



# Taibah University

## Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

## Validity and reliability study of the Mediterranean Lifestyle Index: Turkish adaptation

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Received 26 June 2023; revised 1 February 2024; accepted 1 March 2024; Available online 12 March 2024



### المخلص

**أهداف البحث:** يعد مؤشر نمط الحياة للبحر الأبيض المتوسط أداة قياسية تستخدم لتقييم مدى التزام الفرد بنمط الحياة للبحر الأبيض المتوسط الصحي المعروف بفوائده المتعددة. ويميز هذا المؤشر عن غيره من المقاييس المماثلة أنه يجمع بين تقييم النظام الغذائي ونمط الحياة في تقييم واحد شامل.

**طرق البحث:** تم تطبيق استبانة على 300 فرد تتراوح أعمارهم بين 19 و 65 عاماً. تم أعيد تطبيق الاستبانة على 87 شخصاً شاركوا في البحث. أرسل الاستبيان، الذي تضمن معلومات عامة ومؤشر نمط الحياة للبحر الأبيض المتوسط ومعلومات عن القياسات الأنثروبولوجية، إلى مستخدمي منصة إلكترونية. تم تحويل المقياس إلى النموذج التركي المعمول به من قبل مجموعة خبراء. تم تقييم موثوقية إعادة الاختبار باستخدام معامل الارتباط داخل الطبقة. كما تم حساب معاملات كبا وتقديم رسوم بلاد-التمان لكل بند لتقييم الموثوقية.

**النتائج:** تم حساب متوسط درجات الاستبيان قبل وبعد إعادة التقييم، وبلغت  $14.5 \pm 3.68$  و  $14.3 \pm 3.81$  على التوالي. وبلغ معامل الارتباط البيئي (r) لاختبار موثوقية إعادة الاختبار 0.817.

**الاستنتاجات:** أكدت هذه الدراسة موثوقية وصحة النسخة التركية من مؤشر نمط الحياة للبحر الأبيض المتوسط. وتعد هذه أول دراسة تقوم بترجمة هذا المؤشر إلى لغة أخرى، مما يفتح المجال لتكييفه مع لغات أخرى مستقبلاً.

**الكلمات المفتاحية:** النظام الغذائي للبحر الأبيض المتوسط؛ نمط الحياة للبحر الأبيض المتوسط؛ الموثوقية؛ الصحة؛ التغذية

### Abstract

**Objective:** The Mediterranean Lifestyle Index (MEDLIFE) differs from similar scales in that it concurrently includes diet and lifestyle. The current study translated MEDLIFE into Turkish, and assessed its reliability and validity.

**Methods:** A questionnaire was administered to 300 individuals 19–65 years of age. The questionnaire was subsequently re-administered to 87 research participants. The questionnaire, asking for general information, MEDLIFE, and information regarding anthropometric measurements, was sent to the users of an online platform. The scale was converted into the applicable Turkish form by an expert group. Test-retest reliability was evaluated with the intra-class correlation coefficient (ICC). In addition, kappa coefficients (k) and Bland–Altman graphs were determined for each item to assess reliability.

**Results:** The mean scores before and after were  $14.5 \pm 3.68$  and  $14.3 \pm 3.81$ , respectively, and the intercorrelation coefficient r was 0.817 for test-re-test reliability.

**Conclusion:** The validity and reliability of the scale in the Turkish language was confirmed. This study is the first to translate MEDLIFE into another language and may aid in assessing the scale's adaptability to other languages. Food consumption record and physical activity record studies must be performed to ensure validity.

**Keywords:** Mediterranean diet; Mediterranean lifestyle; Nutrition; Reliability; Validity

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Peer review under responsibility of Taibah University.



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## Introduction

The main benefit of the Mediterranean diet is that it is an effective long-term eating plan that may offer an adequate and balanced diet consisting of various healthful foods. The Mediterranean diet is a dietary pattern that emphasizes the use of olive oil as the primary dietary fat source, and is characterized by a high intake of fruits, vegetables, whole grains, legumes, oil seeds, and olives. Low-to-moderate amounts of chicken, eggs, red meat, dairy products, and fish are also included.<sup>1</sup>

