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A SCALE DEVELOPMENT AND VALIDATION STUDY: COMMUNICABLE DISEASES RISK AWARENESS AND PROTECTION SCALE

BULAŞICI HASTALIKLAR RİSK FARKINDALIĞI VE KORUNMA ÖLÇEĞİ GELİŞTİRME

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ABSTRACT

Objective: It is important to measure the risk awareness and protection levels of individuals to be protected from infectious diseases that maintain their importance for society by showing a dynamic course. This study was aimed to develop the "Communicable Diseases Risk Awareness and Protection Scale" as a measurement tool for adult individuals.

Materials and Methods: This is a methodological research, and the purposeful sampling method was used. The item pool prepared by the researchers has been provided with scope validity with expert opinions. After the pilot study, the 60-item draft scale was applied to the research group, consisting of 740 individuals. After an item analysis and an exploratory factor analysis, a confirmatory factor analysis was performed on the draft scale.

Results: As a result of the principal components analysis and the Varimax rotation method, a six-factor structure was formed with the explained total variance of 45.21%. Since the Chi-square/df:2.78, RMSEA:0.049, CFI:0.97, GFI:0.97, AGFI:0.97, NFI:0.96, and RFI:0.96 met the fit criteria, the construct validity of the scale was confirmed. In reliability analysis: Cronbach α value of the scale was 0.91; sub-dimensions were between 0.60-0.78. The Spearman-Brown coefficient was 0.86, and the test-retest correlation value was 0.95.

Conclusion: It has been determined that the 'Communicable diseases risk awareness and protection scale,' consisting of 6 sub-dimensions and 36 items, was determined to be valid and reliable. The increase in the total score indicates a high level of risk awareness and protection from communicable diseases.

Keywords: Communicable diseases scale, scale development, validity, reliability

ÖZET

Amaç: Dinamik bir seyir göstererek toplum açısından önemini koruyan bulaşıcı hastalıklardan korunmak için bireylerin risk farkındalığı ve korunma düzeylerinin ölçülebilmesi önemlidir. Bu çalışmada yetişkin bireyler için bir ölçme aracı olarak 'Bulaşıcı Hastalıklar Risk Farkındalığı ve Korunma Ölçeği'nin geliştirilmesi amaçlanmıştır.

Gereç ve Yöntem: Metodolojik tipte bir araştırmadır ve amaçlı örnekleme yöntemi kullanılmıştır. Araştırmacılar tarafından hazırlanan madde havuzunun kapsam geçerliliği uzman görüşleri ile sağlanmıştır. Pilot çalışma sonrasında 60 maddelik taslak ölçek, 740 kişiden oluşan araştırma grubuna uygulanmıştır. Madde analizi ve açımlayıcı faktör analizi sonrasında, taslak ölçek için doğrulayıcı faktör analizi yapılmıştır.

Bulgular: Temel bileşenler analizi ve Varimax döndürme yöntemi sonucunda toplam varyansı %45,21 olarak açıklanan altı faktörlü yapı oluşturulmuştur. Ki-kare / sd:2,78, RMSEA:0,049, CFI:0,97, GFI:0,97, AGFI:0,97, NFI:0,96, RFI:0,96 uyum ölçütlerini karşıladığından ölçeğin yapı geçerliliği doğrulanmıştır. Güvenirlik analizinde: Ölçeğin Cronbach α değeri 0,91; alt boyutları 0,60-0,78 arasındadır. Spearman-Brown katsayısı 0,86 ve test-tekrar test korelasyon değeri 0,95'ti.

Sonuç: Altı alt boyut ve 36 maddeden oluşan 'Bulaşıcı hastalıklar risk farkındalığı ve korunma ölçeği' geçerli ve güvenilir olarak belirlenmiştir. Toplam puan artışı, bulaşıcı hastalıklara risk farkındalığı ve korunma düzeyinin arttığını göstermektedir.

Anahtar Kelimeler: Bulaşıcı hastalıklar ölçeği, ölçek geliştirme, geçerlik, güvenilirlik

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INTRODUCTION

Communicable diseases where microorganisms play a role in aetiology can lead to social problems such as panic, anxiety, absenteeism, economic damage, and density in health institutions by causing death, disability, and epidemics (1). Microorganism-related factors, the environment, and individual and social risk factors play a role in transmissions, such as air, droplets, contact, water, food, and sexual or hospital-borne transmissions (2). It can spread to a large part of society, between countries and even continents, in a very short period by infecting sensitive and healthy persons (1). The spread of infectious agents to every region of the world has become easier due to globalization, rapid urbanization, collective travelling, climate change, and global warming (2). Although progress has been made in the control of communicable diseases, it does not lose its importance in terms of morbidity and mortality due to its dynamic structure and continues to be one of the leading public health problems of society (1).

As for the control of communicable diseases, the knowledge, attitudes, and beliefs of the individuals and society are as important as health systems, services and technologies. The levels of risk awareness, correct attitudes and behaviors of individuals provide high benefits to the environment and society in preventing infection and spread (2). The fact that individuals with wrong attitudes and behaviors are factors in the spread of the disease in society creates the need for measuring and evaluating the attitudes and behaviors. Knowing the ways of transmission of infectious diseases will lead individuals to be more careful about protection. In this regard, mistakes known to be true or truths known to be false will make individuals and society susceptible to infectious diseases. For example, there may not be a sufficient level of knowledge for protection from infectious diseases in society on issues such as handwashing, ventilation, handshaking, eating and drinking or personal care environments, crowded areas, vaccinations, sexual transmission, water, and food. This situation reveals the necessity of measuring the attitudes and behaviors of individuals towards infectious diseases. Therefore, developing an objective measurement tool that measures the level of risk awareness and protection levels of communicable diseases will help determine the risk awareness level of both the individual and society.

In the literature reviews, it was determined that there was no scale available in Turkish or English that measures the communicable diseases risk awareness and protection levels of society. Some studies measure the level of knowledge about specific communicable diseases, mostly for special groups. No study measures the levels of awareness, attitudes, and behaviors of individuals related to protection from communicable disease risks in daily and general life. For this purpose, it is necessary to develop a scale with proven validity and reliability.

