Psychometric validation of the Healthy Lifestyles Questionnaire (EVS-KOS) in the Kosovar population

Validación psicométrica del Cuestionario de Estilos de Vida Saludables (EVS-KOS) en la población kosovar

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Abstract

Introduction: The promotion of healthy lifestyles is regarded as a cornerstone of public health and the prevention of chronic non-communicable diseases. Cultural and linguistic adaptation of assessment instruments is essential to ensure their validity across different population contexts.
Objectives: The main objective of this study was to validate the Healthy Lifestyle Questionnaire – EVS - KOS through a confirmatory factor analysis of the measurement model.
Methodology: A total of 230 Kosovar individuals participated in the study, comprising both men and women, aged between 18 and 50 years (M = 22.91; SD = 6.51).
Results: The findings demonstrated that the psychometric properties support the adequacy of the factorial structure of the Healthy Lifestyles Questionnaire – EVS-KOS (8 factors / 24 items), with acceptable and robust validity indices, χ^2/gl = 1,35, CFI = 0,95, TLI = 0,94, RMSEA = 0,039 (IC 95% [0,026, 0,050]) e SRMR = 0,054.
Discussion: These results are consistent with validations conducted in Portugal, Spain, and Ecuador, reinforcing the cross-cultural consistency of the questionnaire, while also highlighting certain cultural specificities within the Kosovar context.
Conclusions: The Healthy Lifestyles Questionnaire – EVS-KOS proved to be a valid and reliable instrument for assessing lifestyles in the Kosovar population, representing a key resource for research and for the development of public health policies in the country.

Keywords

Factor analysis; health; healthy lifestyles; psychometrics.

Resumen

Introducción: La promoción de estilos de vida saludables se considera una piedra angular de la salud pública y de la prevención de las enfermedades crónicas no transmisibles. La adaptación cultural y lingüística de los instrumentos de evaluación es esencial para garantizar su validez en distintos contextos poblacionales.
Objetivos: El objetivo principal de este estudio fue validar el Healthy Lifestyle Questionnaire – EVS-KOS mediante un análisis de factores confirmatorio del modelo de medición.
Metodología: Participaron en el estudio 230 personas kosovares, de ambos sexos, con edades entre 18 y 50 años (M = 22.91; DT = 6.51).
Resultados: Los hallazgos demostraron que las propiedades psicométricas respaldan la adecuación de la estructura factorial del Healthy Lifestyles Questionnaire – EVS-KOS (8 factores / 24 ítems), con índices de validez aceptables y robustos, χ^2/gl = 1,35, CFI = 0,95, TLI = 0,94, RMSEA = 0,039 (IC 95% [0,026, 0,050]) e SRMR = 0,054.
Discusión: Estos resultados son consistentes con las validaciones realizadas en Portugal, España y Ecuador, reforzando la consistencia transcultural del cuestionario, al tiempo que destacan ciertas especificidades culturales dentro del contexto kosovar.
Conclusiones: El Healthy Lifestyles Questionnaire – EVS-KOS demostró ser un instrumento válido y fiable para evaluar estilos de vida en la población kosovar, representando un recurso clave para la investigación y para el desarrollo de políticas de salud pública en el país.

Palabras clave

Análisis factorial; estilos de vida saludables; psicometría; salud.

Introduction

The promotion of healthy lifestyles is currently regarded as a central priority in public health, being recognized as one of the cornerstones in the prevention of chronic non-communicable diseases. Adopting health-promoting practices has proven effects in reducing the risk of obesity, type II diabetes, cardiovascular diseases, and certain types of cancer (Dunton, 2018; Ezzati & Riboli, 2013). Scientific literature has consistently highlighted that behaviors such as regular physical activity, balanced nutrition, adherence to mealtimes, and ensuring adequate periods of rest and recovery are key determinants of quality of life (Aparicio-Ugarriza et al., 2019; Jakicic et al., 2018; Onambele-Pearson et al., 2019). Conversely, health-risk behaviors, including smoking, excessive alcohol intake, illicit substance use, and sedentary lifestyles, are strongly associated with increased morbidity and premature mortality (Meredith et al., 2018).

The conceptualization of healthy lifestyles has evolved over time through different phases of research. At the end of the 19th and beginning of the 20th centuries, authors such as Veblen (1994), Adler (1929) and Weber (1946) emphasized the influence of social strata and individual factors on health behaviors. In the second half of the 20th century, contributions emerged that incorporated psychological and behavioral dimensions (Bandura, 1982; Rodríguez Marín & García Hurtado, 1995). More recently, research has stressed the integration of multiple lifestyle dimensions and their relationship with motivation, self-determination, and basic psychological needs (Batista et al., 2022; Prochaska et al, 2008; García-Ubaque, 2011).

Current evidence highlights the need to distinguish between health-promoting and health-risk behaviors. The former include practices that contribute to physical and psychological well-being, such as aerobic physical activity, dietary control, and maintaining a healthy weight (Jeong et al., 2022; Posai et al., 2022). The latter comprise harmful behaviors such as smoking, excessive alcohol consumption, and adopting a sedentary lifestyle (Çelebi et al., 2022; Shah et al., 2022). Literature also shows that different populations display distinct profiles: for instance, breast cancer survivors tend to report higher levels of health-promoting behaviors compared to the general population (Jeong et al., 2022), while individuals with a history of myocardial infarction exhibit more moderate levels, influenced by sociodemographic and behavioral variables (Shah et al., 2022).

In Kosovo, as in other developing European regions, lifestyles are strongly shaped by socioeconomic factors. Recent studies indicate that health perception and household income are significantly associated with behavioral choices, with more than half of the older population reporting lifestyles ranging from good to excellent (González et al., 2022; Maha et al., 2024). Nevertheless, the prevalence of Non-Communicable Diseases - NCDs in the country, particularly cardiovascular and metabolic diseases, represents an increasing public health concern (Maha et al., 2022; Roldán-González et al., 2022). Preventive strategies that encourage balanced diets, adequate rest, and regular physical activity are therefore essential to counter this trend.

Technological developments have also enabled innovative health promotion interventions. The use of mobile applications, for example, has shown positive results in promoting adherence to healthy behaviors, although sustaining these effects in the long term remains a challenge (García-Ortiz et al., 2022; García-Ortiz et al., 2018). This is especially relevant in countries such as Kosovo, where social and economic inequalities strongly influence access to and maintenance of healthy practices.

