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Hemşirelikte Araştırma Geliştirme Dergisi

Adaptation of the Cardiovascular Disease-Related Health Beliefs Scale to Turkish in Turkish Patients with Type 2 Diabetes; Validity and Reliability

Tip 2 Diyabetli Bireylerde Kalp ve Damar Hastalıkları ile İlişkili Sağlık İnançları Ölçeği'nin Türkçe'ye Uyarlanması, Geçerlik ve Güvenirliği

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Özgün Araştırma

Abstract

Objective: The aim of the study is to define the validity and reliability of the Turkish version of Health Beliefs Related to Cardiovascular Disease Scale for individuals with type 2 diabetes.

Methods: The study was conducted in methodological type. The study group was composed of 278 individuals with type 2 diabetes. The data were collected by Information form and Health Beliefs Related to Cardiovascular Disease Scale. The structural validity of the scale was evaluated by exploratory and confirmatory factor analysis. In the context of reliability analyses, Cronbach's alpha, the item-total score correlation, and the test-retest methods were used.

Results: It was found that the four-factor structure explained 51% of total variance and that item loads ranged between .07 and .81. According to the results of confirmatory factor analysis, the two-factor structure of the scale was found to be better than the four-factor version in terms of fit indices (X^2/df=4.63, CFI=.94, RMSA=.12(.10-.13), SRMR=.15). While Cronbach's Alpha value was 0.69 for the whole scale. Positive and high level correlations were found in consequence of test-retest (r= .724; p<0.001).

Conclusion: The Turkish version of the Health Beliefs Related to Cardiovascular Disease Scale having a two-factor structure (susceptibility and benefits) was found to be valid and reliable in determining the cardiovascular diseases-related health beliefs of individuals with type 2 diabetes.

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Keywords: Type 2 diabetes, cardiovascular diseases, reliability and validity, scale, health beliefs

Öz

Amaç: Bu çalışmanın amacı, tip 2 diyabet hastaları için Kalp ve Damar Hastalıkları ile ilişkili Sağlık İnançları Ölçeği'nin Türkçe geçerlik ve güvenilirliğini belirlemektir.
Yöntem: Çalışma metodolojik tipte uygulandı. Çalışma grubu, tip 2 diyabetli 278 kişiden oluşmaktaydı. Veriler tanıtıcı bilgi formu ve Kalp ve Damar Hastalıkları ile İlişkili Sağlık İnançları Ölçeği ile toplandı. Ölçeğin yapısal geçerliliği, açımlayıcı ve doğrulayıcı faktör analizi ile değerlendirildi. Güvenirlik analizleri kapsamında Cronbach's alpha, madde korelasyon testleri ve test tekrar test methodları kullanıldı.
Bulgular: Dört faktörlü yapının toplam varyansın % 51'ini açıkladığı ve madde yüklerinin .24 ile .84 arasında olduğu bulunmuştur. Doğrulayıcı faktör analizi sonuçlarına göre ölçeğin iki faktörlü yapısının uyum indeksleri açısından dört faktörlü versiyondan daha iyi olduğu bulunmuştur (X2/df=4.63, CFI =.94, RMSA=.12 (.10-.13), SRMR=.15). Ölçeğin tamamı için Cronbach's Alpha değeri .69 bulundu. Test-tekrar test sonucunda pozitif ve yüksek düzeyde korelasyonlar bulundu (r =.724; p<0.001).
Sonuç: Tip 2 diyabetli bireylerin kalp ve damar hastalıkları ile ilişkili sağlık inançlarının belirlenmesinde, Kalp ve Damar Hastalıkları ile İlişkili Sağlık İnançları Ölçeği'nin iki faktörlü yapısının (duyarlılık ve yarar) Türkçe versiyonu geçerli ve güvenilir bulunmuştur.

Anahtar Kelimeler: Tip 2 diyabet, kalp ve damar hastalıkları, güvenirlilik ve geçerlilik, ölçek, sağlık inançları

Introduction

Diabetes is a chronic health problem whose importance has been increasing in the world and in Turkey, and which requires continuous medical care and educational support.[1,2] According to data coming from International Diabetes Federation (IDF), the number of diabetics in the globe climbed up to 424 million in 2017 and it is expected to reach 629 million in the year 2045.[3] These figures are indicative of the fact that diabetes has been increasing all over the world.

