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RESEARCH

Validity and reliability of the Arabic orthorexia nervosa inventory scale in young adults: a validation study

Mo'ath F. Bataineh[1] · Salma H. Alhebshi[1] · Ali M. Al-Nawaiseh[2] · Amjad H. Jarrar[1] · Mohammad I. Hamad[3] · Ayesha S. Al Dhaheri[1] · Leila Cheikh Ismail[4,5] · Habiba I. Ali[1]

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Abstract

Purpose This study aimed to translate and validate the Arabic version of the Orthorexia Nervosa Inventory (ONI) scale to assess orthorexia nervosa (OrNe) among young Arabic-speaking adults in the UAE and explore the relationship between OrNe and various sociodemographic factors.

Methods A total of 625 young adult participants (88.2% female) completed a questionnaire comprising the ONI scale and sociodemographic questions. The study assessed internal reliability using Cronbach's α, external reliability using intraclass correlation coefficient (ICC), content validity using a panel of 12 experts, Known-Group validity using associations between OrNe classification and demographics, and structural validity using confirmatory factor analysis.

Results The Arabic ONI scale showed high internal (Cronbach's α = 0.934) and external (ICC = 0.849) reliability. Content validity was excellent (scale-level content validity index = 0.96). Vegetarians had significantly higher ONI scores, indicating good Known-Group validity. The model fit indices (χ^2/df = 1.663, comparative fit index = 0.993, Tucker–Lewis index = 0.992, goodness-of-fit index = 0.989, root mean square error of approximation = 0.033, standardized root mean square residual = 0.049) reflected excellent structural validity.

Conclusions The Arabic ONI scale is a reliable and valid tool for assessing OrNe tendencies in young Arabic-speaking adults. Future studies should explore its applicability to broader populations and investigate predictors of OrNe tendencies.

Level of evidence Level V, descriptive cross-sectional study.

Keywords Orthorexia · Psychometric properties · Validation · Healthy eating · Eating disorder

Introduction

Healthy eating is widely recognized as a cornerstone of a healthy lifestyle, offering numerous benefits, such as reduced risk of chronic diseases, improved quality of life, and increased life expectancy [1, 2]. However, an obsessive focus on healthy eating, often referred to as Orthorexia Nervosa (OrNe), can lead to significant nutritional, social, and physical impairments [2, 3]. First described in 1997 by Bratman and Knight [4], OrNe is characterized by an excessive preoccupation with food quality, hygiene, meal preparation, and nutritional value, often accompanied by feelings of superiority toward those with different eating habits [5–8].

Despite growing academic and clinical interest in OrNe [9], it is not yet classified as a psychopathological disease in the International Classification of Diseases 11th revision (ICD-11) [10], suggesting a lack of consistent evidence about OrNe as a clinical disorder [11], including inconsistent

✉ Mo'ath F. Bataineh
m.bataineh@uaeu.ac.ae

1 Department of Nutrition and Health, College of Medicine and Health Sciences (CMHS), United Arab Emirates University, P.O. Box No. 15551, Al Ain, United Arab Emirates

2 Department of Sport Rehabilitation, College of Sport Sciences, The Hashemite University, Zarqa, Jordan

3 Department of Anatomy, College of Medicine and Health Sciences, United Arab Emirates University, Al Ain, United Arab Emirates

4 Department of Clinical Nutrition and Dietetics, College of Health Sciences, University of Sharjah, 27272 Sharjah, United Arab Emirates

5 Nuffield Department of Women's & Reproductive Health, University of Oxford, Oxford OX12JD, UK

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results regarding its demographic and dietary characteristics [7]. This inconsistency may result from the use of different assessment tools [12, 13]. Among available OrNe assessment tools [12, 14], most have failed to distinguish between healthy orthorexia and OrNe, resulting in overdiagnosis [15] and showing poor to moderate internal consistency and/or inadequate structural validity [12, 13, 16].

The Orthorexia Nervosa Inventory (ONI), developed by Oberle et al. [17] is a promising new tool composed of 24 items categorized into 3 subscales: ONI impairments (assessing physical and psychosocial impairments caused by dietary restrictions and consequent nutritional deficiencies), ONI behaviors (assessing behavior and concern regarding healthy eating), and ONI emotions (assessing emotional upset related to violation of enforced dietary rules). The ONI impairments subscale is the only available OrNe assessment tool that measures physical impairments associated with Orthorexic behavior, which promises better ON diagnostic capability. Furthermore, ONI demonstrated adequate reliability (internal and external) and acceptable convergent and structural validity [17] along with an indirect ability to distinguish between healthy orthorexia and OrNe behaviors by not counting healthy individuals or individuals with healthy orthorexia as individuals with OrNe tendencies [11]. This tool, which uses English language, has been successfully translated into several languages, including Italian [13], and Turkish [18, 19], but an Arabic version of the ONI has not yet been validated.

