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Development, validity and reliability of the healthy lifestyle behavior scale

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Abstract

Background Healthy lifestyle behaviors encompass activities aimed at promoting, maintaining, or reclaiming health. Evaluating these behaviors accurately requires comprehensive, valid, and reliable tools.

Aims This study aimed to develop the Healthy Lifestyle Behavior Scale and evaluate its psychometric properties in the Turkish population.

Methods For this methodological research, a cross-sectional online-based survey was conducted between 21 March 2023 and 31 March 2023 among 330 participants who were recruited via convenience sampling. The initial item pool included 90 items across seven domains (exercise, health responsibility, preventive health actions, sleep, stress and social support, nutrition, smoking, and alcohol). The content validity of the scale was verified by taking expert opinions. Construct validity and reliability were assessed using principal component analysis (PCA) and Cronbach's alpha.

Results A total of 330 people were recruited for the study (65.2% female, mean age 34.2 ± 9.4 years). The final scale comprised 34 items: 5 on exercise, 4 on health responsibility, 4 on preventive health actions, 2 on sleep, 5 on social support, 3 on stress management, 5 on nutrition, 4 on smoking and 2 on alcohol. The construct validity analysis revealed a 9-factor structure explaining 62.35% of the variance (Kaiser–Meyer–Olkin value = 0.807). Internal consistency was confirmed with Cronbach's alpha (α = 0.863 for the scale, > 0.7 for subscales) and high item-total correlation.

Conclusions Our newly developed Healthy Lifestyle Behavior Scale demonstrated good validity and reliability. It outperformed existing scales, boasting higher alpha values for subfactors and explained variance. This scale is a robust tool for assessing healthy lifestyle behaviors in adults.

Keywords Healthy lifestyle behavior · Validity · Reliability · Scale · Adults

1 Introduction

People's lifestyles and choices affect their risk of developing many noncommunicable diseases, such as cancer, heart disease, stroke and diabetes [1]. It is known that many chronic diseases that cause high morbidity and mortality in the world and in our country, which also impose serious burdens on the insurance institutions of the countries and create high disability-adjusted life years (DALYs) and quality-adjusted life years (QALYs), can be prevented by the implementation of healthy lifestyle behaviors [2]. In 2019, noncommunicable diseases accounted for 74% of deaths worldwide, 88% in high-income countries and 90% in Türkiye [3, 4].

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Healthy lifestyle behaviors are considered to be any activity undertaken to promote, maintain or regain health. Behavioral changes made through such activities continue to be an important element of health promotion [5]. It is known that the healthy lifestyle behaviors exhibited by individuals are affected by many factors, such as age, sex, educational status, socio-economic status and chronic diseases [6, 7].

Healthy lifestyle behaviors, physical activity, personal responsibility, sleep, stress and social support, nutrition, smoking and alcohol use are the main elements in our scale development study. Healthy lifestyle behaviors such as regular physical activity, healthy eating, sleeping 7–8 h a day, and maintaining weight control reduce the risk of mortality [8]. It has been proven that regular physical activity improves health-related quality of life, contributes to the management of chronic diseases, prevents weight gain and is beneficial for mental health and cognitive functions [9]. Personal health responsibility is the behavior that an individual should perform to maintain physical, mental and social well-being. However, to fulfill this responsibility, information and social support and all necessary facilities must be provided by health providers and non-governmental organizations [10]. Sleep has an important role in supporting mental health [11]. Insufficient sleep leads to depressive mood, increased anxiety, obesity and loss of attention [12]. Stress is a situation whose severity varies according to personal perception and causes physical and mental discomfort and tension depending on various factors [13]. Stress leads to different conditions, such as musculoskeletal and sleep problems and myocardial ischemia [14, 15]. According to the 2020 World Health Organization (WHO) guidelines, there are behavioral recommendations for combating stress, being in contact with the environment in accordance with one's own values, and behavioral recommendations against situations that cause stress [16]. For nutrition, according to the CINDI guidelines developed by the WHO, for plant-based nutrition, products with low sugar content and daily salt consumption should not exceed one teaspoon (6 g), alcohol consumption should not exceed 20 g per day, and food in a safe hygienic environment; it is recommended to cook by steaming or boiling [17]. Smoking may negatively affect people's health [18]. In 2020, 22.3% of the global population were smokers, and there were more than 8 million smoking-related deaths in 2019 [19, 20]. Harmful use of alcohol, a toxic and psychoactive substance, is responsible for 5.1% (7.1% for men; 2.2% for women) of the global burden of disease [21].