While type 2 diabetes prevalence was 7.2% in Turkey[4], in the years 1997 and 1998 according to the data coming from a study conducted by Turkish Diabetes epidemiology (TURDEP-I), it was found in TURDEP-II study published in 2010 that the figure went up to 13.7% by increasing 90% in 12 years.[5] According to estimations made by IDF for 2035, Turkey will be among top 10 countries having the biggest population of diabetics in the world.[6]

IDF reports that one of the two individuals is unaware of the fact that they are diabetic.[7] Therefore, individuals with type 2 diabetes are under risk in terms of complication development in the period of time until their disease is diagnosed. Cardiovascular diseases (CVD) are the most frequently encountered complications of diabetes, and it is the most important cause of morbidity and mortality in individuals with diabetes. Coronary artery disease and paralysis risks are 2-4 times higher in type 2 diabetics than in non-diabetics. 60-75% of those patients are lost due to cardiovascular diseases. Besides it was also reported that diabetes was an independent risk factor in terms of CVD. For all these reasons, it is extremely important to control cardiovascular risk factors in patients with diabetes.[1,2,8-11]

CVD risk factors in diabetes are reported as obesity, sedentary life and refusing diet prescribed. A change of life style based on healthy nutrition and regular exercise is required in individuals with type 2 diabetes so as to prevent CVDs.[1,2,8]

From this point of view,, it may be said that determining perceptions of individuals with type 2 diabetes of cardiovascular diseases and of preventing them is important in those patients' protection from cardiovascular diseases.

It was pointed out in the literature that health belief model had made important contributions to understanding how the exercise and diet behaviours of type 2 diabetic adults influence their health beliefs and to the development of attempts to be made so as to diminish CVD morbidity and mortality in this population.[12,13]

Health belief model explains how individuals' behaviours they display for protection from diseases and insufficiency are shaped and influenced. According to Rosenstock, the model explains the correlations between individuals' beliefs and behaviours and the effects of individual motivation on their health behaviours. It also describes what motivates someone to perform or not to perform health-related actions and especially the situations influential in displaying actions related to health.[12,14]

The model includes four components. Perceived susceptibility is an individual's perceptions related to a disease threatening his or her health. Perceived Severity involves evaluations related to the probable results of a disease such as death, disability, pain and social losses. Perceived benefit is the benefit perceived in relation to reduction in suffering from an illness as a result of behaviour to be displayed. Perceived Barriers are the Barriers thought to make it difficult to display the recommended behaviours or are the probable negative sides of the behaviours.[14]

Although diabetes is regarded as equivalent to CVD, no measurement tools are available in Turkey to analyse the correlations between exercise and diet behaviours of adults with diabetes and CVD. This study aims to adapt the Turkish Version Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS) for individuals type 2 diabetes and to perform the validity and reliability analyses of the scale

Methods

Study Design and Sample:

This study was conducted in methodological design. It This study was conducted in Pendik Marmara University Training and Research Hospital and in Küçükyalı Diabetes Centre in İstanbul, in 2014. The research sample was composed of individuals between the ages 18 and 65 with type 2 diabetes agreeing to take part in the research and who had been diagnosed at least two years ago. It is pointed out in scale development work that the amount of data should be at least five times as many as the number of questions at the stage of validity-reliability. Comrey considers 50 as too weak, 100 as weak, 200 as medium, 300 as good, 500 as very good and 1000 as perfect as sample size in validity and reliability studies.[15] Accordingly, the sample size was determined as 300. The data collected from 22 participants were excluded from the study due to incomplete or incorrect coding. In consequence, the study was completed with 278 participants.

The mean age and standard deviation of the participants were 54.92 ± 13.96 and 59.7% of them was female whereas 40.3% was male. The mean HgA1C values and standard deviation of participants were 7.81 ± 1.31. It was found that 50.7% did not have any chronic diseases. 82.7% of patients with chronic disease had hypertension, 40% had hypercholesterolemia and 13.3% had coronary heart disease (More than one answer).