Many indices have been developed, such as the Mediterranean diet scale (MDS),<sup>2</sup> Italian Mediterranean Index (IMI),<sup>3</sup> rMed,<sup>4</sup> MedDietScore,<sup>5</sup> Lebanese Mediterranean Index (LMD),<sup>6</sup> Mediterranean Diet Scoring System to assess adherence to the Mediterranean diet pattern (MDSS),<sup>7</sup> Medi-Lite score,<sup>8</sup> and Mediterranean Diet Adherence Scale (MEDAS).<sup>9</sup> One of these indexes, the MEDLIFE, was created according to the principles of the Mediterranean Diet Pyramid (2011),<sup>1</sup> in line with current recommendations. MEDLIFE, developed by Sotos-Prieto et al., is a scale consisting of three blocks and including 28 items.<sup>10,11</sup> A survey is used to measure an individual's overall adherence to the healthy Mediterranean lifestyle.

The Mediterranean diet is important in Turkish society, because it is a nutritional model acknowledged to have global health benefits. Additionally, because it is considered a sustainable form of nutrition, the Mediterranean diet is increasingly being followed worldwide. A Turkish language validity and reliability study of MEDAS has been conducted.<sup>12</sup> However, in comparison to MEDAS, MEDLIFE has portion sizes considered to be more comprehensible by, and suitable to the eating patterns of, Turkish society. The MEDLIFE scale includes questions on lifestyle and physical activity. The importance of physical activity in the Mediterranean lifestyle should not be underestimated. Therefore, this study was aimed at investigating the MEDLIFE score's validity and reliability in the Turkish language.

## Materials and Methods

The necessary permissions for testing the validity and reliability of MEDLIFE were obtained from the Ethics Commission of Gazi University, at meeting number 12, dated 3 August 2021, "Ethics Commission Approval." The questionnaire was administered to individuals online. Text providing information regarding the study was placed before the start of the questionnaire, and participants were required to confirm having seen this text before answering the questionnaire.

### *Pilot study*

Three experts fluent in both Turkish and English translated the scale, which contains 28 items for language validity, into Turkish. The research team selected the most acceptable Turkish translations to create the final edition of the survey, which was then administered to ten experts to solicit feedback. The evaluation of the translation, including the meaning and spelling of the questions, was performed by people who had completed university/master's/PhD studies in the field of Nutrition and Dietetics. In this process, ten academics were

requested to rate each item in the following three categories: scope assessment (evaluation of 100 points); translated language assessment (evaluation of 100 points); and recommendation, if any. In accordance with professional advice and recommendations, the survey was completed before the pilot study. Two native Turkish speakers translated the questionnaires and then translated the final revised version back into English. A comparison of the questionnaire translated into English with the original version was made, according to expert opinions. The questions were further revised and corrected in line with the feedback (translation, spelling, and meaning) received from the participants in the pilot study. To assess the clarity of the questions, the final questionnaire was administered to five individuals, comprising two non-experts and three experts on the topic. After review of the recommendations, the version of the scale was finalized.

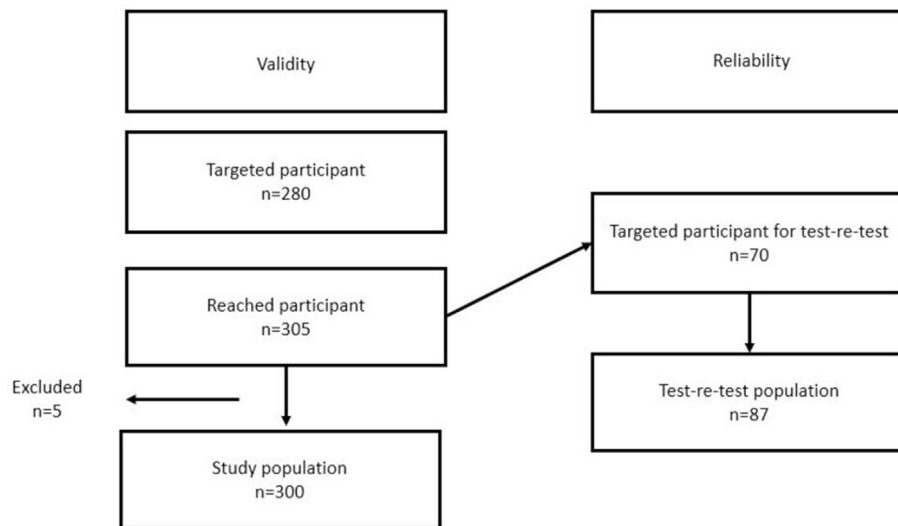
In line with the recommendations above, the word "group," which is more suitable for the Turkish language, was used instead of "block." The expression "turion," a food unique to Spain in the original scale, was removed from the question regarding dessert. "Pâté" was removed, because it is not a dish consumed in Turkey. Portion sizes specified as "units of processed meat" were translated as "number/piece." The portion size specified as "cup" in the questions regarding tea and wine was translated as "glass" and "wineglass," respectively. The final version of the scale was administered to five individuals, and incomprehensible expressions were revised to develop the finalized scale.

