

Is Mindful Eating Higher in Individuals With Orthorexia Nervosa?: A Cross-Sectional Study

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Abstract

Purpose

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

Methods

In the current cross-sectional study, 105 females, 92 males (aged 19–64 years), were enrolled whose scores on the Orthorexia Nervosa Questionnaire-15 (ORTO-15) and the Eating Attitudes Test-26 (EAT-26) and SCOFF scales indicated a prevalence of ON and eating disorder risk. In addition, Mindful Eating Questionnaire (MEQ) was applied to participants to determine mindful eating.

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.

Level of evidence:

V, Cross-sectional descriptive study.

What Is Already Known On This Subject?

It has been reported that ON is an excessive and pathological interest in healthy eating. However, there are conflicting findings in the literature regarding the detection of orthorexic individuals.

What this study adds?

In the literature, mindful eating is thought to be associated with eating disorders, but whether ON is associated with mindful eating is still unclear. Our study results show that individuals with ON have a

higher mindful eating scale score. This may be useful in determining ON diagnostic criteria and developing measurement tools.

Introduction

The Diagnostic and Statistical Manual of Mental Disorders (DSM) published by the American Psychiatric Association (APA) provides definitions of eating and nutritional disorders and diagnostic criteria [1]. In recently published DSM-V guidelines, eating disorders are grouped into eight sub-categories. Orthorexia Nervosa (ON), known as a healthy eating obsession, is not included in the DSM-V guideline as a separate eating disorder due to the lack of data required for accurate diagnosis [1].

It was first described in the literature as "an unhealthy obsession with healthy nutrition" by Steve Bratman in 1997 [2]. 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 [3, 4]. 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 [5]. Although the diagnostic criteria for ON have not been precisely defined by APA, several studies have published various diagnostic criteria regarding the issue. Some of these criteria are thinking of healthy foods for a long time (more than 3 hours a day), feeling superior to people with different eating habits, strictly following a certain nutrition program, putting healthy food consumption in the center of life, and considering the nutritional value of food more important than eating [6, 7].

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 the development of 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 [8]. 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 [9, 10]. 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 [11]. The link between mindfulness and eating disorders is currently unknown [12, 13].

The diagnostic criteria for ON in the literature show that the eating behavior of individuals with ON is different from that of individuals with normal eating behavior. However, these differences have not yet been exactly understood [6, 7]. Recently, the concepts of ON and non-pathological interest in healthy nutrition have been discussed [5, 14, 15]. The status of pathological interest in healthy eating and mindful eating in this population remains unclear [5]. In reference to the increasing number of studies reporting an increased prevalence of ON and its clinical significance, we are of the opinion that understanding the relationship between mindful eating and ON will be important for the diagnostic criteria for ON.

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 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. The secondary aim of the study was to examine whether there is a difference between these scales in terms of the risk assessment for 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 [16]. The power of the study was calculated based on the correlation between the ORTO-15 score and the total MEQ score. The corresponding score ranges from 0.3 to 0.47. 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). Taking into account that there might be some patients who would refuse to participate in the study, the initial sample size was increased, and the study included 197 adults (92 males and 105 females).

The inclusion criteria were set as follows: being between the ages of 18 and 64 years and responding to all four scales. At the beginning of the study, 200 adults were reached and three participants were excluded because they did not respond to all four scales. After informing the participants about the objective of the study as well as the questionnaires used in the study, informed consent forms were obtained from them. 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. Bodyweight (kg) and height (m) were based on self-reported measurements by the participants. 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 [17]. Donini later revised it in 2004 and developed the ORTO-15 scale consisting of 15 questions [18]. It is the most frequently used tool for the assessment of ON, even though it is not a diagnostic tool [19, 20]. Even

though it is not a diagnostic tool, it is the most frequently used scale for the assessment of ON. Distinguishing responses to the questionnaire items are evaluated as '1', while responses indicating normal eating behavior are evaluated as '4'. 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 [21].

The Eating Attitudes Test (EAT-26)

The Eating Attitudes Test (EAT) was developed by Garner and Garfinkel in 1979 to measure symptoms of Anorexia Nervosa [22]. 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 [23].

The SCOFF Test

The scale was created by Morgan et al in 2000 [24]. 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 [25].