Instruments

The data were collected using a descriptive information form that included socio-demographic variables and Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS).

Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS): The four-pointed likert type (definitely disagree-1, disagree-2, agree-3, definitely agree-4) scale developed by Tover et al. (2010) was based on the four sub-factors of health belief model. The sub-factors of "Susceptibility" and "Severity" contained 5 items, whereas the sub-factor of "Benefits" contained 6 items and the sub-factor of "Barriers" contained 9 items.and thus overall scale contained 25 items in total. While Cronbach Alpha was found to be .77 for the whole scale, it was found as .91 for the sub-factor of susceptibility, .71 for Severity, .91 for benefits and .62 for Barriers. Items 11, 12, 13, 14, 15, 16, 19 and 20 were marked in reverse. Tovar et al (2010) stated that they had designed the HBCVDS as theoretically having four factors but that the statistical findings had supported only two of the factors (susceptibility and benefits) they had recommended. Tovar et al (2010) also described the statistical findings for the items in the four factors. This current study analyses both the four-factor and the two factor-structures of the scale.[13]

Data analysis

SPSS 15.0 and LISREL 8.80 package programs were used to evaluate the data. Linguistic validity and construct validity in addition to such descriptive statistics as percentages, frequencies, means and standard deviations were also tested for the validity of the scale in assessing the data. Construct validity was performed through exploratory and confirmatory factor analysis. Varimax rotation technique was used in exploratory factor analysis. Decisions on the interpretability of the data were made by looking at the results of KMO and Barlett's tests. Internal consistency analysis, item-residual item total correlations and test-retest methods were employed for reliability analysis.

Ethical Consideration

This study was approved by the ethical review boards at the authors' institution (09.2013.0370). The necessary permissions were obtained so that the study could be conducted in the hospital.

Limitations

This research is limited with the sample group. In addition, only 38 patients were able to be reached for the test-retest application. Cultural differences in scale adaptation studies are occurrence. For this reason, the original scale with four factors was reduced to two factors

Results

Validity Analyses

Linguistic validity: First, for linguistic validity, the HBCVDS was translated into Turkish by 5 people with good command of both languages. Then, the best statements in the translations were selected by the researchers. The scale was translated back into English by 3 people who had good command of languages and who were different from the first group of translators. The back-translated text was compared with the original text of the scale. Following the necessary regulations, the Turkish version of the form was generated.

Table 1. Factor analysis and item analysis results for the Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS)

	Items	Four Factors Model					Two Factors Model		
		Factor loads				Item total correlations	Factor loads		Item total correlations
		1	2	3	4		1	2	
1	I will probably have a heart attack or paralysis in the future.	.84				.68	.71		.68
2	I have very high risk of having heart attack or paralysis in the next a few years.	.84				.79	.86		.80
3	I feel that I will have a heart attack or paralysis at a time in my life.	.78				.81	.87		.81
4	Now, it is a likelihood for me to have a heart attack or paralysis.	.77				.62	.78		.63
5	I am worried about the probability to have a heart attack or paralysis in the near future.	.66				.69	.78		.69
6	Having a heart attack or paralysis always results in death.		.59			.37			
7	Having a heart attack or paralysis will threaten my relationship with my spouse.		.39			.46			
8	If I had a heart attack or paralysis, all my life would have been changed by it.		**.28**			.52			
9	Having a heart attack or paralysis would influence my sex life in a bad way.		.49			.47			
10	If I have a heart attack or paralysis, I will die in 10 years.		.36			.28			
11	Increasing my exercise will reduce my risk of having a heart attack or paralysis.			.75		.33		.63	.33
12	Healthy eating will reduce my risk of having a heart attack or paralysis.			.78		.42		.77	.41
13	Doing 30 minutes exercise on most of the days and healthy eating is one of the best ways of preventing heart attacks or strokes for me.			.77		.50		.79	.50
14	When I do exercise, it means doing something good for me.			.37		.67		.68	.67