The aim of this study was to develop a qualified, valid and reliable scale, and all steps of scale development studies were applied in every stage. It was aimed to develop the "Communicable disease risk awareness and protection scale (CDRAPS)," which will enable the measurement of the general risk awareness and protection levels of communicable diseases in adult individuals.

MATERIALS AND METHODS

This study, which was carried out to develop a scale, is methodological research. It was planned that the scale was intended for society and adult individuals that constitute the target group. The population of the study consisted of individuals aged 18 and above who applied to family health centres (FHC) in Kayseri province and its districts. The research was conducted between February 2019 and February 2020. Data collection was carried out at Family Health Centers (FHCs) located in Kayseri city centre and Yeşilhisar, Yahyalı, and İncesu districts between May-November 2019. The study was conducted with a sample group, a pilot study group, and a post-test group.

A criterion was used to calculate the sample size, which is applied in all scale development studies. The number of individuals corresponding to 10-20 times the item pool was taken into account for the sample (3, 4). For this purpose, 740 individuals, corresponding to approximately 12 times the item pool (60 items), were included in the sample. To give a quality to the scale, it was aimed to select a sample group that would reflect the differences (heterogeneity) of society. The "maximum diversity sampling method," which is a non-randomized and purposive sampling method, was used as the sampling method. It was aimed to select inclusive and heterogeneous participants according to each characteristic that was intended to be measured. To fulfil this goal, Kayseri is divided into two areas, urban and rural. The urban areas, Kocasinan, Melikgazi, and Talas, are in the centre. The rural area, Akkışla, Bünyan, Develi, Hacılar, İncesu, Pınarbaşı, Sarıoğlan, Sarız, Tomarza, Yahyalı, Özvatan, Felahiye, and Yeşilhisar, are outside the center. The total population of Kayseri's districts in 2019 and their distribution by gender are given in Table 1.

Kocasinan, Melikgazi, and Talas were chosen as urban areas. Yeşilhisar, Yahyalı, and İncesu districts were determined as rural areas by lot. After Kayseri was divided into urban and rural areas, each region was divided into socioeconomic levels. During the study, similar distributions were attempted in terms of gender, age, and educational level. Periodic descriptive statistical analyses of the data, collected from urban and rural areas, were made to try to equalize their distribution in terms of age group, gender, education level, marital status, and place of residence (Table 2).

The descriptive characteristics of the research group are given in Table 2.

Table 1: Total population of Kayseri districts in 2019 and distribution by gender

County/Town	Total population	Male population	Female population	Male %	Female %
Melikgazi	571.166	285.154	286.012	49.9	50.1
Kocasinan	396.912	197.248	199.664	49.7	50.3
Talas	163.773	81.790	81.983	49.9	50.1
Develi	65.745	33.044	32.701	50.3	49.7
Yahyalı	36.208	18.272	17.936	50.5	49.5
Bünyan	30.603	17.166	13.437	56.1	43.9
İncesu	27.969	14.232	13.737	50.9	49.1
Pınarbaşı	24.080	12.546	11.534	52.1	47.9
Tomarza	22.166	11.296	10.870	50.9	49.1
Yeşilhisar	16.098	8.086	8.012	50.1	49.9
Sarıoğlan	14.552	7.318	7.234	50.3	49.7
Hacılar	12.414	6.263	6.151	50.5	49.5
Sarız	9.583	4.902	4.681	51.2	48.8
Akkışla	6.247	3.166	3.081	50.7	49.3
Felahiye	5.861	2.980	2.881	50.8	49.2
Özvatan	4.164	2.098	2.066	50.4	49.6

Table 2: Sociodemographic characteristics of the research group

Features		Number	%
Gender	Male	361	48.8
	Female	379	51.2
Age group	18-29	180	24.3
	30-39	196	26.6
	40-49	182	24.6
	50+	182	24.6
Educational status	Secondary school graduate and below	227	30.7
	High school graduate	260	35.0
	University graduate and above	253	34.3
Location of longest residence	Urban (city centre)	431	58.3
	Rural (county, town and village)	309	41.7
Marital status	Never married	174	23.6
	Married	516	69.7
	Deceased/separated	50	6.7
Total		**740**	**100.0**

A heterogeneous, comprehensive, and wide variance distribution was formed in the research group.

No sampling method and sample size calculations were made for the pilot application and test-retest analysis, and individuals who agreed to participate were included.

In this study, the concept of infectious diseases was evaluated according to the risks and protection behaviors of all transmission routes. An item pool, consisting of approximately 95 items, was prepared by the researchers from the literature. General risk factors covering all infectious diseases in society and ways of prevention

have been researched in the literature and have prepared the items related to attitudes and behaviors that can be applied in daily life. The item pool should be three or four times more than the number of items considered in the final scale (5, 6). The answer choices were designed to be in a five-point Likert type. Response choices for items measuring awareness/attitude are "Strongly Disagree" to "Strongly Agree;" for the items measuring behavior, the response choices range from "Never" to "Always."

Scope, content, and appearance validity were ensured by taking expert opinions for the item pool (7). The expert panel consisted of six faculty members from Erciyes University Faculty of Medicine, Department of Public Health. The item pool consisting of 95 items prepared by the researchers was discussed one by one in a face-to-face panel consisting of six people. After the items were added and removed during the panel, a new pool of 75 items was formed. These items were sent to the committee of experts via e-mail. The expert committee consisted of public health, infectious diseases, and assessment-evaluation specialists throughout Turkiye. 21 experts who gave back feedback scored each question according to its suitability, and as a result, a draft scale consisting of 60 items was created. This draft scale was evaluated in terms of Turkish spelling and grammar rules by two experts from the field of Turkish Language and Literature.

The draft scale, which was shaped after expert opinion, was tested by interviewing 25 persons suitable for the target group, and necessary corrections were made by the researchers.

The data was collected by the researchers through the method of self-reporting since privacy regarding communicable diseases may affect the correct response rates of individuals. Missing data, extreme values, parallelism, and singularity problems in variables were evaluated (8). Item total scores provided the assumption of the normal distribution with the Kolmogorov-Smirnov test. It was observed that multivariate normality was not provided by the Mardia's multivariate normality test ($p<0.001$) (9).

Statistical analysis

The mean, standard deviation, minimum-maximum values, kurtosis, and skewness coefficients of the items were shown with the descriptive statistical analysis of the items. In item analyses, item-total correlation coefficients were calculated with the Pearson correlation analysis, and an independent sample t-test was applied to 27% lower and upper groups.