To obtain more accurate and valid information on health prevention initiatives, it is necessary to evaluate the health behaviors of individuals with valid and reliable tools suitable for their culture. Walker et al. (1987) developed the 'Healthy Lifestyle Behaviors Scale' based on Peder's health promotion model. The first version of the Health-Promoting Lifestyle Profile consists of 48 items and six factors (self-actualization, health responsibility, exercise, nutrition, interpersonal support, and stress management) [22]. The scale was reworked and revised in 1996 and named the Health-Promoting Lifestyle Profile II, which consists of 52 items and six factors (spiritual growth, interpersonal relations, nutrition, physical activity, health responsibility, and stress management) [23]. Recommendations on healthy lifestyle behaviors are changing according to researches, and guidelines are being updated. Therefore, the scales we use to measure healthy lifestyle behaviors should be based on up-to-date information. Accordingly, there is a need for a scale that includes all aspects of healthy living behaviors and is based on up-to-date information. The validity and reliability of the actual scales were found to be high, but this scale does not include important issues such as sexual health, dental health, smoking and alcohol use, vaccinations and screening programs. Many studies in the literature have focused on these points and emphasized the negative health outcomes in these issues [16, 17, 24, 25].

We carried out this study due to the need for a new scale based on current information in line with guidelines, directives, and studies on actual health behaviors that is generalizable to the population and includes all aspects of healthy lifestyle behaviors. The target of this study was to develop a brief, easy-to-use, easy-to-interpret scale with good psychometric properties that is based on current knowledge and includes many aspects of healthy living behaviors.

This study aimed to develop the Healthy Lifestyle Behavior Scale, investigate its psychometric properties and evaluate its validity and reliability. In addition, as a secondary aim, we wanted to evaluate the relationships between sociodemographic factors and healthy lifestyle behavior scale, which have been shown to be valid and reliable, as a standard exploration of the participants.

2 Materials and methods

2.1 Study design and sampling

For this methodological research, a cross-sectional online-based open survey was conducted with 330 participants between 21 March 2023 and 31 March 2023. The target population and inclusion criteria consisted of Turkish citizens aged 18–65 years with internet access, who were users of WhatsApp and/or Instagram, literate Turkish and willing to

participate in the study. The study setting was online, utilizing social media platforms for participant recruitment and data collection. Study data were collected through the LimeSurvey platform. The survey consisted of two pages; The first page of the survey consisted of 18 questions (demographic, socioeconomic, and characteristic) and the second page consisted of a 59-item scale. The usability and technical functionality of the electronic questionnaire were tested by the researchers before the survey was administered; these tests were not included in the data. Participants received the survey link via WhatsApp and Instagram applications. The data were obtained by the researchers by distributing the questionnaires to various groups on the specified platforms.

Researchers shared stories and posts from their own social media accounts (WhatsApp, Instagram) and distributed the survey link to groups they were part of or could reach. Participation in the survey was voluntary and open to anyone over the age of 18 who could read and understand Turkish. Any incentives were not offered to participants (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results). An information form was included at the beginning of the questionnaire. The respondents were informed about the aim of the study and the study, confidentiality/anonymity of the data, the number of questions and the estimated completion time of the survey at the beginning of the survey. The survey questions were displayed in the same order for each participant. To submit the questionnaire, all questions had to be answered. The respondents were able to review and change their answers with a back button. Only the data of the respondents who completed the questionnaire were included. Although the total reach of the posts is unknown, 465 people clicked on the link and viewed the first page of the survey. Of these, 330 respondents gave a complete response (response rate 71.0%). To prevent duplicate participation, "cookie usage" was selected in the survey interface. In addition, at the beginning of the survey, respondents were instructed to participate only once.

The general recommendation for sample size in the guidelines is a ratio of approximately 5 to 10 subjects per item up to approximately 300 subjects [26]. Since the candidate scale contains 59 questions, the sample size was determined to be 300 participants. Data collection ended with 330 participants using the convenience sampling method. Convenience sampling was employed because of its ease of access and time-saving benefits.

2.2 Survey development

2.2.1 Item creation and internal validity evaluation

The authors conducted a literature review for item generation and scale constructs. The WHO guidelines and directives were taken into consideration when creating the items in the newly developed scale. At this stage, 90 items were created for the 7 constructs of the pooled scale (Exercise, Health Responsibility, Preventive Health Actions, Sleep, Stress and Social Support, Nutrition, Smoking and Alcohol).

The questionnaire created in the subdimensions of exercise, health responsibility, preventive health actions, sleep, stress and social support, nutrition, smoking and alcohol was adjusted according to a 5-point Likert scale. (0: never 1: rarely, 2: sometimes, 3: often, 4: always; if it is a negative statement, 0: always 1: often, 2: sometimes, 3: rarely, 4: never (if it is a positive statement, 1: never 2: rarely, 3: sometimes, 4: often, 5: always; if it is a negative statement, 1: always 2: often, 3: sometimes, 4: rarely, 5: never).