15	When I eat healthy food, it means doing something good for me.		**.24**		.60	.56	.61
16	Health eating will reduce my risk of dying of cardiovascular diseases	.55	**.08**		.40	.39	.41
17	I do not know any exercise good for reducing the risk of suffering from cardiovascular diseases.			.47	.36		
18	A walk of more than five minutes is hard slog for me.	.60		**.26**	.21		
19	I have the possibility to reach a place and/or equipment to do exercise.	-.48		**.11**	.07		
20	I have somebody who will do exercise with me.			.42	.20		
21	I do not have 30 minutes to do exercise on most of the days of the week.			.53	.38		
22	I do not know healthy way of eating which will prevent the development of cardiovascular diseases.			.47	.29		
23	I do not have time to cook for myself.			.73	.47		
24	I cannot buy healthy food.			.72	.45		
25	I have problems more important than worrying about diet and exercise.			.33	.15		
	Variance It Explains						
		Factor 1	%18.2			%36.7	
		Factor 2	%14.8			%21.5	
		Factor 3	%10.6				
		Factor 4	%7.4				
	Total		**%51**			**%58**	

Construct validity: The factor analysis of the HBCVDS was done through exploratory and confirmatory factor analyses. Varimax rotation technique was used in exploratory factor analysis. Decisions as to the interpretability of the factor analysis were made by looking at the results of Kaiser-Meyer-Olkin (KMO) test and Barlett's test. Accordingly, it was found that the KMO was .74 and Barlett's value was $p< 0.001$ p=.000.

The distribution of items into factors demonstrated that the HBCVDS had four factors. It was found that the four-factor structure explained 51% of the total variance (Table 1). In the original scale, factor one contained items 1, 2, 3, 4 and 5; factor two contained items 6, 7, 8, 9 and 10; factor three

contained items 11, 12, 13, 14, 15 and 16 and factor four contained items 17, 18, 19, 20, 21, 22, 23, 24 and 25 (Table 2). As is clear from Table 1, item factor loads range between .08 and .84 and that some of the items take on loads from more than one factor.

Table 2. Internal consistency coefficients for the Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS)

		Four Factors Model	Two Factors Model		
Factors	**Items**	**C Alpha**	**C Alpha**	**Test-retest**	
				r*	***p***
Susceptibility	1,2,3,4,5	.88	.88		
Severity	6,7,8,9,10	.67			
Benefits	11,12,13,14,15,16	.75			
Barriers	17,18,19,20,21,22,23,24,25	.56	.75		
Total		**.69**	**.60**	.724	**<0.001**

**Spearman correlation test was used.* *p<.001*

Confirmatory factor analysis (CFA) is a theory-based technique recommended to test hypotheses about factor structures. The criteria used to test the fit between a model and the data are; the ratio of chi square to degree of freedom (X^2/df), the standardised root mean square residual (SRMR), root means square error of approximation and comparative fit index (CFI). The acceptable levels of fit indices were determined as three or below three for the ratio of chi square to degree of freedom, below .05 for SRMR, the .06-.08 range for RMSEA and above .95 for CFI.[16,17]

Items and factors were associated as recommended by Tovar et al (2010) in the original scale[13] and the theoretical structure formed in this way was represented as Model 1. The model formed the basis for model comparisons at the beginning. In other words, it was expected at the beginning that the model would have better fit coefficients than the alternative models. Model 2 predicts that sub-factors were independent properties but model 3 predicts that the sub-factors could be combined in a basic factor. Models 2 and 3 were analysed in accordance with equivalent models. Model 4, on the other hand, reflects a two-factor structure containing the factors of Susceptibility and Benefits which is also supported by data in Tovar et al (2010).[13] Fit indices for the model tests and comparisons are shown in Table 3.