In this context, the development and validation of instruments capable of assessing lifestyles across different languages and cultures is of strategic importance. Such instruments not only allow for the characterization of behavioral patterns in specific populations but also provide essential information for planning public policies and community-based interventions. In the case of Kosovo, marked by profound social transformations and a demographic landscape where a young population coexists with an aging generation, the need for a validated and culturally adapted instrument is particularly evident.

Despite these advances, no psychometric instruments currently exist in Kosovo that assess healthy lifestyles in an integrated and multidimensional way, which limits the identification of behavioral patterns and hinders the development of data-driven public health strategies. In contrast, the Healthy Lifestyle Questionnaire (EVS) has shown structural robustness and practical applicability in multiple cultural contexts. Its validation in Portugal demonstrated a stable factorial organization and predictable associations between health-promoting and health-risk behaviors, supporting its use in adult and young populations (Batista et al., 2016; Batista et al., 2020; Batista et al., 2025). The Spanish version corroborated these findings, revealing adequate psychometric performance and sensitivity to discriminate behavioral profiles in university students (Leyton et al., 2021). Likewise, the Ecuadorian adaptation demonstrated strong internal consistency and the capacity to monitor health-related behaviors in academic environments (Álvarez-Álvarez et al., 2021). In countries where these validations have been consolidated, the EVS has been used as a tool to identify high-risk behavioral groups, characterize lifestyle profiles, and support decision-making in public health. The adaptation of the EVS to the Kosovar context therefore addresses a relevant methodological gap, providing a standardized instrument capable of collecting systematic information on health-promoting and health-risk behaviors in a population undergoing rapid social and demographic transition, and contributing to applied research and the development of preventive strategies aligned with the country's real needs.

Accordingly, the aim of this study was to validate the Healthy Lifestyles Questionnaire EVS-KOS for the Albanian language (Kosovo). The use of this questionnaire will not only enable the assessment of the reliability and validity of its dimensions but also allow for a broader characterization of the lifestyles of Kosovar citizens, regardless of differences in physical activity or sedentary behavior levels.

Method

The present research was designed as a cross-sectional correlational study, aiming to assess the status of a population at a given moment through the administration of questionnaires (Montero & Leon, 2007). With regard to the manipulation of direct interventions on the object of study, it is classified as an observational, descriptive study, since no independent variables were manipulated (Montero & Leon, 2007). In other words, the variables are presented as they occur naturally, without any interference from the researchers.

Participants

The study sample consisted of 230 Kosovar citizens from the general population residing in Kosovo, of both sexes, aged between 18 and 50 years (M = 22.91; SD = 6.51). Among them, 47 were men (20.4%), 165 were women (71.7%), and 18 participants (7.8%) preferred not to disclose their gender. Regarding regular physical activity, one respondent did not provide an answer, 78 (33.9%) reported not engaging in this habit, 71 (30.9%) indicated practicing it for less than six months, and 80 (34.8%) reported maintaining this practice for more than six months.

The sampling method used to select the participants was random (Cubo-Delgado, Martín-Marín, & Ramos-Sánchez, 2011), although it was not based on a probabilistic rationale, as a participatory approach was inherent to the data collection process within the general population.

Procedure

The study received approval from the Bioethics and Biosafety Committee of Universum International College (Kosovo), following the guidelines of the Declaration of Helsinki. All participants were treated in accordance with the ethical guidelines of the American Psychological Association regarding participant consent, confidentiality, and anonymity. Written informed consent was obtained from all participants.

The translation process for the Healthy Lifestyles Questionnaire (EVS-KOS) was carried out in six steps. The first step consisted of the original Portuguese translation of the EVS IV (Batista et al., 2025) by three translators. After this (second step), the questionnaire was reviewed by four experts, all with expertise in the field and fluent in Kosovar, who were responsible for evaluating the translation and adapting the terms to Kosovar. The third step consisted of a new review session by six additional experts. To ensure the content validity of the instrument designed to assess sedentary behavior, the Item Content Validity Index (I-CVI) and the Scale Content Validity Index (S-CVI) were calculated, following the procedures described by Polit and Beck (2006) and Polit, Beck, and Owen (2007).

The six experts, each with at least a decade of experience in the areas of exercise, health, and lifestyle, acted as judges to evaluate all 41 items of the questionnaire. The relevance of each item was assessed on a four-point ordinal scale: 1 (not relevant), 2 (somewhat relevant), 3 (relevant), and 4 (highly relevant). To calculate the I-CVI, only scores of 3 and 4 were considered. The I-CVI for each item was calculated as the proportion of experts who rated the item as a 3 or 4 divided by the total number of experts (n = 6). According to the criteria proposed by Polit et al. (2007), I-CVI values equal to or greater than 0.78 are considered acceptable when between six and ten experts are involved (Polit & Beck, 2006; Polit et al., 2007).

All 41 items presented I-CVI values ranging from 0.84 to 1.00, indicating satisfactory semantic and conceptual adequacy. The S-CVI, calculated as the arithmetic mean of the I-CVI values, was 0.92, exceeding the recommended threshold of 0.90 and indicating high overall content validity for the item set (Polit & Beck, 2006; Polit et al., 2007).

To check clarity (fifth step), the translated questionnaire was administered in a pilot study with 30 adult citizens (M = 26.29, SD = 7.32), in line with the study's target population, to ensure clarity and comprehension. Participants were asked to indicate if the questions were unclear or if they had difficulty identifying a response option. No difficulties were reported by participants in understanding the items or selecting appropriate response options.

The next step involved the participation of a Kosovar teacher to evaluate the instrument, finalizing the translation process and beginning validation.

Following this, a dossier containing the different questionnaires to be administered was created, where we collected sociodemographic data such as gender, age, and regular physical activity habits. The questionnaires were then implemented on the Google Forms platform for online completion. The questionnaires were administered through various channels (WhatsApp, Facebook, and email). The approximate completion time was about ten minutes.

Instrument

The Portuguese version of EVS IV (Batista et al., 2025) was used, with 41 items, utilizing a Likert-type scale that ranges from strongly disagree (1) to strongly agree (5). All questions are categorized into four domains: eating habits, substance use, resting habits, physical activity habits and sedentary behavior. These domains are further divided into eight factors:

- Eating habits, which include a) balanced diet and b) adherence to mealtime.