The internal validity of the questions was analyzed by the content validity ratio (CVR) and content validity index (CVI). The scale was sent to 30 experts via e-mail or the face-to-face method. Sixteen expert opinions were received. These were experts in internal medicine, psychiatry, psychology, nutrition and dietetics, and nursing.

To determine the CVR, the experts were asked for their opinions using a three-point scale (appropriate, appropriate but not necessary, unnecessary) for each item.

The following formula was applied to determine the CVR.

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

In the formula, N is the total number of experts, and n e is the number of experts who selected the main item. The Lawshe technique was used to evaluate the content validity ratio (CVR).

According to the Lawshe technique, a minimum CVR of 0.500 and above was considered appropriate for an evaluation with 16 experts ($p < 0.05$) [27].

The content validity index (CVI) was assessed after CVR.

The CVI was calculated with the following formula:

$$\text{CVI} = \frac{\text{The number of experts giving a rating of '3' or '4'}}{\text{Total number of experts}}$$

The criterion for the content validity of the items was set. Items were considered adequate if there was > 79% agreement, questionable if there was 70–79% agreement, and unacceptable if there was < 69% agreement [28].

After content validity analyses, the first scale to be applied to the participants was determined.

2.2.2 Construct validity

Principal component analysis (PCA) was applied to demonstrate the construct validity of the following constructs: exercise, health responsibility, preventive health action, sleep, stress and social support, nutrition, smoking and alcohol. Principal component analysis (PCA) was used to identify items and constructs. After exploratory factor analysis (EFA), the validation of the constructs and items was tested. Eigenvalues greater than 1 were accepted for factor identification in PCA. Items with factor loadings < 0.4 or factor loading differences < 0.1 were excluded. The Kaiser—Meyer—Olkin (KMO) value was 0.807, and Bartlett's test was statistically significant ($p < 0.001$).

2.2.3 Reliability

Cronbach's alpha coefficient and the item-rest correlation were used to evaluate the internal consistency of the scale and subdimensions.

2.2.4 Other variables

The demographic variables included age, sex, height and weight. The body mass index (BMI) of the participants was calculated using self-reported weight and height (kg/m^2), and participants were grouped as normal weight (≤ 25), overweight or obese (≥ 25) according to BMI values. Participants were asked to indicate marital status as married or single and having children as yes or no. Participants were asked about their education level (high school or less or university or high). Employment status was evaluated in three groups: working, not working and retired. Income status was evaluated in three groups considering local minimum income limits: < 9,000 Turkish Liras (TL), 9,001–18,000 TL and > 18,000 TL. Participants were asked whether they had a known chronic disease and regular medication use due to a disease. If they had chronic disease, they were asked to specify whether they had hypertension, diabetes, coronary artery disease or other disease. Participants were asked "how many days in the last 7 days in total they had been physically active for at least 60 min a day" by defining physical activity, and the physical activity day value was evaluated as a numerical variable. The self-rated health status of the participants was evaluated by answers of excellent, good, fair and poor to the question "How do you think your health is?". Responses were grouped as excellent/good or fair/poor.

The Cantril ladder method was used to measure life satisfaction. The measure is presented pictorially as an 11-point ladder from 0 to 10, with 10 points indicating 'the best possible life' for the individual and 0 points indicating 'the worst possible life'. Participants were asked, "Where do you feel you are standing on the ladder right now?" and asked to answer. According to the participants' answers to the life satisfaction question, values of 7 and above were grouped as high life satisfaction. For quality of life, participants were asked to score between 0 and 100. A score of 100 indicates "great quality of life", "95 almost great quality of life", "85 very good quality of life", "70 good quality of life", "60 moderately good quality of life", "40 somewhat poor quality of life", "30 poor quality of life", "15 very poor quality of life", and 0 indicates "extremely poor quality of life". Participants were asked, "At what level do you currently feel your quality of life is?" and asked to answer. According to the participants' answers to the quality of life question, they were grouped as high quality of life (70 and above) or very high quality of life (85 and above).

2.3 Statistical analysis

The Statistical Package for the Social Sciences version 21.0 for Windows (IBM Corp., Armonk, NY, USA), Jamovi 2.3.18 and Microsoft Office Excel were used for data evaluation and analysis. Categorical variables were presented as frequencies (n) and percentages (%), and numerical variables were presented as the mean ± standard deviation (SD) and median (interquartile range (IQR)). The Kolmogorov–Smirnov test was applied to evaluate the normal distribution of continuous variables. Univariate hypothesis tests were applied to compare the scale scores according to demographic and socio-economic factors. Independent samples t test was used to compare scale scores between two independent groups; one-way ANOVA was used to compare scale scores between more than two independent groups. The Mann–Whitney U test was used to compare each item score between the 27% lower–upper groups. Principal component analysis, Cronbach's alpha and Spearman's correlation analysis were used for validity and reliability. A p value < 0.05 was accepted for statistical significance.