Previously published ONI validation studies have tested the validity of the scale and demonstrated strong psychometric properties supporting the first-order three-factor correlated (parallel) model across both the original and translated versions [13, 17–19]. The three-factor model was initially established using exploratory factor analysis, while subsequent language adaptations, which included the Italian and Turkish versions, used confirmatory factor analysis (CFA) and exploratory structural equation modeling (ESEM) to further confirm and support the suitability of the correlated first-order three-factor model of the scale across cultures [13, 18, 19]. Furthermore, all previous validation studies in adults have supported the multidimensional nature of the scale [13, 17, 18]. Moreover, previous ONI versions consistently showed satisfactory global reliability, with total and subscale α and ω values exceeding 0.880, providing evidence for the scale's measurement stability across cultural contexts [13, 17, 18].

Published ONI validation studies have examined the associations between orthorexic tendencies and various demographic and behavioral characteristics, including age, gender, vegetarianism, and BMI. Participants adhering to vegetarian diets consistently showed higher OrNe tendencies [13, 17]. In addition, OrNe tendencies were gender neutral [13, 17, 18]. Findings with the BMI classifications were less consistent with the Italian and Turkish validation studies [13, 18] reporting greater OrNe tendencies among the overweight and the obese, while the original U.S. development study reported greater OrNe tendencies among the underweight and normal weight [17]. Finally, younger adults tended to exhibit greater emotional distress and OrNe tendencies [17, 19].

The higher levels of consistency and structural validity made ONI less vulnerable to structural weaknesses and limitations and more accurately assessing OrNe tendencies and behaviors. Therefore, in this study, we aimed to translate and examine the psychometric properties of an Arabic version of the ONI scale to provide the tool in a cultural adapted version that would be used in future research with Arab participants and to allow for accurate scientific comparisons across populations with different languages. The primary objectives were to investigate (1) the internal and external reliability of the ONI scale, (2) the content validity and the Known-Group validity of the ONI scale, and (3) the structural validity of the ONI scale. The authors anticipated that the instrument would demonstrate robust validity and reliability. In addition, we expected higher ONI subscale scores among vegetarians, participants reporting poor or fair perceived health, and those with overweight or obesity. In addition, we hypothesized that the first-order three-factor structure will provide the best model fit.

Materials and methods

Study design and participants

This cross-sectional validation study recruited 625 Arabic-speaking participants. Inclusion criteria were age 18–40 years and Arabic language proficiency. Exclusion criteria included pregnancy, lactation, or clinical conditions contraindicating normal eating. The questionnaire, developed in Arabic via Google Forms, was distributed by email to UAEU students and staff. All participants provided an online written informed consent before participating in the study. Participation in this study was voluntary, and the study did not collect or keep any personal identifiable information to avoid participant identification. Participants could exit the study at any point, and data from those who exited were excluded from the final analysis. Data collection occurred between September 20, 2023, and November 21, 2023, in the United Arab Emirates (UAE). No compensation was provided for completing the questionnaire. Study protocol was approved by the United Arab Emirates University (UAEU) Social Sciences Ethics Committee (ethical approval number: ERSC_2022_1946), and the United Arab Emirates University Human Research Ethics Committee (UAEU.HREC) (ethical approval number: ERH_2023_3230_09).

Participants' characteristics

A self-administered questionnaire was used to collect data. The questionnaire included a sociodemographic section covering age, sex, self-reported weight and height, education, employment, marital status, pregnancy, lactation, chronic diseases, special diets, previous eating disorder diagnosis, and self-perceived health. The self-perceived health was assessed with the use of a five-point Likert scale item "In general, how would you rate your health?" and responses scored from 1 (poor) to 5 (excellent). For the final analysis, the responses from the self-perceived health item were recategorized into poor/fair, good, and very good/excellent. Body mass index (BMI) was computed from self-reported weight and height (kg/m^2) and classified as underweight (< 18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), or obese (≥ 30 kg/m^2). The second part contained the Arabic version of the ONI (ONI-A), adapted from the original English ONI [17]. The ONI consists of 24 items across 3 subscales: ONI impairments (10 items), behaviors (9 items), and emotions (5 items), scored on a four-point Likert scale from 1 (not at all) to 4 (very). Total scores range from 24 to 96, with higher scores indicating a greater tendency toward OrNe. The ONI was translated into Arabic through a cross-cultural adaptation process conducted through translation, back-translation, and consensus meeting to compare the original ONI with the back-translation [20]. The translation process involved 3 academic and field experts in human nutrition and scientific translation. A pilot test on 30 participants was performed to test cultural suitability and applicability; their data were excluded from the final analysis. The complete Arabic version of the questionnaire is provided as a supplementary file.

