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Emerging Infectious Diseases Preventive Health Behavior (EID-PHB) scale: Turkish validity and reliability study

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Abstract

Background Emerging infectious diseases are infections that appear for the first time in a specific region or show a rapid increase in the frequency or geographical spread of a known agent. These diseases spread rapidly and pose serious public health threats that can lead to global loss of life. Adopting and promoting preventive health behaviors is crucial in combating these threats. However, the lack of scales that comprehensively assess these behaviors in the general population is noteworthy. The aim of this study is to test the validity and reliability of the preventive health behaviors scale developed for use in Turkish contexts related to emerging infectious diseases.

Method In this psychometric study, the forward–backward translation method was applied in the translation of the scale from English into Turkish, and the content validity was assessed by 10 faculty members who are experts in their fields. The sample of the study consisted of 561 participants registered to a family health centre in a province in eastern Turkey, who met the study criteria and agreed to participate in the study. The construct validity of the scale was evaluated by Exploratory Factor Analysis and Confirmatory Factor Analysis. Reliability was evaluated by internal consistency using Cronbach's alpha coefficient. The data were collected using the 'Preventive Health Behaviours Scale for Emerging Infectious Diseases' and 'Personal Information Form'.

Results After the language equivalence of the scale, the Content Validity Index was calculated and found to be 0.870. The Kaiser - Meyer - Olkin value was 0.895 and Bartlett's test was statistically significant ($\chi2 = 3812.841$, $p < 0.001$). Exploratory factor analysis revealed a seven-factor structure (30 items) explaining 68.739% of variance (loadings 0.492–0.822). Confirmatory factor analysis indicated acceptable fit (CMIN/DF = 3.037, RMSEA = 0.060, CFI = 0.906). Composite reliability was acceptable across factors (CR = 0.68–0.93). Convergent validity was adequate for most factors (AVE ≥ 0.50), with some factors below 0.50 indicating limited convergent validity. Internal consistency was high ($\alpha = 0.927$).

Conclusion In this study, the Turkish validity and reliability of the Preventive Health Behaviours Scale for Emerging Infectious Diseases was determined to be a valid, reliable and psychometrically consistent assessment tool for the Turkish population.

Keywords Health behaviors, Infectious disease, Scale, Validity, Reliability

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Background

Emerging infectious diseases (EIDs) are diseases that have not previously been observed in humans, have appeared for the first time in a specific region, or exhibit a rapid increase in incidence or geographical spread of a known infection [1]. These diseases can emerge as endemic, epidemic, or pandemic, depending on their epidemiological characteristics. EIDs are significant public health issues that affect not only infected individuals but also health systems and social and economic life [2].

Over the past twenty years, newly emerging infectious diseases (e.g., COVID-19) have spread rapidly, becoming pandemics and posing serious public health threats that have led to global loss of life [3, 4]. Understanding the dynamics of newly emerging infectious diseases is critical for efforts to reduce the morbidity and mortality of such infections, for policy development to prepare for infectious threats, and for decision-making in disease control [5]. The preparation of official guidelines by governments on preventive behaviours for newly emerging infectious diseases takes time. Therefore, pre-developed assessment tools that can be used for preventive behaviours against newly emerging infectious diseases are becoming important. However, a review of the literature reveals that scales comprehensively assessing these behaviours in the general population are insufficient. Yet, in the fight against infectious diseases with the potential to spread rapidly, the adoption of protective health behaviours by individuals is decisive in the spread, reduction and control of diseases [6]. From this perspective, conducting research on preventive behaviours against newly emerging infectious diseases is important.

Some emerging diseases are transmitted through droplets, while others are transmitted through blood or environmental contamination. In this case, the protective behaviours developed by individuals against these threats also take on a multidimensional structure. Therefore, the comprehensive, valid and reliable assessment of protective behaviours against emerging infections is important for public health planning and the development of behavioural interventions [7].

Individuals' adoption of preventive health behaviours is influenced by variables such as risk perception, perceived susceptibility, perceived severity, self-efficacy, and behavioural intention. Theoretical models such as the Health Belief Model, the Theory of Planned Behaviour, and the Protective Motivation Theory provide robust theoretical frameworks explaining individuals' adoption of protective behaviours against infectious diseases [8, 9]. These models define the psychological and cognitive factors that influence the adoption of preventive behaviours, particularly in infectious diseases. These theoretical models provide a fundamental framework for conceptualising the sub-dimensions of the scale [10]. The Health Belief Model explains how individuals adopt mask use, contact safety, and other risk-reducing behaviours based on their perceived levels of risk and severity; the Theory of Planned Behaviour aligns with cognitive processes that support behaviours requiring planning and self-efficacy, such as hand hygiene and environmental cleaning [9, 11, 12]. The Protection Motivation Theory focuses on threat assessment (perceived susceptibility and severity) and coping assessment (self-efficacy) processes and, in this respect, forms the theoretical basis of the scale's psychological coping dimension [13]. Therefore, the factor structure of the scale is consistent with the psychosocial components of protective behaviours in the EID context as defined theoretically.

