Assessment of Validity and Reliability of the Turkish Version of the Vaccination Attitudes Examination (VAX) Scale

Esra Yildiz, PhD, RN
Associate Professor, Department of Public Health Nursıng, Faculty of Nursing, Ataturk University, Erzurum, Turkey

Zeynep Gungormus
Professor, Department of Public Health Nursıng, Faculty of Health Sciences, Gazıantep Islamic Science and Technology University, Gazıantep, Turkey

Nuray Dayapoglu, PhD, RN
Associate Professor, Department of Internal Medicine Nursing, Faculty of Nursing, Ataturk University, Erzurum, Turkey

Correspondence: Zeynep Gungormus, Professor, Department of Public Health Nursıng, Faculty of Health Sciences, Gazıantep Islamic Science and Technology Universty, Gazıantep, Turkey E‑mail:gungormusz@yahoo.co.uk

Abstract

Objective: Anti-vaccination attitudes are an important factor predicting vaccination behavior. Determination of anti-vaccine attitudes will accelerate efforts to prevent antivaccination attitudes from emerging. The aim of this study was to assess the validity and reliability of the Turkish version of the Vaccination Attitudes Examination (VAX) scale.
Method: Participants comprised 250 parents of 0-5-year-old children visiting a social media site in Turkey. All participants volunteered to take part in the study.
Result: In an exploratory factor analysis of the scale, scores on the KMO test was found to be 779 and the Bartlett's Test for Sphericity was 1397.752. The scale explained 74.23% of the total variance. Factor loadings of the scale ranged between .668 and .895. The scale had a four-dimensional structure similar to the original scale. The proportion of the Chi-square statistics, which were obtained from the analysis, to the degree of freedom was (χ2/df) 2.243 (χ2=107.677 df=48); the root mean square approximation error (RMSEA) was 0.071, Tucker-Lewis index (TLI) was 0.94 and the comparative fit index (CFI) 0.907. A comparative fit index (CFI) and Tucker-Lewis index (TLI) value equal to or above 0.90 indicate that the data fits well.
Conclusion: The Turkish version of the VAX scale is a valid and reliable measuring tool.
Clinical Relevance: The development of this scale will contribute to the assessment and improvement of vaccination attitudes examination in Turkey.

Keywords: Vaccination Attitudes Examination, Scale, Validity, Turkish

Introduction

Although mortality and morbidity related to contagious diseases have decreased over the years because of effective vaccinations, a decline in vaccination rates has been observed in recent years. As a consequence of the reduction in vaccinations, the incidence of contagious diseases has started to increase again (Brown et al., 2010). In recent years, vaccination refusal behaviors have become popular among individuals.

Anti-vaccination attitudes are an important predictor of vaccination behavior. Low vaccination rates are a substantial health problem. However, there are several factors that may affect the

development of anti-vaccination behavior (Lundy & Janes, 2009; MacDonald, 2015). In certain cases, factors like forget fulness and lack of time for vaccination may be the primary factors determining this behavior (Bozkurt, 2016; Argüt et al., 2016). In others, efficacy problems related to vaccines may reflect general concerns related to unnatural medical interventions (Brown et al., 2010; Mallory et al., 2018). Furthermore, special concerns such as a mistrust of vaccines and vaccine companies may also play a role in the formation of such attitudes. It is important to understand the reasons underpinning the refusal or hesitation to vaccinate in order to predict vaccination behavior and formulate an effective response to improve public health outcomes (Lundy & Janes 2009). Determining the most prominent reasons for vaccination refusal may help determine the strategies targeting these individuals (MacDonald, 2015; Martin & Petrie, 2017). For this purpose, healthcare professionals need a measurement tool to detect anti-vaccination attitudes, so that the decrease in the number of the vaccinated people can be prevented and healthy people protected (Brown et al., 2010).

Healthcare professionals, as individuals in the population under the influence of peers and media, may also exhibit anti-vaccination behavior. It is important, therefore, to investigate the attitudes of both healthcare professionals and other individuals responsible for providing vaccinations (Mallory et al., 2018).

In recent years in Turkey, reservations owing to different reasons have affected the acceptance of vaccines. Therefore, an investigation into factors strengthening vaccination practices may affect vaccination acceptance (Bozkurt, 2016; Argüt et al., 2016). To ensure herd immunity, hesitations at a societal level must also be determined (Mallory et al., 2018).

The purpose of this study was to determine the validity and reliability of the VAX scale in the Turkish language. The current tools used to determine the anti-vaccination attitudes, are focused on certain age groups and/or specific vaccines. Determination of anti- vaccination behavior will enable a comprehensive assessment (Martin & Petrie, 2017; Shapiro et al., 2018). There is no measurement tool available in Turkey

for the determination of the anti-vaccination behavior. Therefore, an assessment of the validity and reliability of the Turkish version of the Vaccination Attitudes Examination (VAX) scale is needed.