Internal and external reliability

Internal reliability was assessed using Cronbach's α coefficient (α ≥ 0.70 indicates acceptable reliability) [21, 22]. External reliability (test–retest) was evaluated in 48 participants who completed the questionnaire twice, 2 weeks apart. Initial and second responses were compared using intraclass correlation coefficients (ICC), with ICC ≥ 0.70 indicating adequate reliability [21]. For the external (test–retest) reliability, the participants who agreed to complete the questionnaire for a second time voluntarily provided an email address so the follow-up link could be sent to them. These email addresses were replaced with randomly generated codes, were kept separate from all responses, and were never connected to the data set, to ensure that participants' anonymity was maintained.

Content, known-group, and structural validity assessment

Content validity was assessed using the content validity index (CVI) [23]. A panel of 12 human nutrition experts rated each item for relevance and clarity on a four-point scale, with 4 representing the best score. The item-level CVI (I-CVI) was calculated by dividing the number of panelists scoring 3 or 4 by the total number of panelists. The scale-level CVI (S-CVI) was the proportion of items scoring 3 or 4. Items with I-CVI ≥ 0.90 were retained, and S-CVI ≥ 0.80 indicated acceptable content validity.

Known-Group validity was assessed by comparing ONI overall and subscales scores across sex, age, BMI classification, vegetarianism, and self-perceived health.

Structural validity was evaluated using confirmatory factor analysis (CFA) to test the single-factor model, the original three-factor (parallel correlated) model, the hierarchical (second-order) model, and the bifactor (orthogonal) model of the ONI scale. The bifactor model was followed by calculation of the Explained Common Variance (ECV) to see how much of the total common variance is due to the general factor vs. the three specific factors (impairments, behaviors, and emotions). The resultant ECV was used to determine if only a total score might be reported (unidimensional ONI scale), or the subscales should also be emphasized (multidimensional ONI scale).

Statistical analysis

Statistical analyses were conducted using SPSS version 29.0 (IBM, USA) and JASP version 0.18.1 (Netherlands). Data normality was tested with the Kolmogorov–Smirnov test. Normally distributed continuous variables are reported as mean ± standard deviation (SD), while non-normally distributed variables are presented as median and interquartile range (IQR). Categorical variables are expressed as counts and percentages. Median split was used as a data-driven way to categorize (dichotomize) continuous variables.

For internal reliability, Cronbach's α (α ≥ 0.70 considered acceptable) was computed. For external reliability, paired-sample *t* tests compared time 1 and time 2 responses, and ICC (≥ 0.70) was calculated. The Omega coefficient was also calculated to reflect the multidimensional reliability of the scale (ω ≥ 0.70 considered acceptable). Known-Group validity comparisons used the Mann–Whitney *U* test and the Kruskal–Wallis *H* test for non-normally distributed variables. Effect size r was obtained and used to calculate Cohen's *d* and effects were reported as per Cohen's guidelines (0.1 = small effect, 0.3 = medium effect, and 0.5 = large effect). The dimensionality of the ONI scale was tested using four suggested models, including single-factor model, the original three-factor (parallel correlated) model, the

hierarchical (second-order) model, and the bifactor (orthogonal) model. For structural validity, CFA used the unweighted least squares (ULS) estimator, appropriate for accounting for normality violation, moderate sample size, and use of a four-point Likert scale [24]. The model fit indices included χ^2/df (< 2), comparative fit index (CFI; > 0.90), Tucker–Lewis index (TLI; > 0.90), goodness-of-fit index (GFI; > 0.90), root mean square error of approximation (RMSEA; < 0.05), and standardized root mean square residual (SRMSR; < 0.05) [25]. Standardized factor loading (SFL) values > 0.30 were considered acceptable. Low ECV (< 0.7) was an indicator of multidimensional scale.

Sample size calculation required 10 participants per tested item, necessitating a minimum of 240 participants for the 24-item ONI-A scale [26]. All tests were two-sided, and statistical significance was set at $p < 0.05$.