Factor Analyses were made for the construct validity of the scale. In the exploratory factor analysis (EFA), the Kaiser-Mayer-Olkin (KMO) coefficient, which reveals the sampling adequacy, was examined. The Barlett Sphericity Test, which tests the conformity of the data to factor analysis based on normality assumption, was conducted. A Principal Component Analysis (PCA) was performed as a factor analytical method since the data did not provide multivariate normality. Kaiser criterion, scree-plot graph, and exploratory factor analysis were used to determine the number of factors. The rotated components matrix was formed with the Varimax rotation method, which maximizes the sum of the variances of the quadratic factor loads in each factor (4).

After item analysis and EFA, the scale became 37 items. A confirmatory factor analysis (CFA) was conducted to verify the created sub-dimensions. The unweighted least squares method was used as the parameter estimation method. Fit indices ($\chi 2$, SRMR, RMR, CFI, NFI, RFI, IFI) were used to test the model fit (10).

Internal consistency analysis, scale-size Pearson correlation analysis, and the test-retest method were used to determine the reliability of the scale. Spearman-Brown two equivalent half-reliability coefficients and Cronbach α coefficients were calculated for the overall factor and sub-dimensions for internal consistency. The test-retest correlation coefficient was the stability coefficient of the scale as a result of the test-retest method, and the intraclass correlation coefficient was calculated as the generalization coefficient.

Statistical analysis TURCOSA Cloud (Turcosa Analytics Co. Ltd., Turkiye) was made with software and LISREL 8.72 statistical package program (11,12). For statistical significance, a p-value of <0.05 at a 95% confidence level was considered significant.

To conduct the study, the study was approved by the Erciyes University Faculty of Medicine Clinical and laboratory Research Ethics Committee (Date:20.03.2019, No:96681246). Administrative permission was obtained from the Turkish Ministry of Health and the Kayseri Provincial Health Directorate with the number 49654233-604.02 dated 10.05.2019. Project support was received from the Scientific Research Projects unit of Erciyes University (Project ID: TTU-2019-9209). Verbal consent was obtained from the participants.

RESULTS

The arithmetic mean values of the items in the item pool ranged from 2.37±1.04 to 4.78±0.54. When the kurtosis and skewness values were examined, item 10 (-2.39 and 6.70), item 52 (-2.65 and 8.15), and item 56 (-3.03 and 10.56) were removed from the scale. It was determined that the items were sufficient to provide item discrimination power with a 27% lower-upper group analysis ($p<0.001$). It was determined that the corrected item-total correlation coefficients were positive and varied between 0.09 and

0.53. Items with a correlation value of less than 0.30 were removed starting from the lowest value. In this way, 20 items that did not correlate completely with the scale were removed from the draft scale.

Exploratory factor analysis (EFA) findings

Kaiser-Meyer-Olkin Value (KMO) is 0.922, and Bartlett's Test of Sphericity Chi-Square value is 7734.78 (sd:666, p<0.001). The calculated KMO fit measure is above 0.50, which is accepted as the critical value. In the Barlett's test, p-value <0.001 indicates that the data structure is sufficient for factor analysis. As a result of Principal Component Analysis (PCA), the common factor variance values of the items vary between 0.332 and 0.671. Since the sample size is over 200, factor loads above 0.3 are considered significant.

The eigenvalue is the sum of the squares of the factor loadings of each factor. It is a coefficient used in calculating the ratio of variance explained by each factor and in deciding the number of important factors. In general, factors with an eigenvalue of 1 and above are taken as significant factors (3). Considering these criteria regarding the eigenvalues of the factors, the total variance explained, and the scree plot graph findings,it was decided to accept the scale as having six factors. The variance rate explained by the six-factor structure is 45.21%. In social sciences, the total variance explained should be over 40%.

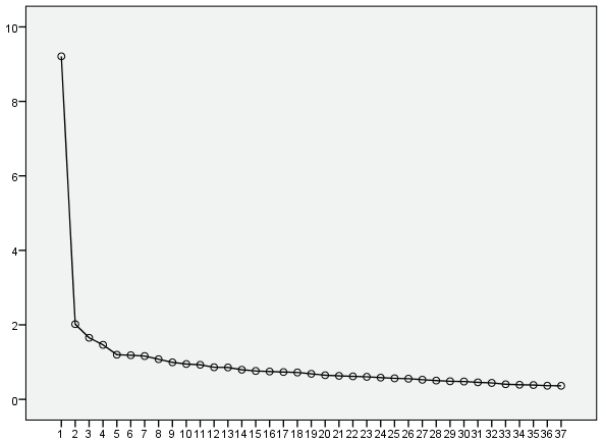

Figure 1: Scree plot graph of items

A Scree plot showing the eigenvalue and factor number of the PCA result is shown in Figure 1.

With the Kaiser Normalization and Varimax vertical rotation technique, it was examined whether the items met the acceptance level of the factor load criteria. It was determined that the factor loads of the 37 items are varied between 0.313 and 0.736.

Eigenvalue, variance explained, and cumulative variance of each factor in the draft scale before and after Varimax rotation is shown in Table 3.

Naming was made by the relevant dimensions under the concepts contained in the items collected under the factors. Factor 1 is named "Common Life Risk Awareness," Factor 2 "Self-Protection Awareness," Factor 3 "Protection Behaviors," Factor 4 "Handwashing Behaviors," Factor 5 "Social Protection Awareness," and Factor 6 is named as "Personal Contagion Awareness."

Confirmatory factor analysis results

A measurement model, which includes the six factors obtained as a result of EFA and the Items that make up these factors, was formed. Standardized coefficients, t-values, error variances, and explanatory rates of the model are shown in Table 4.

The standardized path coefficients of the items in the model are between 0.49-0.81; It has moderate to high potency levels. The t-values of the items in the model are statistically significant at a 95% confidence level. The error variances of the items in the model range between 0.35-0.76 and their explanatory values vary between 24% and 65%. In the model, Item 28, whose standard regression coefficient is below 0.5, was removed and the model was rebuilt. Standard regression coefficients and error variances of the new model are shown in Figure 2.

