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Cultural adaptation and psychometric validation of the Turkish MIND diet adherence scale for young adults

Özge Esgin^{1*}, Nazlı Nur Aslan Çin², Özlem Nur Kaplan³, Leeda Baratzada³ and Ayşe Özfer Özçelik³

Abstract

Background The MIND diet, which promotes brain health, has a potential role in preventing cognitive decline. To further establish its applicability, it is essential to validate the MIND Diet Adherence Scale in different populations with diverse dietary habits, including Turkish young adults.

Objective The aim of this study was to evaluate the construct validity, internal consistency and test-retest reliability of the Turkish version of the MIND diet assessment tool in the Turkish population.

Methods A total of 310 individuals aged between 19 and 39 (mean age 25.0 ± 5.1) voluntarily participated in this study. Data were collected through face-to-face interviews, incorporating socio-demographic characteristics, anthropometric measurements, the MIND Diet Adherence Scale, and the Mediterranean Diet Adherence Scale. Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) of the MIND Dietary Adherence Scale were performed. In the CFA, the goodness of fit of the hypothesized model to the observed data was evaluated using a range of fit indices.

Results The study determined an adequate sample size ($KMO = 0.67$), with sufficient item correlations for factor analysis ($\chi^2 = 449.74$; $p < 0.001$). Confirmatory factor analysis and goodness-of-fit indicators supported the fit of the two-factor model to the Turkish data. The Cronbach's alpha internal consistency coefficient for the MIND Diet Adherence Scale was 0.61. All items in the scale exhibited a positive correlation with the total score, exceeding 0.40. Furthermore, a substantial positive correlation was observed between the Mediterranean Diet Adherence Scale and the MIND Diet Adherence Scale.

Conclusions The Turkish adaptation of the MIND Diet Adherence Scale can be utilized in its entirety, without the need to remove any items. This study affirms that the MIND Diet Adherence Scale is a valid and reliable measurement tool for assessing dietary habits in Turkish society.

Keywords Cognitive health, MIND, Psychometric properties, Turkish young adults

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Introduction

The World Health Organization (WHO) guidelines on reducing or preventing cognitive decline recommend reducing modifiable risk factors, such as diet [1]. More than 18,000 people in Türkiye die each year from diseases of the nervous system [2]. In light of that, Türkiye's particular cultural and culinary traditions require careful study in order to enhance cognitive health through diet. Establishing healthy eating habits early in life will have an impact on quality of life by influencing health later in life.

In order to improve quality of life, reduce the risk of disease and maintain overall health, the levels of antioxidants in the diet have been studied [3–10]. Increasing antioxidant levels in the diet has the potential to reduce the risk of developing neurodegenerative disorders and to improve cognitive health [11]. The Mediterranean diet, known for its high antioxidant content, is thought to have potential benefits for cognitive health. However, some researchers suggest that it is essential to control the intake of dairy products and calcium, which are integral parts of this diet [12]. Morris et al. (2015) developed the MIND diet (Mediterranean-DASH Intervention for Neurodegenerative Delay) by building on the principles of the Mediterranean Diet and the Dietary Approaches to Stop Hypertension (DASH). This innovative diet includes ten food groups that promote brain health and identifies five food groups that have a detrimental effect [13]. Comparative analysis of adherence to the Mediterranean, DASH and MIND diets suggests that the MIND diet score is most effective in predicting cognitive decline [14]. Previous research has consistently shown that adhering to the MIND diet has the potential to delay the onset of Parkinson's disease, reduce the likelihood of parkinsonism, improve daily functioning and enhance cognitive performance [15–19].

The validation of the MIND diet scale in Türkiye has important practical implications for healthcare professionals, policymakers and the general public. Regular assessment of adherence to the MIND diet may help to identify individuals at higher risk of cognitive decline, allowing health professionals to provide targeted dietary advice to potentially delay the onset of cognitive decline. Despite the adaptation of the Mediterranean [20] and DASH [21] diets in Türkiye, there is a notable lack of comprehensive studies assessing the reliability and validity of the MIND diet adherence in the Turkish context. Although the culinary culture varies from region to region in Türkiye, all the foods contained in the MIND diet are available in all regions.

This study aims to bridge this gap by assessing the validity and reliability of the Turkish version of the MIND Diet Adherence Scale. By doing so, we strive to offer insights into the dietary habits of young adults in Türkiye, exploring the potential effectiveness of the MIND diet in

the local context. This study will help healthcare professionals improve public health and develop dietary guidelines that can improve cognitive health across the nation.

