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Psychometric properties of the Turkish version of the Eating Habits Questionnaire (EHQ-TR) for university students

Propriedades psicométricas da versão turca do Questionário de Hábitos Alimentares (EHQ-TR) para estudantes universitários

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ABSTRACT

Objective

It aimed to test the validity and reliability of the Turkish version of Eating Habits Questionnaire (EHQ-TR) which was developed to measure orthorexia nervosa and to examine its psychometric properties in university students.

Methods

This methodological, descriptive, correlational study was conducted with 210 university students. They filled out demographic information form, EHQ-TR and Turkish version of Eating Attitudes Test-26. Internal consistency coefficient, factor analyses and correlations were examined with statistical analyses.

Results

Eating Habits Questionnaire consists of 20 items and three sub-dimensions (problems, knowledge, and feelings). In exploratory factor analysis, the Cronbach's alpha was 0,827 for the total scale which is demonstrated strong internal consistency and 0,742, 0,794, and 0,784 problems, knowledge and feelings subscales, respectively. On the basis of the confirmatory factor analysis results, all of the fit indices were above 0.85, and root mean square error of approximation was 0.060. In addition, the sub-dimensions of EHQ-TR correlated with the Eating Attitudes Test-26 which is associated with disordered eating ($p < 0.05$).

Conclusion

It was concluded that EHQ-TR is a valid and reliable measurement tool that can be used to measure orthorexia nervosa tendencies among university students.

Keywords: Eating habits. Orthorexia nervosa. Reliability and validity.

RESUMO

Objetivo

O objetivo foi testar a validade e confiabilidade da versão turca do Eating Habits Questionnaire (EHQ-TR), desenvolvida para medir a Ortorexia Nervosa (ON) e examinar suas propriedades psicométricas em estudantes universitários.

Métodos

Este estudo metodológico e descritivo correlacional foi realizado com 210 estudantes universitários. Eles preencheram o formulário de informações demográficas. EHQ-TR e a versão turca do Eating Attitudes Test-26 (EAT-26). Coeficiente de consistência interna, análises fatoriais e correlações foram examinados com análises estatísticas.

Resultados

O EHQ-TR é composto por 20 itens e três subdimensões (problemas, conhecimentos e sentimentos). Na análise fatorial exploratória, o alfa de Cronbach foi de 0,827 para a escala total, o que demonstra forte consistência interna, e de 0,742, 0,794 e 0,784 subescalas de problemas, conhecimentos e sentimentos, respectivamente. Com base nos resultados da análise fatorial confirmatória, todos os índices de ajuste ficaram acima de 0,85, e a raiz do erro quadrático médio de aproximação foi de 0,060. Além disso, as subdimensões do EHQ-TR correlacionaram-se com o EAT-26 que está associado aos transtornos alimentares ($p < 0,05$).

Conclusão

Concluiu-se que o EHQ-TR é uma ferramenta de medição válida e confiável que pode ser utilizada para medir tendências de ON entre estudantes universitários.

Palavras-chave: Hábitos alimentares. Ortorexia nervosa. Confiabilidade e validade.

INTRODUCTION

Eating behaviors start in the first years of life and they are develop during childhood and adolescence. Moreover, food preferences continue to be shaped in adulthood. Although there are many factors that affect eating behaviors, including family structure, socioeconomic status, cultural factors, environment, as well as desire to be healthy and avoid illnesses, these are among the most important factors. In the recent years, healthy nutrition has gained attention; natural, healthy, additive-free and organic foods have become increasingly popular popular [1,2].

Eating disorders are becoming an area of concern due to their increasing prevalence in all age, ethnic, and socioeconomic groups [3,4]. Although eating natural foods, organic foods and pursuing super healthy nutrition are important for the healthy well-being, when consumption frequency of such foods reaches to a very high level that can be considered as pathological, a new term arises: Orthorexia Nervosa (ON) [1]. ON was first described by Steven Bratman in 1997. In their book *Health Food Junkies*, Bratman and Knight describe the initial characteristics of people with orthorexia are stated as obsession with healthy food, focused on the preparation of foods and adopting a restrictive diet [2,5].