There are several scales in the literature designed to measure protective health behaviours. However, these scales only assess specific behaviours. For example, the Emerging Infectious Respiratory Diseases Preventive Behaviour Scale focuses solely on respiratory tract infections and does not cover different transmission routes (blood, air, environment) [14]. The Individual Infection Prevention Behaviour Scale, while assessing general infection prevention behaviours, does not include behavioural components such as contact safety, environmental cleaning, reducing the risk of contact with blood or body fluids, or psychological coping [15]. Furthermore, existing scales have generally been developed for healthcare professionals or nursing students and do not have a comprehensive structure applicable to the general public [16, 17]. This situation clearly highlights the need for a comprehensive tool that can validly and reliably measure the different types of protective behaviours exhibited by the public against newly emerging infectious diseases.

In line with this need, the EID-PHB developed by Lee and Shin (2024) addresses the protective health behaviours individuals may exhibit in the face of emerging infections across multiple dimensions. Each sub-dimension included in the scale encompasses the protective measures that should be taken against a specific transmission route observed within the scope of EID. The scale covers mask usage (droplet transmission), hand hygiene and contact safety (contact), environmental cleaning (inert objects that transmit infection), prevention of risky blood or body fluid contact behaviours (bloodborne), and psychological coping. This structure provides a comprehensive measurement capability for EIDs with different characteristics.

The aim of this study is to determine the validity and reliability of the 30-item Turkish version of the Preventive Health Behaviour Scale for Emerging Infectious Diseases (EID-PHB-T-30). Adapting the scale into Turkish will enable the measurement of protective behaviours exhibited by the community in response to emerging infectious diseases using a culturally appropriate and scientifically valid tool. It is anticipated that the findings will contribute to identifying factors influencing preventive behaviours by strengthening research on protective behaviours. This contribution is thought to significantly help minimise the harm that emerging infectious diseases may cause in the future. Furthermore, as the scale is adaptable to different cultures through language and cultural adaptations, it is expected to make important contributions to the global public health literature.

Method

Study population and sampling and sample size

This study was designed as a cross-sectional and methodological research to test the validity and reliability of the preventive health behaviour scale (EID-PHB) for emerging infectious diseases. The study was conducted between June and August 2024 with individuals registered at a primary healthcare centre in a province in eastern Turkey. There are a total of 28 primary healthcare centres in the province where the study was conducted. The research was carried out at this centre due to reasons such as accessibility, high referral density, and the research team's work permit. A total of 561 people participated in the study. The inclusion criteria were all individuals who were registered to the relevant family health centre, over 18 years of age, agreed to participate in the study and had no communication problems. Exclusion criteria were individuals who did not meet the inclusion criteria and had cognitive or mental disorders. The sample was randomly divided into two groups for Exploratory (n = 217) and Confirmatory (n = 344) Factor Analyses [18, 19]. The total sample (N = 561) was randomly split into two independent subsamples for EFA (n = 217) and CFA (n = 344). The split was intentionally unequal to (i) ensure that the EFA subsample met commonly recommended minimum criteria for factor analysis (at least 5–10 participants per item and ≥ 200 cases) [18, 20], while (ii) allocating a larger proportion of participants to the CFA subsample to obtain more stable and precise estimation of model parameters and fit indices. Random allocation was performed without considering participant characteristics, and subsequent comparisons indicated no statistically significant differences between the EFA and CFA groups on key sociodemographic variables (Table 1), supporting the comparability of the two subsamples.

Table 1 Frequency distribution of participants' demographic characteristics'

Characteristics	Participants in EFA (*n* = 217)		Participants in CFA (*n* = 344)		t / χ^2 (*p*)
Average Age	29.19 ± 11.08		31.09 ± 13.15		0.598 (0.547)
Gender					
Woman	117	53.7	238	69.4	1.651 (0.463)
Man	100	46.3	105	30.6	
Marital Status					
Married	97	45.0	198	57.7	0.588 (0.798)
Single	120	55.0	145	42.3	
Education Status					
Primary education	97	44.5	135	39.4	2.985 (0.074)
High School	115	53.2	166	48.4	
University and above	5	2.3	42	12.2	
Employment Status					
Yes	74	33.9	164	47.8	2.145 (0.624)
No	143	66.1	179	52.2	
Income Status					
Above average income	82	37.6	84	24.5	1.478 (0.062)
Average income	103	47.2	166	48.4	
Below average income	32	15.1	93	27.1	
Chronic Disease					
There is	33	15.1	59	17.2	0.414/(0.520)
None	184	84.9	284	82.8	
Infectious Disease Status					
Yes	110	50.9	200	58.3	1.579/(0.432)
No.	107	49.1	143	41.7	
Quarantine Status					
Yes	107	49.1	155	45.2	0.812/(0.368)
No.	110	50.9	188	54.8	

Notes: CFA, confirmatory factor analysis; EFA, exploratory factor analysis

Measurements

The data of the study were collected through face-to-face interviews using the 'Socio-demographic Information Form' and the EID-PHB-T-30.

The personal information form, which was developed by the researchers in line with the literature, consisted of a total of 11 questions about the socio-demographic characteristics of the participants (age, gender, marital status, education, employment status, income, chronic diseases, infectious disease and quarantine status). Chronic diseases were defined as long-term health conditions that require ongoing medical attention or limit activities of daily living, lasting one year or more. In the personal information form, participants were asked "Do you have any chronic diseases diagnosed by a physician?" as a binary (Yes/No) question. To ensure clarity, examples of common chronic conditions (e.g., hypertension, diabetes mellitus, chronic obstructive pulmonary disease, asthma, and cardiovascular diseases) were provided in the questionnaire or explained by the researchers during the face-to-face interviews.

