JERN Journal of Education and Research in Nursing

Original Article
DOI:10.14744/jern.2023.58630
J Educ Res Nurs. 2024;21(1):34-42

Measuring Parents' Vaccination Attitudes: Psychometric properties of Turkish Version of the Vaccination Attitudes Examination Scale

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Abstract

Background: Despite the important role of vaccines in preventing disease and disability of children each year, vaccine hesitancy and refusal among parents are increasing. This threatens child and public health in terms of the recurrence of eradicated diseases, such as pertussis, measles, and polio.

Aims: The study aimed to examine the psychometric properties of the Turkish version of the vaccination attitudes examination (VAX-TR) scale.

Methods: In this methodological study, VAX-TR was administered to 138 Turkish parents aged 25–63 (M=35.39; Standard deviations=6.67). The original vaccine attitudes scale translated into Turkish using translation/back-translation method. Descriptive statistics were analyzed, content validity index was calculated, Kaiser-Meyer-Olkin (KMO) value and Bartlett's sphericity test were examined for the sampling adequacy. The explanatory (explanatory factor analysis [EFA]) and confirmatory factor analyses (CFA) were performed for structure validity. Cronbach's alpha value and item-total score correlations were evaluated for internal consistency.

Results: Cronbach alpha internal consistency coefficient of the scale was 86. The total variance disclosure rate for four factors (mistrust of vaccine benefit, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity) was found to be 69.6%. The results of the KMO test and Bartlett's test were statistically significant. Validating factor analysis compatibility values were $\chi 2$: 60.858, DF=48, $\chi 2$/DF=1.27, root mean squared error approximation=0.044, root mean square residual=0.063, standardized root mean square residual = 0.064, comparative fit index (CFI)=0.93, adjusted goodness of fit index = 0.89, CFI=0.98, and normed fit index=0.94.

Conclusion: The VAX-TR seems to be a valid tool to evaluate vaccination attitudes and hesitancy in the Turkish parents with children aged 0–18 years.

Keywords: Nurse, parents, vaccination attitudes, validity and reliability

Introduction

One of the most cost-effective programs in reducing morbidity and mortality in infants and children is vaccination against vaccine-preventable diseases.[1-3] However, despite widespread availability of vaccination services and the importance of vaccines in saving the lives of millions of children in every year, different concerns, vaccine hesitancy, or refusal among parents are increasing.[4-9] The decision not to be vaccinated, which has recently emerged in the form of vaccine refusal or vaccine hesitation, is an important health behavior that can affect all individuals in the society.[10-12] As the number of unvaccinated individuals increases due to indecisive and negative attitudes about vaccines, herd immunity decreases, epidemics occur, and vaccinated individuals are at risk along with unvaccinated individuals.[2,8] This threatens public health in terms of the recurrence of diseases that have been eradicated in the community, such as pertussis, measles, and polio.[4,13]

Different attitudes and opinions regarding vaccines may vary depending on the vaccine, individual and social effects.[14] In studies on the vaccine refusal or vaccine hesitation, it has been determined that individuals delay their vaccination or have anti-vaccination behaviors and attitudes because of forgetfulness or not having enough time to vaccination, education or income level, concerns about the side effects of vaccines.[10,15,16] In addition to these factors, child-related factors such as believing that vaccination

Cite this article as: Kızıler E, Küçük S, Uludaşdemir D, Karşıgil P. Measuring parents' vaccination attitudes: Psychometric properties of turkish version of the vaccination attitudes examination scale. *J Educ Res Nurs.* 2024;21(1):34-42.