Individuals who develop ON may seek a healthier lifestyle. However, compulsive beliefs and behaviors towards foods can affect the health, cognitive, social and emotional aspects of individuals, adversely impacting their quality of life [6,7]. When the relationship between ON and eating disorders was examined, it was shown that ON symptoms were not only associated with eating disorders, but also with high concerns about body shape and weight. As ON does not have an established psychiatric diagnosis, the psychiatric symptoms that are necessary to distinguish lifestyle choices related to healthy eating (without ON) from pathological behaviors and obsessions surrounding healthy eating (the potential for ON) have not been fully elucidated [7-9].

The Eating Habits Questionnaire (EHQ) was developed as a 21-item self-report inventory on healthy eating to measure a pathological condition labeled as "Orthorexia Nervosa" and to assess cognition, behaviors, and emotions associated with an obsession with healthy eating. In its original study, the EHQ showed good internal consistency and test-retest reliability in a sample of university students [10]. However, there is no validity and reliability study of EHQ in Türkiye. This

study aimed to provide a scale for Türkiye by conducting the Turkish validity and reliability study of the EHQ, which would help to identify knowledge, problems and feelings about healthy nutrition.

METHODS

The study was carried out as a methodological, descriptive study design in order to evaluate the validity and reliability of the Turkish version of the Eating Habits Questionnaire.

The study was planned for university students in accordance to its original form. In order to determine the sample size, a value ten times the number of items in the scale was used [11]. As there are 21 items in the scale, it was decided that at least 210 participants should be involved in the study. Individuals with a diagnosed eating disorder or psychological disorder were excluded from the study.

A total of 210 university students from the University of Health Sciences, Istanbul, were recruited online during classes from September 2021 to November 2021. All participants completed the questionnaires voluntarily using the electronic online platform. A pilot study was carried out with 15 students, but these students were not included in the main sample in order not to affect the scale results.

Demographic information form

In this form questions related to the general characteristics of the participants such as age, gender, height, body weight and Body Mass Index (BMI) were included.

Eating Habits Questionnaire (EHQ)

The Eating Habits Questionnaire (EHQ) was developed to measure healthy eating as a pathological condition labeled “Orthorexia Nervosa” and to determine emotions associated with cognition, behavior, and obsession with healthy eating.

It was developed as a self-report inventory consisting of 21 items for evaluation. The subscales of the EHQ are as follows; 1) problems associated with healthy eating, 2) knowledge of healthy eating, and 3) feeling positively about healthy eating [10]. Each item in the questionnaire was rated on a 4-point Likert scale (False, Not at all true, Slightly true, Mainly True, Very true), where higher scores are indicative of ON tendencies. The answers to each question were given as 1, 2, 3 or 4 points respectively. The total subscale score was obtained by summing the scores per item. While questions 2, 4, 6, 7, 8, 10, 13, 14, 16, 17, 18 and 20 are related to problems; questions 1, 3, 5, 11 and 21 are related to knowledge. In addition, questions 9, 12, 15, and 19 are about subscales measuring feelings.

The Eating Attitudes Test-26 (EAT-26)

The EAT-26 is a test that allows individuals to evaluate their eating behavior and attitudes. In our study, we used the Turkish version of the EAT-26 for convergent validity. The scale consists of 22 questions. The EAT-26 is a sensitive and specific scale for identifying individuals at high risk for eating disorders. Increasing scores indicate a deterioration in eating attitudes [12].

Procedure

In the process of adapting the EHQ into Turkish, the authors got in contact with Dr. Gleaves (Professor of Psychology (Clinical) School of Psychology, Social Work and Social Policy University

of South Australia) via e-mail, who is one of the original scale owners. The necessary approval and details about the scale were obtained from him. During the translation of the scale into Turkish, standard procedures that are recommended in the literature were applied [13,14].

The scale was translated into Turkish separately by three English language and literature expert translators. Barriers in linguistic comprehension, contextualized meaning and possible interpretations of the translated instrument were taken into account in the adaptation process. The expressions in the Turkish questionnaire were compared and reviewed, and the most appropriate expressions were selected in terms of intelligibility. The Turkish scale was back-translated by an English language and literature expert. The researchers compared the original scale items with the form translated from Turkish into English. No further modifications were necessary.

A pilot study, was carried out with 15 students and they were asked to evaluate the scale in terms of language and expression intelligibility. As they stated that the scale was easy and understandable, no changes were applied in to Turkish form, and the researchers subsequently applied the scale to the main sample.