### *Study location, time, and sample*

This research was conducted between September 2021 and February 2022. Power analysis was used to determine the sample size, by using expected means with a 95% confidence interval and a 0.05 type I error. In methodological investigations, the sample size is recommended to be determined by considering items five to ten times the size of the scale, as also calculated through power analysis.<sup>13,14</sup> Although a sample size of 280 (28 items  $\times$  10) was necessary to achieve the desired study power, we initially enrolled 300 individuals to account for the risk of missing data. We planned to perform the test-re-test on 70 people, in line with the suggestion of allocating 25% of the sample specified in the methodological studies.<sup>13,14</sup> We initially enrolled 87 individuals, to account for the risk of missing data (Figure 1 near here).

### *Data collection tools*

The structured data collection form created by the researchers in Google Forms was delivered to the individuals via online platforms such as WhatsApp. People whose phone numbers were registered with the researchers as well as Ankara University students received the survey form. The inclusion criteria included Turkish individuals between the ages of 19 and 65 years. Neither non-Turkish individuals nor those outside the age range were included in the research. Participant names and surnames were verified in the informed consent form in the survey's introductory section, which stated that the survey was applicable only to Turkish-speaking residents of Turkey. The questionnaire form of the study included general information (including date of birth, education status,



**Figure 1:** Study population diagram.

employment status, occupation, and presence of disease); self-reported anthropometric information such as body weight and height; and the Turkish version of MEDLIFE.

#### *The Mediterranean Lifestyle Index*

MEDLIFE was developed by Sotos-Prieto et al.<sup>10,11</sup> The elements in the pyramid<sup>1</sup> are divided into three blocks comprising 28 items. In the first block, 15 items related to the frequency of food consumption (portions of sweets, red meat, processed meat, eggs, legumes, white meat, fish, seafood, and potatoes on a weekly basis; and low-fat dairy products, olives/oil seeds, and spices daily)/garnishes, fruits and vegetables, olive oil, and cereal/bread). In the second block, seven items are related to Mediterranean eating habits (consumption of water, wine, salt, whole grain products, snacks, and sugary beverage). In the third block, six items are related to physical activity, rest, and social habits. Items receive 0 or 1 points and are evaluated on a scale of 0 (worst) to 28 (best) points.<sup>10,11</sup> Through the survey, the individual's holistic adherence to the Mediterranean healthy lifestyle is measured. Although no cut-off exists for evaluating the scale, the evaluation is performed according to tertiles or quartiles.

#### *Statistical analysis*

The distribution of the data was evaluated with the Kolmogorov–Smirnov test, and the data did not show a normal distribution, on the basis of box plots and histograms. Reporting of the data as tertiles and medians aided in interpretation, given the absence of a normal distribution. Data were analyzed in the IBM SPSS® Statistics 22 program.

#### *Language validity*

The scale was first translated into Turkish by three experts. The final version of the questionnaire, which was created by choosing the appropriate expressions, was presented to the ten experts, and the questionnaire was subsequently revised. The edited Turkish form of the questionnaire was translated back into English by two experts. After the necessary corrections were made, the questionnaire was presented to the experts

again, to solicit opinions regarding content/scope validity. The scale was finalized according to the suggestions received.

The convergent validity Spearman correlation coefficient was used to evaluate the construct validity of the MEDLIFE.