Results

Participants

Table 1 presents the characteristics of the study participants. Most participants were women (88.2%), college students (95.2%), single (92.3%), younger than 20 years (51.8%), had normal body weight (49.7%), good perceived health (47.0%), and did not identify themselves as vegetarian (85.3%). No participants reported a previous diagnosis of an eating disorder or chronic disease. Only 12 participants (1.9%) reported following a special diet. Participants' ages range from 18 to 39 years with mean and standard deviation of 20.4 ± 3.3 years and with median of 19 years and IQR from 18 to 22.

Internal and external reliability

Table 2 presents the internal and external reliability analysis results for the Arabic version of the ONI. The Arabic version of the ONI exceeds the adequacy recommendation criteria for both internal and external reliability. The overall Cronbach's α coefficient for the scale was 0.934 and ranged from 0.880 to 0.910 for the individual subscales. The overall ICC for the scale was 0.849, ranging from 0.759 to 0.846 for the individual subscales. Moreover, the omega coefficients were excellent for all three subscale factors: impairments (ω = 0.873), behaviors (ω = 0.902), and emotions (ω = 0.887) supported the use of individual subscale scores. In addition, an excellent global reliability index for multidimensional scale was obtained (ω = 0.949) and provided a strong psychometric support to use ONI total score while screening for OrNe tendencies [13]. General factor (bifactor) omega < 0.70.

Table 1 Characteristics of study participants ($n = 625$)

Measure	Mean (SD)	*n* (%)
Sex		
Female		551 (88.2)
Male		74 (11.8)
Age (years)	20.4 (3.3)	
< 20		324 (51.8)
≥ 20		301 (48.2)
BMI	23.9 (5.6)	
Underweight		91 (14.6)
Normal		310 (49.7)
Overweight		145 (23.2)
Obesity		79 (12.6)
Marital		
Single		577 (92.3)
Married		41 (6.6)
Divorced		4 (0.6)
Widowed		3 (0.5)
Employment		
Students		595 (95.2)
Staff		30 (4.8)
Perceived Health		
V.good/Excellent		52 (8.3)
Good		294 (47.0)
Poor/Fair		279 (44.6)
Vegetarian		
No		533 (85.3)
Yes		92 (14.7)

SD standard deviation

Content validity

The I-CVI values for the individual items ranged from 0.92 to 1.00 for relevance and clarity; therefore, all 24 items were retained. The overall S-CVI of 0.96 was obtained, reflecting an excellent level of content validity.

Known-Group validity

Table 3 shows the associations between ONI scores and sex, age (younger vs. older), BMI classification, self-perceived health, and vegetarianism. The Mann–Whitney *U* test analysis revealed significantly higher ONI behavior subscale scores in male participants than in female participants ($p = 0.042$; $d = 0.163$) and comparable scores in the remaining indicators. In addition, the Mann–Whitney *U* test analysis revealed that younger participants' scores were significantly higher in the ONI emotions subscale than older participants ($p = 0.020$; $d = 0.186$) and had comparable scores in the remaining indicators. In addition, the Mann–Whitney *U* test analysis revealed that the scores

Table 2 Internal reliability ($n=625$) and external reliability ($n=48$) of the Arabic version of Orthorexia Nervosa Inventory (ONI-A) scale

Factor	Internal reliability	External reliability			
	Cronbach's α	Time 1, Mean (SD)	Time 2, Mean (SD)	ICC	*p* value*
Impairments	0.880	18.6 (6.8)	18.3 (7.8)	0.837	< 0.001
Behaviors	0.910	16.7 (6.2)	16.7 (6.3)	0.846	< 0.001
Emotions	0.888	8.6 (3.4)	8.2 (3.6)	0.759	< 0.001
Overall	0.934	43.9 (14.0)	43.1 (15.5)	0.849	< 0.001

*p value of ICC

SD standard deviation, *ICC* intraclass correlation coefficient.

Table 3 Differences in ONI scores based on sex, age (younger vs. older), BMI classification, self-perceived health, and being vegetarian (n = 625)