Table 3. Model test and comparison

Size / Model	**Satorra Bentler x^2_{df}**	x^2 sd	**CFI**	**RMSEA (90% CI)**	**SRMR**	Δx^2_6
Model 1 (Theoretical)	778.46(269)	2.89	.91	.08 (.08 - .09)	.14	
Model 2 (unrelated four factors)	828.15(275)	3.01	.90	.09 (.08 - .09)	.18	49.69
Model 3 (one factor)	1,677.31(275)	21.92	.75	.14 (.13 - .14)	.19	898.85
Model 4 (two factors)	201.41(275)	4.63	.94	.12 (.10 - .13)	.15	

Besides, the convergent and discriminant validity coefficients of the theoretical model were also examined. Convergent validity is analysed according to >.50 for standard regression weights, >.70 for compound safety coefficient (CR), and >.50 for Average Varience Extracted (AVE). Discriminant validity, on the other hand, is the squared maximum structural covariances (Maximum Shared Variance (MSV), MSV<AVE), and it is examined with a bigger value than the absolute value of factor√AVE correlations with other factors.[18] Convergent and discriminant validity coefficients for the four-factor and two-factor theoretical models are shown in Table 4.

Table 4. Convergent and discriminant validity coefficients for Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS) Model 1 and Model 4

	Factors	CR	AVE	MSV	ASV	Benefits	Susceptibility	Seriousness	Barriers
Model 1	Benefits	.78	.43*	.18	.13	.66			
	Susceptibility	.93	.74	.15	.06	- .39	.86		
	Severity	.74	.37*	.53*	.21	.23	.18	.61*	
	Barriers	.56*	.21*	.53*	.24*	.42	.05	.73	.45*
Model 4	Benefits	.75	.42*	.12	.12	.65			
	Susceptibility	.93	.73			-.35	.85		

** Problematic coefficients*

According to the findings obtained from CFA, EFA was repeated for two-factor structure. It was found that the two-factor structure explained 58% of the total variance, and item factor loads range between .39 and .87.

Reliability Analyses

The item-total correlations of the scale varied in the range of .07 to .81 (Tablo 1).

Cronbach Alpha was calculated for the whole scale and for its sub-factors for internal consistency. Following the analysis done so as to determine the internal consistency reliability of the scale, Cronbach alpha was calculated as α=0.69 for the whole scale. Cronbach alpha was found as .88 for the sub-factor of Susceptibility, .67 for the sub-factor of Severity, .75 for the sub-factor of Benefits and .56 for the sub-factor of Barriers (Table 2).

According to the findings obtained from CFA, EFA was repeated for two-factor structure. Cronbach alpha was found as .88 for the sub-factor of Susceptibility, .75 for the sub-factor of Barriers, and .60 for whole scale.

Test-retest was performed so as to determine the consistency coefficients of the scale in the context of reliability. The test-retest analysis was conducted to a total of 38 patients that can reach again, with 15 days intervals to determine the time-invariance of the scale. Test re-test was performed by Spearman correlation test because of the data did not show normal distribution. As a result of the spearman correlation analysis for the test-retest reliability of the scale, there was a strong, positivite and significant relationship (r=.782; p<0.000).

Discussion

KMO and Barlett's values were examined so as to test whether or not the sample size was sufficient for exploratory factor analysis. KMO receives values between 0 and 1, and having a value

close to 1 indicates the sample size is adequate.[16,17] KMO was found to be .74 in this study- which indicated that sample size was sufficient for factor analysis. Having Barlett's test significant ($p<.05$) indicates that the data set has multivariate normality.[16,17] That the Barlett's value was .000 in this study demonstrated that the factor analysis could be interpreted.

On examining the distribution of items into factors by using Varimax rotation technique, it was found that the four-factor structure explained 51% of the total variance and two-factor structure explained %58 of total varience (Table 1). Differing views are available in relation to the variance that a scale should explain in the literature. Henson and Roberts (2006) state that variance should be 52% at least.[19] Accordingly, the variance explained was in the acceptable limit in this study.

It was found that item factor loads ranged between .08 and .84 and that the item total correlations calculated for reliability analysis of the scale were between .07 and .81. Items 8, 15, 16, 18 and 19 were found to have factor loads below .32 (Table 1). It is pointed out that item factor loads should be at least .32 or above in scale development and adaptation process.[17] Accordingly, having item total correlations with value of .30 and above is sufficient in discriminating the property to be measured and this is compatible with the total scale.[17,20] It is recommended that items with factor loads below .32 should be removed from the scale. Yet, there are also views suggesting that one should be faithful to the original structure of a scale in scale adaptation work, and thus one should not remove any items from the scale. On the other hand the item factor loads were ranged between .39 and .87, and the item total correlations were between .33 and .81 for two-factor structure of the scale. These findings shows that the two-factor scale has better validity and reliability values.