#### *Reliability*

To test reliability, we calculated ICC by using test-re-test data. The word in-class analyses included repeated measures of the same variable. Simultaneously, kappa coefficients were determined, and Bland–Altman graphs were plotted for each item in the scale, to assess reliability. The Kappa coefficient gives reliability information by correcting the “luck matches” occurring because of chance.<sup>14</sup> In validation studies of dietary assessment tools, values of  $k$  from 0 to 0.20 indicate poor agreement, values from 0.21 to 0.40 indicate moderate agreement, values from 0.41 to 0.60 indicate moderate agreement, values from 0.61 to 0.80 indicate good agreement, and values from 0.81 to 1 indicate excellent agreement.<sup>15</sup> Bland Altman plots showed the difference between the estimates of the same score (MedDiet score) derived from the two methods versus the mean score from both methods, and were applied to evaluate the relationship between measurement error and true value, with a mean score of 0 indicating full agreement between the methods.<sup>16,17</sup>

## **Results**

#### *Descriptive statistics*

This study initially enrolled 300 individuals (87 for the test-re-test) to account for the risk of missing data. The data distribution was evaluated with the Kolmogorov–Smirnov test, and was determined not to be normal distribution, on the basis of box plots and histograms. In the original MEDLIFE validity study, descriptive data were given according to the tertiles obtained from the total MEDLIFE score; therefore, we evaluated the descriptive data in the same manner in our study. Additionally, because our data were not normally distributed, the 25th and 75th quartile values are given for each component, in addition to the median (Table 1 near here).

**Table 1: Descriptive findings for the participants.**

		Tertile 1 (n = 101)	Tertile 2 (n = 113)	Tertile 3 (n = 86)	p
		Median (25–75)	Median (25–75)	Median (25–75)	
Age (years)		32 (25–38)	34 (29–41)	32.5 (27–40)	0.108
Body weight (kg)		64.5 (58–75.5)	65 (57–75)	64 (55–73.25)	0.294
Height (cm)		166 (160–172)	165 (160–170)	165.5 (160–172.25)	0.897
BMI (kg/m <sup>2</sup> )		23.4 (21.47–26.37)	23.4 (21.39–26.39)	22.5 (20.65–20.09)	0.116
MEDLIFE total		11 (9–12)	14 (13–15)	17 (16.75–18.25)	0.000
Group 1		5 (4–6)	8 (6–8)	9 (8–11)	0.000
Group 2		3 (2–4)	4 (3–5)	5 (4–6)	0.000
Group 3		2 (1–3)	3 (2–3)	3 (3–5)	0.000
		<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>χ<sup>2</sup></b>
Gender	<b>Male</b>	24 (23.8)	22 (19.5)	17 (19.8)	<b>P</b> 0.703
	<b>Female</b>	77 (76.2)	91 (80.5)	69 (80.2)	0.704
Education	Elementary and below	3 (3.0)	3 (2.7)	4 (4.7)	4.408
	High school	8 (7.9)	13 (11.5)	8 (9.3)	0.622
	Graduate	68 (67.3)	78 (69.0)	51 (59.3)	
	Postgraduate	22 (21.8)	19 (16.8)	23 (26.7)	
Marital status	Married	57 (56.4)	60 (53.1)	49 (57.0)	0.372
	Single	44 (43.6)	53 (46.9)	37 (43.0)	0.830
Employment status	Yes	53 (52.5)	64 (56.6)	52 (60.5)	1.212
	No	48 (47.5)	49 (43.4)	34 (39.5)	0.545
Chronic disease state	Yes	36 (35.6)	38 (33.6)	22 (25.6)	2.382
	No	65 (64.4)	75 (66.4)	64 (74.4)	0.304
Drug use	Yes	19 (18.8)	26 (23.0)	11 (12.8)	3.361
	No	82 (81.2)	87 (77.0)	75 (87.2)	0.186
Nutritional supplement use	Yes	31 (30.7)	47 (41.6)	28 (32.6)	3.179
	No	70 (69.3)	66 (58.4)	58 (67.4)	0.204
Smoking status	Yes	17 (16.8)	25 (22.1)	15 (17.4)	1.161
	No	84 (83.2)	88 (77.9)	71 (82.6)	0.560
Alcohol consumption status	Yes	31 (30.7)	21 (18.6)	21 (24.4)	4.248
	No	70 (69.3)	92 (81.4)	65 (75.6)	0.120
BMI (kg/m <sup>2</sup> )	<25	65 (64.4)	72 (63.7)	65 (75.6)	3.739
	≥ 25	36 (35.6)	41 (36.3)	21 (24.4)	0.154

Abbreviation: BMI: body mass index.