- Substance use, which encompasses c) tobacco use, d) alcohol consumption, and e) use of other drugs.

- Three additional dimensions, with a single designated factor each for f) resting habits, g) physical activity habits, and h) sedentary behavior.

Regarding the measurement of eating habits in a total of 11 items, specifically balanced diet (e.g., "I usually eat fish two or more times a week.") – six items; respect for meal times (e.g., "I usually respect meal times.") – five items; in the consumption of harmful substances in a total of 15 items, tobacco consumption (eg, "I smoke regularly.") – five items, alcohol consumption (eg, "I drink alcoholic beverages regularly on weekends (beer , liquors, wines, combined drinks…)." – five items, the consumption of other drugs (eg, "I've ever tried drugs (joints, marijuana, cocaine, stimulants,…)" – five items, rest habits (eg, I normally sleep 7-8 hours a day.") – four items, physical activity habits (eg, I consider myself a physically active person.) – five items, and sedentary behavior (e.g., I usually spend more than 3 hours a day sitting during my work/studies.) – six items.

Data analysis

We used SPSS software (version 23.0 for Windows, SPSS Inc., Chicago, IL, USA) to perform descriptive analyses, skewness and kurtosis tests (Pestana & Gageiro, 2005), as well as internal reliability analyses using Cronbach's alpha coefficient (Nunnally, 1978) and McDonald's Omega (ω) (McDonald, 1999). The author (Pestana & Gageiro, 2005) also proposed the limits, in absolute value, and considered values up to 2 for asymmetry and 7 for kurtosis for a behaviour like normal; between 2 and 3 for asymmetry and between 7 and 21 for kurtosis for moderately normal behaviour; and values greater than 7 in asymmetry and 21 in kurtosis for extremely normal behaviour.

Both indices serve to assess the internal consistency of the variables under study, ranging between 0 and 1, with higher values indicating greater reliability (Revelle & Zinbarg, 2009; Gignac & Kretzschmar, 2017). Convergent validity of the measurement model was assessed through standardized factor loadings, composite reliability, and average variance extracted for each factor, using .500, .600, and .400 as minimum cut-off values, respectively (Bagozzi & Yi, 1988; Gignac & Kretzschmar, 2017). In addition, item–factor correlations were calculated.

To examine whether the number of factors was reasonable given the proposed measurement model, Gignac and Kretzschmar (2017) suggested calculating the hierarchical subscale Omega coefficient (OmegaHS). This index can be interpreted as an effect size measure that is essentially immune to sample size. According to the authors, OmegaHS values can indicate the strength of a specific latent variable: values close to 0.00 denote very weak latent variables, while those close to 1.00 indicate very strong latent variables. They further propose the following guidelines: relatively small (< .20), typical (.20–.30), and relatively large (> .30). Values below .10 should probably be considered very low.

Internal validity was analyzed using Confirmatory Factor Analysis (CFA). The CFA was carried out with the Lavaan package (Rosseel, 2012) embedded in JASP software, version 0.18.1, to test the model. As the model comprised eight factors, two separate models were tested, one for health-promoting behaviors and one for non-health-promoting behaviors.

Model determination included assessing multivariate normality using the normalized Mardia coefficient, which should be below 5 to allow estimation through the maximum likelihood method (Schermelleh-Engel, Moosbrugger, & Müller, 2003). In cases where multivariate normality was not met, we followed recommendations to use robust maximum likelihood estimation (Schermelleh-Engel et al., 2003), applying the robust χ^2 correction (Satorra & Bentler, 2001).

For each latent factor, item loadings were constrained to 1. Standardized estimates were reported, although unstandardized values were used in the model. To assess model fit, we adopted the following criteria: (a) the normalized Chi-square ratio (χ^2/df), with values < 3.0 indicating reasonable fit (Hair et al., 2019); (b) the Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI), also known as Tucker–Lewis Index (TLI), with values ≥ .95 indicating good fit (Hu & Bentler, 1999), though ≥ .90 were deemed acceptable; (c) the Root Mean Square Error of Approximation (RMSEA), with values ≤ .06 indicating good fit (Hu & Bentler, 1999), and the commonly used cut-offs: ≤ .05 (good fit), ≤ .08 (acceptable), ≤ .10 (mediocre), and > .10 (poor fit) (Brown, 2015; Byrne, 2016; Kline, 2016); (d) the Standardized Root Mean Square Residual (SRMR), representing the average residual between model-predicted and observed correlation matrices, with SRMR ≤ .08 indicating good fit (Hu & Bentler, 1999), though values up to .10 may still be considered acceptable (Worthington & Whittaker, 2006; Kline, 2016)

Given the wide age range of the sample (18–50 years) and the methodological recommendations for psychometric studies involving heterogeneous populations (Hair et al., 2019; Schermelleh-Engel, Moosbrugger, & Müller, 2003), additional exploratory analyses were conducted to examine whether age could introduce relevant distortions in the internal structure of the instrument. The literature highlights that demographic variables, such as age, may influence response patterns, particularly in behavioural constructs related to lifestyle (Worthington & Whittaker, 2006). Therefore, it was necessary to verify whether the stability of the relationships among the EVS-KOS factors remained consistent across different age groups.

For this purpose, the sample was divided into three age categories: 18–25 years, 26–35 years, and 36–50 years, following criteria commonly used in behavioural and epidemiological research. Two statistical procedures were subsequently performed to assess preliminary invariance in the internal relationships among factors: (1) a collinearity diagnosis between age group and the questionnaire dimensions; and (2) a comparison of the factor correlation matrices across the three age subgroups.

Collinearity analysis was conducted using Tolerance and Variance Inflation Factor (VIF) indices, which are considered robust measures for detecting redundancy or excessive linear dependence among predictor variables (Hair et al., 2019). VIF values below 5 and tolerance values above 0.20 are generally interpreted as evidence of an absence of problematic collinearity.

The second procedure consisted of comparing the Spearman correlation matrices among the EVS-KOS factors within each age group. The use of non-parametric correlations is justified by the ordinal nature of the items and the potentially non-normal distribution of the data (Gignac & Kretzschmar, 2017). This type of analysis enables the evaluation of structural consistency and the stability of inter-factor relationships, and is recommended as a preliminary step prior to formal multigroup invariance testing (Schermelleh-Engel et al., 2003; Hu & Bentler, 1999).