On examining the fit statistics found through CFA, it was found that the theoretical model shown in Table 4 had better fit and unfit coefficients than models 2 and 3. Kline (2005) finds it sufficient to show the fit and unfit coefficients available in Table 4 in evaluating the correlations between covariance generated on the basis of a model and covariance observed.[21] Hair, Black, Babin and Anderson (2010) claim that chi square will be statistically significant even though models with the number of people bigger than 250 and the number of items between 12 and 30 fit the data;[22] and that having CFI bigger than .92, SRMR and RMSEA smaller than .07 will be sufficient.[21,22] Thus, it is clear that the coefficients for the theoretical model are close to the cut off values recommended by Hair et al. On the other hand, while the RMSEA and SRMR values of the theoretical model are lower than those of the two factor models, the CFI (.94) and AIC (247.41) values of the two factor models were found to be more appropriate than those of the theoretical model (CFI=.91 and AIC=890.46). Whereas the fit levels of the other coefficients were sufficient, SRMR was found to be higher- which indicated that a certain part of the model was incorrectly described. On examining fitted residuals matrix, it was found that there were additional correlations between item 11, item 12 item 13 apart from the ones predicted by the model. The low factor loads of the items mentioned are also supportive of this interpretation. Convergent and discriminant validities which are the components of construct validity, are considered for Model 1 and Model 4 separately in the light of this finding.

As is clear from Table 3, reliability coefficients for the sub-factors apart from the coefficient for Barriers (CR=.56) are >.56. Standard regression weights for the sub-factors were as in the following: between .76 and .96 for susceptibility, .46 and .67 for Severity, between .15 and .98 for benefits and between -.35 and .74 for Barriers. The MSV values were found to be smaller than AVE for Benefits and Susceptibility and bigger than AVE for Susceptibility and Barriers. AVE values were smaller than ASV only for the sub-factor of Barriers. Besides, the √AVEs were smaller than the correlations with other

factors for Susceptibility and Barriers. In the light of these results it may be stated that construct validity values are satisfactory for the sub-factors of Benefits and Susceptibility but that they were not high enough for the other two factors (especially for Barriers).

Table 4 shows the convergent and discriminant validity coefficients for Model 4. Accordingly, the reliability coefficients for both factors are >.70. In addition to that, AVE is <.50 for the factor of Benefits. The standard regression weights for the factors are between .75 and .91 for Susceptibility and Between. 14 and .98 for Benefits. MSV values are smaller than AVE for both factors. √AVEs are bigger than the correlations with the other factor. Hence, it may be repeatedly said that the vales for construct validity are satisfactory for the sub-factors of Benefits and Susceptibility. Path diagram for the two-factor structure and the standard regression weights are shown in Figure 1.

