for Social Sciences (SPSS 25.0) was used for data analysis, with a significance level of 0.05 and a confidence interval of 95%. Categorical data are given as numbers (n) and percent (%), while quantitative data are given as mean (M), standard deviation (SD) values. Whether the variables were normally distributed or not was determined by the Kolmogorov Smirnov test. In quantitative two-category data, the difference was analyzed using the Student's t-test when normal distribution assumptions were met and the Mann–Whitney U test when not. Spearman's correlation coefficient was computed between all continuous variables and the main dependent variable. Multiple linear regression

was used to determine the predictors of the ORTO-15 score, as it provided the necessary assumptions.

Results

Data of 105 women and 92 men (Total sample M age = 30.60±6.80 years) were available for analyses. Baseline characteristics and scale scores of participants are presented in Table 1. The mean BMI of the participants was 23.78±4.15 kg/m^2. The mean ORTO-15 test score was 38.39±3.56. The mean EAT-26 test score and SCOFF score were 12.95±7.46 and 1.29±1.22, respectively. In addition, 70.9% of the participants had ON, according to the cut-off points of the ORTO-15 scale and 14.6% and 40.7% of the participants had eating disorders, according to the cut-off points of the EAT-26 and SCOFF scales, respectively (Supplemental Table 1).

There were statistically significant differences between the ORTO-15 cut-off points and total MEQ scores. Moreover, there was a major difference between the ORTO-15 cut-off scores and emotional eating and conscious eating scores, which are sub-factors of the MEQ scale. There were no statistical differences between the other sub-factors of MEQ scale according to ORTO-15 cut-off points (Table 2). The EAT-26 and SCOFF scores according to the ORTO-15 cut-off points are given in Fig. 1. There was no significant difference between the ORTO-15 cut-off point and the EAT-26 and SCOFF scores.

Table 3 shows the correlation between the participants' ORTO-15, EAT-26, MEQ, SCOFF scores, and BMI value. The ORTO-15 score correlated negatively with total MEQ score, SCOFF score, and EAT-26 score ($p < 0.01$). There was a positive correlation between EAT-26 and SCOFF scores $p < 0.01$). This result was important for the ability of these two scales to determine the eating disorder risk. Furthermore, the SCOFF score of the individuals increased as their BMI values increased ($p < 0.05$).

The multiple regression analysis results for predictors of ORTO-15 scores are presented in Table 4. The one-point increase in the ORTO-15 scores of the participants led to a 0.094 decrease in MEQ scores (B = –0.094 SE = 0.021) and a 0.175 decrease in EAT-26 scores (B = -0.175 SE = 0.033). The EAT-26 and MEQ scores affected the ORTO-15 scores by 17.7% ($R^2 = 0.177$).

Table 1 Baseline characteristics and scale scores of participans

Variables	Female (n = 105) M(SD)	Male (n = 92) M(SD)	Total (n = 197) M(SD)
Age (year)	29.52 (6.42)	31.84 (7.06)	30.60 (6.80)
Marital status			
Single, *n, (%)*	63 (60)	38 (41.3)	101 (51.3)
Married, *n, (%)*	42 (60)	54 (58.7)	96 (48.7)
Smoking, *n, (%)*	15 (14.3)	10 (10.9)	25 (12.7)
Alcohol, *n, (%)*	9 (8.6)	7 (7.6)	16 (8.1)
BMI (kg/m^2)	22.20 (4.46)	25.60 (2.86)	23.78 (4.15)
ORTO-15 score	38.73 (3.40)	38.00 (3.72)	38.39 (3.56)
EAT-26 score	12.60 (7.46)	13.34 (7.49)	12.95 (7.46)
SCOFF score	1.32 (1.20)	1.27 (1.24)	1.29 (1.22)
Total MEQ score	97.4 (12.0)	95.51 (10.57)	96.5 (11.4)

Abbreviations: *M*, mean; *SD*, standard deviation; *BMI*, body mass index; *ORTO-15*, orthorexia nervosa questionnaire; *EAT-26*, eating attitude test; *MEQ*, mindful eating questionnaire