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Received: March 21, 2023
Accepted: August 15, 2023
Publication Date: March 1, 2024

are a painful attack for their children, and thinking that the harms of vaccination outweigh the benefits for the child also play a role in the acceptance of the vaccine by parents.[14] Although attitudes toward vaccination differ according to the type and characteristics of the vaccine, the behavior of rejecting a vaccine suggests that there is a negative attitude towards all vaccines. However, to develop effective interventions to increase vaccination rates in children, it is important to understand the underlying reasons for the negative attitudes and thoughts of parents, who make the vaccination decision for the child.[4]

Due to the increase in vaccine hesitancy and anti-vaccine actions in our country and in the world, there is a need for tools whose validity and reliability have been tested to investigate the underlying causes. The VAX scale is successfully used to identify the underlying causes of vaccination attitudes and hesitancy in many countries and has been validated in Romanian,[17] Spanish,[18] Italian,[19] and Korean.[20]

Nurses have responsibilities such as informing families about the safe administration of vaccines, their benefits, effects, and side effects.[5] Nurses also play a key role in determining the reasons for increasing vaccine refusal or vaccine hesitation and taking precautions for this situation.[21] Existing vaccine research's often focuses on particular populations such as parents, the elderly, oncology patients, and women, or specific vaccines such as meningitis and HPV.[22,23] In our country, there are studies in which standard measurement tools are used to determine the views of parents on vaccine refusal. When these studies were examined, it was seen that parents with children in the younger age group were included in the sample.[24-26] However, it is very important to determine the views of parents who have children during adolescence, when vaccines such as HPV are applied. For this reason, it was considered necessary to reach parents with children in the 0–18 age group. The purpose of the study is to examine the psychometric properties of the Turkish version of the vaccination attitudes examination (VAX-TR) scale, which is used to determine individuals' anti-vaccine attitudes and underlying causes.

Research Question

1. According to its psychometric properties, is the VAX-TR a valid and reliable scale for the Turkish sample group?

Materials and Methods

Type of Study

This study is a methodological study.

Population and Sample of Study

The study group included parents who have children aged between 0 and 18, are literate, and voluntarily agreed to participate to study. Parents who agreed to participate in the research invited to the research through snowball technique. In calculating the sample size in methodological studies, the number that met the condition of 5–10 times the number of scale items met our sample size.[27-30] vaccine attitudes scale (VAX) consists of 12 items. The number of samples planned to be reached was calculated to be a minimum of 12×5=60 and a maximum of 12×10=120 parents. The research resulted in the participation of 138 parents in total.

Data Collection Instruments

The data collection tool used in the research consists of two parts. In the first part, there is a descriptive information form on socio-demographic characteristics. In the second part, there is the VAX-TR.

Sociodemographic Characteristics Form

This form includes six questions investigating individual characteristics. Vaccination attitudes of parents were evaluated with a total of four yes/no questions identifying whether they and their child had the seasonal flu vaccine in the previous year and whether it will be next year.

Vaccination Attitudes Examination

The VAX was designed to identify vaccine attitudes and refusal, and the causes underlying the hesitancy by Martin and Petrie in 2017. The scale provides an efficient method for identifying people with vaccination refusal with sub-dimensions of (1) mistrust of vaccine benefits, (2) worries about unforeseen future effects, (3) concerns about commercial profiteering, and (4) preference for natural immunity. VAX is a 12-item scale with high internal consistency. The Cronbach's alpha coefficient of the sub-dimensions are between .86 and .93. The scale, which aims to evaluate the general anti-vaccination attitudes in the society in six stages of change, is a 6-point Likert-type self-assessment scale that is easy to understand and apply. Each item is scored between "1 point" (strongly disagree) and "6 points" (strongly agree). Reverse coding is performed for the first three items of the scale (mistrust of vaccine benefits sub-dimension). The total score is not calculated on the scale, and the data are evaluated by calculating the mean score over the total score. Higher scores indicate increased anti-vaccination attitudes.[4]

Data Collection

The data were collected online by Google forms. First, VAX-TR transferred to the online environment and was conveyed to the parents through Google forms between June and August 2019. Each researcher sent the online data collection form to the parents in the phone books and asked them to share the scale with their friends and relatives who were suitable for the research sample. All participants received a personal email invitation for online questionnaire (VAX-Turkish) which they could fill the scale only once. Participants who accepted to participate in the study were able to access the data collection forms after approved the "I am willing to participate in the study" button. Completing the scale takes approximately 10 min. Parents who were foreign nationals and could not speak Turkish, and whose children had an illness that prevented them from receiving vaccinations, were also excluded from the research.