**Table 2: Kappa values for each item in the two MEDLIFE applications.**

MEDLIFE Total	Criteria for 1 point 0–28	Before	%	After	%	Kappa	R	
		Yes		Yes				
		n		n				
Sweets	≤2 servings/week	45	51.7	37	42.5	0.543	0.000	
Red meat	<2 servings/week	49	56.3	47	54.0	0.721	0.000	
Processed meat	≤1 servings/week	67	77.0	68	78.2	0.637	0.000	
Eggs	2–4 servings/week	53	60.9	49	56.3	0.622	0.000	
Legumes	≥2 servings/week	52	59.8	48	55.2	0.578	0.000	
White meat	2 servings/week	50	57.5	49	56.3	0.414	0.000	
Fish/seafood	≥2 servings/week	20	23.0	20	23.0	0.610	0.000	
Potatoes	≤3 servings/week	62	71.3	54	62.1	0.641	0.000	
Low-fat dairy products	2 servings/day	27	31.0	30	34.5	0.401	0.000	
Nuts and olives	1–2 servings/day	50	57.5	44	50.6	0.493	0.000	
Herbs, spices, and garnish	≥1 servings/day	56	64.4	66	75.9	0.622	0.000	
Fruit	3–6 servings/day	25	28.7	26	29.9	0.418	0.000	
Vegetables	≥2 servings/day	52	59.8	48	55.2	0.531	0.000	
	Criteria for 1 point <sup>a</sup>		Before		After		Kappa	R
			Yes		Yes			
Olive oil	≥3 servings/day	43	49.4	45	51.7	0.540	0.000	
Cereals	3–6 servings/day	41	47.1	39	44.8	0.676	0.000	
Water or infusions	6–8 servings/day	44	50.6	43	49.4	0.563	0.000	
Wine (white/red wine)	1–2 portions/day	1	1.1	2	2.3	–0.16	0.877	
Limit salt in meals	Yes	59	67.8	63	72.4	0.726	0.000	
Preference for whole grain products	Yes	57	65.5	57	65.5	0.644	0.000	
Snacks	≤2 servings/week	59	67.8	58	66.7	0.400	0.000	
Limit snacking between meals	Yes	50	57.5	55	63.2	0.641	0.000	
Limit sugar in beverages	Yes	67	77.0	74	85.1	0.667	0.000	
Physical activity (>150 min/week or 30 min/d)	Yes	43	49.4	37	42.5	0.770	0.000	
Siesta/nap	Yes	23	26.4	20	23.0	0.537	0.000	
Hours of sleep	Yes	67	77.0	69	79.3	0.529	0.000	
Watching television	6–8 h/day	38	43.7	41	47.1	0.699	0.000	
Socializing with friends	≤1 h/day	46	52.9	40	46.0	0.680	0.000	
Collective sports	≥2 h/weekend	16	18.4	15	17.2	0.725	0.000	

<sup>a</sup> 0 points if these criteria are not met.

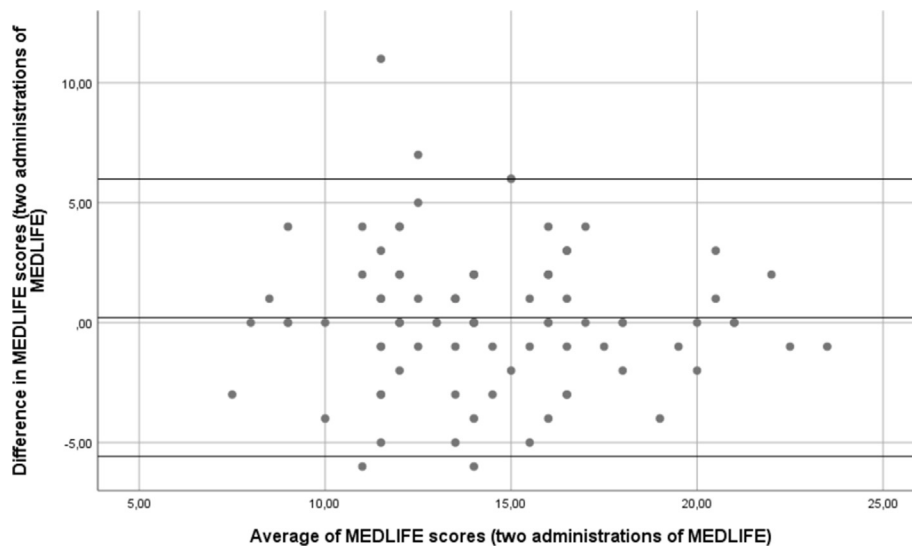
The convergent validity Spearman correlation coefficient was used to evaluate the construct validity of MEDLIFE. The correlation coefficient was expected to be high ( $r > 0.70$ ). In some cases, another scale measuring the same construct might not be available. Here, tests measuring a structure similar to the relevant structure were used, and a correlation coefficient between 0.50 and 0.70 was considered to provide sufficient evidence of validity.<sup>14</sup> Factor analysis was not used for assessing construct validity, because the scale was not suitable for factor analysis and was also not used in the original study.<sup>11</sup>