Together, these procedures allowed us to determine whether age could act as a moderating variable of the instrument's internal correlations, providing additional evidence for the structural stability of the EVS-KOS across different age segments. This approach strengthens the validity of the study by ensuring that the factorial model is not artificially influenced by age-related heterogeneity in the sample—a concern frequently noted in cross-cultural validation of psychometric instruments (Worthington & Whittaker, 2006).

Results

Analysis of internal consistency, discriminant and convergent validity

The initial psychometric analysis focused on the internal consistency of the eight EVS-KOS dimensions, as well as on their convergent and discriminant validity (Table 1). Overall, the results indicated adequate measurement properties, although certain specific weaknesses emerged and warrant critical consideration.

The analysis of internal consistency across the eight EVS-KOS dimensions revealed Cronbach's alpha (α) values ranging from .61 (Resting Habits) to .86 (Tobacco Consumption). Omega coefficients (Ω) ranged between .61 and .87, indicating generally acceptable levels of internal reliability. Composite reliability (CR) values varied between .67 and .86 across all dimensions.

Regarding convergent validity, standardized factor loadings (FL) were mostly distributed between .547 and .893. The average variance extracted (AVE) showed values between .40 (Balanced Diet, Consumption of Other Drugs, Resting Habits) and .61 (Tobacco Consumption). The dimensions Alcohol Consumption, Physical Activity Habits, and Sedentary Behavior demonstrated AVE values equal to or above .49.

Table 1. Internal consistency values, discriminant and convergent validity of EVS-KOS

Variable	item	CF	FL	Skew	Kurt	OHS	α	Ω	AVE	FC
Balanced Diet	EVS 16	0.635	0.302*	0.06	-0.72	0.29	0.71	0.73	0.41	0.73
	EVS 35	0.702	0.781*							
	EVS 39	0.641	0.793*							
Respect for Meal Time	EVS 5	0.718	0.726*	0.06	-0.58	0.30	0.70	0.71	0.44	0.76
	EVS 23	0.622	0.631*							
	EVS 37	0.646	0.779*							
Tobacco Consumption	EVS 13	0.842	0.921*	1.42	0.61	0.44	0.86	0.87	0.61	0.86
	EVS 19	0.715	0.810*							
	EVS 34	0.761	0.892*							
Alcohol Consumption	EVS 8	0.675	0.734*	3.33	13.27	0.38	0.79	0.79	0.51	0.80
	EVS 14	0.789	0.833*							
	EVS 17	0.758	0.817*							
Consumption of Other Drugs	EVS 27	0.551	0.676*	3.47	13.47	0.27	0.66	0.70	0.40	0.68
	EVS 32	0.573	0.830*							
	EVS 38	0.677	0.839*							
Resting Habits	EVS 3	0.617	0.607*	-0.07	-0.37	0.36	0.61	0.61	0.40	0.67
	EVS 9	0.514	0.617*							
	EVS 31	0.728	0.547*							
Physical Activity Habits	EVS 1	0.675	0.787*	-0.41	-0.51	0.36	0.78	0.78	0.41	0.73
	EVS 20	0.662	0.803*							
	EVS 29	0.601	0.804*							
Sedentary Behavior	EVS 12	0.830	0.810*	-0.35	-0.37	0.27	0.63	0.68	0.49	0.79
	EVS 18	0.774	0.769*							
	EVS 24	0.676	0.354*							

Note: FL – Factor Loading: Correlation between item and factor; CF – Factor loading of the item in the factor *p < 0,01; Skew – Skewness; Kurt – Kurtosis; α – Cronbach's Alpha; Ω – McDonald's Omega; AVE – Average variance extracted; FC – Composite reliability.

Discriminant validity was examined using the OmegaHS coefficient (OHS), with values ranging from .27 to .44. The highest values were observed for Tobacco Consumption (.44), Alcohol Consumption (.38), and Resting Habits (.36), while the lowest were found for Balanced Diet (.29) and Sedentary Behavior (.27).

Additionally, skewness (Skew) and kurtosis (Kurt) values indicated that the items displayed acceptable distributions for the application of structural equation modelling, with the exception of the dimensions related to alcohol and drug consumption, which showed substantial deviations. These asymmetries were expected due to the low prevalence of such behaviours in the sample and do not compromise the overall interpretation of the results, although they warrant caution when interpreting individual items.

Taken together, the indicators of internal consistency and convergent and discriminant validity support the structural adequacy of the EVS-KOS.

The descriptive results presented in Table 2 show that the dimensions associated with health-promoting behaviours exhibited higher mean values compared to those associated with health-risk behaviours. The variables Balanced Diet (M = 3.54; SD = 0.92), Respect for Meal Time (M = 3.22; SD = 1.10), and Resting Habits (M = 3.46; SD = 0.86) recorded the highest mean scores, whereas Tobacco Consumption (M = 1.80; SD = 1.25), Alcohol Consumption (M = 1.25; SD = 0.66), and Consumption of Other Drugs (M = 1.28; SD = 0.66) showed substantially lower averages. The Physical Activity Habits dimension presented a mean of 3.25 (SD = 1.16), while Sedentary Behavior demonstrated a mean value of 3.40 (SD = 1.03).

Table 2. Descriptive statistics and bivariate correlation between variables of EVS -KOS

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Balanced Diet	3.54	0.92	-	0.52**	-0.13	-0.06	-0.10	0.27**	0.50**	-0.14*
2. Respect for Meal Time	3.22	1.10		-	-0.11	-0.07	0.05	0.36**	0.36**	0.14*
3. Tobacco Consumption	1.80	1.25			-	0.28**	0.30**	-0.02	-0.20**	0.14*
4. Alcohol Consumption	1.25	0.66				-	0.38**	-0.14*	-0.24**	0.23**
5. Consumption of Other Drugs	1.28	0.66					-	-0.04	-0.09	0.19**
6. Resting Habits	3.46	0.86						-	0.25**	0.01
7. Physical Activity Habits	3.25	1.16							-	-0.15*
8. Sedentary Behavior	3.40	1.03								-

Note: *p < .05; **p < .01

Regarding the bivariate correlations, a moderate positive association was observed between Balanced Diet and Respect for Meal Time (r = .52, p < .01), as well as between Balanced Diet and Physical Activity Habits (r = .50, p < .01). Balanced Diet also showed a significant negative correlation with Sedentary Behavior (r = –.14, p < .05).