Research Hypothesis:

- (1) We expect to capture the two dimensions of the MIND diet scale through factor analysis.
- (2) We expect to find significant correlations with the Mediterranean diet to increment its validity.
- (3) We also expect that the MIND diet scale is validity and reliability in Turkish young adults.

Methods and materials

Participants

The study sample consisted of 310 (consisting of 27 males and 283 females) healthy individuals aged between 19 and 39 years (mean age 25.0 ± 5.1), including university students and staff from Ankara University. Some previous studies of the MIND diet have also been conducted on a specific gender [22, 23]. Inclusion criteria included: no chronic illnesses, no significant hearing or vision impairments, no disabilities, and fluency in Turkish. Participants were selected using convenience sampling and participated voluntarily. Sociodemographic (e.g., sex, education, marital status, smoking, and alcohol consumption) and anthropometric data (height, weight, BMI) were collected for descriptive analysis.

Procedure

This research was carried out with the official authorization of Ankara University, including the Faculty of Health Sciences, Faculty of Communication and Faculty of Educational Sciences. The study protocol obtained ethical approval from the Research Ethics Committee of Ankara University (protocol number: 11/58; date: 24/10/2022), adhering to the ethical principles outlined in the Declaration of Helsinki.

Data were collected through structured face-to-face interviews conducted between December 2022 and March 2023. Participants were informed about the study's aim and procedures and provided written informed consent. The surveys included two diet adherence scales: the MIND Diet Adherence Scale and the Mediterranean Diet Adherence Scale. Anthropometric measurements were taken by trained researchers using standardized procedures. Missing data were handled using mean/median imputation or multiple imputation depending on the extent and pattern of missingness. Complete case analysis was also conducted to test robustness.

Measurements

MIND diet adherence scale

The MIND Diet Adherence Scale, originally developed by Morris et al. (2015), includes 15 food items divided into

10 promote brain health (green leafy vegetables, other vegetables, berries, nuts, olive oil, whole grains, non-fried seafood, beans, non-fried poultry and wine) and 5 unhealthy food groups that have a detrimental effect (red meat, butter and margarine, cheese, pastries and sweets, and fries/fast food). MIND diet model suggests: at least 6 servings/week of green leafy vegetables, at least 1 serving/day of other vegetables, at least 2 servings/week of berries, at least 5 servings/week of nuts, olive oil as primary source of fat in the diet, at least 3 servings/day of whole grains, at least 1 portion/week of fish, >3 servings/week of beans, at least 2 portions/week of poultry, 1 glass/day of wine and, limiting consumption of butter, margarine, cheese, red meat, pastries and sweets, and fries/fast food. Scoring ranges from 0 to 15 based on intake frequency. The scoring mechanism involves a nuanced approach based on the frequency of consumption. Notably, olive oil is accorded a specific scoring criterion, evaluating whether it constitutes the primary source of fat in the diet (1 point if affirmative, 0 points if not). Other foods are scored on a scale of 0, 0.5 or 1 point, providing a comprehensive evaluation of dietary habits. This systematic scoring methodology enables the determination of a total score, reflecting participants' overall adherence to the MIND diet [13].

Mediterranean diet adherence scale

The survey instrument used in this study includes the Mediterranean Diet Adherence Scale, a comprehensive tool designed to measure participants' adherence to the Mediterranean diet. The Mediterranean Diet Adherence Scale comprises 14 questions. A score of 1 is assigned for positive responses indicating use, while a score of 0 is assigned for negative responses indicating non-use. The cumulative scores are then analysed to categorize participants according to their level of adherence:

Acceptable Adherence: A cumulative score of 7 or above signifies an acceptable level of adherence to the Mediterranean diet.

Strict Adherence: Participants attaining a score of 9 or above are classified as strictly adherent to the Mediterranean diet [22, 23]. A study was conducted to assess the validity and reliability of the Mediterranean Diet Adherence Scale in Turkish [20].

Translation method of the scale

The MIND Diet Adherence Scale was adapted into Turkish using the forward-backward translation method [24]. Two independent English translators performed the initial translation into Turkish. Then, both translations were validated, and any discrepancies were addressed by the research team. These versions were harmonized by a team of experts, and a native Turkish speaker—blind to the original version—back-translated it into

English. Cultural relevance was ensured through expert panel reviews (7 dietitians and 2 physicians), focusing on clarity, relevance, and local dietary practices. The final version was piloted with a small group to ensure comprehensibility and cultural appropriateness. Feedback was used to refine item wording and maintain semantic equivalence with the original scale.