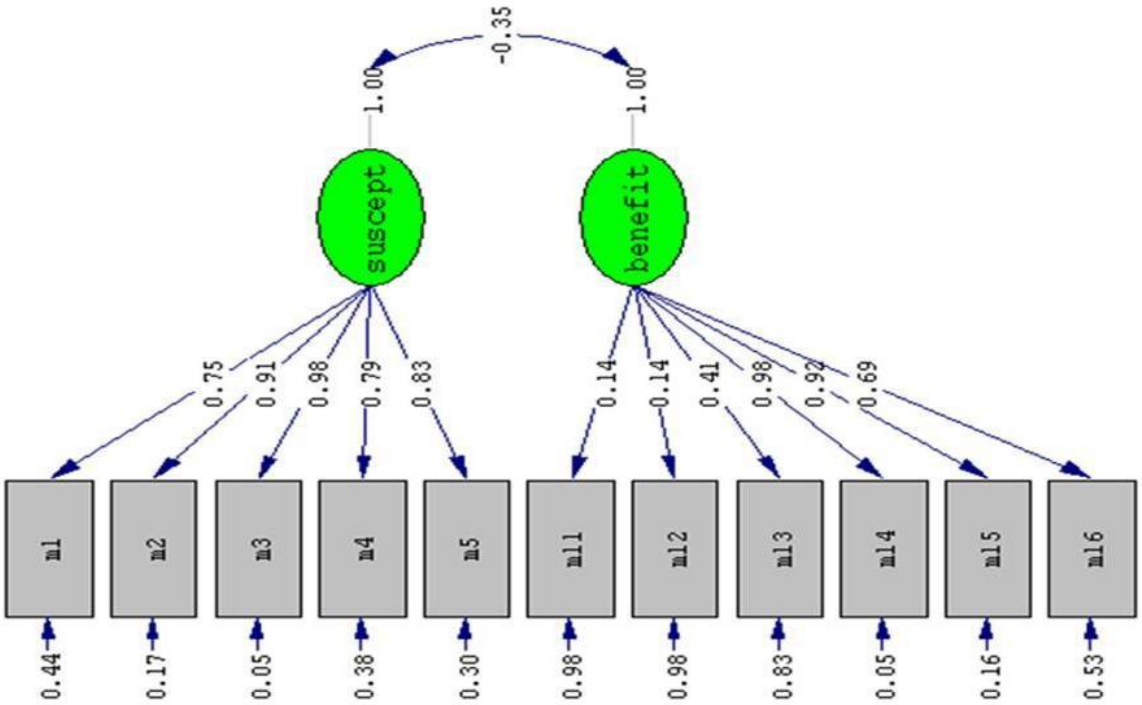

Figure 1. Path diagram for the two-factor structure of the Health Beliefs Related to Cardiovascular Disease Scale (HBCVDS), and its factor loads

Cronbach Alpha was calculated as α=0.69 for the whole test in the analysis performed so as to determine the internal consistency of the scale. It was also found that the Cronbach Alpha was .88 for the sub-factor of Susceptibility; it was .67 for Severity, .75 for Benefits and .56 for Barriers (Table 2). Cronbach alpha was found as .88 for the sub-factor of Susceptibility, .75 for the sub-factor of Barriers, and .60 for whole scale for two factor structure of the scale. It is pointed out that a scale with reliability coefficient of .70 and above is regarded as a reliable scale.[17] Accordingly, it is clear that the sub-factors of Susceptibility and Benefits have high reliability coefficients but that the sub-factors of Severity and Barriers have low reliability coefficients. Tower et al (2010) also state that the sub-factors of Susceptibility and Benefits have high reliability coefficients but that the sub-factors of Severity and Barriers have low reliability coefficients in its original form of the scale (.91, .91, .71, .62 respectively).[13]

However, some also hold the view that reliability coefficients can be found to be lower in adaptation work than in the original scale.

While positive and high correlations were found (r=.782; p<0.001p=.000) for the whole scale in consequence of test-retest performed in the context of scale reliability (Table 3). Correlation is expected to be above .70 in test-retest method which is used in order to measure the invariability of the scale according to time.[17] On the other hand, having correlation values of .70-1.00 indicates high level correlation.[20] Based on the data, it may be said that the scale displays invariability according to time.

Conclusion

The findings obtained in this study have demonstrated that the exploratory factor analysis results of the Turkish version of the scale of four-factor cardiovascular diseases-related health beliefs were at acceptable levels but that the two-factor model (Susceptibility and Benefits) had better fit indices than the four-factor model according to the results yielded in confirmatory factor analysis. Accordingly, the two-factor model is a valid and reliable scale usable in measuring the risk perceptions of Turkish patients with type 2 diabetes.

Nurses can evaluate the risk perceptions of cardiovascular diseases related of individual with diabetes with this scale. Thus, they can plan and implement training activities to prevent cardiovascular diseases for patient with low perception diabetes.

Contributions

Design of study: G K-O, N E-T
Analysis and collection of data: G K-O, N E-T
Preparation of manuscript: G K-O, N E-T

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