Table 3: Eigenvalue and explained variance ratios of factors before and after varimax rotation

	Initial values			Sum of squares of loads after rotation		
Factor	**Initial eigenvalue**	**Variance explained %**	**Cumulative variance %**	**Initial eigenvalue**	**Variance explained %**	**Cumulative variance %**
1	9.21	24.89	24.89	3.79	10.24	10.24
2	2.02	5.45	30.34	3.03	8.18	18.43
3	1.65	4.47	34.81	2.85	7.69	26.12
4	1.46	3.95	38.77	2.47	6.67	32.79
5	1.20	3.24	42.01	2.35	6.35	39.14
6	1.18	3.20	45.21	2.25	6.07	45.21

Table 4: Standardized coefficients, t-values, error variances and explanatory ratios of the model

	Items	Standardized coefficient	t-value	p	Error variance	R2
FACTOR 1	Item 18	0.49	12.05	0.041	0.76	0.24
	Item 16	0.57	14.79	0.039	0.67	0.33
	Item 36	0.52	13.75	0.037	0.73	0.27
	Item 15	0.53	14.15	0.037	0.72	0.28
	Item 41	0.72	23.30	0.031	0.48	0.52
	Item 23	0.53	13.72	0.038	0.72	0.28
	Item 35	0.58	15.15	0.038	0.66	0.34
	Item 45	0.62	18.47	0.034	0.61	0.39
	Item 33	0.58	16.41	0.035	0.66	0.34
FACTOR 2	Item 39	0.69	21.72	0.032	0.52	0.48
	Item 67	0.69	21.02	0.033	0.53	0.47
	Item 28	0.48	11.45	0.042	0.77	0.23
	Item 25	0.64	18.96	0.034	0.59	0.41
	Item 40	0.65	20.60	0.032	0.58	0.42
	Item 42	0.53	14.48	0.036	0.72	0.28
	Item 37	0.56	14.47	0.039	0.68	0.32
	Item 57	0.66	22.87	0.029	0.56	0.44
	Item 24	0.67	21.28	0.031	0.55	0.45
FACTOR 3	Item 62	0.62	18.86	0.033	0.62	0.38
	Item 53	0.52	14.10	0.037	0.72	0.28
	Item 58	0.66	19.93	0.033	0.57	0.43
	Item 65	0.61	17.92	0.034	0.63	0.37
	Item 63	0.51	12.14	0.042	0.74	0.26
	Item 43	0.60	18.90	0.032	0.64	0.36
	Item 50	0.54	15.25	0.036	0.71	0.29
	Item 49	0.61	19.92	0.031	0.63	0.37
FCT 4	Item 48	0.81	26.05	0.031	0.35	0.65
	Item 56	0.69	19.51	0.036	0.52	0.48
	Item 54	0.77	26.94	0.029	0.40	0.60
FCT5	Item 3	0.50	11.27	0.045	0.75	0.25
	Item 26	0.62	15.15	0.041	0.62	0.38
	Item 19	0.49	10.22	0.048	0.76	0.24
	Item 8	0.68	16.23	0.042	0.54	0.46
FCT6	Item 46	0.64	16.95	0.038	0.59	0.41
	Item 44	0.52	11.61	0.045	0.73	0.27
	Item 47	0.69	19.41	0.035	0.53	0.47
	Item 14	0.59	13.58	0.043	0.65	0.35

The model is statistically significant. Table 5 shows the fit criteria of the model as a result of confirmatory factor analysis.

In our study, the Standardized Root Mean Square Residual (SRMR) was acceptable for the model of the scale in the CFA result; x^2/sd, Root Mean Square Error

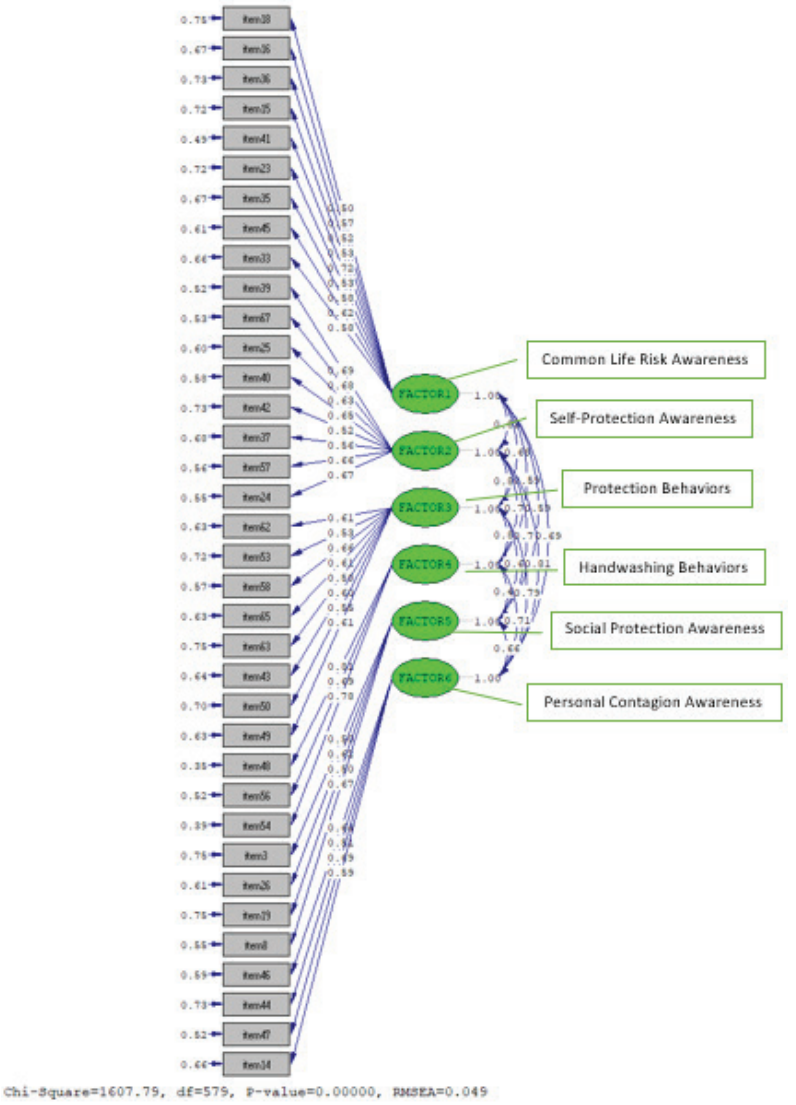

Figure 2: Confirmatory factor analysis result scale model

of Approximation (RMSEA), Comparative Fit İndex (CFI), Goodness of Fit İndex (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Incremental Fit Index (IFI), and Relative Fit Index (RFI) are a good fit.