One challenge was to ensure the translation was culturally sensitive. We worked with experts and nutritionists to find out how cultural differences might affect people's understanding of food. The MIND Diet Adherence Scale uses words for food that don't have direct equivalents in Turkish, so the research team worked together with nutritionists and language specialists to find the right words for the scale. Türkiye has different culinary practices in different regions, thus the translation process considered foods and dietary habits common across different regions of Türkiye.

Data analysis plan

All statistical analyses were conducted using SPSS software (version 26.0) and R (Lavaan package). The level of statistical significance was set at $p < 0.05$. Descriptive statistics were used to summarize participant characteristics.

Construct validity was examined through exploratory and confirmatory factor analyses. This analysis involved young adult participants, and it was determined that a minimum of 150 participants was required to achieve an adequate sample size for the 15-item scale used in the study. It is a well-established practice that the sample size should be at least ten times the number of items in the scale to ensure the robustness of the factor analysis [25]. The structural integrity of the 15 questions was scrutinized through exploratory factor analysis (EFA), a methodical approach to unravelling underlying patterns and relationships within the data set. The confirmatory factor analysis method was determined as DWLS. Confirmatory factor analysis (CFA) goodness-of-fit indices, including χ^2/df , root mean square error of approximation (RMSEA), the goodness-of-fit index (GFI) and the comparative fit index (CFI), were utilized to assess the fit of the factor model to the data. These included the Chi-square to Degrees of Freedom ratio (χ^2/df), where a statistically significant value ($p < 0.05$) was considered indicative of an acceptable fit. Additionally, the Root Mean Square Error of Approximation (RMSEA) was employed, with values below ≤ 0.06 deemed satisfactory. The Goodness-of-Fit Index (GFI) and the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI) were also utilized, with thresholds of ≥ 0.90 , respectively, reflecting an adequate model fit [26, 27]. The robustness of the data set was methodically evaluated through the Kaiser–Meyer–Olkin (KMO) Test and Bartlett's test of sphericity.

Table 1 General information about healthy young adults

General Information	Women (n = 283) n (%)	Men (n = 27) n (%)	Total (n = 310) n (%)
Age (years) ^a	24.3 ± 5.2	32.6 ± 12.4	25.0 ± 5.1
Education status			
Primary school	2 (1.4)	2 (7.4)	6 (1.9)
Middle school	2 (0.7)	1 (3.7)	3 (1.0)
High school	22 (7.8)	5 (18.5)	27 (8.7)
College	165 (58.3)	0 (0.0)	165 (53.2)
University and above	90 (31.8)	19 (70.4)	109 (35.2)
Education time (years) ^a	14.3 ± 1.9	15.3 ± 4.8	14.4 ± 2.3
Marital Status			
Married	32 (11.3)	11 (40.7)	43 (13.9)
Single	251 (88.7)	16 (59.3)	267 (86.1)
Smoking			
Never Smoked	231 (81.6)	14 (51.9)	245 (79.0)
Quit Smoking	5 (1.8)	1 (3.7)	6 (1.9)
Smoked	47 (16.6)	12 (44.4)	59 (19.0)
Alcohol consumption			
No	242 (85.5)	22 (81.5)	264 (85.2)
Yes	41 (14.5)	5 (18.5)	46 (14.8)
BMI (kg/m²)^a	22.5 ± 3.4	24.3 ± 2.5	22.7 ± 3.3
Underweight	26 (9.3)	0 (0.0)	26 (8.4)
Normal	206 (73.3)	15 (55.6)	221 (71.8)
Overweight or obese	49 (17.4)	12 (44.4)	61 (19.8)

^a Data are presented as the mean ± standard deviation

A KMO value of 0.67 was obtained, surpassing the recommended threshold of 0.50, thereby affirming the adequacy of the sample size. The statistical significance of the Bartlett test ($\chi^2 = 449.74$; $p < 0.001$) attests to the substantial interdependence among the items, validating the suitability of the data set for in-depth exploration.

Internal consistency was evaluated through item analysis conducted on data obtained from 310 participants, utilizing reliability coefficients, specifically Cronbach's α , to thoroughly assess the internal consistency of the measures.

Test-retest reliability was assessed with a group of 50 participants who underwent the Turkish version of the MIND Diet, with reliability being ensured by conducting the test again two weeks after the initial completion.

Pearson correlation analysis was employed to examine the correlation between adherence scores obtained from the MIND Diet Adherence Scale and the Mediterranean Diet Adherence Scale. This analysis helps in assessing the concurrent validity of the Turkish adaptation.