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 [26]. The sub-factors of the questionnaire are thoughtless eating, emotional eating, eating control, awareness, eating discipline, conscious eating, and interference. A higher the score obtained from the questionnaire, the higher the awareness of eating [26].

Statistical Analyzes

Statistical Package for Social Sciences (SPSS, version 23) was used for data analysis, with a significance level of 0.05 and a confidence interval of 95 percent. When evaluating the study data, the normality distribution of parameters was evaluated by the Kolmogorov-Smirnov test. Data were analyzed by descriptive statistical methods (mean, standard deviation, number, and percentage). The Student's t-test was used for the two-group comparison of quantitative data. Spearman's correlation coefficient (.05 level for significance) was computed between all continuous variables and the main dependent variable (the ORTO-15 score). Multiple linear regression was used to identify predictors of the ORTO-15 score.

Results

Data of 105 females and 92 males (Total sample Mage = 30.60 years, SD = 6.80) 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 kg/m², SD = 4.15 (MBMI-females = 22.20 kg/m², SD = 4.46; MBMI-males = 25.60 kg/m², SD = 2.86). The mean ORTO-15 test score was 38.39 points, SD = 3.56. The mean EAT-26 test score and SCOFF score were 12.95, SD = 7.46 and 1.29, SD = 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).

Table 1 Baseline characteristics and scale scores of participants

| Variables | Female (n = 105) | Male (n = 92) | Total (n = 197) |
|---|------------------|---------------|-----------------|
| | M ± SD | M ± SD | 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) |
| Body height (cm) | 164.11 (6.08) | 175.34 (5.54) | 169.35 (8.08) |
| Body weight (kg) | 59.88 (12.94) | 78.66 (9.22) | 68.65 (14.71) |
| 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) |
| <i>Abbreviations: M = mean; SD = standard deviation; BMI = body mass index; ORTO-15 = orthorexia nervosa questionnaire; EAT-26 = eating attitude test; MEQ = mindful eating questionnaire</i> | | | |

There were statistically significant differences between the ORTO-15 cut-off points and total MEQ scores ($M_{\text{ORTO-15 scores} \leq 40} = 97.96$, $SD = 11.30$; $M_{\text{ORTO-15 scores} > 40} = 92.96$, $SD = 10.8$; $p = 0.005$). Moreover, there was a major difference between the ORTO-15 cut-off scores and emotional eating ($M_{\text{ORTO-15 scores} \leq 40} =$

16.02, SD = 4.87; $M_{\text{ORTO-15 scores} > 40} = 14.11$, SD = 4.75; $p = 0.013$) and conscious eating ($M_{\text{ORTO-15 scores} \leq 40} = 16.65$, SD = 3.02; $M_{\text{ORTO-15 scores} > 40} = 15.57$, SD = 2.66; $p = 0.021$) scores, which are sub-factors of the MEQ scale. There were no statistical 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 ($p > 0.05$).

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

| | ORTO-15 scores \leq 40 | ORTO-15 scores $>$ 40 | p |
|--|--------------------------|-----------------------|----------------------|
| | M \pm SD | M \pm SD | |
| 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 |
| <i>Abbreviations: M = mean; SD = standard deviation; ORTO-15 = orthorexia nervosa questionnaire-15; EAT-26 = eating attitude test-26; MEQ = mindful eating questionnaire</i> | | | |
| <i>*p < 0.05, **p < 0.01, p^a value calculated from Student t test, p^b value calculated from Mann Whitney U test</i> | | | |

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 ($r = -0.269$; $p < 0.01$), SCOFF score ($r = -0.217$; $p < 0.01$), and EAT-26 score ($r = 0.293$; $p < 0.01$). There was a positive correlation between EAT-26 and SCOFF scores ($r = 0.374$; $p < 0.01$). 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 ($r = 0.181$; $p < 0.05$).