The EID-PHB form was developed by Wee Kyung Lee and Sung Rae Shin in 2024 [21]. The scale consists of 34 items and 6 subscales (droplet transmission prevention, contact prevention, airborne transmission prevention, bloodborne transmission prevention, environmental prevention, psychological coping). It consists of a 5-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree'), taking into account the ease and sensitivity of the answers. The lowest score on the scale is 34 and the highest score is 170. A higher score indicates a higher level of preventive health behaviour. Cronbach's alpha coefficient of the scale was found to be 0.93.

The scale used in our study was developed by Wee Kyung Lee and Sung Rae Shin (2024). Permission to use the scale has been obtained from the scale owner. Our study focuses on the validity and reliability of this scale in Turkish (Appendix A).

Data collection

The research data was collected through face-to-face interviews with individuals who visited the relevant family health centre during visits made by researchers. Data collection was conducted during weekday working hours (08:00–17:00). Researchers explained the purpose of the study and provided information to adults in the center's waiting area. It was stated that participation was voluntary, that participants could withdraw from the study at any time, and that all data would be kept confidential. Informed consent forms were obtained from individuals who met the inclusion criteria and voluntarily agreed to participate in the study. Data were collected by questionnaire method. The participants were explained how to fill out the questionnaire. Tables and seating arrangements were set up in the waiting area so that the questionnaires could be filled out comfortably, and the questionnaires were completed under the supervision of researchers. In the meantime, necessary explanations were made by the researcher to those who had questions. The form that the participants were asked to fill out consisted of two parts. The first part included the consent form explaining the content of the study and that participation was completely voluntary, and the second part included demographic information and scale. Participant data were kept confidential and no personal information, e-mail, telephone number or other identification information was collected. The administration of the data collection forms took an average of 10–15 min. The completed forms were then collected by the researcher. When it was decided that the form had reached a sufficient sample size, the data collection process was terminated.

Translation

The translation and cultural adaptation process followed internationally accepted guidelines for cross-cultural adaptation of self-report measures [22, 23]. Specifically, we applied a forward–backward translation procedure in line with Beaton et al.'s recommendations, including independent forward translations, synthesis, back-translation, expert committee review, and pre-final version evaluation, to ensure both linguistic equivalence and cultural relevance of the Turkish version. In practice, two independent bilingual translators whose native language was Turkish carried out the forward translation from English to Turkish. One translator had a health sciences background and was familiar with the construct, whereas the other had no clinical background to capture more natural, everyday language. The two forward translations were compared item by item by the translators and the research team, and discrepancies were resolved through consensus meetings. When alternative phrasings were possible, priority was given to conceptual equivalence and clarity for the general population rather than literal, word-for-word translation.

The reconciled Turkish version was then back-translated into English by a different bilingual translator who was blinded to the original scale. The back-translated items were compared with the original English items by the authors and an expert panel to identify any semantic or conceptual inconsistencies. Where minor differences or culturally inappropriate expressions were identified, the Turkish wording was modified while preserving the original meaning. Thus, the final Turkish version is a conceptually equivalent and culturally adapted form of the original scale, rather than a strictly literal translation.

Statistical analysis

SPSS 27.0 and AMOS 20.0 programs were used to analyse the data of the study. The data were analysed using numbers and percentages and descriptive statistics to describe the general demographic characteristics of the participants. Before factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were performed to determine the adequacy of the sample and its suitability for factor analysis. For the content validity of the scale, language and content validity, exploratory and confirmatory factor analyses were performed. EFA was used to explore the psychometric properties of the EID-PHB-T-30, while CFA was used to confirm its validity. To confirm the convergent and discriminant validity of the scale, correlation analyses were performed for AVE, CR and inter-factor correlation coefficients. Internal consistency for each factor was assessed using Cronbach's α coefficient.

Content validity

Before data collection, an expert opinion form regarding the content validity of the EID-PHB-T-30 was shared with 10 faculty members who are experts in the field. The form included the original version of the scale, its Turkish translation, subdimensions, and scoring method, and was sent to the experts via email. Content validity was assessed using the Davis technique with ten subject-matter experts. Each expert rated every item on a 4-point relevance scale (1 = not relevant, 2 = needs major revision, 3 = needs minor revision, 4 = highly relevant). Item-level Content Validity Index (I-CVI) was calculated as: I-CVI = (number of experts rating the item 3 or 4) / (total number of experts). For a panel of 10 experts, an I-CVI ≥ 0.78 was set as the acceptability threshold. The scale-level Content Validity Index based on the average of item-level CVIs (S-CVI/Ave) was computed as the arithmetic mean of all I-CVI values: S-CVI/Ave = mean(I-CVI for all items). In this study, I-CVI values ranged from 0.833 to 1.000 and the S-CVI/Ave was 0.870, indicating acceptable content validity. Items with I-CVI < 0.78 would have been considered for revision or removal; in our case all items met the criterion. The expert evaluation was conducted to ensure the items' suitability for the field and conceptual equivalence. However, a separate and formal face validity study with the target participants was not carried out. A separate pilot test of the translated questionnaire was not conducted prior to the main data collection. During data collection, researchers were available to respond to participants' questions, and no systematic difficulties in understanding the items were reported.