Results

This study demonstrated that the Turkish version of the MIND Dietary Adherence Scale is a valid and reliable instrument for assessing dietary adherence in young adults. The study sample included 310 individuals (91.3% female), with a mean age of 25.0 ± 5.1 years and a mean

Table 2 Factor analysis of the MIND diet's Turkish version in healthy young adults

Items (English)	Items (Turkish)	Factor 1 Healthy Foods	Factor 2 Un- healthy Foods
Green Leafy Vegetables	Yeşil Yapraklı Sebzeler	0.446	
Other Vegetables	Diğer Sebzeler	0.507	
Berries	Üzümsü Meyveler	0.478	
Nuts	Sert Kabuklu Yemişler	0.313	
Olive Oils	Zeytinyağı	0.532	
Whole Grains	Tam Tahıllar	0.495	
Fish (not fried)	Kızartılmamış Balık	0.348	
Beans	Kurubaklagiller	0.581	
Poultry (not fried)	Kızartılmamış Kümes Hayvanları	0.518	
Wine	Şarap	0.426	
Butter, Margarine	Tereyağı ve Margarin		0.330
Cheese	Peynir		0.328
Red Meat and Products	Kırmızı Et ve Ürünleri		0.618
Fast-Fried Foods	Kızartmalar/Fast Food		0.432
Pastries and Sweets	Hamur İşleri ve Şekerlemeler		0.662
	Eigenvalue	2.52	1.71
	The percentage of variance explanation	14.65	13.56

Extraction method: Principal component analysis; Rotation method: Varimax

BMI of 22.7 ± 3.3 kg/m². Confirmatory factor analysis supported the structural validity of the scale, while internal consistency and test-retest reliability showed strong reliability measures. Furthermore, significant correlations were observed between MIND dietary adherence scores and the Mediterranean diet, further supporting the validity of the scale.

Socio-demographic and anthropometric characteristics

The study comprised a total of 310 participants, consisting of 27 males and 283 females. The mean age of the participants was 25.0 ± 5.1 years, and their mean education level was 14.4 ± 2.3 years. The majority of the participants (86.1%) were single. With regard to lifestyle habits, 79.0% of the participants said they did not smoke, while 85.2% did not consume alcohol. The mean BMI of the participants was 22.7 ± 3.3 kg/m² (Table 1).

Construct validity and confirmatory factor analysis

Table 2 presents the outcomes of the factor analysis. Correlations between items, a prerequisite for factor analysis, were assessed using Bartlett's test of sphericity. The sample size adequacy was evaluated through the KMO test, indicating that the statistical results support the sufficiency of the sample size (KMO = 0.67). Additionally, Bartlett's test of sphericity revealed a strong

association between the items, allowing for component analysis ($\chi^2=449.74$; $p<0.001$). In this study, the Turkish adaptation of the MIND diet comprised two factors derived from 15 items, categorizing them into “healthy foods” and “unhealthy foods”. The factor loading, indicating how each item relates to the total score, exceeded 0.30. Together, these two factors explained 28.21% of the variation.

Table 3 provides an overview of the CFA and goodness-of-fit indicators, while Fig. 1 depicts the results graphically. The findings indicate that the Turkish data fit the model well, with favourable values for the following indicators: $\chi^2/df=1.40$, RMSEA: 0.045, GFI: 0.940, TLI:0.942 and CFI: 0.950.

Convergent and divergent validity

In this study, AVE values were calculated to evaluate the convergent validity of the factors. AVE values were found to be Healthy foods=0.475 and Unhealthy foods=0.495, respectively. CR values were also calculated and found to be Healthy foods=0.718 and Unhealthy foods=0.598, respectively. For convergent validity, all CR values related to the scale are expected to be greater than AVE values are expected to be greater than 0.50. In this study, CR values of the factors were higher than AVE values, but AVE values were lower than the critical 0.50. Although the CR value indicates acceptable internal consistency, the AVE value remains below the recommended threshold of 0.50, suggesting limited convergent validity.

Internal consistency

The internal consistency levels and Cronbach’s alpha coefficients, along with item-total correlations for MIND diet items, are presented in Table 4. The reliability coefficient for the MIND diet scale, as indicated by Cronbach’s alpha, was calculated as 0.61. Notably, all scale items exhibit a positive correlation with the total score, surpassing the 0.40 threshold. This result signifies that the scale demonstrates a robust capability to holistically evaluate MIND diet adherence. As a result, the analysis of Cronbach’s alpha values in the “Cronbach’s alpha if item is deleted” column reveals that no item should be removed from the scale. This suggests that each item

contributes meaningfully to the overall reliability and internal consistency of the MIND Diet Adherence Scale.