3 Results

3.1 Demographic characteristics

A total of 330 people participated in the study, and most of the participants (65.2%) were female. The mean participant age was 34.2 ± 9.4 years. The mean BMI was 24.9 ± 4.2, and 54.2% of the participants had a BMI < 25. A total of 61.5% of the participants were married, 52.7% had children, 85% were university graduates, and 76.1% were employed. Most of the participants (68.8%) had an income of 18,000 TL or above. A total of 21.2% of the participants had a chronic disease, and 18.2% were taking regular medication. Hypertension was reported by 4.8%, diabetes mellitus by 2.4%, coronary artery disease by 2.1% and other chronic diseases by 18.8%. A total of 53.6% of the participants described their health status as excellent-good. Of the participants, 50.6% reported high quality of life, 17% reported very high quality of life, and 53% reported high life satisfaction.

3.2 Content validity analysis

The scale pool consisted of 90 items. In the content validity analyses, 59 items that met the content validity ratio (CVR) ≥ 0.50 and content validity index (CVI) > 79% criterion remained in the scale. Of the 59 items, 7 were related to exercise, 13 to health responsibility, preventive health actions, 7 to sleep, 10 to stress and social support, 13 to nutrition, 5 to smoking and 4 to alcohol.

3.3 Construct validity analysis

Exploratory factor analysis (EFA) was applied for construct validity. The Kaiser–Meyer–Olkin (KMO) index was 0.807, Bartlett's test was significant (p < 0.001), and the total variance explained by the 9-factor structure was 62.35.

Exploratory factor analysis (EFA) revealed a 9-factor structure. The items designed as personal responsibility constructs were divided into two different constructs. The stress and social support constructs were divided into two different constructs. The 25 items with low factor loadings (< 0.4), factor loading differences < 0.1 and loadings of two factors were removed. A 9-factor structure consisting of 34 items was obtained. Of the 34 items, 5 were exercise, 8 were personal health responsibility (4 were evaluated as health responsibility, 4 were evaluated as preventive health actions in different constructs), 2 were sleep, 5 were social support, 3 were stress management, 5 were nutrition, 4 were smoking and 2 were alcohol (Table 1). The difference between the groups with the highest score of 27% and the lowest score of 27% in all 34 items (Table 2).

3.4 Reliability analysis

The scale subscales had good reliability results. The Cronbach's alpha value was 0.863 for the scale and above 0.7 for the subscales. The item-rest correlation and Cronbach's alpha values of the subscales are presented in Table 3.

Table 1 Results of principal component analysis for healthy lifestyle behavior scale

Construct	Item	Factor loading								
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
Health responsibility	PHR1	0.887								
	PHR3	0.821								
	PHR4	0.762								
	PHR2	0.678								
Smoking	S3		0.923							
	S2		0.922							
	S5		0.708							
	S1		0.675							
Exercise	E6			0.714						
	E2			0.706						
	E5			0.681						
	E7			0.673						
	E1			0.633						
Nutrition	N10				0.750					
	N5				0.664					
	N6				0.644					
	N11				0.582					
	N7				0.534					
Social Support	SS1					0.804				
	SS2					0.687				
	SS5					0.639				
	SS3					0.474				
	SS4					0.433				
Preventive health actions	PHR9						0.745			
	PHR8						0.701			
	PHR7						0.645			
	PHR10						0.622			
Stress management	SM10							0.811		
	SM9							0.723		
	SM8							0.706		
Alcohol	A4								0.883	
	A2								0.871	
Sleep patterns	SP2									0.859
	SP3									0.837

PHR: Personal health responsibility; S: Smoking; E: Exercise; N: Nutritional; SS: Social support; SM: Stress management; A: Alcohol; SP: Sleep pattern

There was a significant correlation above 0.30 between the total scale score and the other subcategories except alcohol. There was a very weak correlation between alcohol and the total score of the scale ($r = 0.14$, $p = 0.01$). When the relationship between alcohol and other subcategories was analyzed, a significant and very weak relationship was found with smoking ($r = 0.20$, $p < 0.01$).

3.5 Scale scoring

To develop a 0–100 point scale, never (0), rarely (1), sometimes (2), often (3), and always (4) points were accepted. The item scores were summed, divided by the total number of items and multiplied by 25 to obtain a scale scored in the range of 0–100 points. For the factors, the scores of the items loaded on the factor were summed, divided by the number of items in each factor and multiplied by 25 to obtain factor scores in the range of 0–100 points.