A test-retest analysis was applied to 87 participants to determine reliability. The median, and first and last quartile scores of the MEDLIFE application were comparable between tests (median 14.00, 25–75: 12–17,  $p < 0.001$ ). The correlation coefficient between the results obtained from the test-re-test method was accepted as an indicator of reliability. We evaluated test-retest results and internal consistency, and used the intercorrelation coefficient to determine the reliability of the scale. The ICC

value was  $R = 0.817$ , which was considered reliable (0.80–0.89 indicates moderate agreement).<sup>14,16,17</sup> Therefore, the kappa coefficients (Table 2) for each item and the Bland-Altman plot (Figure 1) of the total difference in scores were used to estimate the agreement between applications of the scale.

Kappa values for 28 items varied between  $-0.164$  and  $0.770$  ( $p < 0.001$ ). A total of 15 items (53.57%) had good agreement (0.61–0.80); 10 items (35.71%) (sweets, legumes, white meat, oil seeds, olives, fruit, vegetables, olive oil, water, and herbal teas), and lunchtime and bedtime habits, had moderate agreement (0.41–0.60); 2 items (7.14%) (low-fat dairy products and snack consumption) had moderate agreement (0.21–0.40); and 1 item (3.57%) (wine) had no agreement (Table 2 near here).

The calculation of the mean MEDLIFE score difference between MEDLIFE tests ( $0.21 \pm 2.95$ , 95% limit of agreement,  $-5.58$ ,  $5.99$ ) confirmed that the two MEDLIFE tests resulted in similar overall MEDLIFE scores (i.e., almost zero bias) (Figure 2 near here).



**Figure 2:** Bland Altman plots and limits of agreement for the total MEDLIFE score, as estimated by two administrations of MEDLIFE. The unbroken line indicates the mean bias, and the dashed lines indicate the limits of agreement. MEDLIFE, The Mediterranean Lifestyle Index.

## Discussion

The purpose of cross-cultural comparison is to compare the norms of the scales applied in other languages. Comparisons could be include, changeable according the scale, the mean score of the main scale, the cut-off point and the number of factors structures and item analyses. The cut-off point for MEDLIFE has not been determined, and is evaluated from low to high adherence on the basis of tertiles. Because the scale is structurally not suitable for factor analysis, factor analysis was not performed in the original study.

MEDLIFE was created to provide a questionnaire for evaluating adherence to a Mediterranean lifestyle, including food and physical exercise habits, as well as social contact. The Spanish Mediterranean food pyramid serves as the foundation for the MEDLIFE index. The 28-item MEDLIFE index includes questions regarding eating habits (fifteen items); traditional Mediterranean dietary practices (seven items); and physical activity, rest, and social engagement routines (six items).

Tools designed to capture lifestyle behaviors must crucially be validated before they are applied and expanded to the general population. This study was aimed at assessing the reliability and validity of a brief 28-item Turkish questionnaire measuring the Mediterranean eating practice and lifestyle.

The mean value,<sup>10</sup> which was 11.3 points in the original scale, was determined to be 14 points in our study. The difference in the score might have been because the original scale was applied to middle-aged people, whereas our study was conducted primarily in young people (median: 33; 27–40 years). Linear regression models and Spearman rank correlations were used to evaluate content validity and internal consistency. In the original MEDLIFE validity study, the correlation of the final composite score ( $r = 0.626$ ,  $p < 0.05$ )<sup>10</sup> between instruments showed moderate to good correlation. In our current study,  $r$  was

found to be 0.689 ( $p < 0.05$ ). These validity estimators were comparable to, or better than, those obtained in other studies,<sup>6,18–20</sup> including MEDAS<sup>6</sup> ( $r = 0.52$  between the questionnaire and the food frequency questionnaire), DQI-R<sup>18</sup> ( $r = 0.66$  between 7 day dietary record and food frequency questionnaire), Spanish dietary history (mean of seven 24-h recall dietary record,  $r = 0.53$ ),<sup>18</sup> Meats, Eggs, Dairy, Fried foods, fat In baked goods, Convenience foods, fats added at the Table, Snacks (MEDFACTS)<sup>17</sup> ( $r = 0.50$  by block correlations, except for total fat intake,  $r = 0.30$ ).