Measure	ONI Score (maximum possible score)			
	Overall (96)	Impairments (40)	Behaviors (36)	Emotions (20)
Sex, Median (IQR)				
Female	46.0 (36.0–56.0)	18.0 (14.0–24.0)	18.0 (12.0–22.0)	10.0 (6.0–13.0)
Male	47.0 (36.8–58.3)	17.0 (12.0–21.0)	18.0 (15.0–23.0)	10.0 (6.8–13.0)
p value	0.785	0.085	**0.042**	0.896
Age, Median (IQR)				
< 20	47.0 (36.0–57.0)	19.0 (14.0–24.0)	17.0 (12.0–22.0)	10.0 (7.0–14.0)
≥ 20	45.0 (35.0–55.0)	18.0 (13.0–23.0)	18.0 (13.0–22.0)	9.0 (6.0–12.5)
p value	0.201	0.053	0.757	**0.020**
BMI, Median (IQR)				
Underweight	43.0 (33.0–54.0)	18.0 (14.0–22.0)	16.0 (11.0–20.0)	9.0 (6.0–12.0) [a]
Normal	46.0 (35.0–57.0)	19.0 (14.0–24.0)	18.0 (12.0–22.0)	10.0 (6.0–12.0) [a]
Overweight	48.0 (38.0–56.0)	18.0 (14.0–23.0)	18.0 (13.0–22.0)	11.0 (8.0–15.0) [b]
Obese	50.0 (38.0–60.0)	18.0 (13.0–26.0)	18.0 (13.0–22.0)	11.0 (7.0–15.0) [b]
Perceived Health, Median (IQR)				
V.good/Excellent	44.0 (38.0–57.3)	18.0 (13.3–23.0) [ab]	18.0 (14.3–24.8)	
Good	45.0 (34.8–55.0)	17.0 (13.0–23.0) [b]	18.0 (12.0–21.0)	
Poor/Fair	48.0 (37.0–57.0)	19.0 (14.0–24.0) [a]	18.0 (12.0–22.0)	
p value	0.122	**0.046**	0.259	
Vegetarian, Median (IQR)				
No	45.0 (35.0–55.0)	18.0 (14.0–24.0)	17.0 (12.0–21.0)	10.0 (6.0–13.0)
Yes	49.0 (39.0–59.0)	19.0 (15.0–23.0)	20.0 (14.0–24.0)	11.0 (7.0–14.0)
p value	**0.009**	0.150	**0.001**	**0.040**

[a, b] Values within the same column with different superscript letters are significantly different based on the Kruskal–Wallis *H* test ($P < 0{\cdot}05$)

of participants who were identified as vegetarians were significantly higher in the total ONI ($p=0.009$; $d=0210$), ONI behaviors ($p=0.001$; $d=0.257$), and ONI emotions ($p=0.040$; $d=0.164$) in comparison with non-vegetarian participants and comparable scores in ONI impairments. Furthermore, the Kruskal–Wallis *H* test analysis showed significant differences in ONI emotions subscale score based on BMI classification ($\chi^2(3)=18.740$; $p<0.001$, $d=0.323$), with a mean rank in ONI emotions subscale score of 269.16 for underweight, 297.21 for normal weight, 351.84 for overweight, and 354.17 for obese. In addition, significant differences were detected in ONI impairments subscale score based on perceived self-health categories ($\chi^2(2)=6.166$; $p=0.046$; $d=0.164$), with a mean rank in ONI impairments subscale score of 294.98 for good perceived health, 310.88 for very good and excellent perceived health, and 332.38 for poor and fair perceived health. Moreover, the Kruskal–Wallis *H* test analysis showed significant differences in ONI emotions subscale score based on perceived self-health categories ($\chi^2(2)=12.322$; $p=0.002$; $d=0.260$), with a mean rank in ONI emotions subscale score of 279.38 for good perceived health, 292.55 for very good and excellent perceived health, and 340.82 for poor and fair perceived health.

Structural validity

A confirmatory factor analysis of the unidimensional (one-factor) model for the ONI-A showed that the one-factor model did not converge and was thus rejected. Table 4 shows the confirmatory factor analysis fit indices for the unidimensional and multidimensional CFA models of the ONI-A. The calculated ECV was 0.629. The different model fit indices and subsequent ECV value supported adequate goodness of fit for the three-factor (parallel and correlated and multidimensional) model of the ONI-A scale. The hierarchical (second-order) CFA model was not presented in Table 4 to avoid redundancy, as it was mathematically equivalent to the corresponding three-factor CFA model.

Table 5 shows the standardized factor loadings (SFL) for each item in the three-factor model of the ONI-A scale. All items showed standardized factor loadings greater than 0.30. In addition, all SFLs were significant. Both the magnitude and significance of the factor loadings demonstrated that all items were related to their corresponding subscales.

Discussion

The main aim of this study was to translate the ONI scale into Arabic (ONI-A) and examine its psychometric properties. We used confirmatory factor analysis, which agreed with previously published research, and confirmed the structural validity of the three-factor model of the ONI-A. Moreover, the ONI-A demonstrated acceptable content validity, good Known-Group validity, and excellent reliability (internal and external).