Internal consistency reliability analysis results of the scale are shown in Table 6.

The correlations between sub-dimensions of the scale are between 0.27 and 0.64 and are statistically significant. The correlations between the sub-dimensions, and the scale total score are between 0.59 and 0.87 and are statistically significant.

The overall internal consistency coefficient of the scale is 0.91, and the two equivalent half reliability coefficient is 0.86. The internal consistency coefficients of the dimensions are between 0.60 and 0.78. The two equivalent half reliability coefficients of the dimensions are between 0.57 and 0.79. Four weeks after the application of the scale to 72 people from the study group, the same scale was applied again, and the stability coefficients were calculated.

The test-retest correlation coefficient is 0.95, and the in-class correlation coefficient is 0.97. These results show that the scale has test-retest reliability.

Items of the scale and factors titles are shown in Table 7.

DISCUSSION

The gradual increase in communicable diseases makes them not an individual health problem but turns them

Tablo 5: Confirmatory factor analysis result fit criteria of the model

	Fit values of the model	Good fit criteria*	Acceptable fit criteria*	Fit degree
x^2/sd	2.78	2-3	3-5	Good
RMSEA	0.049	<0.05	<0.08	Good
90% CI	0.046-0.052	<0.05	<0.08	
SRMR	0.058	<0.05	<0.08	Acceptable
CFI	0.97	0.95-1.00	0.90-0.95	Good
GFI	0.97	0.95-1.00	0.90-0.95	Good
AGFI	0.97	0.95-1.00	0.90-0.95	Good
NFI	0.96	0.95-1.00	0.90-0.95	Good
NNFI	0.97	0.95-1.00	0.90-0.95	Good
RFI	0.96	0.95-1.00	0.90-0.95	Good
IFI	0.98	0.95-1.00	0.90-0.95	Good

*Reference:10, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual, CFI: Comparative Fit Index, GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of Fit Index, NFI: Normed Fit Index, NNFI: Non-Normed Fit Index, RFI: Relative Fit Index, IFI: Incremental Fit Index

Table 6: Internal consistency reliability analysis results of the scale

	Number of items	Cronbach α*	Spearman-Brown coefficient*
CDRAPS	**36**	**0.91**	**0.86**
Factor 1	9	0.78	0.75
Factor 2	8	0.78	0.79
Factor 3	8	0.76	0.77
Factor 4	3	0.70	0.68
Factor 5	6	0.60	0.57
Factor 6	6	0.63	0.64

*: Below 0.60 is not acceptable; Between 0.60 and 0.70 is acceptable as a minimum; Significantly between 0.70 and 0.80; It is very good between 0.80 and 0.90 (10).

into a social health problem and shows that they are a sociological problem. In this study, a measurement tool has been developed that will facilitate the measurement and evaluation of communicable diseases risk awareness and protection levels of individuals in society.

When the literature is examined, many studies on infectious diseases and transmission routes have been found, and it has been seen that they are directed to certain groups and specific transmission routes. However, studies evaluating the general risk awareness of the general population and infectious diseases are limited (13-118). Existing scales used in the literature are important information tests, but they were developed for a single specific disease (STD Information Test, AIDS information scale) (13, 14).

Studies investigating the level of knowledge of sexually transmitted diseases were mostly conducted on university students and less frequently on high school students but were conducted on substance addicts, brothel workers, marriage applicants, and those with some psychiatric diseases (antisocial personality disorder, schizophrenia, bipolar patients). In studies conducted with high school students and different universities and faculties in Turkiye, it has been determined that young people do not have enough knowledge about STDs and ways to prevent them (15-21); similarly, the level of knowledge is low also in substance addicts and some psychiatric patients (22-24). It has been determined that women working in brothels, defined as a risk group in terms of STD, have a high knowledge gap; most of them are not informed, and they do not even consider themselves in the risk group (25,26). In a study in which a young adult age group of soldiers participated, it was determined that the level of knowledge about STDs was lower among male individuals with a lower education level and those who came from the eastern regions (27). In studies conducted with married

Table 7: Factors titles and ıtems of the scale

FACTOR 1: Common life risk awareness
When I attend crowded organizations such as weddings and festivities, the possibility of infection make me nervous.
When I enter closed and crowded environments (such as cinemas, shopping malls, mosques, wedding halls), I get anxious because of the possibility of disease transmission.
I do not want to eat foods such as bagels and dried nuts sold openly in the street or bazaar due to the possibility of infectious diseases.
I do not want to go to places such as hot springs, baths, and swimming pools due to the possibility of disease transmission.
When touching places such as doorknobs, stair handles and bus handles in public areas, the possibility of disease transmission makes me nervous.
I believe that diseases can be transmitted in places such as restaurants and cafeterias.
I believe that diseases can be transmitted through treatments such as manicure, pedicure, and shaving at hairdressers.
I avoid consuming products such as yoghurt, cheese, and eggs that are sold outdoors in the market for fear of infectious diseases.
I believe that plastic toys in shopping malls create an infectious disease risk for children.
FACTOR 2: Self-protection awareness
I pay attention to whether the people around me cover their mouths when coughing, sneezing.
I behave with hesitation when using public restrooms.
I believe that I can be protected from some infectious diseases such as flu and cold by ventilating my environment.
I believe that communicable diseases can be transmitted by mosquitoes, houseflies, and some insects.
I believe that I can be protected from some infectious diseases such as flu and cold by eating right.
Entering the house with shoes makes me nervous as it can lead to disease transmission
When I go to health institutions, I avoid touching the surroundings due to the possibility of disease transmission.
When I touch money, I think I have to wash my hands because of the possibility of disease transmission.
FACTOR 3: Protection behaviors
I stay away from people around me when I have the flu or cold.
I take care of my diet to avoid infectious diseases.
I avoid shaking hands with people who have infectious diseases such as flu and cold.
I pay attention that the meat is well cooked due to the possibility of disease transmission.
I check the expiry dates of food while shopping.
Information on infectious diseases catches my attention.
I avoid eating cheese and butter made from unboiled or unpasteurized milk.
I especially research the measures that can be taken to prevent infectious diseases.
FACTOR 4: Handwashing behaviors
I wash my hands with soap before eating.
When I enter the house from outside, I wash my hands especially with soap.
When I cover my mouth with my hand while coughing or sneezing, I wash my hands immediately.
FACTOR 5: Social protection awareness
I believe getting vaccinated protects me from infectious diseases.
The increase in people who do not get vaccinated in society worries me.
I believe the chlorination of water is essential to prevent infectious diseases.
I believe handwashing protects me from many infectious diseases.
FACTOR 6: Personal contagion awareness
I take care to separate the personal belongings of family members in case of infectious diseases.
If I have an infectious disease, I will tell people who can be infected.
I believe having more than one sexual partner increases the possibility of infection.
I avoid using other people's personal belongings for fear of infectious disease.