Respect for Meal Time demonstrated positive correlations with Resting Habits (r = .36, p < .01) and Physical Activity Habits (r = .36, p < .01), and additionally displayed a positive correlation with Sedentary Behavior (r = .14, p < .05).

Among the health-risk behaviours, Tobacco Consumption was positively correlated with Alcohol Consumption (r = .28, p < .01) and Consumption of Other Drugs (r = .30, p < .01), while showing a negative correlation with Physical Activity Habits (r = –.20, p < .01).

Alcohol Consumption presented positive correlations with Consumption of Other Drugs (r = .38, p < .01) and Sedentary Behavior (r = .23, p < .01), and negative correlations with Resting Habits (r = –.14, p < .05) and Physical Activity Habits (r = –.24, p < .01).

Consumption of Other Drugs showed a positive correlation with Sedentary Behavior (r = .19, p < .01).

Resting Habits correlated positively with Physical Activity Habits (r = .25, p < .01).

Finally, Physical Activity Habits demonstrated a negative correlation with Sedentary Behavior (r = –.15, p < .05).

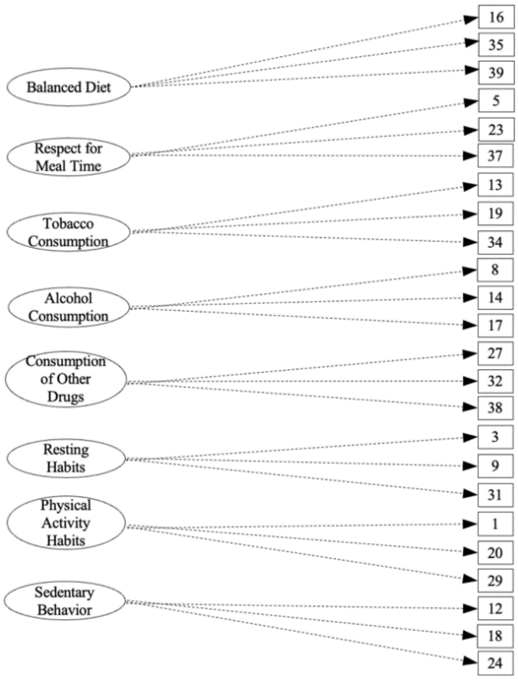
In sum, the results reveal consistent patterns of association between health-promoting and health-risk behaviours, reinforcing the convergent validity of the EVS-KOS and its capacity to discriminate between distinct lifestyle profiles within the Kosovar population.

Confirmatory Factor Analysis

The confirmatory factor analysis was conducted to examine the structural adequacy of the eight-factor model proposed for the EVS-KOS. The estimated model includes 24 items distributed across the eight latent dimensions corresponding to the behaviours assessed: Balanced Diet, Respect for Meal Time, Tobacco Consumption, Alcohol Consumption, Consumption of Other Drugs, Resting Habits, Physical Activity Habits, and Sedentary Behavior.

The conceptual organization of the instrument is graphically represented in Figure 1, where each factor is directly linked to its respective items.

Figure 1. Schematic example of the eight-factor model of the KOS EVS version (24 items)



The results of the factorial estimation showed that the items loaded onto the theoretically expected factors, with no meaningful cross-loadings between dimensions. The standardized factor loadings (SFL), presented in Table 3, are distributed across each dimension of the model. Overall, factor loadings ranged from .06 to .91, with higher values observed in factors related to health-risk behaviours and more specific behavioural patterns, such as Tobacco Consumption (it13: .90; it19: .82; it34: .75) and Alcohol Consumption (it8: .72; it14: .79; it17: .75).

High loadings were also observed in the health-promoting behaviour factors Balanced Diet (it35: .73; it39: .80) and Respect for Meal Time (it37: .81). In contrast, several items presented lower loadings, such as it16 (.06) within Balanced Diet, it23 (.43) within Respect for Meal Time, and it31 (.04) within Resting Habits. These values reflect varying magnitudes of contribution to their respective latent variables, without compromising the presence of the factors in the model.

With regard to the standardized residual variances (SVR), the values were generally low to moderate, ranging from .02 to .45, suggesting an adequate degree of correspondence between the theoretical model and the observed data. Lower residual variances were predominantly found in consumption-related factors—for example, Alcohol Consumption (it8: .04; it14: .05; it17: .03) and Consumption of Other Drugs (it27: .02; it32: .08; it38: .07). Conversely, higher residuals were observed for some items associated with health-promoting behaviours, such as it31 (.22) within Resting Habits and it18 (.45) within Sedentary Behavior.

The estimated covariances between factors revealed both positive and negative associations, consistent with the behavioural nature of the constructs. Stronger positive covariances were recorded between conceptually related factors, such as Balanced Diet and Physical Activity Habits (.512), and Resting Habits and Respect for Meal Time (.474). Negative covariances emerged primarily between health-promoting and health-risk dimensions, such as Physical Activity Habits and Tobacco Consumption (–.203), and Balanced Diet and Sedentary Behavior (–.205), reflecting patterns aligned with the behavioural structure underpinning the instrument.

Table 3. Estimated parameters of the items in the 24-item EVS KOS structural model