Statistics

In the study, the obtained data set was analyzed using the IBM®SPSS® (version 25) package program for Explanatory Factor Analysis (EFA) (to determine the item-factor relationship). Within the scope of reliability analysis, Pearson correlation analysis for test-retest reliability, t-test and Mann-Whitney U test for dependent groups, the Cronbach's alpha coefficient for internal consistency analysis, and Pearson correlation analysis for item-total score analysis were envisaged. The Bartlett test of sphericity was used to statistically test the correlation between the variables in the data matrix. The Kaiser-Meyer-Olkin (KMO) criterion, which is obtained by using the correlation and partial correlation coefficients, is also an important criterion in evaluating the suitability of the data for factor analysis. KMO, which is a sample adequacy criterion, takes a value between 0-1. Confirmatory Factor Analysis (CFA) was also applied to test the suitability of the factors obtained by exploratory factor analysis to hypothetical or theoretical factor structures. IBM®SPSS® (version 25) Statistics for Windows and Amos (Version 24.0) package program were used for Confirmatory Factor Analysis in the study (to determine whether the items and sub-dimensions explain the original structure of the scale). Descriptive data were expressed in means, standard deviations, medians and frequencies. The p -value was <0.05 was considered significant.

Ethics statement

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of the Ethics Committee of the University of Health Sciences (decision no: 21/505).

RESULTS

Among the participants, 81.9% were female and 18.9% were male. The mean age of the participants was 21.48 ± 3.98 years, mean body weight was 58.50 ± 12.10 kg, mean height was 165.29 ± 8.05 cm, and mean BMI was 31.52 ± 3.49 kg/m².

Exploratory factor analysis

In the study, whether there is a correlation between the items, which are the prerequisites of factor analysis, was tested with the Bartlett sphericity test; the adequacy of the sample size was examined by the Kaiser–Meyer–Olkin (KMO) measure. As a result of the EFA, KMO coefficient was found to be 0.82. Bartlett’s test χ^2 value was 1253.058 ($p=0.001$). Regarding reliability, the Cronbach’s α coefficient of the whole scale was 0.827.

Factor variance and factor loadings of the EHQ-T were given in Table 1. The factor loadings of the questions in the problems, knowledge, and emotions ranged between 0.470-0.737, 0.499-0.833, and 0.500, 0.837, respectively. Cronbach’s Alpha (α) was considered sufficient as it was above 0.700. The Cronbach’s Alpha of the sub dimensions were 0.742, 0.794, and 0.784, respectively. It was determined that the items were gathered under three dimensions as stated in the original EHQ scale. Some items in the “problems” subscale in the original scale were loaded onto the “knowledge” subscale in the Turkish version, and some items in the “knowledge” subscale were loaded onto the “feelings” subscale.

Table 1 – Factor variance and factor loadings of Eating Habits Questionnaire.

Items	Factor Loadings		
	Problems	Knowledge	Feelings
EHQ 18	0.737		
EHQ 8	0.671		
EHQ 17	0.664		
EHQ 14	0.576		
EHQ 6	0.561		
EHQ 13	0.555		
EHQ 10	0.484		
EHQ 7	0.470		
EHQ 5		0.833	
EHQ 11		0.829	
EHQ 4		0.661	
EHQ 20		0.621	
EHQ 1		0.578	
EHQ 2		0.499	
EHQ 19			0.837
EHQ 12			0.744
EHQ 15			0.654
EHQ 3			0.650
EHQ 21			0.636
EHQ 9			0.500
Explained Variance Ratio	16.345	15.573	15.330
Cronbach’s Alpha	0.742	0.794	0.784
Total Explained Variance Ratio=47.248			
Kaiser Meyer Olkin (KMO) =0.829			
Bartlett Sphericity Test=1253.058 $p=0.001^{**}$			
Total Cronbach’s Alpha (α)=0.827			

Note: $p^{**}<0.01$.

As the 16th question on the scale had a correlation value of -0.008, it was excluded from the scale. The total correlation values of the remaining questions ranged from 0.379 to 0.722. Therefore, it did not require any reductions in the dimensions of the EHQ-TR (Table 2).

Table 2 – Correlation coefficient for Eating Habits Questionnaire.