Data Analysis

Data were analyzed using SPSS for Windows version 21.0 (SPSS Inc.; Chicago, IL, USA) SPSS version 21.0-AMOS and the "Psych" and "GPArotation" libraries in the R program. Descriptive statistics were analyzed using percentages, means, and standard deviations (SD). The validity of the VAX-TR was evaluated with language validity (translation/back-translation), content validity (expert opinion, Davis technique, Lawshe technique), surface validity and structure validity (correlations, explanatory factor analyses (EFA), and confirmatory factor analysis [CFA]) analyses. The sampling adequacy of the research and the suitability of the sample size for factor analysis

were evaluated with the Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's sphericity test. Principal component analysis and the varimax vertical rotation technique were used for factor extraction. Number of factors was chosen based on the screen plot. The reliability of the scale was evaluated using item-total score correlation and internal consistency methods. Internal consistency of the VAX was assessed with Cronbach's alpha coefficient. The significance level in statistical decisions was accepted as $P < .05$.

Ethical Considerations

Before the study, permission was obtained from Leslie R. Martin (the first author of the original VAX), through e-mail, to conduct the Turkish validity and reliability study. This study was approved by Ankara Yıldırım Beyazıt University Ethics Committee (Approval Number: EC2019/22, Date: February 13, 2019). All participants were informed that all collected data would be processed anonymously and confidentially, and online written informed consent was obtained. The study was carried out in accordance with the declaration of Helsinki (2008).

Results

Of the parents, 118 were female (85.5%) with a mean age of 35.39 (SD=6.67) years. The majority were married (n=133, 96.4%), were employee (n=114, 82.6%), and held at least bachelor's degree (n=124, 90%). Prior vaccination behavior and vaccination intentions were assessed with four dichotomous (yes/no) items in total. It was determined that most of the participants did not have flu shot for themselves (92.8%) and their children (94.2%) in the prior year. In addition, most of the participants intended not to be vaccinated themselves (91.3%) and their children (92.0%) next year (Table 1).

Table 1. Demographic characteristics of the participants (n=138)

Characteristics	n	%
Sex		
Female	118	85.5
Male	20	14.5
Age	Mean±sd: 35.39±6.6 (min=25; max=63)	
Number of children*	IQR=1 (min=1; max=4)	
Education		
1–8 years	1	0.7
Collage	13	9.3
Bachelor's degree	87	63.6
Master/doctorate	37	26.4
Working status		
Employee	114	82.6
Non-employee	24	17.4
Marital status		
Married	133	96.4
Single	5	3.6
Got flu shot this year		
Yes	10	7.2
No	128	92.8
Will get flu shot next year		
Yes	12	8.7
No	126	91.3
Child got flu shot this year		
Yes	8	5.8
No	130	94.2
Child will get flu shot next year		
Yes	11	8.0
No	127	92.0

*A median (IQR) is calculated for data that do not conform to the normal distribution, IQR: Inter quartile range.

Parents' Vaccination Attitudes Examination Scores

The mean scores of the Turkish version of VAX and sub-dimensions are shown in Table 2. Parents' vaccination attitudes scores found as moderate. Scale and subscale mean scores were found to be similar to the study of Martin et al. (Table 2). The total mean score of the Turkish version of the scale was 3.03±.98. Subdimensions, "Worries over unforeseen future effects (3.67±1.38)," and "Preference for natural immunity (3.52±1.33)" got the highest scores.

Validity of the Vaccination Attitudes Examination-TR

First, scale validity, one of the psychometric features, was examined to understand that the tool we used was correctly measuring the feature or quality we wanted to measure. The validity of the VAX-TR was evaluated with language validity, content validity, surface validity, and structure validity analyses.

Language Validity of the Vaccination Attitudes Examination-TR

For language validity, the translation and back-translation methods were used. The scale was translated from English, which is the original language, to Turkish by three bilingual academic translators whose native language is Turkish. The translation was carried out by independent translators. These three versions were consolidated into one Turkish version by the researchers. This form was translated back into English by three academic nurses who know both languages (Turkish-English) well. The back-translated English form was compared with the original version of the scale. Translation of the scales from Turkish to English and back translation from English to Turkish were done by different experts. The original scale items and the translated-back translated scale items were compared; the scales were reviewed by a Turkish language instructor. The scale was finalized by making necessary corrections in line with the suggestions from the experts to ensure the closeness of the scale items in terms of meaning and to increase their intelligibility.