MIND diet and mediterranean diet adherence

The adherence scores of the MIND diet and the Mediterranean diet were compared using the Pearson correlation test, revealing a significant and positive correlation ($p=0.001$, $r=0.70$). This suggests that individuals who closely followed the Mediterranean diet also tended to exhibit greater adherence to the MIND diet.

Discussion

Türkiye is experiencing an increase in the number of cognitive impairment cases, as reported by the Ministry of Family and Social Policies. The incidence and mortality rates, along with associated care costs, make cognitive impairment a pressing public health concern in the country [28]. Türkiye has distinct dietary habits influenced by cultural, culinary and regional factors. Understanding how the MIND diet, designed to enhance brain health, aligns with, and can be adapted to, Turkish dietary patterns is crucial for developing targeted interventions. Although there have been studies on dietary interventions such as the Mediterranean and DASH diets in Türkiye, there is a noticeable gap in research specific to the MIND diet. The absence of Turkish reliability and validity studies necessitates a focused investigation into the effectiveness of the MIND diet in this context, which has been associated with cognitive benefits and the prevention of neurodegenerative diseases [16, 18]. Establishing its validity and reliability in the Turkish population could open avenues for dietary interventions that mitigate cognitive decline and enhance mental health. Cognitive impairment not only affects individual well-being but also places a substantial burden on public health resources. Investigating the MIND diet’s potential to improve cognitive function could lead to cost-effective preventive measures at the population level. A comprehensive approach to health, encompassing dietary habits, is gaining recognition worldwide. Validating the MIND diet in Türkiye contributes to this global effort, emphasizing the importance of nutrition in cognitive health and its potential impact on reducing the overall burden of chronic diseases. Türkiye, like many countries, is experiencing an aging population. With age often comes an increased risk of cognitive decline. Validating the MIND diet provides a strategic avenue for promoting healthy aging and maintaining cognitive function in Türkiye’s older demographic. Successful validation of the MIND diet in Türkiye could provide a valuable basis for the inclusion of MIND diet principles in national dietary guidelines. This integration would provide recommendations for the Turkish population to enhance cognitive health through dietary choices.

Table 3 Confirmatory factor analysis of the MIND diet’s Turkish version in healthy young adults

Fit statistic	Value	Criteria
Chi-square/Degree of Freedom (χ^2/df)	1.40	$1 \leq \chi^2/df \leq 3$
Root mean square approximation error (RMSEA)	0.045	≤ 0.06
Confirmatory-of-fit index (CFI)	0.950	≥ 0.90
Tucker–Lewis index (TLI)	0.942	≥ 0.90
Goodness-fit index (GFI)	0.940	≥ 0.90

Confirmatory factor analysis (CFA) was employed to rigorously validate and confirm the structural integrity of the adapted MIND Diet Adherence Scale, ensuring its reliability in the Turkish context