The original reliability study of the scale was assessed by administration of the 28-item MEDLIFE questionnaire and a 142-item validated questionnaire (full-Q) to 196 adults (mean age  $41.4 \pm 9.2$  years) living in Madrid, Spain. Reliability was evaluated with Kappa ( $k$ ) statistics, ICCs, and limits of agreement. The two instruments' overall correlation was 0.626. With an ICC of 0.544, MEDLIFE was able to rank participants by the full-Q result generated from MEDLIFE.<sup>11</sup> In our study, test-retest results and internal consistency were evaluated with the intercorrelation coefficient to test the reliability of the scale. The ICC value,  $R = 0.817$ , was in the moderate range of agreement and was considered reliable.<sup>14</sup> Despite the accepted use of correlations to assess reliability in the analysis of diet validation methods, additional assessments are supportive, because they provide a limited measure of the agreement between measures. Therefore, a Bland Altman graph was plotted for the kappa coefficient and total difference in score for each item, to predict the agreement between applications of the scale. Whereas 53.57% of the 28 items showed good agreement, and 41.85% showed moderate agreement, no agreement was observed for the item with only the wine question. The consumption of wine in the Mediterranean diet is considered inappropriate in our country, because of cultural differences. The calculation of the mean MEDLIFE score difference between MEDLIFE

tests ( $0.21 \pm 2.95$ , 95% limit of agreement,  $-5.58, 5.99$ ) confirmed that the two MEDLIFE tests resulted in similar overall MEDLIFE scores (i.e., almost zero bias), and the scale was found to be reliable in Turkish.

### Strengths and limitations

The primarily study limitation relates to the amount of alcohol consumed by individuals in Turkish society. On the basis of the responses provided to the study's alcohol question, the Kappa value was  $-0.16$  ( $R = 0.877$ ). The question was retained on the scale because alcohol consumers were included in the study sample. Because people's consumption varies by season, the lack of application of MEDLIFE questions in different seasons, and the lack of evaluation in this regard are also study limitations. Moreover, the lack of evaluation of food consumption records and physical activity forms is among the limitations of the study.

The strength of this study is that it provides the first evaluation of the Turkish validity of the MEDLIFE scale and the reliability of the items, to our knowledge. Because this work represents the first translation of the scale into another language, it may guide translation of the scale into other languages.

### Conclusion

In this study, the validity and reliability of the scale in Turkish was evaluated, thus supporting the validity and reliability of MEDLIFE as a scale that can be applied to Turks. This work may guide the evaluation of the scale's validity and reliability in other languages. MEDLIFE's brevity and utility allow it to serve as a therapeutic tool to assess dietary adherence or as an educational tool to promote the Mediterranean eating pattern.

### Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not for-profit sectors.

### Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Ethical approval

No ethical issues are relevant to this work.

### Author contributions

OC and EC designed the study; conducted research; and wrote, collected, and organized data. YA organized the work and wrote the final draft of the article. All authors have

critically reviewed and approved the final draft, and are responsible for the content and similarity index of the manuscript.