Content Validity of the the Vaccination Attitudes Examination-TR

For the content validity of the scale, expert opinion of five academicians working at Ankara Yıldırım Beyazıt University University Faculty of Health Sciences (three experts from the Department of Pediatric Nursing and two from the Department of Public Health Nursing) was sought. The experts evaluated the content validity based on the Lawshe and Davis technique. According to Davis technique, experts

Table 2. VAX scale mean scores distributions

		Turkish version of VAX	Original VAX (Martin and Petrie)	
Scale		x±SD	x±SD (Study-1)	x±SD (Study-2)
VAX		3.03±0.98	-	-
Sub-dimensions	Mistrust of vaccine benefit	2.66±1.40	2.28±1.34	2.41±1.19
	Worries over unforseen future effects	3.67±1.38	3.28±1.50	2.83±1.07
	Concerns about commercial profiteering	2.26±1.30	2.38±1.47	4.19±1.23
	Preference for natural immunity	3.52±1.33	3.14±1.42	3.38±1.19

VAX: Vaccination attitudes examination, SD: Standard deviations.

were asked to rate the relevance of each item, usually on a 4-point scale (1=not relevant, 2=somewhat relevant, 3=quite relevant, and 4=highly relevant).[31] In this technique, the number of experts who marked (3) and (4) options is divided by the total number of experts to obtain the "content validity index (CVI)" for the item. The CVI score for the entire scale was calculated with the average of all the CVI scores of the items. This value is expected to be greater than 0.80.[31]

The "content validity ratio (CVR)" was calculated for each item based on the form developed by Lawshe. According to Lawshe technique, CVR is calculated with $[N_E-(N/2)]/(N/2)$ formula, in which the "N_E" is the number of experts indicating the item is "essential" and "N" is the total number of experts that answer to that item.[32] In this study, CVR for each item was calculated as [5-(5/2)]/(5/2)=1. Then, the CVR of items was compared with the Lawshe table values calculated according to the number of experts at a certain level of inaccuracy/significance. The minimum CVR, which is required to be at the $\alpha=0.05$ significance level for five experts, is 0.99.[32] According to this figure, it was decided to remain in the scale since all items had a CVR > 0.99. And since the CVI average of the items in our scale is 1, scale is said to be statistically significant.

Surface Validity of the Vaccination Attitudes Examination-TR

Turkish version of VAX was sent to five academic nurses to evaluate intelligibility and determine the structure problems that may be experienced in the scale items before the scale was applied to the research sample. Participants made some suggestions for the explanations of the scale. The suggestions were reviewed by the researchers and necessary arrangements were made.

Structural Validity

The factor analysis method was used to evaluate the structure validity of the VAX-TR. At first, KMO and Bartlett sphericity tests were used to calculate the suitability of the research sample for factor analysis (Table 3). The KMO coefficient was found .817, which indicates that the sample of the study was suitable for EFA. According to the Barlett's test results (χ^2 = 999.381, df=66, $P < 0.001$), it was considered to be statistically significant and there was a sufficient association between the variables for factor analysis.[33] EFA and CFA were applied to evaluate the conformity of VAX-TR with Turkish language and culture in terms of structure.

Explanatory Factor Analysis

EFA determines the number of factors and whether the factors are related to each other.[34] The variables and the factor structure of the scale are shown in Table 3. The analysis of factor loads was investigated with principal component and orthogonal varimax rotation technique and they ranged between .40 and .95. According to the Kaiser-Guttman rule, since only variables with eigenvalues >1 should be retained, four factors with eigenvalue >1 were considered.[35-37] As a result of EFA, the variables were subdivided into similar factors and, the factor structure of the study was found to be similar to the original scale's. This 4-factor (mistrust of vaccine benefit, worries over unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity) explained 69.6% of variance.