men aged between 21-71 years, it was observed that the majority of them had a low level of knowledge about STDs (28).

Studies investigating the level of knowledge of blood-borne diseases were mostly conducted on health workers, students, risky occupational groups such as hairdressers, barbers and beauty salons, and substance addicts. The risk of encountering blood-borne diseases, especially the Hepatitis B virus, increase with occupational risk groups and substance abusers (29). In the studies conducted on hairdressers, barbers, and beauty salons, the level of knowledge about blood-borne diseases is insufficient, hepatitis B vaccination rates are low, appropriate disinfection rates are low, handwashing rates are low (30), protective measures (wearing gloves, wearing masks, using different towels and covers for each customer etc.) is low, and they do not know the protective procedures at the desired level (31-33). In one study, HBV DNA positivity rate was found to be 6.6% in razor blades used in barbershops in Samsun (34). The fact that most of these risks are risks that can be eliminated with some basic precautions shows once again the importance of individuals' awareness of infectious diseases prevention and risk awareness. In a study conducted in a hospital in Istanbul, only 60% of the nurses stated that they see infectious diseases as a hazard related to occupational health and safety (35). Hepatitis B knowledge levels were found to be low in studies conducted with high school students in different regions of Turkiye (36-40).

It has been determined that studies investigating the knowledge level of zoonotic diseases are less than studies on other modes of transmission. The studies were carried out on people living in rural areas, those engaged in farming and animal husbandry, those studying at health-related schools, and veterinary students. It was determined that one-third of the participants did not know that diseases can be transmitted from unboiled milk, most of them consumed raw milk, and the rate of using personal protective equipment was low (41). In a study conducted with people living in a semi-urban area, it was determined that individuals' knowledge and awareness levels about brucella disease were low (42). In another study, the presence of Brucella abortus, a Brucella species, as suspicious in 17.3% of 202 cows' milk samples collected from 14 villages, also helped to show this risk, which is important for society (43). In a study conducted with nurses working in hospitals located in the city center of Kocaeli, it was stated that the level of knowledge about zoonotic diseases was insufficient and only 5% of them thought that they had sufficient knowledge about zoonotic diseases (44). Especially, many zoonotic diseases (such as Crimean-Congo hemorrhagic fever, anthrax, rabies and brucellosis) continue to be an significant public health problem in Turkiye (45).

The fact that the knowledge levels of infectious diseases are insufficient even in these groups, which are thought to be risky in terms of specific transmission routes, arouses curiosity about the awareness levels of individuals from different segments of society. However, the lack of a standard measurement tool that measures awareness, attitudes and behaviors towards general risks in infectious diseases limits studies on this subject. Application of existing knowledge tests to the general population in research can cause difficulties. While these tests were developed to measure the level of knowledge of individuals, BHRFC is intended to measure individuals' general risk awareness of infectious diseases and their behavioral levels. Using these knowledge tests together with the 'Infectious Diseases Risk Awareness and Prevention Scale' developed in our research in studies where these knowledge tests are used in risk groups will provide new findings in the interpretation of the results. The existence of an objective measurement tool that measures the risk awareness and protection levels of the society about infectious diseases will not only make a significant contribution to the literature but also the risk awareness levels determined as a result of its use in different researches will guide the training for the society after determining the risk awareness levels as a result of its use in different researches.

In the study, the implementation of both the expert panel and the expert committee stages, in getting expert opinion for the item pool, contributed to the strengthening of the scope, content, and appearance validity of the scale. The research group has included 740 individuals corresponding to approximately 12 times the items. Comrey and Lee stated that 50 samples were very poor, 100 were poor, 200 were moderate, 300 were good, 500 were very good, and 1000 or more samples were excellent (46). Regarding the opinions about the sample size, it can be said that the sample size for the research group is sufficient for the scale development study. To conduct scale development studies with a sufficient number of participants will cause incorrect factor structures and inferences.

The total variance explained by the six-factor structure created as a result of EFA is 45.21%. The high explained variance is interpreted as an indicator that the related concept or structure is measured so well (47). According to Scherer, Wiebe, Luther, and Adams, explained total variance rate in social sciences between 40% and 60% is considered sufficient (48). In this framework, it is seen that the contribution of CDRAPS sub-dimensions to the total variance is sufficient.

The Cronbach Alpha reliability coefficients of the scale are over 0.80 (9), and the Spearman-Brown two-equivalent semi-reliability coefficients are above 0.70. It

is an indication that the scale has a high level of reliability (49). In social science research, a reliability coefficient of 0.70 or higher has been determined as an "acceptable" reliability coefficient. In our study, it can be said that the scale is of high reliability for the general and medium for the sub-dimensions.

In our study, the RMSEA value of 0.49 in the CFA model, which was established to ensure the construct validity of the dimensions, indicates a good fit (50).

As a result, the existence of an objective measurement tool that measures the communicable diseases risk awareness and protection levels of the society will both contribute significantly to the literature. The risk awareness levels determined as a result of the use of the scale in different studies may guide education for society. Health training for society should be planned on subjects that are not included in the scale although they are in the item pool.

It is thought that the use of this scale by different researchers will provide the necessary feedback to society and health planners. Applying the relevant scale to different groups in the society in new studies will increase the reliability and validity of the scale.