Construct validity

Item analysis was performed on the EFA participants ($n = 217$) prior to factor extraction to evaluate item performance. For each item we inspected: mean, standard deviation, skewness and kurtosis, corrected item–total correlations, and "Cronbach's alpha if item deleted." Items were flagged for potential removal or revision if they met any of the following criteria: corrected item–total correlation < 0.30; marked skewness or kurtosis indicating poor distribution; pronounced ceiling or floor effects; or a meaningful increase in overall Cronbach's alpha if the item was deleted. Flagged items were reviewed for conceptual relevance before EFA. Suitability for factor analysis was evaluated using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Results supported factorability (KMO = 0.895; Bartlett's $\chi2 = 3812.841$, $p < 0.001$).

EFA procedure

Exploratory factor analysis (EFA) was conducted using Principal Axis Factoring (PAF), which estimates only common variance and is recommended for identifying latent constructs in scale development and validation [20, 24]. PAF with Varimax rotation was used to obtain a clear and interpretable factor structure. The resulting seven-factor solution from the EFA formed the basis for the subsequent CFA model. Kaiser's criterion (eigenvalues > 1.0), visual inspection of the scree plot, and theoretical interpretability guided the decision on the number of factors to retain. Items were retained on a factor if the rotated primary loading was ≥ 0.40 and communalities were ≥ 0.30. Items with substantial cross-loadings were considered problematic when the difference between primary and secondary loadings was ≤ 0.20; such items were reviewed for both statistical and conceptual fit. Items with low primary loadings, low communalities, or problematic cross-loadings were considered for removal.

CFA procedure

Confirmatory factor analysis (CFA) was conducted on the independent validation subsample ($n = 344$) to test whether the factor structure obtained from the exploratory factor analysis (EFA) provided an adequate representation of the data. CFA was performed using AMOS 20.0 with maximum likelihood (ML) estimation. The measurement model was specified according to the EFA results: each observed item was loaded on its hypothesized latent factor, and latent factors were allowed to correlate.

Model fit was evaluated using multiple goodness-of-fit indices. The chi-square/degree of freedom ratio (CMIN/DF; also reported as χ^2/df) was used as a parsimonious fit indicator, where values < 5 indicate acceptable fit and values < **3** indicate good fit. The Root Mean Square Error of Approximation (RMSEA) was used to assess approximate fit, where values ≤ 0.08 indicate acceptable fit and values ≤ 0.06 indicate good fit. Incremental fit was assessed using the Comparative Fit Index (CFI) and the

Tucker–Lewis Index (TLI), where values ≥ 0.90 indicate acceptable fit and values ≥ 0.95 indicate good fit. Additional fit indices reported were the Normed Fit Index (NFI) and the Goodness-of-Fit Index (GFI), for which values close to or above 0.90 are generally interpreted as acceptable. These cut-off values were interpreted in line with commonly used recommendations in the structural equation modeling literature [18, 24].

Standardized factor loadings were examined to evaluate the strength of item–factor relationships; loadings of ≥0.50 were considered adequate. Modification indices were inspected, and error covariances were added only between items within the same factor/subdimension when both statistical evidence (modification indices) and substantive interpretability supported the modification, to improve model fit without compromising the theoretical structure (e.g., e14–e22, e2–e3, e4–e7).

Convergent and discriminant validity

Convergent validity was assessed using Average Variance Extracted (AVE) and Composite Reliability (CR). AVE values ≥ 0.50 and CR values ≥ 0.70 were considered indicative of adequate convergent validity and internal consistency, respectively. Discriminant validity was evaluated by examining inter-factor correlations; correlations substantially lower than 1.0 indicate that factors measure distinct constructs.

Reliability

The internal consistency reliability of the scale was assessed using Cronbach's alpha coefficient. The Cronbach's alpha coefficient of the scale was found to be 0.927, indicating strong internal consistency.

Results

Participants' characteristics'

In the study, a total of 561 participants were included. The mean age for the full participants was 30.34 years (SD = 12.40); 63.1% were female; 52.6% were married; 50.6% were high school graduates; 56.9% were not employed; and 47.9% reported moderate income. Overall, 83.6% reported no chronic disease; 55.3% reported a history of infectious disease; and 52.6% reported not having undergone quarantine. Demographic characteristics for the total participants and for the EFA ($n = 217$) and CFA ($n = 344$) subsamples are presented side-by-side in Table 1. it was determined that the mean age of the EFA group was 29.19 ± 11.08, 53.7% were female, 55% were single, 53.2% were high school graduates, 66.1% were not working, and 47.2% had a average income level. It was determined that 84.9% of the participants in the EFA group did not have chronic diseases, 50.9% had an infectious disease and 50.9% did not stay in quarantine. The mean age of the CFA group was 31.09 ± 13.15, 69.4% were female, 57.7% were married, 48.4% were high school graduates, 52.2% were unemployed, and 48.4% had a average income level. It was determined that 82.8% of the participants in the CFA group did not have chronic diseases, 58.3% had an infectious disease and 54.8% did not stay in quarantine. There was no statistically significant difference between the groups (Table 1).

Psychometric evaluation of the scale

content Validity

Item-level CVI values ranged from 0.833 to 1.000; the scale-level S-CVI/Ave was 0.870, indicating acceptable content validity.