Items	Total Correlation	ICC (95%)	<i>p</i>
EHQ 18	0.389	0.578 (0.366-0.719)	0.001*
EHQ 8	0.293	0.711 (0.564-0.808)	0.001*
EHQ 17	0.331	0.511 (0.266-0.675)	0.001*
EHQ 14	0.443	0.663 (0.494-0.776)	0.001*
EHQ 6	0.313	0.673 (0.509-0.782)	0.001*
EHQ 13	0.291	0.485 (0.227-0.657)	0.001*
EHQ 10	0.342	0.565 (0.346-0.711)	0.001*
EHQ 7	0.339	0.722 (0.583-0.815)	0.001*
EHQ 5	0.423	0.606 (0.408-0.738)	0.001*
EHQ 11	0.539	0.595 (0.392-0.730)	0.001*
EHQ 4	0.520	0.704 (0.555-0.803)	0.001*
EHQ 20	0.526	0.530 (0.295-0.687)	0.001*
EHQ 1	0.283	0.615 (0.422-0.744)	0.001*
EHQ 2	0.363	0.709 (0.562-0.806)	0.001*
EHQ 19	0.412	0.379 (0.068-0.587)	0.001*
EHQ 12	0.388	0.486 (0.228-0.658)	0.001*
EHQ 15	0.441	0.568 (0.351-0.712)	0.001*
EHQ 3	0.405	0.635 (0.452-0.757)	0.001*
EHQ 21	0.500	0.575 (0.362-0.717)	0.001*
EHQ 9	0.443	0.471 (0.206-0.648)	0.001*

Note: $p^* < 0.01$; ICC: Correlation Coefficient. EHQ: Eating Habits Questionnaire.

The lowest score of the scale was 20, and the highest score was 80. The mean score of the scale was found to be 44.03 ± 8.21 . The mean scores of the problems, knowledge and feelings sub-dimension were 12.90 ± 4.01 , 13.73 ± 3.49 and 17.40 ± 3.69 , respectively. The relationships between the scale and its sub-dimensions were evaluated as statistically significantly positive.

Confirmatory factor analysis

On the basis of the CFA results, fit indices were determined as follows: ($\chi^2=287.365$ $df=165$), $\chi^2/df = 1.742$, Root Mean Square Error of Approximation (RMSEA)=0.060, Goodness of Fit Index (GFI) = 0.884, Comparative Fit Index (CFI)=0.900, Incremental Fit Index (IFI) = 0.901, Standardized Root Mean Square Residual (SRMR)=0.080 and Tucker–Lewis Index (TLI)= 0.902.

For Confirmatory Factor Analysis, covariance connections were conducted as a result of the similarities between the 2nd and 4th questions in the knowledge dimension, and between the 3rd and 21st questions in the emotions dimension. The tested model was shown in Figure 1. Furthermore evaluation of effects between questions and sub-dimensions for the EHQ-TR model was given in Table 3.

Each of the sub-dimensions' path coefficients on the 21 questions was found to be statistically significant ($p < 0.05$). Accordingly, the knowledge sub-dimension consisted of questions 1, 2, 4, 5, 11 and 20; the problems sub-dimension consisted of questions 6, 7, 8, 10, 13, 14, 17 and 18, and the feelings sub-dimension consisted of questions 3, 9, 12, 15, 19 and 21. All sub-dimensions were highly statistically significant on the questions ($p = 0.001$). Also, it was found that each of the coefficients on the EHQ three sub-dimensions was statistically significant ($p < 0.05$).

Convergent validity

The mean score of the EAT-26 scale was found to be 27.66 ± 12.82 . As presented in Table 4, the convergent validity of the EHQ-TR was significantly correlated with EAT-26. The correlations between the three subscales of the EHQ (problems, knowledge and feelings) and EAT-26 were significantly positively related with a confidence level of $p < 0.05$.