Table 2 Evaluation of the difference between the groups with the HBLS score lowest 27% and highest of 27%

Construct	Item	HLBS score				p value[1]
		Lowest 27%		Highest 27%		
		Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	
Health responsibility	PHR1	3.17 ± 1.18	3 (2–4)	4.47 ± 0.71	5 (4–5)	< 0.001
	PHR2	3 ± 1.05	3 (2–4)	4.55 ± 0.66	5 (4–5)	< 0.001
	PHR3	3.01 ± 1.26	3 (2–4)	4.5 ± 0.64	5 (4–5)	< 0.001
	PHR4	2.55 ± 1.16	2.5 (2–3)	4.19 ± 0.93	4 (4–5)	< 0.001
Smoking	S1	3.45 ± 1.86	5 (1–5)	4.57 ± 1.1	5 (5–5)	< 0.001
	S2	2.39 ± 1.51	2 (1–3)	4.17 ± 1.35	5 (4–5)	< 0.001
	S3	2.22 ± 1.47	2 (1–3)	4.15 ± 1.39	5 (4–5)	< 0.001
	S5	2.88 ± 1.66	3 (1–5)	4.28 ± 1.3	5 (4–5)	< 0.001
Exercise	E1	1.8 ± 0.9	2 (1–2)	2.89 ± 1.27	3 (2–4)	< 0.001
	E2	3.13 ± 1.34	3 (2–4)	4.47 ± 0.77	5 (4–5)	< 0.001
	E5	3.15 ± 1.36	3 (2–4)	4.45 ± 0.86	5 (4–5)	< 0.001
	E6	2.16 ± 1.15	2 (1–3)	3.42 ± 1.14	3 (3–4)	< 0.001
	E7	3.69 ± 1.23	4 (3–5)	4.68 ± 0.62	5 (4.5–5)	< 0.001
Nutrition	N5	2.94 ± 1.23	3 (2–4)	3.9 ± 1.17	4 (3–5)	< 0.001
	N6	3.02 ± 1.24	3 (2–4)	4.2 ± 1	4.5 (4–5)	< 0.001
	N7	2.2 ± 1.05	2 (1–3)	3.18 ± 1.19	3 (2–4)	< 0.001
	N10	2.61 ± 1.26	3 (2–3)	4.03 ± 1.09	4 (3–5)	< 0.001
	N11	2.62 ± 1.24	2 (2–4)	4.1 ± 0.9	4 (4–5)	< 0.001
Social Support	SS1	2.43 ± 1.21	2 (1–3)	3.65 ± 1.05	4 (3–4)	< 0.001
	SS2	2.29 ± 1.13	2 (1–3)	3.81 ± 1.18	4 (3–5)	< 0.001
	SS3	1.56 ± 0.8	1 (1–2)	3.02 ± 1.28	3 (2–4)	< 0.001
	SS4	2.38 ± 1.18	2 (1–3)	3.73 ± 1.04	4 (3–4.5)	< 0.001
	SS5	2.9 ± 1.26	3 (2–4)	4.07 ± 1.08	4 (3–5)	< 0.001
Preventive health actions	PHR7	2.14 ± 1.27	2 (1–3)	3.5 ± 1.45	4 (2–5)	< 0.001
	PHR8	2.02 ± 1.13	2 (1–3)	3.42 ± 1.06	3 (3–4)	< 0.001
	PHR9	1.42 ± 0.79	1 (1–2)	3.19 ± 1.46	3 (2–5)	< 0.001
	PHR10	2.14 ± 1.24	2 (1–3)	4.17 ± 1.11	5 (4–5)	< 0.001
Stress management	SM8	3.04 ± 1.1	3 (2–4)	3.97 ± 1.02	4 (3–5)	< 0.001
	SM9	2.74 ± 1.16	3 (2–4)	3.92 ± 0.99	4 (3–5)	< 0.001
	SM10	2.74 ± 1.11	3 (2–3)	3.9 ± 1.06	4 (3–5)	< 0.001
Alcohol	A2	4.16 ± 1.28	5 (3–5)	4.59 ± 0.89	5 (5–5)	< 0.001
	A4	4.43 ± 1.16	5 (5–5)	4.82 ± 0.72	5 (5–5)	< 0.001
Sleep patterns	SP2	3.41 ± 1.25	4 (3–4)	4.19 ± 0.91	4 (4–5)	< 0.001
	SP3	2.7 ± 1.29	3 (2–4)	3.75 ± 1.07	4 (3–5)	0.004

[1]: Mann—Whitney U test

PHR: Personal health responsibility; S: Smoking; E: Exercise; N: Nutritional; SS: Social support; SM: Stress management; A: Alcohol; SP: Sleep pattern; HLBS: Healthy Lifestyle Behavior Scale; SD: standard deviation; IQR: interquartile range

3.6 Associations with demographic and socioeconomic factors

When the relationship between the sociodemographic characteristics of the participants and healthy life behavior scores was examined, a significant relationship was observed between sex, BMI, educational status, income level, DM, self-rated health status, high quality of life, high life satisfaction and healthy life behavior ($p < 0.05$). There was no significant relationship between marital status, having children, employment status, having chronic diseases, HT, regular medication use and healthy living behavior ($p > 0.05$).