In the current study, the Cronbach's alpha and Omega values of the three subscales indicated good-to-excellent consistency. The overall Cronbach's alpha and Omega values indicated excellent internal reliability. The strong Omega values for all subscales confirmed the reliability of the multidimensional ONI scale. To ensure the consistency of the overall and three ONI subscales over time, the ICC was measured. The ICC values reflect a high level of consistency between the measures across the two timepoints. This indicates that the scale exhibits excellent external reliability as it consistently yields similar results when administered at different times. These finding align with the previously published ONI validation studies that report strong reliability for the ONI scale [13, 17, 18]. Conducting an I-CVI analysis to ensure that the items of the psychometric scale are relevant to the intended construct, a score 0.78 or above is considered to have an agreement among experts regarding their relevance to the content domain [23]. The I-CVI values for the individual items ranged 0.92–1.00 for relevance and clarity; therefore, all 24 items were retained. The overall S-CVI of 0.96 reflected an excellent level of content validity. These results are consistent with the original versions of the tool [17] and the Turkish [18, 19] and Italian [13] versions of the scale, underscoring the scale's robustness across different cultural contexts.

The previously published cross-cultural validations of the Orthorexia Nervosa Inventory (ONI) studies consistently reported no significant gender differences in OrNe tendencies [13, 17, 18]. In detail, the original U.S. validation study found no variation in ONI scores between men and women, suggesting that preoccupation with healthy eating, related impairments, and the accompanying emotional distress may be largely gender-independent [17]. Similar results have been reported in the Italian and Turkish adaptations, which also showed no significant gender-based differences across ONI subscales [13, 18]. In the current study, gender differences were similarly minimal. Only the behaviors subscale showed slightly higher scores among men, although the effect size was small. Taken together, evidence from diverse cultural settings indicates that orthorexic behaviors, functional impacts, and emotional responses appear to be broadly independent of gender. This pattern stands in contrast to traditional eating disorders, where gender differences are well-established [11].

Table 4 Goodness-of-fit indices from the confirmatory factor analysis of the tested models of the ONI-A scale

Fit measure	Single factor	Three factor	Bifactor
χ^2	1542.685	413.985	249.942
df	252	249	228
χ^2/df	6.122	1.663	1.096
SRMSR	0.094	0.049	0.038
RMSEA (90% CI)	0.091 (0.086–0.095)	0.033 (0.027–0.038)	0.012 (0.000–0.021)
CFI	0.945	0.993	0.999
TLI	0.940	0.992	0.999
GFI	0.959	0.989	0.993

χ^2 chi-square, *df* degrees of freedom, *SRMSR* Standardized Root Mean Square Residual, *RMSEA* Root Mean Square Error of Approximation, *CI* Confidence Interval, *CFI* Comparative Fit Index, *TLI* Tucker–Lewis Index, *GFI* goodness-of-fit index. The retained model is denoted in bold font. ULS was used as the parameter estimation method

Table 5 Standardized factor loading of the three-factor model of the ONI-A scale

Item	Scale	SFL	*p* value*
	ONI—Impairments		
10	"Health experts have expressed concern about my highly restrictive diet."	0.385	< 0.001
24	"The stricter I become with my diet, the more I experience one or more of the following physical symptoms: fatigue, fainting, rapid heartbeat, nausea, diarrhea, pain, etc."	0.536	< 0.001
12	"The detoxification process and fasting that I follow have become more frequent and intense over time."	0.699	< 0.001
5	"My restrictive diet has led me to lose more weight than most people would consider healthy for me."	0.638	< 0.001
19	"Whenever I feel unwell, my family and friends often attribute my illness to my highly restrictive diet."	0.579	< 0.001
14	"Despite eating healthier over time, my physical health has already deteriorated."	0.718	< 0.001
3	"Due to the amount of time I dedicate to my healthy diet, I spend less time than I used to with my family and friends."	0.737	< 0.001
20	"While spending time with family or friends, my thoughts often wander to thoughts about healthy eating."	0.765	< 0.001
7	"My healthy diet is a significant source of tension in my relationships."	0.729	< 0.001
16	"Due to the time I dedicate to my healthy diet, I either miss work for a period or skip my classes at school."	0.714	< 0.001
	ONI—Behaviors		< 0.001
17	"I either don't buy processed food products or compulsively check food labels to ensure they only contain healthy and pure ingredients."	0.604	< 0.001
11	"I follow a healthy diet with many rules."	0.764	< 0.001
8	"Over time, my diet has become deprived of entire food groups that I believe are not healthy."	0.795	< 0.001
6	"Preparing food in the healthiest ways possible is crucial in my dietary regimen."	0.562	< 0.001
22	"I strongly avoid all foods that I feel are unhealthy."	0.734	< 0.001
18	"The number of healthy dietary rules I follow gradually increases over time."	0.808	< 0.001
15	"Healthy eating is among the most important things in my life."	0.680	< 0.001
4	"I strictly follow a healthy diet, consuming only what my diet allows, and I do not allow myself any deviations from this regimen."	0.796	< 0.001
2	"I care much more about the healthiness of what I eat than the pleasurable taste of food."	0.796	< 0.001
	ONI—Emotions		< 0.001
9	"When I deviate from my healthy diet, all I can think about is how much I've failed."	0.758	< 0.001
13	"Whenever I consume unhealthy food, I feel a great sense of being unclean."	0.723	< 0.001
1	"I feel a lot of guilt and self-hatred when I deviate from my healthy diet."	0.855	< 0.001
23	"Feeling satisfied with my body is entirely dependent on my adherence to a healthy diet."	0.730	< 0.001
21	"Just the thought of consuming unhealthy food makes me extremely anxious."	0.850	< 0.001