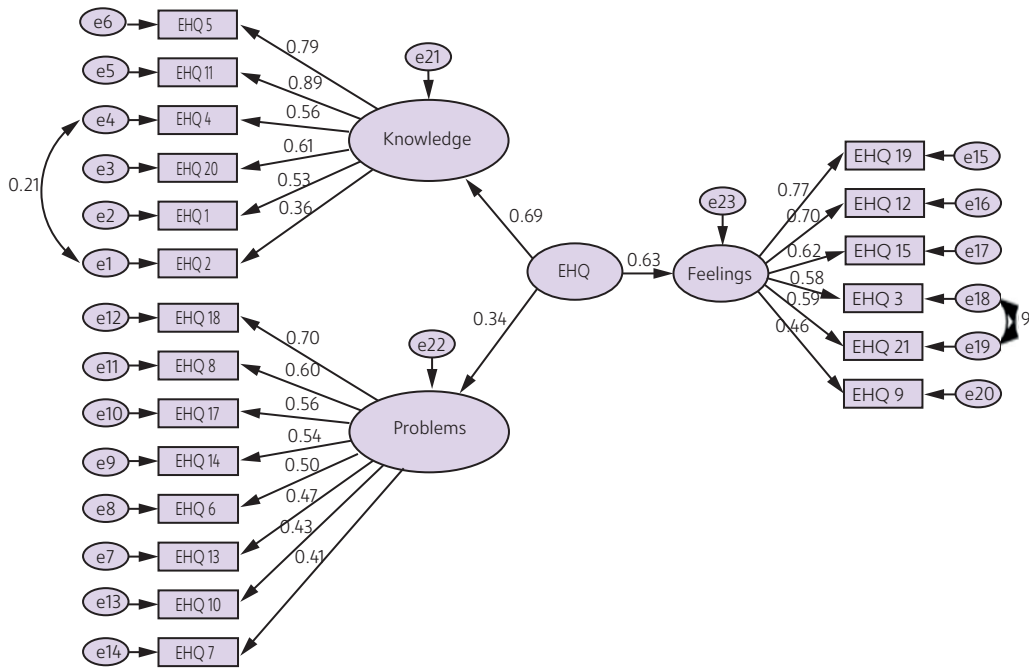


Figure 1 – Confirmatory Factor Analysis Model for Eating Habits Questionnaire.

Table 3 – Questions and sub-dimensions for the Eating Habits Questionnaire model.

Items	Sub-dimension	Standardized Estimation (β)	Estimation (β)	Standard Error	Critical Value	p
EHQ 2	← Knowledge	0.361	1	-	-	-
EHQ 1	← Knowledge	0.526	1.317	0.298	4.422	0.001*
EHQ 20	← Knowledge	0.612	1.541	0.331	4.661	0.001*
EHQ 4	← Knowledge	0.562	1.531	0.305	5.022	0.001*
EHQ 11	← Knowledge	0.893	2.425	0.480	5.052	0.001*
EHQ 5	← Knowledge	0.790	2.144	0.431	4.979	0.001*
EHQ 13	← Problems	0.468	1	-	-	0.001*
EHQ 6	← Problems	0.501	0.978	0.201	4.875	0.001*
EHQ 14	← Problems	0.543	1.376	0.270	5.093	0.001*
EHQ 17	← Problems	0.562	1.321	0.255	5.185	0.001*
EHQ 8	← Problems	0.598	1.261	0.236	5.346	0.001*
EHQ 18	← Problems	0.704	1.287	0.225	5.711	0.001*
EHQ 10	← Problems	0.433	1.266	0.284	4.456	0.001*
EHQ 7	← Problems	0.411	0.906	0.210	4.309	0.001*
EHQ 19	← Feelings	0.766	1	-	-	0.001*
EHQ 12	← Feelings	0.700	0.964	0.108	8.947	0.001*
EHQ 15	← Feelings	0.616	0.845	0.106	7.975	0.001*
EHQ 3	← Feelings	0.584	0.790	0.106	7.479	0.001*
EHQ 21	← Feelings	0.595	0.716	0.094	7.612	0.001*
EHQ 9	← Feelings	0.460	0.704	0.117	6.003	0.001*

Note: $p^* < 0.01$. EHQ: Eating Habits Questionnaire.

Table 4 – Correlations of the Eating Habits Questionnaire and its dimension with the Eating Attitudes Test-26.

Test	Problems		Knowledge		Feelings		EHQ-TR	
	r	p	r	p	r	p	r	p
EAT 26	0.330	0.019*	0.317	0.025*	0.322	0.023*	0.416	0.003**

Note: $p^* < 0.05$; $p^{**} < 0.01$. r: Pearson Correlation coefficient. EAT 26: Eating Attitudes Test-26; EHQ-TR: Eating Habits Questionnaire.