Covariance between variables					item	SFL	SVR
Balanced Diet	↔	Respect for Meal Time	0.543	Balanced Diet	it16	0.06	0.21
	↔	Tobacco Consumption	-0.095		It35	0.73	0.13
	↔	Alcohol Consumption	-0.046		It39	0.80	0.17
	↔	Cons. of Other Drugs	-0.150				
	↔	Resting Habits	0.308				
	↔	Physical Activity Habits	0.512				
	↔	Sedentary Behavior	-0.205				
Respect for Meal Time	↔	Tobacco Consumption	-0.119	Respect for Meal Time	It5	0.77	0.12
	↔	Alcohol Consumption	-0.107		it23	0.43	0.19
	↔	Cons. of Other Drugs	0.026		It37	0.81	0.13
	↔	Resting Habits	0.474				
	↔	Physical Activity Habits	0.436				
	↔	Sedentary Behavior	-0.168				
Tobacco Consumption	↔	Alcohol Consumption	0.344	Tobacco Consumption	it13	0.90	0.10
	↔	Cons. of Other Drugs	0.376		It19	0.82	0.11
	↔	Resting Habits	-0.058		it34	0.75	0.06
	↔	Physical Activity Habits	-0.203				
	↔	Sedentary Behavior	0.146				
Alcohol Consumption	↔	Cons. of Other Drugs	0.455	Alcohol Consumption	It8	0.72	0.04
	↔	Resting Habits	-0.171		It14	0.79	0.05
	↔	Physical Activity Habits	-0.193		It17	0.75	0.03
	↔	Sedentary Behavior	0.241				
Cons. of Other Drugs	↔	Resting Habits	-0.037	Cons. of Other Drugs	It27	0.64	0.02
	↔	Physical Activity Habits	-0.073		It32	0.66	0.08
	↔	Sedentary Behavior	0.213		It38	0.69	0.07
Resting Habits	↔	Physical Activity Habits	0.316	Resting Habits	it3	0.78	0.29
	↔	Sedentary Behavior	-0.063		it9	0.46	0.19
					It31	0.04	0.22
Physical Activity Habits	↔	Sedentary Behavior	-0.130	Physical Activity Habits	It1	0.66	0.12
					It20	0.73	0.12
					It29	0.80	0.14
Sedentary Behavior				Sedentary Behavior	It12	0.77	0.28
					it18	0.91	0.45
					It24	0.08	0.17

Note: SFL - Standardized Factor Loadings; SVR - Standardized Residual Variances

Overall, Figure 1 illustrates the conceptual organization of the eight-factor model, and Table 3 presents the estimated parameters, including factor loadings, residual variances, and covariances between factors. Together, these elements describe the structural behaviour of the EVS-KOS following confirmatory factor validation, which demonstrated acceptable incremental fit indices: $\chi^2/df = 1.35$, CFI = .95, TLI = .94, RMSEA = .039 (95% CI [.026, .050]), and SRMR = .054.

A relevant methodological aspect concerns the potential instability of relationships among the EVS-KOS factors as a function of age. To address this issue, the sample was divided into three age groups (18–25; 26–35; 36–50 years), and two complementary analyses were performed (Table 4): (1) an assessment of collinearity between age group and each dimension of the instrument; and (2) a comparison of the Spearman correlation matrices across the three groups.

In the collinearity analysis, the multiple regression models conducted for each of the eight EVS-KOS dimensions revealed tolerance values between .929 and .946 and VIF values between 1.057 and 1.077. These values are well below the thresholds typically associated with problematic collinearity (VIF ≥ 5; Hair et al., 2019), indicating an absence of linear redundancy between age and the instrument's factors. Thus, age group does not function as a distorting variable in the structural relationships among the assessed dimensions.

The analysis of the factor correlation matrices across age groups revealed a highly consistent structural pattern. In the 18–25 age group, moderate positive correlations were observed among health-promoting behaviours (e.g., Balanced Diet with Respect for Meal Time, ρ ≈ .33; Balanced Diet with Physical Activity Habits, ρ ≈ .30), alongside expected negative correlations between health-promoting and health-risk behaviours (e.g., Balanced Diet with Sedentary Behaviour, ρ = –.14).

In the 26–35 age group, the correlational tendencies were maintained without any inversion of signs: positive associations among healthy behaviours and negative associations between health-promoting and risk behaviours.

Despite the smaller size of the 36–50 age group, the correlational pattern remained coherent (e.g., Tobacco Consumption with Alcohol Consumption, ρ ≈ .31; Resting Habits with Respect for Meal Time, ρ ≈ .67), demonstrating structural stability even within reduced subsamples.

Importantly, no systematic sign inversion was observed—an outcome that would be particularly problematic in psychometric research (Byrne, 2016; Kline, 2016). Moreover, differences in the magnitude of equivalent correlations across the three age groups generally remained within ±.15, a variation considered normal in naturally heterogeneous samples (Hair et al., 2019), providing no indication of age-related bias.

In summary, the convergence of (a) absence of collinearity and (b) stability of the correlation matrices demonstrates that the wide age range of the sample did not meaningfully affect the internal structure of the EVS-KOS. These findings reinforce the robustness of the relationships among factors and support the adequacy of the psychometric procedures adopted in this study.

Table 4. Collinearity and Correlations of EVS KOS by Age Group

Regression Model by Dependent Variable	Age group Collinearity		EVS KOS Correlations by Age Group (18-25;26-35;36-50)							
	Tolerance	FIV	1	2	3	4	5	6	7	8
1. Balanced Diet	.929	1.077	-	0.33** 0.14 0.16	-0.08 -0.24 -0.16	-0.08 0.12 -0,19	-0.12 -0.12 -0.16	0.15* 0.04 -0.09	0.30** 0.21 0.25	-0.02 0.15 0.35
2. Respect for Meal Time	.946	1.057		-	-0.13 -0.12 -0.01	-0.07 -0.11 -0.07	0.03 -0.54** -0.32	0.18* 0.43 0.67**	0.25** 0.18 0.72**	0.02 -0.37 0.38
3. Tobacco Consumption	.936	1.068			-	0.31** -0.04 0.56	0.37** 0,29 0.03	-0.01 0.20 0.13	-0.23** 0.04 0.09	0.13 0.08 0.25
4. Alcohol Consumption	.939	1.064				-	0.37** 0.23 0.01	-0.19** 0.23 -0.08	-0.20** -0.01 -0.09	0.27** 0.32 0.11
5. Consumption of Other Drugs	.933	1.071					-	-0.12 -0.21 -0.34	-0.13 0.14 -0.18	0.11 0.43 0.01
6. Resting Habits	.931	1.074						-	0.09 0.53* 0.42	0.06 0.26 0.02
7. Physical Activity Habits	.931	1.074							-	-0.06 0.35 0.35
8. Sedentary Behavior	.942	1.061								-

Note: *p < .05; **p < .01

Table 5 provides a comparative summary of the fit indices reported in the different international validations of the Healthy Lifestyle Questionnaire (EVS), enabling the psychometric performance of the Kosovar version (EVS-KOS) to be contextualized in relation to previously published adaptations. Overall, all reported models present CFI values ranging from .92 to .97 and TLI values between .90 and .96, indicating high levels of structural fit that meet widely accepted quality criteria (Hu & Bentler, 1999; Hair et al., 2019). The EVS-KOS version exhibits a CFI of .95 and a TLI of .94, placing it very close to the Portuguese validations (Batista et al., 2016; Batista et al., 2020; Batista et al., 2025), as well as to the Spanish (Leyton et al., 2021) and Ecuadorian versions (Álvarez-Álvarez et al., 2021). This pattern reflects strong cross-cultural convergence in the factorial structure of the instrument.