Construct validity with EFA Sampling adequacy supported factorability (KMO = 0.895; Bartlett's $\chi2 = 3812.841$, $p < 0.001$). EFA (PAF with Varimax rotation) yielded a seven-factor solution (eigenvalues > 1) explaining 68.739% of the total variance. Four items (I19, I21, I25, I26) were removed during EFA based on loadings: two items did not reach a primary loading ≥ 0.40 on any factor, and two items showed substantial cross-loadings with insufficient separation between primary and secondary loadings (difference ≤ 0.20), which prevented clear factor assignment. The final 30-item solution showed rotated factor loadings between 0.492 and 0.822. The seven factors and their explained variances were: F1 Mask and Contact Safety (8 items; 17.462%), F2 Psychological Coping (5 items; 12.467%), F3 Hand Hygiene (4 items; 9.089%), F4 Contaminated Carriers (3 items; 8.032%), F5 Respiratory Etiquette (3 items; 7.803%), F6 Preventing the Risk of Airborne and Bloodborne Transmission (4 items; 7.282%), and F7 Environmental Precaution (3 items; 6.604%).

The phrase "four items showed binary item characteristics" refers to items that either (a) failed to load meaningfully on any factor (primary loading < 0.40) or (b) exhibited ambiguous cross-loadings (multiple substantial loadings with ≤ 0.20 difference between primary and secondary loadings). Such items could not be assigned unambiguously to a single factor and were therefore removed [18]. In the preliminary EFA, items 19 (I clean my hands with hand sanitiser when there is no soap and water), 21 (I leave the place as soon as possible when ventilation is inadequate), 25 (I take a shower when I come into contact with the blood of others) and 26 (I try not to get infected when using an injector (self-injection, blood transfusion, blood donation, blood collection, etc.)) were removed from the scale as they showed overlapping item characteristics (Table 2).

Construct validity with CFA

CFA on the validation participants ($n = 344$) supported the seven-factor, 30-item structure. Standardized loadings were ≥ 0.50 for all items. Model fit indices indicated

Table 2 Protective Health Behaviours for Emerging İnfectious Diseases Scale Rotated Factor Pattern Matrix ($n = 217$)

Items	**Factors**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Factors 1 (F1): Mask and Contact Safety							
Item9	0.818						
Item4	0.804						
Item5	0.802						
Item10	0.781						
Item8	0.770						
Item 7	0.740						
Item11	0.721						
Item6	0.527					0.347	
Factors 2 (F2): Psychological Coping							
Item32		0.807					
Item31		0.744					
Item33		0.743					
Item30		0.740					
Item34		0.625					
Factors 3 (F3): Hand Hygiene							
Item18			0.822				
Item17			0.810				
Item16			0.660		0.313		
Item15			0.588		0.399		
Factors 4 (F4): Contaminated Carriers							
Item12	0.304			0.734			
Item14				0.731			
Item13		0.359		0.688			
Factors 5 (F5): Respiratory Etiquette							
Item2					0.794		
Item1					0.709		
Item3					0.688		
Factors 6 (F6): Preventing The Risk Of Airborne and Bloodborne Transmission							
Item23						0.733	
Item22						0.653	
Item24						0.496	
Item20	0.366			0.357		0.492	
Factors 7 (F7): Environmental Precaution							
Item27							0.710
Item29		0.410					0.695
Item28						0.430	0.651
Eigen value	10.135	3.292	2.110	1.613	1.254	1.161	1.057
Explained variance (%)	17.462	12.467	9.089	8.032	7.803	7.282	6.604
Total explained variance (%) 68.739							

acceptable fit: CMIN/DF = 3.037; RMSEA = 0.060; CFI = 0.906; TLI = 0.893; NFI = 0.867; GFI = 0.875. Error covariances were introduced between items within the same subdimension where modification indices and substantive interpretability justified them (e14–e22, e2–e3, e4–e7) (Fig. 1).

Convergent and discriminant validity

To confirm the convergent and discriminant validity of the EID-PHB-T-30, correlation analysis was performed for AVE, CR and inter-factor correlation coefficients. AVE values for each factor ranged between (0.36–0.88). CR values were determined to be between (0.68–0.93). A moderate positive correlation was found between the factors ($p < 0.001$).

Internal consistency

The reliability coefficient of all items of the EID-PHB-T-30 was 0.925. Cronbach α values of the sub-dimensions ranged between 0.68 and 0.91. Corrected item-total correlations were between 0.334 and 0.646. indicating good internal consistency (> 0.30 for all items) (Table 3).