Confirmatory Factor Analyses

CFA measures whether there is a relationship between the model structure of the scale and the variables.[38,39] The suitability of the model was analyzed with CFA using the AMOS package program (Figure 1). When the fit values obtained as a result of CFA are examined, Chi-square/Degrees of Freedom (χ^2/df) was found to be 1.27 (χ^2 = 60.858; df=48, P=0.001). The root mean square residual (RMR) index of the scale was 0.063, and the root mean squared error approximation (RMSEA) index was 0.044, comparative fit index (CFI) was 0.98, and goodness-fit index (GFI) was 0.93. The other goodness-of-fit indices (GFI's) values obtained from the scaling model are shown in Table 4. When all model fit values were examined, it was determined that all values were within the desired limits.

The Reliability of the Turkish version of VAX scale

The reliability of the scale was evaluated with item-total correlation coefficients and Cronbach's alpha internal consistency coefficient (Table 5). The item-total correlation shows relationship between the items and the scale total score. It is performed to check whether an item on the scale is consistent with the average value measured by the others. According to the obtained item-total correlation value, it is evaluated whether that item can be removed from the scale. A correlation value <0.2 or 0.3 indicates that the corresponding item does not correlate very well with the scale and, thus, it may be removed.[40] Item-total correlation coefficients of the VAX-TR ranged between .40 and .84. The Cronbach alpha internal consistency coefficient of the scale was found to be 0.86, and 0.75–0.90 for the sub-dimensions.

Discussion

In this study, the psychometric properties of VAX-TR were examined and it was evaluated whether the scale could be used as a valid and reliable tool in evaluating vaccination attitudes in the Turkish parents. Participants were similar to those in the original scale study in terms of sociodemographic characteristics.

Table 3. Factor loadings of the items

		Vaccination attitudes examination			
Dimensions	Items	F1	F2	F3	F4
Mistrust of vaccine benefit	I feel safe after being vaccinated.	.67			
	I can rely on vaccines to stop serious infectious diseases.	.90			
	I feel protected after getting vaccinated.	.95			
Worries over unforeseen future effects	Although most vaccines appear to be safe, there may be problems that we haven't yet discovered.		.80		
	Vaccines can cause unforeseen problems in children.		.74		
	I worry about the unknown effects of vaccines in the future.		.81		
Concerns about commercial profiteering	Vaccines make a lot of money for pharmaceutical companies but don't do much for regular people.			.74	
	Authorities promote vaccination for financial gain, not for people's health.			.82	
	Vaccination programs are a big con.			.68	
Preference for natural immunity	Natural immunity lasts longer than a vaccination.				.40
	Natural exposure to viruses and germs gives the safest protection.				.89
	Being exposed to diseases naturally is safer for the immune system than being exposed through vaccination.				.73
Explained variance		19.4	18.7	16.9	14.5
Cumulative variance		19.4	38.1	55.0	69.6
Kaisser Meyer Olkin			.817		
Bartlett's Test			χ^2=999.381, df=66, P<0.001		

The first thing to do in adaptation studies is to adapt the original scale to language and society characteristics. During the translation of the scale, changes may occur in the structure of the original scale due to the conceptual and expressive differences of the language. For this reason, it is necessary to carefully examine the scale items and standardize them according to the norms of the society to which the scale will be adapted.[27] In this context, translation and back-translation processes were carried out by researchers and expert translators at the stage of ensuring language validity in our study. The original scale items and the translated-back translated scale items were compared. As a result of these studies, the language validity of the scales was ensured and it can be said that the VAX-TR is an understandable and applicable measurement tool.

After language validity, the scale was examined in terms of content and surface validity. Whether the scale and its sub-dimensions measure the desired situation was evaluated with the expert opinion of five faculty members who are experts in the field of health and statistics. For surface validity, the scale items were evaluated by five academic nurses in terms of appearance, layout, readability, and ease of application. In the literature, it is considered sufficient for the number of experts to be between 3 and 20 for content and face validity,[27,41] and this criterion was complied with in the study.