Powerful sides of the research

It is the first scale development study that can evaluate the risk and protection awareness levels of adult individuals on communicable diseases in Turkiye. It was made for the community. Developing the scale in heterogeneous groups belonging to the sociodemographic variable will increase its applicability in society. After the exploratory factor analysis, confirmatory factor analysis, which is a stronger analysis method, contributed to the strengthening of the construct validity of the scale.

Limitations of the research

This research is not a multicenter study consisting of individuals from different regions of Turkiye.

Informed Consent: Written consent was obtained from the participants.

Ethics Committee Approval: This study was approved by the Erciyes University Clinical Research Ethics Committee (Date: 20.03.2019, No: 194).

Peer Review: Externally peer-reviewed.

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REFERENCES

1. Güler Ç, Akın L. Halk sağlığı temel bilgiler. 3. baskı. Ankara: Hacettepe Üniversitesi yayınları, 2015;1350-53.
2. Tezcan SG. Temel epidemiyoloji. 1. baskı. Ankara: Hipokrat Kitabevi, 2017;179-198.
3. Büyüköztürk Ş. Faktör analizi: Temel Kavramlar ve Ölçek Geliştirmede Kullanımı. Kuram ve Uygulamada Eğitim Yönetimi Dergisi 2002;32:470-83.
4. Şencan H. Sosyal ve davranışsal ölçümlerde güvenilirlik ve geçerlilik. 1. baskı. Ankara: Seçkin Yayıncılık, 2005;362-397.
5. Tezbaşaran Ata. Likert tipi ölçek geliştirme kılavuzu. Ankara: Türk Psikologlar Derneği Yayınları, 1996; 14.
6. Seçer İ, Psikolojik test geliştirme ve uyarlama süreci. Ankara: Anı yayıncılık 2. baskı; 2018;45-59.
7. DeVellis RF. Ölçek geliştirme kuram ve uygulamalar. 3.basımdan çeviri. Ankara: Nobel kitabevi, 2017, 99-100.
8. Çokluk ÖS, Şekercioğlu G, Büyüköztürk S. Sosyal bilimler için çok değişkenli istatistik: SPSS ve LİSREL uygulamaları. 5.baskı. Ankara: Pegem Akademi Yayıncılık, 2018; 11.
9. Özdamar K. Ölçek ve test geliştirme yapısal eşitlik modellemesi. Eskişehir: Nisan kitabevi, 2017, 65.
10. Crowley SL, Fan X. Structural equation modelling: Basic Concepts and applications in personality assessment research. J Pers Assess 1997;68(3):508-31. [CrossRef]
11. TURCOSA Cloud (Turcosa Analytics Ltd Co, Türkiye). www.turcosa.com.tr.
12. Jöroskog KB. Sorbom D. SIMPLIS: A Simplified version of LISREL. Mooresville, IN: Scientific Software, Inc. 1987.
13. Evcili F, Gölbaşı Z. Cinsel Sağlık Bilgi Testi: geliştirme, geçerlik ve güvenirlik çalışması. ACU Sağlık Bilimleri Dergisi 2017;1:29-33.
14. Aydemir N, Yakın İ, Arslan HS. Developing AIDS knowledge and AIDS attitude scales and assessing their reliability and validity. Psikoloji Çalışmaları - Studies in Psychology 2018;38(1):73-93. [CrossRef]
15. Solmaz Avcıkurt A. Evaluation of knowledge and attitudes on HIV/AIDS of Balikesir University students. Balıkesir Health Sci J 2014;3(2):79-86. [CrossRef]
16. Akalpler Ö, Eroğlu K. Kuzey Kıbrıs Türk Cumhuriyeti'nde üniversite öğrencilerinin sık görülen cinsel yolla bulaşan enfeksiyonlara ilişkin bilgileri ve cinsel davranışları. Hacettepe Üniversitesi Hemşire Fakültesi Dergisi 2015;2(2):1-19.
17. Karabulutlu Ö, Kılıç M. Üniversite öğrencilerinin cinsel sağlık ve üreme sağlığı hakkındaki bilgi düzeylerinin belirlenmesi. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi 2011;14(2):39-45.
18. Demir G, Şahin TK. Selçuk üniversitesi öğrencilerinin cinsel yolla bulaşan hastalıklar konusundaki bilgi düzeylerinin belirlenmesi. Düzce Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi 2014;4(18):19-24.
19. Karaköse A, Aydın S. Genç erkeklerin cinsel yolla bulaşan hastalıklar hakkındaki bilgi düzeyinin incelenmesi. Yeni Üroloji Dergisi 2011;6(1):31-7.
20. Ulu NK, Demı r H, Taşar MA, Dallar YB. Ankara'da düşük sosyoekonomik düzeyi olan bir bölgede ergenlerin cinsel yolla bulaşan hastalıklar hakkındaki bilgi düzeyleri. Türkiye Çocuk Hastalık Dergisi 2015;9(1):32-8.