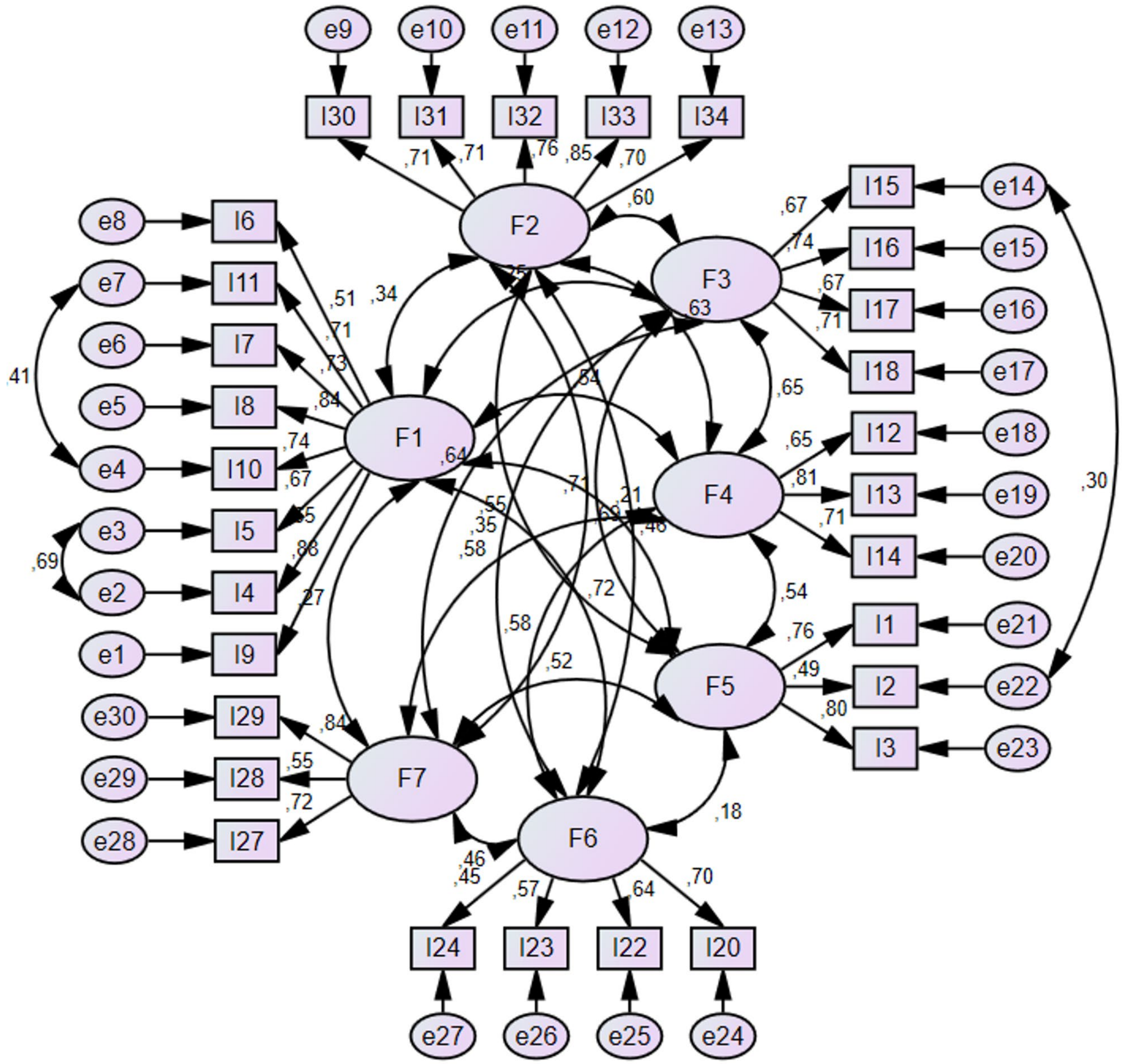

Fig. 1 Path diagram of preventive health behaviours scale for emerging infectious diseases

Discussion

The findings obtained in this study demonstrate that the scale exhibits high levels of validity and reliability. Language equivalence, content validity, exploratory and confirmatory factor analyses, and internal consistency analyses have demonstrated that the scale has a psychometrically robust structure for assessing protective health behaviors against emerging infectious diseases. These results support the scale's applicability in measuring protective health behaviors in the community and fill an important gap in the literature.

The scale was developed and culturally adapted to comprehensively measure preventive health behaviors exhibited by society against infectious diseases. The findings show that the scale can reliably and validly measure its different dimensions. Some structural differences were observed between the original scale and the Turkish version. While seven factors emerged in the exploratory factor analysis of the Turkish version. the number and order of factors differed from the original study. This difference may reflect perceptual and behavioral differences arising from language and cultural context. For example. some items were understood differently in Turkish culture. and this situation was reflected in the factor structure. This situation highlights the importance of cultural adaptation of the scale and reveals the unique dimensions of preventive health behaviors in Turkish society.

Table 3 Results of the reliability analysis of the psychometrically tested short-form (30-item) Turkish version of the Emerging Infectious Diseases Preventive Health Behavior Scale (EID-PHB-T-30)

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	110.563	240.343	0.355	0.914
Item 2	110.909	235.744	0.423	0.914
Item 3	110.490	240.725	0.367	0.914
Item 4	112.241	222.987	0.639	0.91
Item 5	112.385	222.966	0.611	0.911
Item 6	111.770	225.231	0.569	0.911
Item 7	111.895	225.359	0.599	0.911
Item 8	111.972	223.806	0.633	0.91
Item 9	112.223	223.384	0.646	0.91
Item 10	112.537	224.978	0.574	0.911
Item 11	112.496	226.479	0.514	0.913
Item 12	111.226	230.3	0.569	0.911
Item 13	110.829	233.881	0.587	0.912
Item 14	110.820	234.719	0.518	0.912
Item 15	110.722	236.426	0.533	0.912
Item 16	110.622	238.646	0.446	0.913
Item 17	110.349	242.856	0.334	0.915
Item 18	110.599	240.076	0.376	0.914
Item 20	111.501	228.533	0.576	0.911
Item 22	111.644	230.619	0.503	0.913
Item 23	112.437	230.904	0.419	0.914
Item 24	111.613	235.495	0.342	0.915
Item 27	110.562	240.14	0.436	0.914
Item 28	111.235	234.627	0.39	0.914
Item 29	110.849	236.172	0.507	0.913
Item 30	110.859	237.075	0.501	0.913
Item 31	110.768	237.596	0.491	0.913
Item 32	110.825	237.473	0.462	0.913
Item 33	110.777	236.238	0.552	0.912
Item 34	110.747	237.314	0.509	0.913
	Mean	**Variance**	**Std. Deviation**	**Cronbach Alfa**
	115.11	248.65	15.kk77	0.925