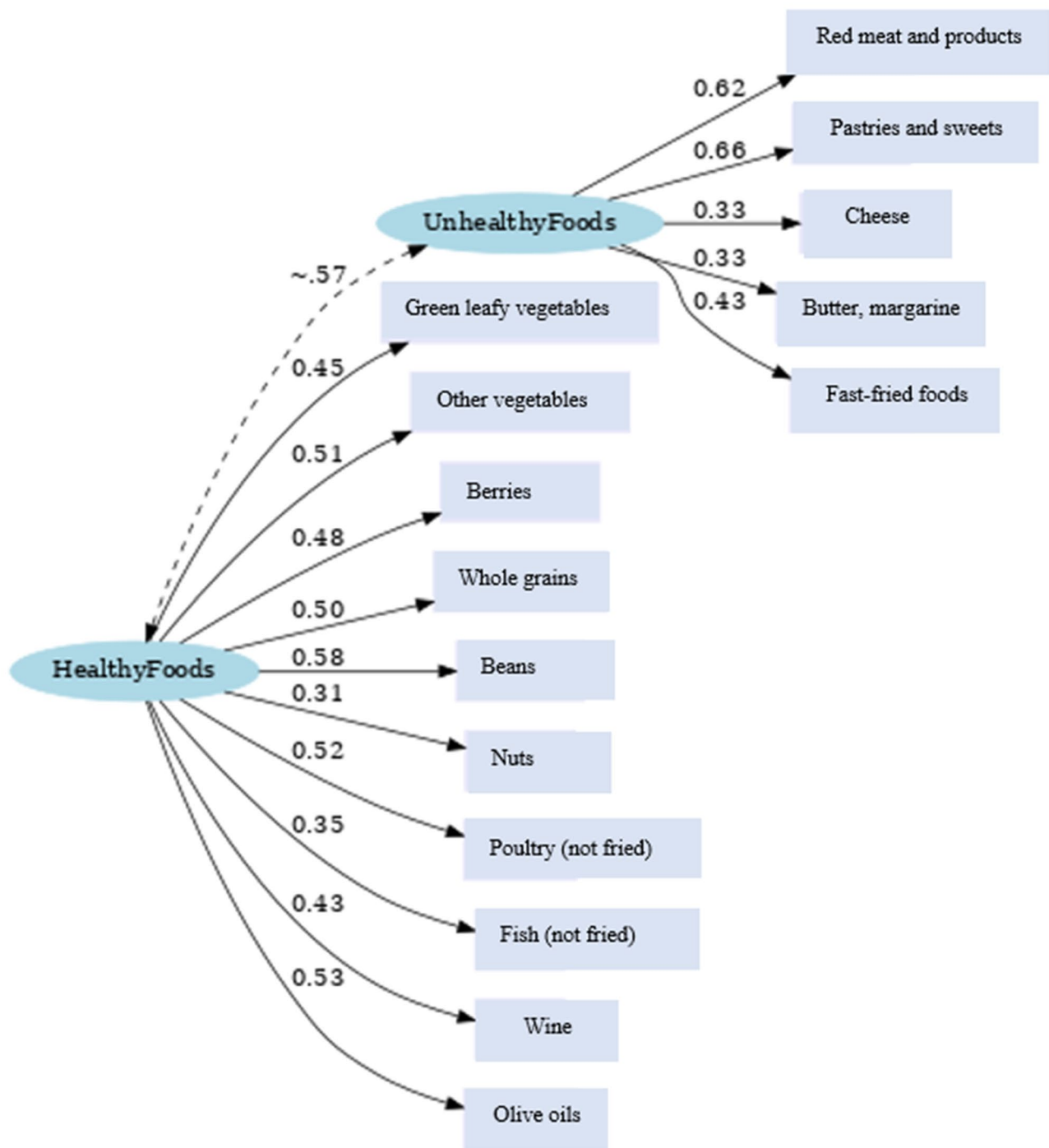


Fig. 1 Suitability of the two-factor model for the Turkish version of the MIND diet

Understanding and addressing cultural factors is crucial when adapting dietary assessments like the MIND diet for a specific population like Türkiye. Türkiye has a rich culinary heritage influenced by a combination of Middle Eastern, Mediterranean and Central Asian cuisines. It seems that in the adaptation process, the inclusion of traditional Turkish foods and ingredients that

align with the MIND diet principles may have been considered. Recognizing and incorporating familiar items into the scale might enhance its cultural relevance. Dietary habits in Türkiye often include the regular consumption of certain foods, such as olive oil, nuts, beans, and various fruits and vegetables. In the adaptation process, the popularity and accessibility of these foods in

Table 4 Internal consistency analysis of the MIND diet's Turkish version in healthy young adults

Items (English)	Adjusted Item-Total Score Correlation	Correlation Coefficients <i>r</i>	Cronbach's Alpha If Item Is Deleted
Healthy Foods			
Green Leafy Vegetables	0.419	0.858*	0.560
Other Vegetables	0.337	0.934*	0.574
Berries	0.184	0.980*	0.599
Nuts	0.259	0.614*	0.588
Olive Oils	0.336	0.848*	0.571
Whole Grains	0.125	0.756*	0.611
Fish (not fried)	0.320	0.584*	0.579
Beans	0.299	0.733*	0.582
Poultry (not fried)	0.175	0.973*	0.620
Wine	0.121	0.984*	0.615
Unhealthy Foods			
Butter, Margarine	0.287	0.923*	0.581
Cheese	0.121	0.964*	0.610
Red Meat and Products	0.283	0.886*	0.583
Fast-Fried Foods	0.216	0.722*	0.594
Pastries and Sweets	0.276	0.795*	0.584

* $p < 0.001$ (2-tailed). The internal consistency levels were measured using Cronbach's alpha coefficients and item-total correlations

Türkiye were likely taken into account, ensuring that the MIND diet recommendations resonate with the existing dietary patterns. The availability and accessibility of certain foods can vary across different regions of Türkiye. Considering these variations in food availability during the adaptation process is crucial to make the MIND diet practical and achievable for individuals across the country. Turkish meals typically consist of a variety of dishes served together. Although the culinary culture varies from region to region in Türkiye, all the foods contained in the MIND diet are available in all regions. For Türkiye, which has a culturally diverse cuisine, the content of the MIND diet is not far from the cultural sense. The adaptation process may have taken into consideration the customary meal structure and ensured that the MIND diet recommendations align with the traditional Turkish eating habits. This could include guidance on incorporating MIND-friendly foods within the context of a typical Turkish meal.