### References

- Bach-Faig A, Berry EM, Lairon D, Reguant J, Trichopoulou A, Dernini S, et al. Mediterranean diet pyramid today. Science and cultural updates. *Public Health Nutr* **14**(12A), **2010**: 2274–2284.
- Trichopoulou A, Costacou T, Bamia C, Trichopoulos D. Adherence to a Mediterranean diet and survival in a Greek population. *N Engl J Med* **2003**; 348(26): 2599–2608.
- Agnoli C, Grioni S, Sieri S, Palli D, Masala G, Sacerdote C, et al. Italian Mediterranean Index and risk of colorectal cancer in the Italian section of the EPIC cohort. *Int J Cancer* **2013**; 132(6): 1404–1411.
- Buckland G, Agudo A, Luján L, Jakszyn P, Bueno-de-Mesquita HB, Palli D, et al. Adherence to a Mediterranean diet and risk of gastric adenocarcinoma within the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort study. *Am J Clin Nutr* **2010**; 91(2): 381–390.
- Panagiotakos DB, Pitsavos C, Stefanadis C. Dietary patterns: a Mediterranean diet score and its relation to clinical and biological markers of cardiovascular disease risk. *Nutr Metabol Cardiovasc Dis* **2006**; 16(8): 559–568.
- Schröder H, Fitó M, Estruch R, Martínez-González MA, Corella D, Salas-Salvadó J, et al. A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. *J Nutr* **2011**; 141(6): 1140–1145.
- Monteagudo C, Mariscal-Arcas M, Rivas A, L.Lorenzo-Tovar M, Tur JA, Olea-Serran F. Proposal of a Mediterranean diet serving score. *PLoS One* **2015**; 10(6):e0128594.
- Sofi F, Dinu M, Pagliai G, Casini A, Marcucci R. Validation of a literature-based adherence score to Mediterranean diet: the MEDI-LITE score. *Int J Food Sci Nutr* **2017**; 68(6): 757–762.
- León-Muñoz LM, Guallar-Castillón P, Graciani A, López-García E, Mesas AE, Aguilera MT, et al. Adherence to the Mediterranean diet pattern has declined in Spanish adults. *J Nutr* **2012**; 142(10): 1843–1850.
- Sotos-Prieto M, Moreno-Franco B, Ordovás JM, León M, Casasnovas JA, L.Peñalvo J. Design and development of an instrument to measure overall lifestyle habits for epidemiological research: the Mediterranean Lifestyle (MEDLIFE) index. *Publ Health Nutr* **2015**; 18(6): 959–967.
- Sotos-Prieto M, Santos-Beneit G, Bodega JL, Pocock S, Mattei J, Peñalvo JL. Validation of a questionnaire to measure overall Mediterranean lifestyle habits for research application: the MEDiterranean LIFEstyle index (MEDLIFE). *Nutr Hosp* **2015**; 32(3): 1153.
- Pehlivanoğlu EFÖ, Balcioglu H, Ünluoğlu İ. Akdeniz diyeti bağlılık ölçeği'nin türkçe'ye uyarlanması geçerlilik ve güvenilirliği. *Osmangazi Tıp Dergisi* **2020**; 42(2): 160–164.
- Lin CY, Hou WL, Tseng YH, Lin ML, Griffiths MD. Validity, reliability, and cross-validation of a new questionnaire developed using the theory of planned behavior: the dating violence bystander help-giving intention questionnaire (DVBHIQ). *Heliyon* **2023**; 9(9):e19706.
- Büyüköztürk S. Faktör analizi: temel kavramlar ve ölçek geliştirmede kullanımı. *Kuram ve uygulamada eğitim yönetimi* **2002**; 32(32): 470–483.
- Altman DG. *Practical statistics for medical research*. CRC Press; 1990.
- Altman DG, Bland JM. Statistics notes: quartiles, quintiles, centiles, and other quantiles. *BMJ* **1994**; 309(6960): 996.

17. Bland JM, Altman D. Statistical methods for assessing agreement between two methods of clinical measurement. **Lancet** **1986**; 327(8476): 307–310.
18. Guallar-Castillón P, Sagardui-Villamor J, Balboa-Castillo T, Sala-Vila A, Ariza Astolfi MJ, Sarrion Pelous MD, et al. Validity and reproducibility of a Spanish dietary history. **PLoS One** **2014**; 9(1):e86074.
19. Mochari H, Gao Q, Mosca L. Validation of the MEDFICTS dietary assessment questionnaire in a diverse population. **J Am Diet Assoc** **2008**; 108(5): 817–822.
20. Newby P, Hu FB, Rimm EB, Smith-Warner SA, Feskanich D, Sampson L, et al. Reproducibility and validity of the Diet Quality Index Revised as assessed by use of a food-frequency questionnaire. **Am J Clin Nutr** **2003**; 78(5): 941–949.

**How to cite this article:** Cemali Ö, Çelik E, Akdevelioğlu Y. Validity and reliability study of the Mediterranean Lifestyle Index: Turkish adaptation. *J Taibah Univ Med Sc* 2024;19(2):460–467.