In the literature. several tools have been developed to measure infection prevention behaviours. such as the Emerging Infectious Respiratory Disease Preventive Behaviors Scale [14] and the Infection Prevention Behavior Scale of Individuals (IPBS-I) [15]. While these instruments provide valuable insights, they mainly focus on general infection prevention or specific routes of transmission (e.g. respiratory). In contrast, the EID-PHB-T-30 demonstrated strong psychometric properties and offers a more comprehensive structure. encompassing multiple domains including droplet, airborne, bloodborne transmission, environmental prevention, and psychological coping. This multidimensional framework enables a broader evaluation of preventive health behaviours in the general population. Moreover, the cultural adaptation and validation of the EID-PHB-T-30 for the Turkish context address the need for reliable and contextually relevant tools, thereby contributing both nationally and internationally to the measurement of preventive behaviours against emerging infectious diseases.

In the literature, it is considered desirable to verify the content validity of the items with at least three to ten experts [25]. Therefore, a total of 10 experts. including experts with experience in infectious diseases and public health, were sent an e-mail to evaluate the item content validity index (I-CVI) and scale content validity index (S-CVI) of the EID-PHB-T-30. The experts evaluated the scale items according to the Davis technique, with a score range of 1–4 points for the comprehensibility of each item and whether each item had proper. correct. clear and clear expression. The evaluation was made as 1 not appropriate, 2 items need to be modified, 3 appropriate but minor changes are needed, and 4 defined as very appropriate [26]. In the literature, it is stated that the item-level content validity index (I-CVI) should be 0.78 or higher when there are six to ten evaluators [27, 28]. Therefore, since the I-CVI value of all items in the scale was above 0.87, no item was removed from the scale. However, the experts expressed their opinions about possible changes that could be made to the items. In the original study of the scale, the I-CVI was above 0.83.

The total variance explained as a result of repeated factor analysis in the study was determined as 68.739%. When the factor loadings and total variance are analysed, it is seen that the items are sufficient to explain the total variance and the factor structure is strong. The scale has not yet been translated into other languages outside of the original development study. Therefore, this study represents the first adaptation and validation of the instrument in Turkish, which provides an important contribution by making the scale available for use in different cultural contexts.

To make the factor structure of the scale more robust and to increase its validity and reliability, 4 items showing overlapping item characteristics were removed. After the removal of 4 items, the factor loadings of all items of the newly emerging scale of preventive health behaviours for infectious diseases consisting of 30 items were found to be greater than 0.50. According to the results of the Confirmatory Factor Analysis, the goodness of fit indices of the model were found to be acceptable. The CMIN/DF value of 3.037 indicates that the model has a reasonable fit with the data. The RMSEA value of 0.060 indicates that the overall fit of the model is good and the errors are small. A value between 0.05 and 0.08 for RMSEA indicates that the model has an acceptable fit. In addition, most of the CFI (0.906). TLI (0.893). NFI (0.867) and GFI (0.875) values are close to or above 0.90. indicating that the model presents a factor analysis that is appropriate for the theoretical structure. These results support that the construct validity of the scale is strong and the theoretical structure is a good fit with the data set. These results show that each item of the EID-PHB-T-30 can assess the targeted concept more consistently, contributes to the scale domain. and acceptable goodness-of-fit indices indicate structural invariance [29]. The strong psychometric properties of the scale in the study indicate that it can be used reliably and validly in different populations. This provides an important tool to evaluate the effectiveness of preventive health behaviours for emerging infectious diseases and to monitor their impact.

To confirm the convergent and discriminant validity of the EID-PHB-T-30. correlation analyses were performed for AVE, CR and inter-factor correlation coefficients. AVE values between 0.36 and 0.88 indicate that each factor is adequately explained by the relevant items and that the factors have a homogeneous structure [30]. In the literature, it is recommended that the ideal AVE value should be above 0.50 [30, 31]. The values obtained in this study show that the scale has an acceptable convergent validity [29]. CR values between 0.68 and 0.93 indicate that the internal consistency and reliability of the factors are quite high [31].

To confirm the discriminant validity of the scale. the correlation coefficients between the factors were analysed. The results of the analyses revealed a moderate positive correlation between the factors ($p < 0.001$). In the original study, the correlation coefficient between the factors was found as $r = 0.21 \sim 0.60$ ($p < 0.001$). The finding obtained in our study is important in that it shows that discriminant validity has been achieve, that the factors are interrelated, but also that they measure different concepts [31]. It shows that different aspects of preventive health behaviours for emerging infectious diseases are interrelated. but still consist of different components that can be separated from each other.