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*

The multiple regression analysis results for predictors of ORTO-15 scores are presented in Table 4. Accordingly, the SCOFF scores did not contribute to the regression model ($B = 0.262$, $SE = 0.21$, $p = 0.209$). 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 4
Multiple linear regression analysis for predictors of ORTO-15 scores

| Predictors | <i>B</i> | <i>SE</i> | β | <i>t</i> | <i>p</i> | |
|------------|----------|-----------|---------|----------|----------|-----------|
| 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 [11, 13, 27-29]; however, ON is different from other eating disorders in terms of being 'healthy eating obsession' [17]. 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 [30]. However, the diagnostic criteria for ON show that orthorexic individuals eat with a healthier consciousness [3]. 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 have an unhealthy pathological condition [31]. Based on all this information, we thought that there would be a negative relationship between ON and mindful eating. As unexpected, 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 ($p < 0.05$). There may be several reasons for this: the inadequacy of the ORTO-15 scale, which is used for the measurement of ON 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, multiple linear regression analyses were performed to determine the effect rates of the variables affecting the ORTO-15 scores of the participants. 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 [32]. 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 [33].

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 [5]. 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.

In addition to all this, the secondary aim of our study was to investigate whether the SCOFF scale, which contains fewer items and can detect the risk in a shorter time, yields similar results compared to EAT-26 scale. A study on the SCOFF and EAT-26 scales showed no correlation between the scale scores and gender [34]. According to our results, the SCOFF and EAT-26 scales showed a positive correlation ($p < 0.05$). We obtained these results from a study suggesting an advantage of fewer questions and shorter time using SCOFF scale.

Strength and Limits

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 amongst 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.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

The research proposal was approved by the Ethics Committee of the University of Karabuk. All procedures performed 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.

Informed consent

Informed consent was obtained from all participants included in the study.

Availability of data and material

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figures

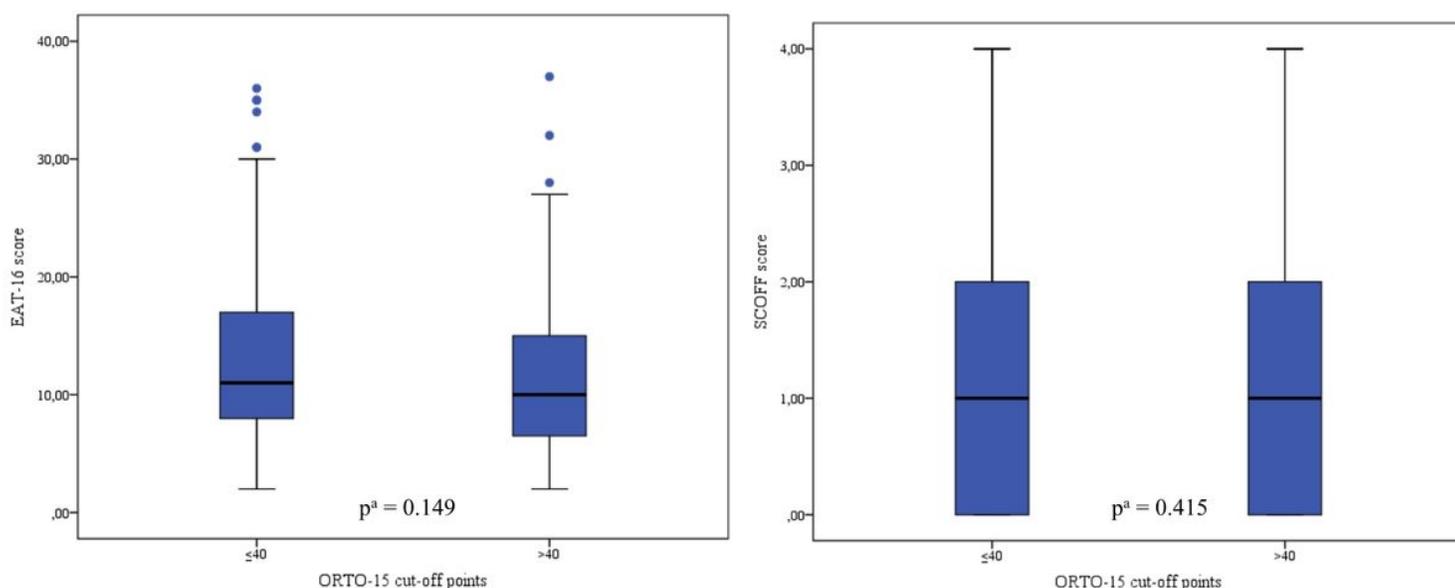


Figure 1

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

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplementdata.docx](#)