DISCUSSION

This study aimed to evaluate the psychometric properties of the Turkish version of the EHQ (EHQ-TR) in university students. The data were evaluated using Bartlett's sphericity test and the KMO test to determine whether the data were appropriate and sufficient for factor analysis. In the literature, it was emphasized that the Bartlett's sphericity test value should be statistically significant, and that KMO value ranging from 0.80–0.90 is considered very good. In the current study, the value of Bartlett's sphericity test was $p=0.001$, and the KMO value was 0.829, which is very good. In factor analysis, variance rates ranging from 40% to 60% are accepted as ideal [15]. Thus, the variance level of 47% in this study was found to be sufficient. It was determined that the database and the sample size were suitable for factor analysis according to the literature [16].

The EHQ-TR demonstrated strong internal consistency with a Cronbach's $\alpha=0.827$ for the total scale. In the Spanish version of the scale, Cronbach's α was found as 0.903 [5]. The subscales of EHQ were $\alpha=0.85$ (knowledge), 0.81 (problems), and 0.81 (feelings and behaviors) in the Polish version [17]. In the United States, Godefroy et al. [18] revealed that the EHQ and its three subscales exhibit very high internal consistency. While, Cronbach's α was 0.90 for the total EHQ scale, and 0.87, 0.79, and 0.73 for the behaviors, problems and feelings subscales, respectively [18]. In the Italian version of the EHQ, three factors were determined that assess knowledge, positive feelings of healthy eating and problems [19]. On the other hand, Mohamed Halim et al. [20] identified four ON dimensions (healthy eating cognitions, dietary restriction, diet superiority and social impairment), that are inconsistent with the scale's original three dimensions (problems, knowledge and feelings). They found the Cronbach's α coefficient to be 0.89 for the total EHQ scale. In this study, the factor weights of the questions in the problems subdimension ranged between 0.470 and 0.737, in the knowledge subdimension between 0.499 and 0.833, and in the emotions subdimension 0.500 and 0.837. These values were considered sufficient. Our results demonstrated that the total EHQ score was positively correlated with its three subscales. Therefore, it has been determined that the questionnaire measures three-dimensional separate features of the EHQ and it is a reliable measurement tool [21].

There were differences as well as similarities in the variability of the number of items eliminated among the different versions. The Turkish version, compared to the original scale, had the same number of factors but a reduced number of items. The EHQ-TR consists of 20 items in accordance with the Italian and Spanish versions [5,17]. Items with an item-total correlation coefficient of less than 0.20 should not be included in the scale as they are statistically insignificant. The 16th question in the scale ("Few foods are healthy for me to eat") was excluded from the EHQ-TR because it did not have a significant weight. Likewise, in the Spanish version, the 19th question ("I follow a health-food diet rigidly") was removed because it had no factorial weight on any dimension [5]. According to the authors, the translated question may not have been understood by the participants due to cultural differences. As a result of the pre-test and post-test conducted to evaluate the clarity of the scale questions, the intra-class correlation coefficients between the questions were statistically significant at a high level. This indicates that the questions produced understandable and consistent results [22].

Regarding divergent validity, the EHQ-TR and its three subdimensions (problems, knowledge and feelings) with the EAT-26 revealed that the coefficient correlations ranged from 0.317 to 0.416 and showed significantly positive relations. Parra-Fernández et al. [5] demonstrated that a higher score on the EHQ-ES designed to determine ON symptoms correlated with a higher score on the

EAT-26 among university students in Spain. Gleaves et al. [10] also found a positive relationship between problems ($r=0.79$), knowledge ($r=0.54$), feelings ($r=0.41$) and the EAT-26 total score in the original scale.

Our results are consistent with numerous studies showing that greater ON symptomatology is associated with higher levels of disordered eating [5,17,19].

CONCLUSION

Our findings suggest that the EHQ-TR appears to be a valid and reliable instrument to assess knowledge, problems, and feelings related to ON in Turkish young adults. It is possible to use the Turkish version of the EHQ-TR in research and clinical practice .

Strength and limits

As a limitation of our study, it cannot be generalized to the population because it was conducted on a small group of university students. Second, the current study was conducted with Nutrition and Dietetics students, therefore, knowledge about healthy nutrition may indirectly affect their responses. A strength of the present study is that it is the first study that has examined the psychometric properties of a Turkish version of the EHQ which measures ON.

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