The internal consistency reliability and homogeneity of the EID-PHB-T-30. whose validity and reliability were assessed. were evaluated using item-total score correlations and Cronbach alpha coefficients. In the original study, Cronbach's alpha value was found to be 0.93. In our study, the total reliability coefficient of all items of the scale was found to be 0.93. indicating that the scale has a high degree of internal consistency and that the items measure protective health behaviours against emerging infectious diseases in harmony with each other. The accepted reliability coefficient in the literature is reported as 0.70 and above. In our study, this value is well above the accepted limit and provides strong evidence for the reliability of the scale [32, 33].

Item-total score correlations were calculated to evaluate the relationship between the items of the EID-PHB-T-30 and the scale. In the original study of the scale, Cronbach's alpha values were found between 0.71 and 0.92. In our study, Cronbach alpha values of the sub-dimensions were found between 0.68 and 0.91. The findings show that the correlation coefficients of all items were between 0.36 and 0.64. These values are well above the minimum value of 0.30 recommended in the literature and provide strong evidence for the internal consistency and homogeneity of the scale [34]. In the literature, it is stated that items with item-total correlations below 0.20 should be removed from the scale, and values between 0.20 and 0.30 should be carefully evaluated whether the item should be kept in the scale [34]. In our scale, since the correlation coefficients of all items were above 0.30, it can be said that all items effectively measured the construct forming the scale and made a significant contribution to the scale. This shows that each item of the validity and reliability scale plays an important role in evaluating preventive health behaviours for emerging infectious diseases and serves the general purpose of the scale. High item-total correlations also point to the construct validity of the scale. because the fact that the items are strongly correlated with the scale score indicates that they reflect the construct to be measured.

Limitations

This study was conducted in a single province in eastern Turkey; therefore, generalizability is limited to individuals registered in that locale. To enhance external validity, future research should recruit larger, more diverse samples from multiple regions of the country. Additionally, outcomes were based on self-report, which may introduce response biases (e.g., social desirability or overreporting of protective behaviors).

This study also has several methodological limitations. First, we did not conduct a formal, participant-based face validity assessment (e.g., cognitive interviews or pilot debriefings); item comprehensibility was instead addressed through expert review and subsequent psychometric testing. Second, while content validity was evaluated using expert ratings and CVI indices (I-CVI and S-CVI/Ave), we did not compute the Content Validity Ratio (CVR); including CVR could further strengthen content validation. Third, we did not conduct a test–retest study with a 2–4 week interval; therefore, temporal stability of the scale using Pearson's correlation coefficient was not estimated. Another limitation is that we did not administer additional validated questionnaires measuring related or unrelated constructs alongside the EID-PHB-T-30. Therefore, convergent and discriminant validity were examined only through internal indices (e.g., factor loadings, AVE, CR and inter-factor correlations) rather than through correlations with external criterion measures. Future studies should include other theoretically related and unrelated scales to more comprehensively evaluate convergent and divergent validity. Future studies should incorporate (i) a structured face validity protocol with target users, (ii) CVR alongside CVI during expert review, and (iii) a 2–4 week retest to calculate test-retest reliability using Pearson's or Spearman's correlation coefficients and evaluate temporal stability.

Conclusion

In conclusion, the final Turkish version of the scale (EID-PHB-T-30) consists of 30 items, providing a more concise and psychometrically validated structure compared to the original 34-item version, specifically adapted for the Turkish population.

It is thought that the scale. which has been proven to be valid and reliable, will be used in studies to determine and improve the levels of preventive health behaviours of individuals in Turkish society for the prevention of emerging infectious diseases. and will help health professionals and governments to develop, implement and evaluate their programmes by preparing quarantine policies related to emerging infectious diseases.

Increasing preventive health behaviours for emerging infectious diseases is very important in terms of preventing the rapid spread of the disease. The validity and reliability of this scale will be a valuable tool to achieve the determined goal. Studies covering the whole country are necessary to understand how changes in the level of health behaviours of the population affect health outcomes over time.

Future studies can further strengthen the psychometric properties of the scale by conducting confirmatory factor analyses on different sample groups and examining the validity of the scale in different cultures. In addition, language adaptations and cultural validity studies should be conducted to increase the applicability of the scale in communities with other cultural and demographic characteristics. Completion of these processes will increase the international usability of the scale and provide a powerful tool for assessing the preventive health behaviours of different communities towards infectious diseases.

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

Conception and design: NT. NH; data collection: EBS; analysis and result interpretation of data: NT. EBS; drafting of the manuscript: NT. EBS; critical revision of the manuscript for important intellectual content: NT. NH; statistical analysis: NT. All authors read and approved the final manuscript.

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Data availability

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Declarations

Ethical approval

Before data collection. approval was obtained from Atatürk University Faculty of Medicine Ethics Committee with reference number 2024 – 315; written permission was obtained from the owner of the scale to use the Preventive Health Behaviours Scale for Emerging Infectious Diseases and from Erzurum Provincial Health Directorate for the collection of research data. Before starting the study. the purpose of the study was explained to the participants and their informed consent was obtained. Participants were informed that they could leave the study at any time. The study was conducted in accordance with the Declaration of Helsinki.

Informed consent

Informed consent was obtained from the individuals participating in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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