Validity refers how correctly and consistently a scale measures what is intended to measure. Scale validity is performed using factor analysis and criterion validity.[42] However, since there is no gold standard scale used to evaluate vaccination attitudes in the same sample group, the criterion validity could not be tested. In this study, factor analysis method was used to evaluate the structural validity. Factor analysis is a statistical method used to create a smaller number of factors that measure similar characteristics by bringing together the related ones among many variables that measure different characteristics.[40,42] EFA and CFA are the two main components used in factor analysis (84). EFA examines whether a factor that forms the basis of the data is sufficient for a hypothesis. The factor number and model structure of the scale are determined by creating a correlation matrix from the correlations between the variables.[27,39] Whether there is a harmony between the factors determined as a result of EFA and the factors put forward theoretically is investigated by CFA.[27]

KMO and Bartlett tests were used to evaluate the suitability of the research sample for factor analysis. A KMO value between 0.90 and 1.00 indicates the sample is "adequate" for factor analysis. KMO values between 0.80 and 0.89 are "very good", between 0.70 and 0.79 are "good", between 0.60 and 0.69 "moderate", The KMO values <0.60 indicate that the sample is not adequate and unacceptable.[43] In this study, the KMO coefficient (.817), and Barlett's test result (P < 0.001) show that the sample is suitable for EFA.

As a result of EFA, a 12-item scale with four identified sub-dimensions with eigenvalues >1 was obtained. These four sub-dimensions