Methods

This study was conducted as a methodological study in Turkey. Parents of children between 0 and 5 years of age who had applied to a social media, were included in the study. The data were collected between June 1, 2018 and October 1, 2018. The number of included volunteers was 5-10 times of each item in the scale. During the study, the number of individuals assessed was 20 times the item number. Accordingly, 250 individuals were enrolled in the study. Individuals older than 18 years who chose to participate, were included in the study.

Data collection tools: A questionnaire and the Vaccination Attitudes Examination Scale were used for the data collection. Before the study, the scale was translated from English into Turkish and again from Turkish into English. The original scale was then compared with the translated questionnaire.

A group consisting of eight experts (professors, associate professors, and assistant professors) representing different specialization areas was formed to determine the best translation of each item and to develop a Turkish version of the scale. For the assessment of the expert opinions, the Content Validation Index (CVI) was used. Each item was evaluated on a 4-point scale. The calculated CVI was 0.90.

The questionnaire: The questionnaire constituted of eight questions directed at the social-demographic characteristics of the individuals.

Vaccination Attitudes Examination Scale: The VAX scale has 12 items and 4 sub dimensions focusing on mistrust of vaccine benefit, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity. This scale was developed by Martin and Petrie in 2017 to measure the general attitude towards vaccines and has a 6-point Likert's scale (1=I definitely do not agree, 6=I definitely agree). The 1st, 2nd, and 3rd items are inversely scored. High scores obtained in the scale show that the anti- vaccination attitude is strong. The lowest and

highest possible scores are 12 and 60. It was developed for adults (Martin & Petrie, 2017).

Data collection: Individuals were briefed on the objective of the study and informed consent was obtained. Participants were asked to complete the questionnaire and answer the self-assessment questions.

Data Evaluation: The obtained data were analyzed using software packages SPSS and AMOS. Confirmatory and exploratory factor analyses were performed to analyze the validity of the scale. The concordance indices were calculated. Cronbach's alpha coefficient was calculated for the validation analysis of the scale.

Ethical Principles: Before the initiation of the study, we obtained consent from the original developer of the scale. In addition, we obtained approval from the ethics committee (2018 4/3) and the consent of participating individuals.

Results

Of the participants, 75.6% were female, 95.2% married, 34.4% high-school graduates, and 59% had at least two children. The mean age of the participants was 32.88 years (SD 6.85). All of the participants had vaccinated their children in the past and 15.7% of them stated that they had encountered the common complications associated with the vaccines like fever, pain, and swelling.

Exploratory Factor Analysis: The results of Bartlett's test of sphericity and the KMO test, performed for the determination of the concordance of the data set for factor analysis, are summarized in Table 1.

The dataset seemed to be suitable for factor analysis, as the KMO coefficient was close to 1 and the result of Bartlett's test for sphericity was significant.

According to the total explained variance (Table 2) parsed as a 4-factor structure, the 74.2% of the total 4-factor variance is explained.

The factor loads belonging to the items are listed in Table 3. Factor loads ranged between 0.895 and 0.668.

Cronbach's alpha coefficients were calculated to test the reliability of the Turkish version of the VAX scale (Table 4). The investigation of the results of the reliability analysis showed that the reliability levels of the scale and sub dimensions were sufficiently high.

The proportion of the Chi-square statistics, which were obtained from the analysis, to the degree of freedom was ($\chi2/df$) 2.243 ($\chi2$=107.677 df=48); the root mean square approximation error (RMSEA) was 0.071, Tucker-Lewis index (TLI) was 0.94 and the comparative fit index (CFI) 0.907. A comparative fit index (CFI) and Tucker-Lewis index (TLI) value equal to or above 0.90 indicate that the data fits well (Table 5, Figure 1).

Table 1: Results of KMO test, and Bartlett's test for sphericity.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.779
Bartlett'sTestof Sphericity	Approx. Chi-Square	1397.752
	df	66.000
	Sig.	0.000

Table 2: Explained variance for the Turkish version of the VAX scale.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.176	34.803	34.803	4.176	34.803	34.803
2	2.344	19.533	54.336	2.344	19.533	54.336
3	1.548	12.896	67.232	1.548	12.896	67.232
4	0.841	7.005	74.237	0.841	7.005	74.237
5	0.717	5.979	80.216			
6	0.485	4.040	84.256			
7	0.439	3.662	87.917			
8	0.408	3.401	91.318			
9	0.351	2.925	94.244			
10	0.278	2.318	96.562			
11	0.228	1.898	98.460			
12	0.185	1.540	100,000			

Table 3: Factor loading for Turkish version of the VAX scale.