Similarly, the RMSEA value obtained for the Kosovar version (.04; 90% CI [.026, .050]) falls within the range considered indicative of good fit (≤ .05) and demonstrates a performance comparable to that of the Spanish EVS-II (Leyton et al., 2021) and the more recent Portuguese EVS-IV, both of which report RMSEA values ≤ .06. Notably, the χ^2/df ratio of the EVS-KOS (1.35) is the most favourable among all versions presented, suggesting a particularly strong correspondence between the model and empirical data—an especially meaningful finding given the challenges often associated with validations conducted in emerging sociocultural contexts.

The SRMR value (.05), also aligned with previous versions (ranging between .02 and .06), further reinforces the model's adequacy at the level of standardized residuals, demonstrating that discrepancies between the observed matrix and the model-reproduced matrix remain minimal.

Table 5. Fit indices model to the Healthy Lifestyle Questionnaires (EVS)

	EVS vp	EVS	EVS sp	EVS II	EVSspII	EVS eq	EVS III	EVS IV	EVS KOS
X^2	632.68	172.117	-	305.925			644.6828	253.499	301.364
Sig X^2	(p=.000)	(p=.000)	(p=.000)	(p=.000)			(p=.000)	(p=.001)	(p=.001)
df	157.775	41.078	-	120.017			168	189	224
X^2/df	4.01	4.19	4.2	2.55	3.76	9.02	3.84	1.34	1.35
TLI	-	.96	-	.92			.90	.93	.94
CFI	.94	.97	.94	.94	.97	.96	.92	.97	.95
SRMR	.06	.04	.04	.05	.06	.03	.06	.02	.05
RMSEA	.07	.07	.06	.06	.05	.06	.06	.01	.04
90% CI RMSEA	-	(.058 - .076)	-	(.056 - .072)	(.046 - .052)		(.054 - .064)	(.01 - .02)	(.026 - .050)

EVS vp – Portuguese preliminary version of Aspano (2015); EVS – Portuguese version of Batista et al. (2016); EVS sp – Castilian version of Leyton et al. (2018); EVS II – Portuguese version of Batista et al. (2020); EVS II sp – Castilian version of Leyton, Mesquita & Jiménez-Castuera (2021); EVS eq – Ecuadorian version of Alvarez-Alvarez, et al. (2021); EVS III - Portuguese version of Batista et al. (2022); EVS IV - Batista et al. (2025); EVS KOS – Present version of the Kosovar validation.

Taken together, this comparison reveals that the Kosovar version of the EVS demonstrates a level of structural adequacy equivalent to—and in some indices even superior to—validations conducted in Portugal, Spain, and Ecuador. This strengthens the evidence that the questionnaire preserves its conceptual integrity regardless of linguistic or cultural context. These findings reinforce the psychometric robustness of the EVS-KOS and support its inclusion in the growing body of internationally consistent instruments for assessing healthy lifestyles.

Discussion

The results obtained in this study indicate that the EVS-KOS presents a stable and psychometrically consistent factorial structure, supporting the adequacy of the proposed eight-factor model. The global fit indices demonstrated robust model fit (χ^2/df = 1.35, CFI = .95, TLI = .94, RMSEA = .039, SRMR = .054), falling within ranges considered acceptable for confirmatory models of multidimensional instruments. These values align with what the literature identifies as indicators of good model adequacy, reflecting close convergence between empirical data and the theoretical structure (Hu & Bentler, 1999; Brown, 2015; Kline, 2016). Consistency with prior EVS validations conducted in Portugal (Batista et al., 2016; Batista et al., 2020; Batista et al., 2022; Batista et al., 2025), Spain (Leyton et al., 2021), and Ecuador (Álvarez-Álvarez et al., 2021) further reinforces the cross-cultural stability of the measure, supporting its replicability across distinct sociocultural contexts.

The standardized factor loadings revealed psychometric patterns consistent with the existing literature. The factors associated with health-risk behaviours—namely Tobacco Consumption and Alcohol Consumption—showed high loadings (between .72 and .90), reflecting the more objective, direct, and behaviourally anchored nature of these items. Previous studies have demonstrated that behaviours involving substance use or dependence tend to exhibit greater consistency due to their semantic clarity and lower interpretative ambiguity (Meredith et al., 2018; Çelebi et al., 2022).

Within the health-promoting dimensions, the Balanced Diet and Respect for Meal Time factors predominantly presented loadings above .60, particularly for items related to regular eating patterns and structured meal schedules. These results are consistent with research showing that stable and routine dietary behaviours exhibit high intra-individual consistency (Aparicio-Ugarriza et al., 2019; Posai et al., 2022). Convergence with Portuguese and Spanish EVS studies strengthens the hypothesis of a universal organisation of dietary habits, albeit culturally modulated by food availability and everyday social structure (Leyton et al., 2021; Batista et al., 2025).

Some items—such as it16 (Balanced Diet), it23 (Respect for Meal Time), and it31 (Resting Habits)—showed lower loadings. This heterogeneity is coherent with findings from previous psychometric studies using the EVS, in which items reflecting diffuse or situational habits tend to display greater interpretative variability (Batista et al., 2016; 2020). The results suggest that this is not indicative of structural weakness but rather an inherent effect of the behavioural nature of factors such as rest patterns and meal scheduling, which are frequently influenced by contextual variables (e.g., work routines, academic pressures, family meal culture)—a phenomenon widely acknowledged as a legitimate source of residual variance (Onambele-Pearson et al., 2019; Telama et al., 2014).

Therefore, the retention of these items in the model is justified not only by statistical criteria but also by conceptual considerations, as premature item elimination may compromise construct coverage and reduce content validity—a position widely supported in the scale development literature (Worthington & Whittaker, 2006).

The indicators of convergent validity were generally satisfactory. The average variance extracted (AVE) was ≥ .40 across all dimensions, with values exceeding .50 for more objective factors such as Tobacco Consumption and Alcohol Consumption. These results align with the classical reference criteria proposed by Bagozzi and Yi (1988), who note that moderate AVE values are acceptable in multifactorial behavioural instruments.