*p value of SFL

SFL standardized factor loadings.

The present study found that participants with higher BMI tended to score higher on the ONI, with significantly elevated emotions subscale scores with medium effect size observed among individuals with overweight or obesity. This pattern aligns with the Italian and Turkish validation studies, both of which reported positive correlations between BMI and overall ONI scores, as well as the emotions and impairments subscales [13, 18]. In contrast, the original U.S. development study identified a negative association between BMI and ONI scores, indicating stronger OrNe tendencies among individuals with lower BMI [17]. These inconsistencies suggest that restrictive, purity-driven eating behaviors, which included behavioral preoccupation, functional impairments, and emotional distress, may be influenced more by cultural context than by only the body weight. Overall, the literature indicates that while BMI may be an important correlate for OrNe tendencies, this relationship is likely to be shaped by cultural norms and contextual factors.

In the current study, vegetarian participants exhibited significantly higher ONI subscale scores compared with non-vegetarians. This finding aligns with previous research showing a greater tendency for orthorexic eating patterns among participants with strict vegetarian diets [13, 17, 27–29]. The consistency of this pattern across studies using different assessment tools suggests that the association between vegetarian dietary practices and elevated OrNe tendencies is stable and not tool-dependent. Nevertheless, the lack of differences in the impairments subscale between the two groups indicates that these elevated tendencies may not translate into greater physical or psychological impairment. Instead, the differences observed in behavioral and emotional domains may reflect increased distress or rigidity among vegetarians when deviating from their healthy

eating patterns. This distinction highlights the importance of considering not only the presence of OrNe tendencies and behaviors, but also how individuals emotionally respond to disruptions in their dietary patterns.

The present study found that younger individuals scored higher on the ONI emotions subscale than older adults. This aligns with the previous ONI validation studies [17, 19], which also reported a negative association between age and the ONI emotions subscale scores. Collectively, these results might suggest that younger people may be more emotionally affected when they deviate from their healthy eating patterns. At the same time, rapid generational shifts in health-related beliefs and values may contribute to these age-related differences in OrNe tendencies [5]. However, the effect of age on OrNe prevalence varies among studies [2, 30], and should warrant more investigation in the future.

The distinctive function of the ONI is to identify patterns of restrictive eating motivated by health considerations. Assessing participants' perceptions of their overall health and comparing them to ONI scores helped us understand the relationship between perceived health satisfaction levels and ONI scores. None of the previous validation studies checked in association with perceived health. In this study, a significant negative correlation was found between the perceived health, impairment, and emotion subscales. However, the overall ONI score did not significantly correlate with how individuals perceived their health. Previous research has indicated that greater health concerns are associated with higher ONI scores [31] and that a health-focused self-concept may contribute to OrNe manifestation through fear of losing control overeating and a strong preference for healthy foods [32]. This may explain our findings that individuals who perceived themselves as having poor health showed higher impairment and emotion scores, even though the overall ONI score was not significantly correlated with their perceived health. A possible reason for the lack of significance in the current findings compared to previously published research findings could be attributed to the tool used to assess OrNe tendencies. The ONI scale used in the current study used direct questions about the physical impairments related to OrNe, which were missing from the tools used in previous studies, and such questions could negate self-reported feelings about one's own health factors other than physical health [33].