The translation process likely considered linguistic nuances to ensure that the MIND diet questions are clear, culturally sensitive and easily understood by the Turkish-speaking population. Language plays a significant role in conveying dietary concepts accurately.

Content validity was rigorously evaluated to ensure the scale's independence from external influences, its capacity to measure all desired dimensions and subdimensions accurately, and its expression of distinct concepts [29]. To determine the scale's factor structure,

a comparison was made with the original scale's factor arrangement. The study employed Bartlett's test of sphericity to investigate item correlations, a crucial prerequisite for factor analysis. Additionally, the adequacy of the sample size was assessed through the KMO test. A KMO value exceeding 0.50, as observed in this study (0.67), attests to the scale's sufficient sample size. Notably, the statistical significance of Bartlett's test of sphericity was confirmed. The Cronbach's alpha coefficient, indicating internal consistency, ranges from 0 to 1 [30, 31]. Proximity of this coefficient to 1 indicates the scale's high reliability. In this study, the Turkish adaptation of the MIND diet, consisting of 15 components, demonstrated the presence of two factors: healthy foods and unhealthy foods, in line with the original MIND diet studies. Notably, the factor loading, representing the association of each item with the total score, exceeded the recommended threshold of 0.30 [32, 33]. Some components (nuts, fish, cheese and butter, margarine) are close to 0.30. The significant prevalence of allergy to oilseeds in Türkiye may reduce the tendency towards nuts [34]. Türkiye is surrounded by seas on three sides and the dietary pattern in the interior and eastern regions of the country differs from the Mediterranean, Aegean and Black Sea regions. Nevertheless, the consumption of fish, dairy products and fat has increased over the years across Türkiye [35]. Although the data are homogenised across all regions, regional differences may have caused the items to converge to 0.30.

When adapting a scale to Turkish, maintaining the original factor structure is crucial. The CFA results, along with goodness-of-fit indicators ($\chi^2/df = 1.40$, RMSEA: 0.045, GFI: 0.940, TLI: 0.942 and CFI: 0.950), confirmed that the two-factor model was suitable for the Turkish data. This suggests that the structural integrity of the MIND diet scale was preserved during the adaptation process [36–38]. Türkiye exhibits regional diversity in terms of climate, geography and cultural practices, leading to variations in dietary habits. The adaptation process may have addressed these regional differences, ensuring that the MIND diet recommendations are applicable and acceptable across various regions of Türkiye. Cultural attitudes towards health and wellness play a role in dietary choices. The adaptation process may have considered how health is perceived in Türkiye, including cultural beliefs about the connection between diet and well-being. Aligning the MIND diet with culturally rooted health perspectives enhances its acceptability.

Average Variance Extracted (AVE) is a statistical indicator used in structural equation modeling to assess the proportion of variance explained by a construct, relative to the variance due to measurement error [39]. For a construct to be deemed valid, its AVE value is generally expected to be greater than 0.50 [40], meaning that

more than half of the variance in the observed variables is attributed to the construct itself. In addition to AVE, Composite Reliability (CR) is used to evaluate the internal consistency of the measurement [41]. In this study, the Average Variance Extracted (AVE) values for Healthy foods (0.475) and Unhealthy foods (0.495) are below the recommended threshold of 0.50, indicating that these factors do not fully capture the underlying constructs. However, the Composite Reliability (CR) values for both factors (Healthy foods: 0.718, Unhealthy foods: 0.598) show acceptable internal consistency, suggesting reliable measurements. The low AVE values may result from cultural and linguistic differences. For example, culturally, Turkey is characterized as a predominantly Muslim society, where the consumption of alcohol, including wine is viewed as unhealthy [42], cheese is seen as healthy [43], and red meat is considered beneficial due to its protein and iron content [44]. These cultural variations may have led to misinterpretations of certain scale items, impacting the AVE values.