Table 2 Scale scores of participants according to the cut-off points of ORTO-15

	ORTO-15 scores ≤ 40 M(SD)	ORTO-15 scores >40 M(SD)	p
Total MEQ score	97.96 (11.30)	92.96 (10.81)	0.005[a**]
Sub-factors of MEQ scale			
Thoughtless eating	16.12 (3.06)	15.79 (2.56)	0.469[b]
Emotional eating	16.02 (4.87)	14.11 (4.75)	0.013[a*]
Eating control	14.85 (3.04)	14.16 (2.98)	0.150[b]
Awareness	15.62 (2.5)	15.75 (2.15)	0.741[b]
Eating discipline	11.80 (2.57)	11.05 (2.46)	0.064[b]
Conscious eating	16.65 (3.02)	15.57 (2.66)	0.021[a*]
Interference	6.90 (1.73)	6.54 (1.57)	0.171[b]

Abbreviations: *M*, mean; *SD*, standard deviation; *ORTO-15*, orthorexia nervosa questionnaire-15; *EAT-26*, eating attitude test-26; *MEQ*, mindful eating questionnaire

*$p < 0.05$, **$p < 0.01$, p^a *value* calculated from Student t test, p^b *value* calculated from Mann–Whitney U test

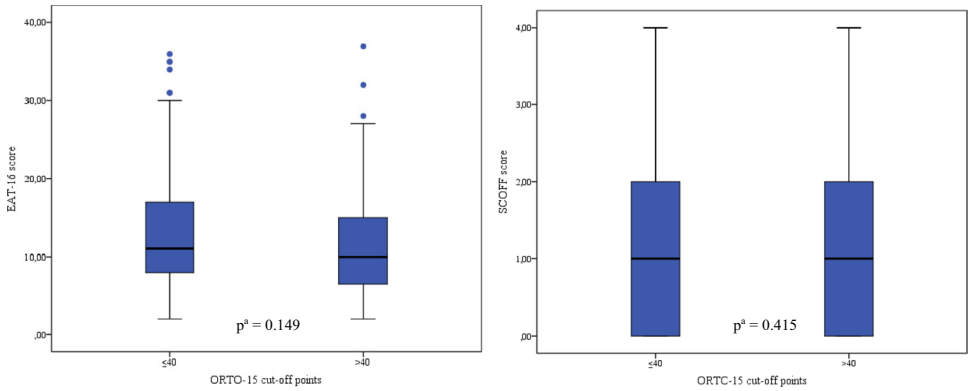

Fig. 1 According to ORTO-15 cut-off points, EAT-26, and SCOFF scores **a**) ORTO-15-EAT-26 scores **b**) ORTO-15-SCOFF scores Abbreviations: ORTO-15=orthorexia nervosa questionnaire-15; EAT-26=eating attitude test-26 p[a] value calculated from Mann–Whitney U test

Table 3 Correlation coefficients among variables

	Variables	1	2	3	4	5
1	ORTO-15	1				
2	EAT-26	-0.293**	1			
3	MEQ	-0.269**	-0.135	1		
4	SCOFF	0.018	0.374**	-0.217**	1	
5	BMI	-0.11	0.086	0.005	0.181*	1

Abbreviations: *ORTO-15*, orthorexia nervosa questionnaire-15; *EAT-26*, eating attitude test-26; *MEQ*, mindful eating questionnaire; *BMI*, body mass index

p value calculated from Spearman Correlation test

*$p < 0.05$ **$p < 0.01$

Table 4 Multiple linear regression analysis for predictors of ORTO-15 scores

	Predictors	*B*	*SE*	*β*	t	p
ORTO-15	MEQ	–.094	.021	–.299	–4.503	<0.001**
	EAT-26	–.175	.033	–.367	–5.242	<0.001**
	SCOFF	.262	.208	.090	1.261	0.209

Abbreviations: *ORTO-15*, orthorexia nervosa questionnaire-15; *EAT-26*, eating attitude test-26; *MEQ*, mindful eating questionnaire. $R = 0.436$; Adjusted $R^2 = 0.177$; **$p < 0.001$

Discussion and conclusion

Some studies in the literature have reported that there may be a negative correlation between eating disorders and mindful eating (Giannopoulou et al. 2020; Lyzwinski et al. 2018; Masuda et al. 2012; Smith et al. 2019; Warren et al. 2017). However, ON is different from other eating disorders in terms of being "healthy eating obsession" (Bratman and Knight 2000). It is believed that mindful eating can promote healthy eating and be protective against the development of eating disorders.