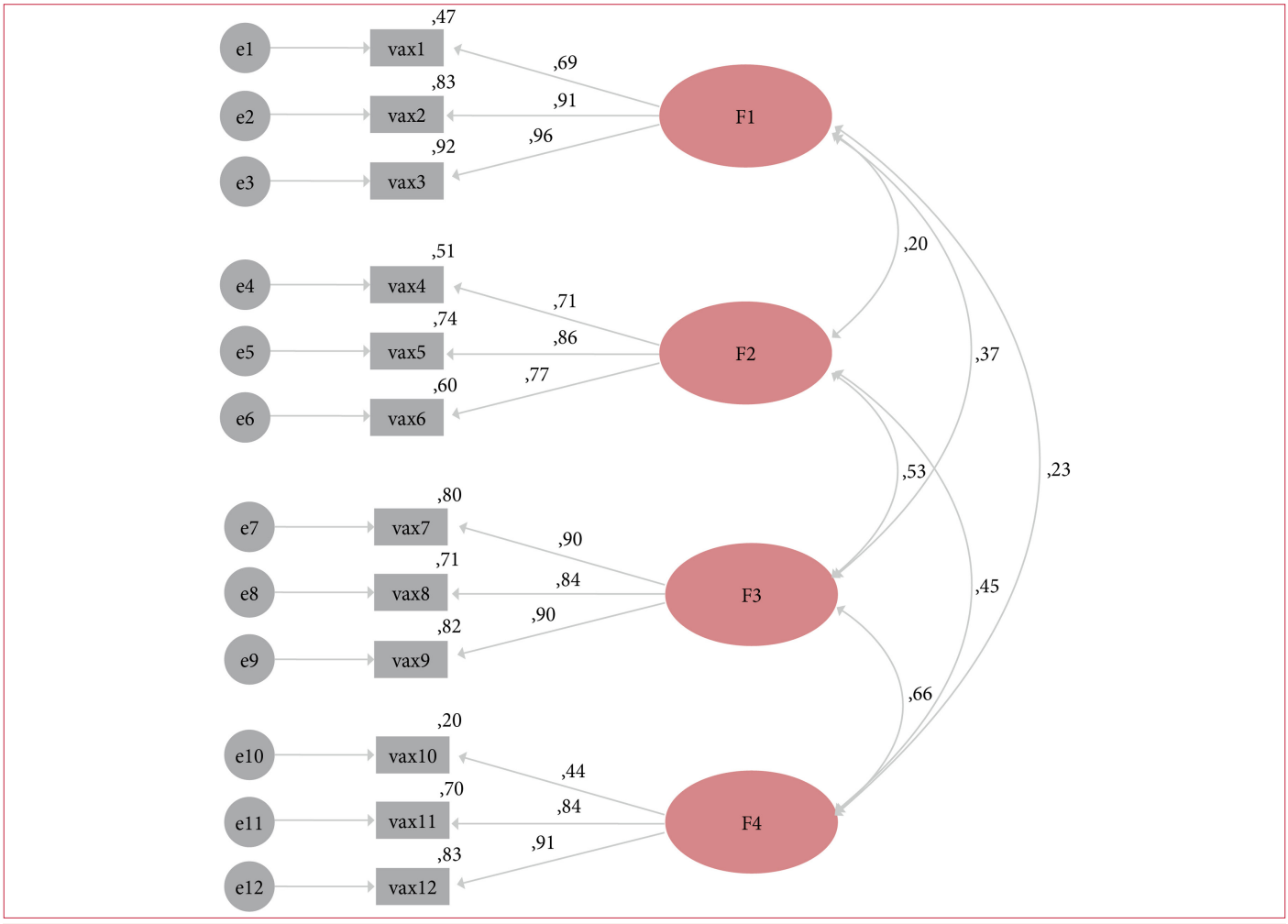

Figure 1. Vaccination attitudes examination structural model pathdiagram.

clarified 69.6% of the total variance. It has been reported that the explained total variance values of a valid scale are 40–60% in multi-factor scales and 30% in single-factor scales.[44,45] According to EFA results, it can be said that the Turkish VAX has high construct validity. It was reported that there is a similar model structure with four sub-dimensions in the adaptation studies of the VAX into Spanish, Italian, and Romanian languages. The four sub-dimensions obtained for VAX-Romanian explained 71.22% of the total variance,[17] 77.8% for VAX-Spanish,[18] and 78.2% for VAX-Italian.[19]

The higher the item load of an expression, the higher its relationship with the factor it explains. In the that the literature, it is recommended item load be at least .40.[40,44] The loadings of the VAX-TR were found to be ranged between .40 and .95 (Table 3). In the Martin and Petrie's study, the factor loads were found as .60–.80.[4]

CFA is a validity determination method used in the adaptation of measurement tools developed especially in other cultures and samples. To evaluate the suitability of the factor model obtained by EFA for the sample of the study, CFA was performed and goodness of fit indices were evaluated. Chi-squared test (x^2/df), the RMSEA, the CFI, and the standardized root mean square residual (SRMR), (GFI), (adjusted goodness of fit index [AGFI]) were evaluated and shown in Table 4. In general, the ratio of x^2/df lower than 3.0 is considered as an indicator of good fit. In our study, x^2/df was 1.27 and showed good fit. Values between 0 and 1 for the RMR and below 0.05 for RMSEA are good indicators of compliance. The AGFI and CFI =0.90 or above also indicate a good fit.[29,45-49] In terms of the model, RMR index (.063) and RMSEA index (.044) show a good fit to data whereas the GFI (.98) and CFI (.97) were in a desirable range. CFA results showed that the four-factor model of VAX-TR was fit to the sample group. It was observed that VAX-TR's fit indices are close to the fit indices of the original scale. As a result of the analysis, it was concluded that the use of VAX-TR is valid.

It is important for a scale to be reliable as well as valid. Reliability means the consistency of the measure. The reliability of the scale was evaluated with item-total score correlation and internal consistency methods. The item-total score correlation shows the relationship between the scale items and the whole scale.[40,45] The higher the correlation coefficient, the stronger the relationship between the scale and the items. If the item-total score correlation coefficient is .30 and above, it indicates that the strength of the item is high. Items with an item total score correlation coefficient below .30 should be removed from the scale.[40] We determined that the item-total score

Table 4. Goodness-of-fit indices for the model

Goodness-of-fit indices	Good fit level	Acceptable fit level	Values for this model
Ratio χ^2/sd	≤3.0	≤4.0–5.0	1.27
Goodness of fit index	≥.90	≥.85	.93
Adjusted goodness of fit index	≥.90	≥.85	.89
Normed fit index	≥.95	≥.90	.94
Relative goodness-of-fit index	≥.95	≥.90	.91
Comparative fit index	≥.97	≥.90	.98
Incremental fit index	≥.95	≥.90	.98
Tucker-Lewis index	≥.95	≥.90	.98
Standardized root mean square residual	.0–1.0	.0–1.0	.06
Root mean square error of approximation	≤.05	≤.06–.08	.04

correlations of the Turkish VAX scale ranged between 0.40 and 0.84 and no item needs to be excluded from the scale. In this context, we can say that the Turkish VAX has high distinctiveness with regards to vaccine refusal or hesitancy.