Table 3 The reliability analysis results for healthy lifestyle behavior scale

Construct	Item	Item-rest correlation	Cronbach's Alfa	
			Construct	Total
Health responsibility	PHR1	0.439	0.860	0.863
	PHR2	0.586		
	PHR3	0.513		
	PHR4	0.498		
Smoking	S1	0.198	0.835	
	S2	0.326		
	S3	0.344		
	S5	0.250		
Exercise	E1	0.382	0.764	
	E2	0.437		
	E5	0.431		
	E7	0.405		
Nutrition	N5	0.312	0.732	
	N6	0.439		
	N7	0.342		
	N10	0.408		
	N11	0.459		
Social support	SS1	0.348	0.735	
	SS2	0.433		
	SS3	0.432		
	SS4	0.421		
	SS5	0.382		
Preventive health actions	PHR7	0.313	0.710	
	PHR8	0.381		
	PHR9	0.432		
	PHR10	0.473		
Stress management	SM8	0.346	0.734	
	SM9	0.425		
	SM10	0.407		
Alcohol	A2	0.050	0.749	
	A4	0.129		
Sleep patterns	SP2	0.234	0.719	
	SP3	0.301		

PHR: Personal health responsibility; S: Smoking; E: Exercise; N: Nutritional; SS: Social support; SM: Stress management; A: Alcohol; SP: Sleep pattern

Compared with male participants, female participants had a greater mean total score on the Healthy Living Behavior Scale (60.7 ± 13.1; 54.7 ± 13.3, $p < 0.001$). Participants with a BMI < 25 had a higher mean total score on the healthy living behavior scale ($p = 0.013$). Participants with an educational level of university and above had a higher mean total score on the healthy living behavior scale ($p = 0.019$). Participants with higher income status had higher scores on the Healthy Living Behavior Scale than did those in other income groups ($p = 0.001$). Patients without DM had a greater mean total score on the healthy living behavior scale than patients with DM ($p = 0.032$). Participants who described their health status as excellent-good had a higher mean total score on the healthy life behavior scale than those who described their health status as fair-poor ($p < 0.001$). The scale scores were greater for participants with high quality of life and high life satisfaction ($p < 0.001$). The relationships between the participants' healthy living behavior scale scores and their sociodemographic characteristics are presented in Table 4.

4 Discussion

In our study, the validity and reliability of the scale, which was created in light of current information and recommendations, were demonstrated. The Cronbach's alpha value was 0.863 for the scale and above 0.7 for the subscales. These values are in the "satisfactory to good" range [29]. The KMO index was 0.807; Bartlett's test was significant. [30]. A 9-factor structure consisting of a total of 34 items was obtained. The total variance explained by the 9-factor structure was 62.35. In our study, a significant relationship was found between sex, BMI, educational status, income level, DM, self-rated health status, high quality of life, high life satisfaction and healthy life behavior. No significant relationships were found between marital status, having children, employment status, having chronic diseases, HT, regular medication use and healthy life behavior.

The overall alpha coefficient of the first version of the 'Healthy Lifestyle Behaviors Scale' developed by Walker was 0.92, and the variance explained by the six factors was 47.1%. In 1996, the scale was revised and named the Health-Promoting Lifestyle Profile II, and the Cronbach's alpha value was found to be 0.94 for the total scale [22]. The validity and reliability of these scales in Türkiye have been examined in different studies [31, 32]. The alpha value for the first version of the 48-item scale was found to be 0.91 in Esin's study and 0.90 in Akça's study. The alpha values of the subfactors ranged between 0.55 and 0.84 in Esin's study and between 0.52 and 0.81 in Akça's study [31, 32]. By identifying areas where these scales were inadequate, we developed our new scale, which is more up-to-date. The acceptable item-rest correlation for a multidimensional questionnaire/scale ranges between 0.2 and 0.4 [33]. In our study, this value was found to be below 0.2 only for alcohol substances. The effects of alcohol on health are well known. In the short term, consequences such as falls, drowning, murder, suicide, and alcohol poisoning may occur. Excessive alcohol use is associated with many diseases, such as high blood pressure, heart disease, stroke, liver disease, digestive problems, and various cancers. The CDC also emphasizes that excessive alcohol consumption is harmful to health [34, 35]. According to the World Health Organization, 3 million deaths worldwide each year are caused by the harmful use of alcohol. This represents 5.3% of all deaths. The harmful use of alcohol causes social and economic losses to individuals and society. A total of 13.5% of the total deaths between the ages of 20 and 39 can be attributed to alcohol [36]. For these reasons, it is important to ask about alcohol use when assessing healthy living behavior, as we did in our scale; therefore, alcohol consumption items that were not present in previous scales were retained in the scale.