Mindful eating behavior provides eating with a healthier consciousness by focusing on the present moment (Strahler 2021b). However, the diagnostic criteria for ON show that orthorexic individuals eat with a healthier consciousness (Costa et al. 2017). The ORTO-15 questionnaire is a widely used tool in many countries to determine the prevalence of ON. For this reason, it is thought that there may be a relationship between the MEQ scale developed for mindful eating and ORTO-15, which is currently the most used questionnaire for determining the prevalence of ON. Orthorexia Nervosa is defined as an unhealthy obsession with healthy eating. Therefore, individuals with ON are believed to be have an unhealthy pathological condition (Kalra et al. 2020). Based on all this information, we thought that there would be a negative relationship between ON and mindful eating. Unexpectedly, ON positively correlated with mindful eating. The analysis of the MEQ subgroups revealed that emotional eating and conscious eating sub-factors had a significant correlation with ON. There may be several reasons for this: the inadequacy of the ORTO-15 scale, which is used to adequately measure the psychopathological features of

ON, the contradiction in the literature regarding the diagnostic criteria for ON, and the limited number of clinical studies.

Moreover, our results showed that the EAT-26 and MEQ scores influenced the scores obtained from the ORTO-15 questionnaire. A study on university students found a correlation between the ORTO-15 and EAT-40 scores. The analysis of the effect rates revealed that a one-point increase in EAT-40 score increased the likelihood of ORTO-15 score to be ≤40 by 1.21 times (Kaya 2018). Another study on university students reported that the ORTO-15 and SCOFF scores were significant. The analysis of the effect rates showed that 16.9% of the SCOFF score was explained by the symptoms of the ORTO-15 questionnaire (Okumusoglu 2017).

A recent study also showed that mindful eating psychologically contributed to ON. In parallel with our results, the results of this study showed a positive correlation between ON and mindful eating. This result was thought to be caused by the fact that the scales used to measure the prevalence of ON might not be able to clearly determine the interest in healthy nutrition (Strahler 2021a). The pathophysiological mechanisms of ON and the diagnostic criteria for this condition remain unknown. This study on the relationship between mindful eating behavior and ON is one of the first studies and is preliminary. In this regard, we are of the opinion that reliable measurement tools should be developed to distinguish between the interest in healthy nutrition and pathological condition.

The present study has some limitations that must be considered when interpreting the data. The study has a cross-sectional design that cannot prove causation but only explore correlations among the measured variables. Therefore, the results and conclusions of the study should be interpreted cautiously. The sample of the study was also very limited to detect the correlation between ON and mindful eating. Considering the inadequacy of the ORTO-15 questionnaire to determine ON, it can be speculated that the study was limited in this respect. Therefore, there is a need for clinical studies with larger samples to determine the definitive criteria for diagnosis and treatment.

Despite these limitations, the study has several strengths. This study is probably one of the few studies that evaluated different scales together that may contribute to mindful eating in individuals with ON. Determination of the mindful eating status of individuals with ON is of great importance to determine the criteria for diagnosis and treatment. Our study demonstrated a negative correlation between the ORTO-15 and MEQ total scores and sub-factors, emotional eating and conscious eating. However, there is a need for further studies to classify ON as a separate eating disorder and to determine the criteria for diagnosis and treatment and this link.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10389-023-01829-0.

Authors' contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Büşra Demirer and Hülya Yardımcı.

Data availability None.

Code availability None.

Declarations

Ethics approval 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. The study was approved by the Ethics Committee of the University (Protocol No: 2019/8).

Consent for publication The authors affirm that human research participants provided informed consent.

Consent to participate Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors have no relevant conflict of interest.

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