21. Topbaş M, Çan G, Kapucu M. Trabzon'da bazı liselerdeki adolesanların aile planlaması ve cinsel yolla bulaşan hastalıklar hakkındaki bilgi düzeyleri. Gülhane Tıp Dergisi 2003;45:331-7.
22. Yalnız H, Nebioğlu M, Karacan BS, Güven M, Geçici Ö. Madde bağımlılığı tanısı alan gençlerde cinsel yolla bulaşan hastalıklar ve aile planlaması ile ilgili bilgi düzeyi ve verilen eğitimin etkisi. Dusunen Adam 2011;24:106-12. [CrossRef]
23. Yıldız H, Pan E, Bolu A, Bilgili ME, Gümüş İ, Abuaf ÖK. Antisosyal kişilik bozukluğu olan erkek hastalarda cinsel ve kan yoluyla bulaşan hastalık prevalansının araştırılması. Türk Dermatoloji Dergisi 2015;9(1):18. [CrossRef]
24. Akçay D. Madde kullanım bozukluğu olan gençlerin cinsel yolla bulaşan hastalık bilgi düzeyleri. Genel Tip Dergisi 2019;29(1):24-8. [CrossRef]
25. Tokuç B, Gül H, Eski Ocak M, Ekuklu G. Edirne genelevinde çalışan kadınların cinsel yolla bulaşan enfeksiyonlar konusunda bilgi, tutum ve davranışları. 2006;25(1):27-32.
26. Öcal BÇ, Börekçi G. Genelevde çalışan kadınların ve ev kadınlarının cinsel yolla bulaşan hastalıklar konusundaki bilgi düzeylerinin anksiyete ile ilişkisi. Erciyes Medical Journal 2007;29(6):456-66.
27. Akan S, Ediz C, Kızılkan YE, Tavukçu HH, Hayit H, Yılmaz Ö. Erkek askeri personelin cinsel yolla bulaşan hastalıklar hakkındaki bilgi düzeyinin incelenmesi. Yeni Üroloji Dergisi 2019;14(3):152-59. [CrossRef]
28. Guner O, Celik N, Ertem G. Investigation of the knowledge level of married men about sexually transmitted diseases. Eur J Ther 2017;22(4):202-8. [CrossRef]
29. McMillen CW. Pandemics: A Very Short Introduction. Oxford University Press, New York 2016. [CrossRef]
30. Şahin NH, Bilgiç D, Esen Ü, Çetinkaya R, Tozoğlu Z. Bayan kuaförü çalışanlarının Hepatit B›ye ilişkin bilgi ve uygulamalarının belirlenmesi. TAF Preventive Medicine Bulletin 2009;8(2):147-54.
31. Ogan T, Tosun S, Turan H, Arslan H. Aksaray il merkezinde kuaför çalışanlarının Hepatit konusundaki bilgi düzeyi ve davranışları. Ege Tıp Dergisi 2014;53(4):189-94. [CrossRef]
32. Güney Y, Dabak Ş. Fatsa'da kuaför salonlarında çalışanların kanla bulaşan hastalıklar konusundaki bilgi düzeyleri ve uygulamaları. Türkiye Halk Sağlığı Dergisi 2019;17(18):249-62. [CrossRef]
33. Vurucuoğlu A, Güngör DÖ, Berber İC, Kidak LB. Kuaför ve güzellik salonu çalışanlarının bulaşıcı hastalıklar konusunda bilgi düzeyleri ve uygulanan korunma yöntemleri. Izmir Democr Univ Health Sci J 2018;1(1):27-38.
34. Eroglu C, Zivalioglu M, Esen S, Sunbul M, Leblebicioglu H. Detection of Hepatitis B virus in used razor blades by PCR. Hepatitis monthly 2010;10(1):22-5.
35. Güler Ç. Tıp dışı deri girişimlerinde hijyen (Özgür Doruk Güler Çevre Dizisi 64). Yazıt Yayıncılık, Ankara 2011, pp. 3-16.
36. Abacigil F, Ulu G, Pirincci S, Arikan A, Okyay P, Beser E. Knowledge of Hepatitis B virus ınfection and ınfection control practices among faculty of dentistry workers, in Aydin. TAF Prev Med Bull 2016;15(5):421. [CrossRef]
37. Balin SO, Denk A. Assessment of Hepatitis B awareness among high school students. Klimik Dergisi Klimik J 2016;29(2):78-82. [CrossRef]
38. Keten HS, Ersoy Ö, Yıldırım F, Ölmez S, Keten D, Çelik M. Lise öğrencilerinin Hepatit B hastalığı konusunda bilgi düzeyleri. Çağdaş Tıp Dergisi 2014;4(18):138-42. [CrossRef]
39. Ünsal A, Tözün M. Lise öğrencilerinin Hepatit B bilgi düzeyi, Eskişehir. TAF Preventive Medicine Bulletin 2012;11(5):609-16.
40. Savaşer S, Yalçın ZH, Savaşer S, Balcı S, Ceylan N, Yalçın Z, et al. Lise öğrencilerinin Hepatit B hastalığı ve hastalıktan korunmaya yönelik farkındalık durumu. İstanbul Üniversitesi Florence Nightingale Hemşirelik Dergisi 2011;19(1):1-8.
41. Şahın M, Nazlı can E, Akbaba M. Hayvancılıkla uğraşanlarda zoonotik hastalıklarla ilgili bilgi, tutum ve davranış üzerine kesitsel bir çalışma. Sak Tıp Dergisi 2019;9(18):426-32. [CrossRef]
42. Babaoğlu Ü, Demir G. Yarı kentsel bölgede yaşayan kişilerin brusella hakkında bilgi durumları. Acıbadem Üniversitesi Sağlık Bilimleri Dergisi 2017;4:214-219.
43. Babaoglu UT, Ogutucu H, Demir G, Sanli D, Babaoglu AB, Oymak S. Prevalence of Brucella in raw milk: an example from Turkey. Nigerian Journal of Clinical Practice 2018;21(7):907-11.
44. Taştan R, Altıntaş L, Cevizci S. The determination of knowledge level of nurses working in the hospitals in the centre of Kocaeli province about zoonotic diseases. Turk Bull Hyg Exp Biol 2016;73(4):365-78. [CrossRef]
45. T.C. Sağlık Bakanlığı Temel Sağlık Hizmetleri Genel Müdürlüğü Zoonotik Hastalıklar Daire Başkanlığı. Zoonotik hastalıklar hizmet içi eğitim modülü. Ankara: Sağlık Bakanlığı Yayını, 2011.
46. Erkuş A. Psikolojide ölçme ve ölçek geliştirme-1. Ankara: Pegem akademi 3. Baskı, 2016;59-60.
47. Çokluk ÖS, Şekercioğlu G, Büyüköztürk S. Sosyal bilimler için çok değişkenli istatistik: SPSS ve LİSREL uygulamaları. 5.baskı. Ankara: Pegem Akademi Yayıncılık, 2018;194-200.
48. Tavşancıl E. Tutumların ölçülmesi ve SPSS ile veri analizi. 5. Baskı. Ankara: Nobel Yayın Dağıtım; 2014;48.
49. Tavşancıl E. Tutumların ölçülmesi ve SPSS ile veri analizi. 5. Baskı. Ankara: Nobel Yayın Dağıtım, 2014;29.
50. Çokluk ÖS, Şekercioğlu G, Büyüköztürk S. Sosyal bilimler için çok değişkenli istatistik: SPSS ve LİSREL uygulamaları. 5.baskı. Ankara: Pegem Akademi Yayıncılık, 2018;271.