Item	Component			
	1	2	3	4
7	0.846			
8	0.836			
9	0.778			
1		0.895		
2		0.867		
3		0.853		
11			0.839	
12			0.767	
10			0.668	
5				0.848
4				0.845
6				0.718

Table 4: Cronbach's Alpha Values for the Turkish version of the VAX Scale.

Factors	N of Items	Cronbach'sAlpha
Mistrust of vaccine benefit	3	0.847
Worries about unforeseen future effects	3	0.775
Concerns about commercial profiteering	3	0.866
Preference for natural immunity	3	0.760
Total	12	0.818

Table 5: Fit indices for the Turkish version of the VAX scale.

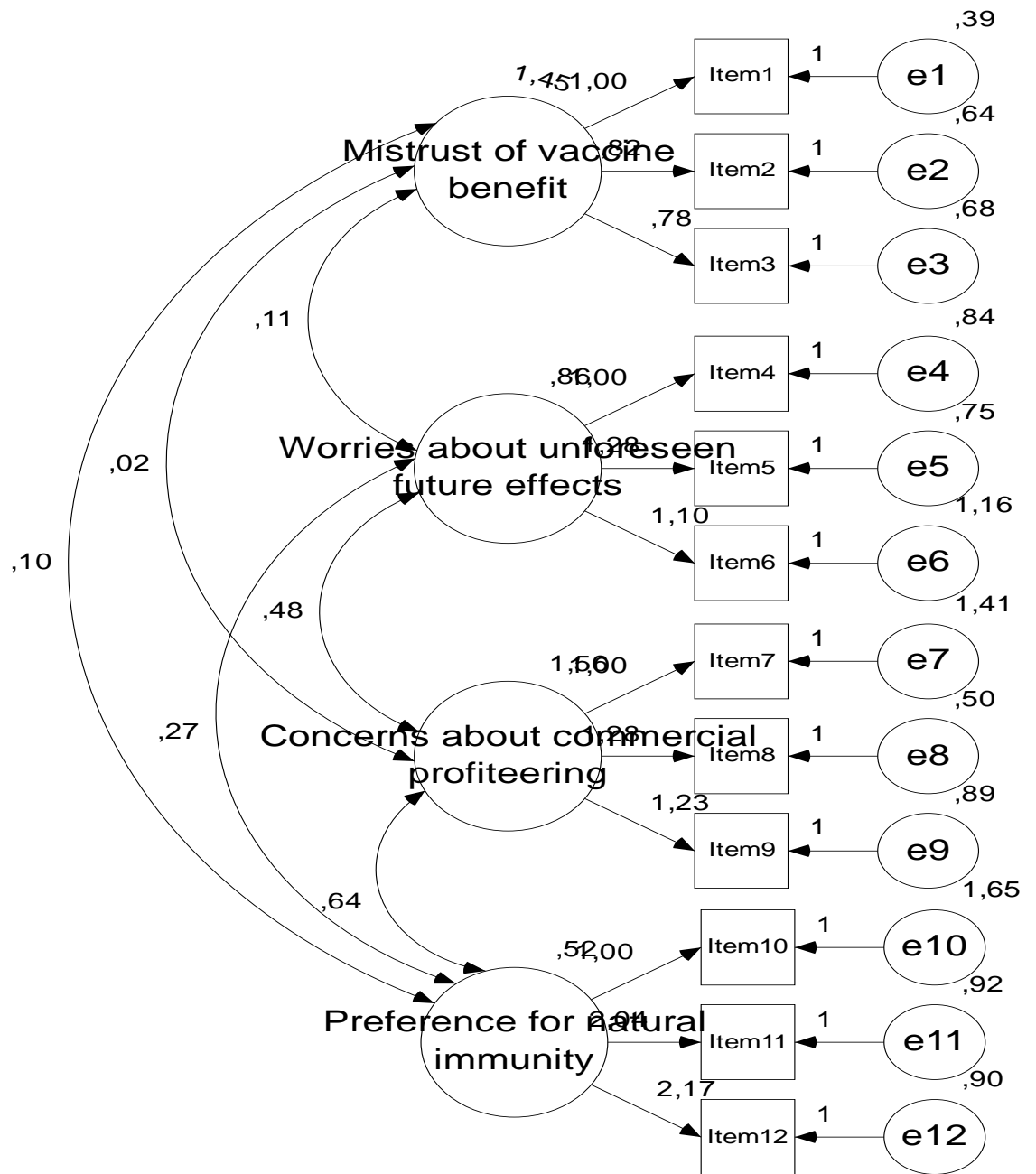| Acceptable Fit Indices	Calculated Fit Indices
$\chi^2/sd<5$	2.24
GFI >0.90	0.932
AGFI >0.80	0.89
CFI >0.90	0.907
TLI>0.90	0.94
RMSEA <0.08	0.071

Figure 1: Path Diagram for Turkish version of the VAX scale.