Internal consistency is an indication that all of the items in the scale or the items constituting a factor investigate the same feature. In our study, the Cronbach alpha coefficient method was used for assessing internal consistency. When the Cronbach alpha coefficient is between 0.80 and 1, the scale is considered to have high reliability, and 0.61< α <0.80 value is considered as medium reliability.[45] In this study, the Cronbach alpha coefficient of the VAX-TR scale was 0.86, and it ranged between 0.75 and 0.90 for the subdimensions. Accordingly, it can be stated that the VAX-TR has high reliability. In the study of Martin et al., the psychometric values of the scale were evaluated in two separate samples, and the Cronbach alpha internal consistency coefficients are shown in Table 5. It is reported that the Cronbach alpha coefficient was 0.83 of the VAX-Spanish and vary between 0.74 and 0.90 for sub-dimensions and show good internal consistency.[18] The Cronbach alpha internal consistency coefficient of the Romanian version of the scale was 0.82[17] and 0.94 for the Korean version.[20]

Table 5. Item total score correlations and Cronbach alpha's of the VAX

Sub-Dimensions	Items	Item total score correlations		Cronbach alpha's of Turkish scale	Cronbach alpha's of sample 1**	Cronbach alpha's of sample 2**
		VAX	Cronbach Alpha's*			
Mistrust of vaccine benefit	I feel safe after being vaccinated.	0.65	0.93	0.88	0.92	0.91
	I can rely on vaccines to stop serious infectious diseases.	0.81	0.79			
	I feel protected after getting vaccinated.	0.84	0.76			
Worries over unforeseen future effects	Although most vaccines appear to be safe, there may be problems that we haven't yet discovered.	0.82	0.86	0.82	0.89	0.85
	Vaccines can cause unforeseen problems in children.	0.79	0.89			
	I worry about the unknown effects of vaccines in the future.	0.84	0.85			
Concerns about commercial profiteering	Vaccines make a lot of money for pharmaceutical companies, but don't do much for regular people.	0.64	0.78	0.90	0.93	0.77
	Authorities promote vaccination for financial gain, not for people's health.	0.73	0.69			
	Vaccination programs are a big con.	0.65	0.78			
Preference for natural immunity	Natural immunity lasts longer than a vaccination.	0.40	0.86	0.75	0.86	0.78
	Natural exposure to viruses and germs gives the safest protection.	0.69	0.54			
	Being exposed to diseases naturally is safer for the immune system than being exposed through vaccination.	0.68	0.55			
Cronbach Alpha's				0.86	-	-

VAX: Vaccination attitudes examination, *Cronbach Alpha's when the item is deleted. **Original validity study of Martin and Petrie.

Conclusion

It was determined that the psychometric values of the VAX-TR showed that the scale had high internal consistency. Similar results were obtained with the model structure of the original scale and its versions in other languages. The VAX-TR is valid and reliable scale to measure vaccination attitudes, intentions, and vaccination decisions in Turkish parent group with children aged 0–18. The scale is also considered to determine the anti-vaccination attitudes and the causes underlie the vaccine refusal or vaccine hesitancy.

Ethics Committee Approval: This study was approved by Ankara Yıldırım Beyazıt University Ethics Committee (Approval Number: EC2019/22, Date: 13.02.2019).

Informed Consent: All participants were informed that all collected data would be processed anonymously and confidentially, and online written informed consent was obtained.

Peer-review: Externally peer-reviewed.

Author Contribution: Concept – E.K., S.K., D.U., P.K.; Design – E.K., S.K., D.U., P.K.; Supervision – E.K., S.K., D.U.; Fundings – E.K., D.U.; Materials – E.K., D.U.; Data Collection and/or Processing – E.K., D.U.; Analysis and/or Interpretation – E.K., D.U.; Literature Review – E.K., D.U., P.K.; Writing – E.K., S.K., D.U., P.K.; Critical Review – E.K., S.K., D.U., P.K.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support or funding.

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