The OmegaHS coefficient ranged from .27 to .44, indicating adequate distinctiveness between factors without evidence of substantial dimensional redundancy. This pattern is consistent with the theoretical assumption underlying the EVS: health-promoting and health-risk behaviours constitute conceptually independent yet interrelated domains (Gignac & Kretzschmar, 2017). Higher OmegaHS values in consumption-related factors (tobacco and alcohol) are in line with previous EVS validations and empirical evidence demonstrating greater coherence in addiction-related behaviours (Shah et al., 2022; Meredith et al., 2018).

The bivariate correlations revealed socially coherent behavioural patterns, reinforcing the structural validity observed in the CFA. The positive association between Balanced Diet and Respect for Meal Time indicates an organised and regular dietary profile, frequently associated with health-promoting practices (Aparicio-Ugarriza et al., 2019). Similarly, the positive relationship between dietary habits and Physical Activity Habits reflects mutually reinforcing lifestyle behaviours, a phenomenon widely reported in the behavioural clustering literature (Prochaska et al., 2008).

At the opposite end of the behavioural spectrum, risk-related attitudes showed significant co-occurrence: Tobacco Consumption, Alcohol Consumption, and Consumption of Other Drugs were positively correlated with one another. The literature consistently links this pattern to compensatory behavioural processes and additive risk clusters, in which harmful behaviours tend to emerge jointly (Meredith et al., 2018; Shah et al., 2022).

Even more relevant for the robustness of the EVS-KOS were the negative cross-domain correlations, which reflect the expected antagonism between healthy lifestyle behaviours and harmful habits. The negative associations between physical activity and smoking, as well as between healthy eating habits and sedentary behaviour, mirror behavioural patterns that are consistently observed across cultures (Telama et al., 2014; Dunton, 2018).

The results of the present study, when compared with previous EVS validations conducted in different countries, consistently reinforce the cross-cultural robustness of the instrument's factorial structure. The Kosovar version (EVS-KOS) demonstrated fit indices highly comparable to—and in some cases slightly superior to—those reported in the Portuguese (Batista et al., 2016; Batista et al., 2020; Batista et al., 2025), Spanish (Leyton et al., 2021), and Ecuadorian versions (Álvarez-Álvarez et al., 2021). The convergence of the CFI (.95), TLI (.94), and RMSEA (.04) with recommended thresholds (Hu & Bentler, 1999; Kline, 2016; Hair et al., 2019) confirms that the eight-factor structure remains stable across different sociocultural contexts—an especially relevant finding in Kosovo, where no previously validated multidimensional instruments existed for assessing lifestyle behaviours. This structural equivalence suggests that underlying constructs such as dietary habits, physical activity, substance use, and rest behaviours maintain coherent psychological meaning across cultures, supporting the hypothesis of conceptual invariance of the EVS.

Taken together, the international comparison indicates that the EVS-KOS not only replicates the established factorial structure but also integrates credibly into the broader family of validated instruments for cross-cultural lifestyle assessment.

The additional exploratory analysis conducted to examine the validity of the age range confirmed that age did not introduce significant distortions in the internal relationships among the EVS-KOS factors. Tolerance values (.762–.946) and VIF values (1.057–1.319) indicated the absence of collinearity between age and the instrument's dimensions. Moreover, the Spearman correlation matrices demonstrated highly similar patterns across the three age groups (18–25, 26–35, 36–50 years), with no sign inversions and with differences of less than .15 in correlation magnitudes—an indicator of structural stability. This consistency reinforces that the wide age interval did not meaningfully affect the validity of the instrument, in line with authors who recommend preliminary stability checks before resorting to formal multigroup invariance testing (Schermelleh-Engel et al., 2003; Worthington & Whittaker, 2006).

Although the age range was broad (18–50 years), the results of this study addressed this issue in an objective and empirical manner, specifically through collinearity analysis and the examination of correlational stability across age groups. The collinearity analysis showed high tolerance and low VIF values (≈ 1.06–1.08), signalling no redundancy between age and the EVS-KOS factors. The stability of the correlational matrices across age groups revealed no sign inversions, with only marginal variations (≤ .15) in equivalent correlations.

Such consistency is interpreted in the literature as preliminary structural invariance, suggesting that age does not act as a behavioural moderator of the instrument's factors (Hair et al., 2019; Byrne, 2016; Kline, 2016). The results therefore demonstrate that age heterogeneity does not compromise the internal validity of the EVS-KOS and that the broader age range enables a more comprehensive characterisation of lifestyle patterns within the Kosovar cultural context.

Although the study presents robust findings, several limitations should be acknowledged. First, data collection was based on self-report, which may introduce social desirability bias, particularly for items related to substance use. Second, despite the observed stability across age groups, the relatively small size of the 36–50 age group limits the inferential power for more demanding invariance analyses (e.g., configural or scalar invariance). Third, the cross-sectional nature of the study does not allow for an examination of behavioural trajectories over time, thereby precluding causal interpretations or assessments of longitudinal stability. Future research should therefore employ stratified sampling procedures and conduct formal multigroup invariance testing.

The EVS-KOS emerges as an operationally relevant tool for public health in Kosovo. Its use enables the identification of behavioural profiles, the differentiation between health-promoting and health-risk behaviours, and the early detection of vulnerable groups, particularly young adults. Integrating the instrument into educational, clinical, and community settings may support the development of preventive policies, the monitoring of behavioural interventions, and the design of targeted strategies for specific populations, such as university students or workers in physically demanding sectors. Furthermore, the psychometric robustness demonstrated in this study provides a foundation for future longitudinal applications and lifestyle monitoring programmes within the Kosovar context.

Conclusions

The present study aimed to validate the Healthy Lifestyles Questionnaire EVS-KOS for the Kosovar population, ensuring linguistic and cultural adaptation. The results indicate that the instrument exhibits good psychometric properties, with internal consistency ranging from acceptable to excellent across its different dimensions. Confirmatory factor analysis demonstrated adequate global fit indices, supporting the structural validity of the proposed eight-factor model.

In sum, the EVS-KOS constitutes a valid and reliable instrument for assessing lifestyles in the Kosovo population aged 18 to 50 years, providing a useful resource for researchers, health professionals, and policymakers. Its application enables not only the characterization of distinct behavioural profiles but also the substantiation of public health intervention strategies, contributing to the promotion of healthier lifestyles and the prevention of non-communicable chronic diseases affecting the region.

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