Discussion

Although vaccines enable the prevention of deaths and disabilities caused by contagious diseases, peoples' attitudes toward vaccination may differ. Anti-vaccination behaviors affect vaccination attitudes (Martin & Petrie, 2017). The VAX, which is a scale used for the evaluation of the attitudes towards vaccination, was assessed in a different cultural setting. Thus, the differences or similarities related to the evaluation of vaccination programs will be explained. This scale may also contribute to the detection of anti-vaccination behavior and to the development of an effective strategy against it. We conducted this study to determine the validity and reliability of the VAX scale.

In our study, we observed that the scale had sufficient sampling regarding validity according to the results of the KMO test and Bartlett's test for sphericity. The percentage of the explained variance of the scale had a high value (Polit & Beck, 2008). The results of the factor analysis, which was conducted to confirm the concordance of the sub dimensions, showed that all items of the scale were weighted in sub dimensions just like in the original version of the scale. We found that the scale centered around four factors, reflecting anti-vaccination attitudes similar to the original scale. The results showed that anti-vaccination attitudes found in the cultures where the original scale was used, were comparable with the attitudes of the Turkish population in our study.

We used the same sub dimensions of the VAX, developed by Martin et al., which are called "mistrust of vaccine benefit, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity." The similarity of these results confirmed that perceptions about vaccines in two distant geographical regions were common (Martin & Petrie, 2017). The vaccination strategies against contagious diseases are conducted worldwide with a global approach. This global approach might also be responsible for the common attitudes towards anti-vaccination.

The investigation of the reliability analysis of the scale showed that reliability was at an acceptable level (Buyukozturk, 2002). Specifically, the Cronbach's alpha value of the sub dimension "the preference for natural immunity" was a lower sub dimension within the sub dimensions as in the original version of the scale, pointing to the similarity between the two cultures. There were also similar findings in other sub dimension values compared to the original version of the scale. Similar results for distant regions may depend on the use of comparable media and high-technology communication tools, easier means of communication, and the internet, which is a common source of information about vaccines.

The fit indices values of the scale showed that the concordance of the Turkish version was within acceptable limits (Harrington, 2009). The Turkish version of the scale is a validated and reliable tool for use with the Turkish population.

Conclusion

These findings showed that the Turkish version of the VAX can be used for the detection of individuals, who do not vaccinate or refuse to vaccinate. This scale is a reliable tool for an effective approach to the modification of the anti-vaccination attitudes from the point of view of public health.

References

Argut, N., Yetim, A., & Gokcay, E. G. (2016). The factors affecting vaccination acceptance. *The Journal of the Child*, *16*(1), 16-24.

Bozkurt, H.B. (2016). An overview of vaccine rejection and review of literature. *Kafkas Journal of Medical Sciences*. 8,71-76.

Brown, K. F., Kroll, J. S., Hudson, M. J., Ramsay, M., Green, J., Long, S. J., ... & Sevdalis, N. (2010). Factors underlying parental decisions about combination childhood vaccinations including MMR: a systematic review. *Vaccine*, *28*(26), 4235-4248.

Buyukozturk, Ş. (2002). Factor analysis: basic concepts and using to development scale. *Educational Administration in Theory and Practice*. 32, 470-483.

Harrington, D. (2009). *Confirmatory factor analysis*. Oxford university press.

Lundy, K. S., & Janes, S. (2009). *Community health nursing: Caring for the public's health*. Jones & Bartlett Learning.

MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34), 4161-4164.

Mallory, M. L., Lindesmith, L. C., & Baric, R. S. (2018). Vaccination-induced herd immunity: Successes and challenges. *Journal of Allergy and Clinical Immunology*, 142(1), 64-66.

Martin, L. R., & Petrie, K. J. (2017). Understanding the dimensions of anti-vaccination attitudes: The vaccination attitudes examination (VAX) Scale. *Annals of Behavioral Medicine*, 51(5), 652-660.

Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and assessing evidence for nursing practice.* Lippincott Williams & Wilkins.

Shapiro, G. K., Tatar, O., Dube, E., Amsel, R., Knauper, B., Naz, A., ... & Rosberger, Z. (2018). The vaccine hesitancy scale: Psychometric properties and validation. *Vaccine*, 36(5), 660-667.