In this study, exercise was found to be a factor with five items and a high factor load. Physical activity is a risk reducer for breast cancer, colorectal cancer, diabetes, heart disease, etc. Physical activity reduces the risk of high blood pressure and stroke, improves mental health and cognitive function and prevents weight gain. It helps to age in a healthy way. It improves sleep, reduces the risk of falls, improves balance and joint mobility, helps protect weak bones and prevents muscle loss [37, 38]. According to the World Health Organization, the recommended duration of physical activity for adults is at least 150–300 min of moderate-intensity aerobic physical activity, at least 75–150 min of high-intensity aerobic physical activity or an equivalent combination of moderate and high-intensity activity per week [38]. Therefore, being physically active is very important for healthy life behavior.

Walkers et al. questioned health responsibility on the scale of health responsibility, generally through consultation with experts and reading. In our developed scale, personal health responsibility formed two factors in terms of consultation and behavior. From a public health perspective, primary prevention is important and the first goal. For this reason, vaccinations, screenings, and prevention of transmission of sexually transmitted diseases are important topics in terms of public health [24]. These topics are getting vaccinations that are recommended but not included in the routine vaccination program, having annual check-ups for dental health, undergoing recommended cancer screenings and researching sexual health and methods of prevention against sexual diseases or getting expert opinion. What makes this study unique is that we have developed a scale that includes these topics.

In this study, sleep pattern was found to be a factor with two items and had a high factor load. According to the American Academy of Sleep Medicine, sleep is essential for healthy life behaviors such as nutrition and exercise. According to the AASM, adolescents between the ages of 13 and 18 years should sleep 8–10 h each night to support optimal health, while adults should sleep at least 7 h each night [39].

In this scale, smoking constituted a factor with four items. According to the CDC, smoking causes cancer, heart disease, stroke, lung disease, diabetes and chronic obstructive pulmonary disease. Exposure to cigarette smoke causes approximately 41,000 deaths among nonsmoking adults and 400 deaths among infants each year. Passive smoking causes stroke, lung cancer and coronary heart disease in adults [40].

Table 4 Evaluation of participants' healthy lifestyle behavior scale scores and sociodemographic characteristics (n = 330)

Characteristics	n (%)	HLBS score (MEAN ± SD)	p value
Sex			
Male	115 (34.8%)	54.7 ± 13.3	< 0.001[1]
Female	215 (65.2%)	60.7 ± 13.1	
BMI (kg/m^2)			
< 25	179 (54.2%)	60.3 ± 13.5	0.013[1]
≥ 25	151 (45.8%)	56.6 ± 13.1	
Marital status			
Married	203 (61.5%)	58.3 ± 13.9	0.557[1]
Single	127 (38.5%)	59.1 ± 12.7	
Having child			
No	156 (47.3%)	59.4 ± 12.4	0.296[1]
Yes	174 (52.7%)	57.9 ± 14.3	
Education status			
High school or less	49 (15%)	54.5 ± 15.6	0.019[1]
University or more	281 (85%)	59.3 ± 12.9	
Working status			
Employed	251 (76.1%)	59.1 ± 13.3	
Not employed	68 (20.6%)	57.3 ± 13.9	0.503[2]
Retired	11 (3.3%)	55.9 ± 13.2	
Income status			
0–9.000 TL	33 (10.0%)	51.7 ± 15.9	
9.000–18.000 TL	70 (21.2%)	56.1 ± 13.0	0.001[2]
18.000 TL or more	227 (68.8%)	60.3 ± 12.8	
Having chronic disease			
No	260 (78.8%)	58.4 ± 12.7	0.570[1]
Yes	70 (21.2%)	59.4 ± 15.9	
Having hypertension			
No	314 (95.2%)	58.8 ± 13.3	
Yes	16 (4.8%)	55.1 ± 16.3	0.288[1]
Having Diabetes Mellitus			
No	322 (97.6%)	58.8 ± 13.3	0.032[1]
Yes	8 (2.4%)	48.5 ± 17.6	
Having chronic arterial disease			
No	323 (97.9%)	58.6 ± 13.4	0.987[1]
Yes	7 (2.1%)	58.5 ± 16.5	
Having other chronic a disease			
No	268 (81.2%)	58.4 ± 13.2	0.545[1]
Yes	62 (18.8%)	59.5 ± 14.5	
Regular medication use			
No	270 (81.8%)	58.3 ± 12.7	0.353[1]
Yes	60 (18.2%)	60.0 ± 16.5	
Self-rated health status			
Excellent-good	177 (53.6%)	62.6 ± 12.6	< 0.001[1]
Fair-poor	153 (46.4%)	54.0 ± 13.0	
High quality of life			
No	163 (49.4%)	53.9 ± 13.1	< 0.001[1]
Yes	167 (50.6%)	63.2 ± 12.2	
Very high quality of life			
No	274 (83.0%)	57.0 ± 13.1	< 0.001[1]
Yes	56 (17.0%)	66.2 ± 12.8	
High life satisfaction			
No	155 (47.0%)	53.4 ± 12.7	< 0.001[1]
Yes	175 (53.0%)	63.2 ± 12.4	