In the current study, evaluation of the structural validity confirmed the goodness of fit of the parallel (correlated) three-factor model of the ONI-A. Oberle et al. developed the original three-factor ONI scale using exploratory factor analysis; however, the authors did not confirm the model fit with confirmatory factor analysis [17]. Turan et al. confirmed the three-factor model fit of the Turkish version using confirmatory factor analysis and showed that the fit indices reached the cutoff limits for goodness of fit [24]. The Italian version also confirmed the goodness of fit of the three-factor model [13]. In addition, all standardized factor loadings were greater than 0.30 with most exceeding 0.50, which suggests that an important extent of item variance was explained by the related factors they were meant to measure, and that items have a strong influence on their related factors. Moreover, the current findings showed that the parallel (correlated) three-factor model provided the best and most parsimonious representation of the data. Although the bifactor (orthogonal) model exhibited a slightly better fit indices, the difference with the parallel (correlated) three-factor model were negligible and the parallel (correlated) three-factor model was preferred for the sake of parsimony. The preference for the parallel (correlated) three-factor model over the bifactor (orthogonal) model was reinforced by the low omega and low ECV value, indicating limited support for a common general factor. Instead, the findings were more strongly aligned with a multidimensional structure of the ONI scale. This choice agreed with Rodriguez et al. [34], who noted that relying on the comparison of goodness-of-fit indices per se is not sufficient for model selection, and the selection should be complemented by examining other parameters. Likewise, the single-factor model was not retained due to the poor fit indices, which also confirmed the multidimensional structure of ONI.

Conclusion

The findings of the current study demonstrated the adequate validity and reliability and supported the multidimensionality of the Arabic version of the ONI scale. Testing the psychometric properties of the 24 ONI items demonstrated excellent internal and external reliability, content validity, and structural validity among young Arabic-speaking adults in the UAE. Additional research is required to explore the scale's applicability to other age groups and to assess the predictors of OrNe tendencies in larger and more diverse populations.

Strengths and limits

This is the first adaptation of the ONI tool for Arabic-speaking populations. Sending recruitment invitations by e-mail enabled this study to reach a high number of potential participants while allowing them the freedom to complete the questionnaire when appropriate; at the same time, it was difficult to accurately calculate the response rate. While the suggested minimum sample size for confirmatory factor analysis should range from 5 to 15 participants per item [26], the current study's participant-to-item ratio exceeded the suggested minimum ratio. Moreover, the current study

collected sociodemographic information from the participants, which provided a comprehensive view of the study sample. Furthermore, the use of different protocols to evaluate the validity and reliability strengthened the current results. One limitation of this study is the over-representation of female participants, which limits the representation of males and the generalizability of the results to the general population. In addition, we did not determine whether the vegetarian dietary approach was adopted as a new intervention or as part of cultural practices, because a study investigating the causality of following a vegetarian diet would be crucial for understanding the relationship between OrNe and such dietary patterns [35]. In addition, this study used self-reported data for the presence or absence of clinical conditions without clear confirmation by a specialist, making the current results subject to self-reporting bias.

What is already known on this subject?

The prevalence of OrNe is alarming and is mostly attributed to an obsession with healthy eating habits. The ONI is a new and promising ON-screening measure. It is unique among the available OrNe tendency screening tools, as it is the only tool with a subscale related to physical impairment. Moreover, it shows higher levels of consistency and structural validity, which makes ONI less vulnerable to structural weaknesses and limitations and more accurately assesses OrNe tendencies and behaviors. The ONI was translated and adapted to Arabic, and its reliability and validity were studied.

What does this study add?

The ONI was translated and adapted into Arabic, following previously described protocols. The internal and external reliability and content, Known-Group, and structural validity of the Arabic version of the ONI were assessed and confirmed using appropriate statistical methods. To the best of our knowledge, this is the first study to evaluate the Arabic version of the ONI. This study further supports the value of the ONI as a valid and reliable screening tool for OrNe-related research.

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Author contribution MFB: conceptualization, project administration, supervision, methodology, investigation, formal analysis, writing—original draft, writing—review, and editing. SHA: translation, project coordination, investigation, methodology, writing, review, and editing. AMAl-N: formal analysis, writing, review, and editing. AHJ: formal analysis, investigation, writing, review and editing. MIH: investigation, writing, review, and editing. ASAD: investigation, writing—review, and editing. LCI: investigation, writing, review, and editing. HIA: investigation, writing, review, and editing. All authors have approved the final version of the manuscript.

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Availability of data and materials The data set generated and analyzed during this research project can be provided upon reasonable request from the corresponding author.

Declarations

Ethics approval and consent to participate This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the United Arab Emirates University (UAEU) Social Sciences Ethics Committee (ethical approval number: ERSC_2022_1946), and the United Arab Emirates University Human Research Ethics Committee (UAEU.HREC) (ethical approval number: ERH_2023_3230_09).

Consent to participate Written informed consent was obtained from all individual participants included in this study.

Competing interest All authors declare that they have no competing financial interest or personal relationships that may have influenced the work reported in this study.

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