The correlation between the Mediterranean diet and MIND diet adherence was assessed through correlation analysis, taking into consideration their similarities in measuring dietary patterns. The results revealed a robust and positive correlation between the Mediterranean Diet and the MIND Diet Adherence Scale. This indicates a strong association between adherence to these two dietary patterns in the study participants.

A reliability test was conducted to evaluate the consistency of individuals' responses to the scale items and the accuracy with which the desired trait was measured [29]. Cronbach's alpha scores below 0.50 suggest low reliability, scores between 0.50 and 0.80 suggest moderate reliability, and scores above 0.80 suggest high reliability [45]. The Cronbach's alpha coefficient for internal consistency of the Turkish version of the MIND diet scale was found to be 0.61. A positive correlation of scale items with the total score, exceeding 0.40, indicates that the scale can be utilized in its entirety, and no item removal is necessary. Examination of interrater consistency demonstrated statistically significant consistency in scale responses. In this study, the MIND dietary adherence scale was found to be moderately reliable. However, it still remains a useful tool for assessing adherence to the MIND diet in clinical and research settings. Potential variability in dietary recall and individual interpretation of food categories may contribute to measurement error, emphasising the importance of supplementing self-reported data with objective biomarkers whenever possible. Future studies could further improve its applicability by validating the scale in larger and more diverse populations.

In conclusion, while the MIND diet scale demonstrates promising psychometric properties among Turkish young adults, its application in clinical and occupational

settings remains underexplored. By emphasizing the role of the MIND diet in cognitive health, the study contributes to disease prevention, health promotion and the overall well-being of the Turkish population.

Limitations

The study focused on academic and administrative staff as well as students from Ankara University. Although the sample encompasses students and staff from different regions and socio-economic backgrounds, expanding the sample to include individuals from different professions will increase the generalizability of the findings. The study did not conduct a comprehensive analysis of regional differences in Türkiye, which may affect the concordance results. This limitation should be considered when interpreting the applicability of the findings to a wider population. The study did not extensively investigate external factors such as environmental influences, work-related stress or other lifestyle factors that could impact dietary habits. Considering a broader range of variables would offer a more comprehensive result. These factors may have contributed to variations in adherence to the MIND diet, potentially affecting the observed relationships. The predominance of women in the study sample (91%) limits the generalizability of the results to the general population of young adults.

The study primarily focused on a relatively healthy population without chronic diseases. This limits the applicability of the findings to clinical populations, where dietary patterns and cognitive health may be influenced by underlying medical conditions. Future research should explore the applicability of the MIND diet scale to clinical populations.

Another limitation of the study is the low Cronbach's alpha value (0.61). This indicates that the internal consistency of the scale is at a moderate level. While this suggests an acceptable reliability, it also suggests that this needs to improve.

The study primarily focused on a relatively healthy population without chronic diseases. This limits the applicability of the findings to clinical populations, where dietary patterns and cognitive health may be influenced by underlying medical conditions. Future research should explore the applicability of the MIND diet scale to clinical populations.

Abbreviations

BMI	Body Mass Index
CFI	Comparative Fit Index
CFA	Confirmatory Factor Analysis
CR	Composite Reliability
CVI	Content Validity Index
EFA	Exploratory Factor Analysis
KMO	Kaiser-Meyer-Olkin
MIND	Mediterranean-DASH Intervention for Neurodegenerative Delay
NFI	Normed Fit Index
RMSEA	Root Mean Square Error of Approximation

SD Standard Deviation
SPSS Statistical Package for the Social Sciences
TLI Tucker-Lewis Index
WHO World Health Organization

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Author contributions

Conceptualization: ÖE, NNAÇ, ÖNK, LB, AÖÖ. Data curation: ÖE, NNAÇ, ÖNK, LB, AÖÖ. Formal analysis: ÖE, NNAÇ, ÖNK, LB, AÖÖ. Funding acquisition: ÖE, LB. Methodology: ÖE, NNAÇ, ÖNK, LB, AÖÖ. Project administration: ÖE, LB. Visualization: ÖE, NNAÇ. Writing - original draft: ÖE, NNAÇ, ÖNK, LB, AÖÖ. Writing - review & editing: ÖE, NNAÇ, ÖNK, LB, AÖÖ. All authors reviewed, revised and approved the final manuscript, making important intellectual contributions.

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Data availability

All data generated or analysed during this study are used in this published article. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study protocol obtained ethical approval from the Research Ethics Committee of Ankara University (protocol number: 11/58; date: 24/10/2022), adhering to the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all study participants prior to their inclusion in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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