Table 4 (continued)

[1]Independent samples t test
[2]One-way ANOVA test

This study shows that sex is an important social determinant of health, shaping how women and men engage in health behaviors. In our study, the mean total score of female participants on the Healthy Living Behavior Scale was greater than that of male participants. The Gender Equality Index 2021 report and studies generally frame women as engaging in health-promoting behaviors, while men are considered to adopt risky behaviors despite their harmful consequences [41, 42]. Among the participants, those with a BMI < 25 had a higher mean total score on the healthy lifestyle behavior scale. In support of our findings, there are results showing an inverse relationship between a healthy lifestyle and BMI [43, 44]. However, it has also been observed that obese and overweight people exhibit healthier behaviors in terms of diet and exercise compared to those with normal weight [45]. In our study, the healthy lifestyle behavior scale scores of participants with an educational level of university and above and participants with a higher income level were higher than those of the other groups. There are findings supporting our study in our country and abroad [18, 46, 47]. We think that the fact that financial means facilitate access to both preventive and curative health services and that the thought of having this opportunity gives confidence to people may cause this result. Participants were asked to rate their health status as excellent, good, fair or poor. The answer to this short question is considered to be a dynamic assessment that evaluates the trajectory of health, not just current health at a given time. This self-assessment is then thought to influence behaviors that affect health status [48]. In our study, those who described their health status as excellent-good had significantly higher healthy living behavior scores than did those who described their health status as fair-poor. In a study conducted in retired adults, the health behavior score of those who rated their perceived health status as very good was significantly greater than that of those who rated their health status as good or poor [49].

5 Strengths and limitations

This study has several limitations. One of the important limitations of this study is the convenience sampling method, which is a nonprobability sampling method. Despite its benefits, such as being cost-effective and less time-consuming, the generalizability of the sample to the population is limited, and its ability to represent a large population is low. Therefore, future research should aim to use probability-sampling techniques to increase the representativeness and validity of the findings [50]. Data collection using the electronic survey method resulted in a limited population of literate individuals and those with internet access. This factor limits the external validity of the study. The study was conducted as a self-report survey; participants may have been hesitant to provide information or may have given incorrect information.

In addition to its limitations, this study has several strengths. The overall internal consistency coefficient of the scale (Cronbach's alpha = 0.863) shows that this scale is reliable. The alpha values of the subfactors and the total explained variance were greater than those of the other scales. This shows that it provides more consistent and reliable results than other scales and that it measures the researched characteristics better. In addition, our study included items such as smoking, alcohol, dental health, vaccination and sexual health, which are important factors in healthy life behaviors.

6 Conclusion

The Healthy Lifestyle Behavior Scale can be used as a reliable and valid tool in the assessment of healthy lifestyle behaviors. This will enable effective planning and implementation of health interventions. Although this study was conducted with a sample with limited generalizability, it has high validity and reliability. Practices in different community groups or with high levels of participation are also needed. It is also suitable for use in different languages and populations through validity and reliability studies.

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Author contribution US designed the study. All authors participated the data collection. KS, SNA, BK, DT, OB performed the statistical analysis. KS, SNA and BK interpreted the results. DT and OB created the tables. KS, SNA, BK, DT and OB wrote the manuscript. US revised the manuscript. US supervised the study. All authors read and approved the final manuscript.

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Data availability The data that support the findings of this study are not openly available due to legal and ethical restrictions but are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate This study was approved by the Ethics Committee of Istanbul University-Cerrahpasa Medical Faculty (Approval number and date: 13.01.2023-589421). Online informed consent was obtained from all participants before starting the study. When the survey link was clicked, a page introducing the study and including the informed consent form was opened. Participants who clicked on the "I agree to participate in the study" button reached the page containing the questionnaire and scale. The study was conducted in accordance with the Declaration of Helsinki.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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