

Original Research / Orijinal Araştırma

Psychometric Properties of Turkish Version of Hypoglycemia Attitudes and Behavior Scale

Hipoglisemi Tutum ve Davranış Ölçeğinin Türkçe Versiyonunun Psikometrik Özellikleri

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Abstract

Aim: The aim of the study was to assess the reliability and validity of the Hypoglycemia Attitudes and Behavior Scale (HABS) for the Turkish population. **Method:** The study was conducted with 153 individuals with Type 2 diabetes mellitus who used insulin. In evaluating data, content validity index, Cronbach α , test-retest testing, item total score correlation, explanatory and confirmatory factor analysis and concordance statistics were used. **Results:** Cronbach alpha values for the subscales were determined as 0.71 for avoidance, 0.72 for confidence, and 0.85 for anxiety. The results of confirmatory factor analysis showed that the factor structure of the adapted scale was in accordance with the three-factor model of the original scale. It was found that the 11-item Hypoglycemia Attitudes and Behavior Scale consisted of three factors: avoidance of hypoglycemia, confidence in hypoglycemia, and anxiety concerning hypoglycemia. Three items in the original scale were removed because their error variances were negative and they did not have significant t values. **Conclusion:** The results showed that the HABS was a valid and reliable scale instrument for the Turkish population.

Key words: attitude, behaviour, hypoglycemia, nursing, type 2 diabetes, validity.

Özet

Amaç: Çalışmanın amacı, Hipoglisemi Tutum ve Davranış Ölçeğinin (HTDÖ) Türk toplumunda geçerlilik ve güvenilirliğini değerlendirmektir. **Yöntem:** Çalışmaya insülin kullanan Tip 2 diabetes mellitusu olan 153 birey katıldı. Verilerin değerlendirilmesinde içerik geçerlilik indeksi, Cronbach α , test tekrar test, madde toplam puan korelasyonu, açıklayıcı ve doğrulayıcı faktör analizi ve uyum istatistikleri kullanıldı. **Bulgular:** Cronbach alfa değerleri kaçınma alt boyutu için 0.71, güven alt boyutu için 0.72 ve anksiyete alt boyutu için 0.85 olarak belirlendi. Doğrulayıcı faktör analizi sonuçları, uyarılan ölçeğin faktör yapısının, özgün ölçekteki üç faktörlü model ile uyumlu olduğunu gösterdi. On bir maddeden oluşan Hipoglisemi Tutum ve Davranış Ölçeğinin 'hipoglisemiden kaçınma, hipoglisemik güven ve hipoglisemik endişe' olmak üzere üç faktörden meydana geldiği bulundu. Orijinal ölçekte olan 3 madde, hata varyansları negatif olduğu ve anlamlı t değerlerine sahip olmadığı için çıkarıldı. **Sonuç:** Sonuçlar, HTDÖ'nün Türk toplumu için geçerli ve güvenilir bir ölçüm aracı olduğunu gösterdi.

Anahtar kelimeler: tutum, davranış, hipoglisemi, hemşirelik, tip 2 diyabet, geçerlilik.

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Introduction

Hypoglycemia is defined as a blood glucose level below 70 mg/dl.^{1,2} Patients with type 2 diabetes may experience conditions such as tremor, dizziness, fatigue, sleepiness, drowsiness, light-headedness, and fainting. These symptoms generally cause anxiety and discomfort in patients. Very frequent recurrence of hypoglycemia attacks may be an indication for the failure to adequately manage glycemic control and quality of life.^{3,4,5} Although there are studies about hypoglycemia-related anxiety and worry experienced by patients with Type 1 diabetes in the literature, there are a limited number of studies on experiences of the patients with Type 2 diabetes.^{5,6} In a study conducted by Yu and Ko in 2012, it was determined that the majority of 320 hypoglycemic patients with Type 2 diabetes were old. It was stated in one study that the hypoglycemia anxiety levels in women were higher than in men.⁸ In the study by Leiter et al. which assessed hypoglycemic fear, it was reported that 84.2% of the patients with Type 2 diabetes feared that they might have serious hypoglycemia in the future by rating it as 'sometimes/always', while 29.9% of them feared that they would have hypoglycemia in the future.

The fear that hypoglycemia might develop in daily life produces anxiety and worry among patients with Type 2 diabetes. If diabetic individuals know what kind of behaviors and attitudes they should demonstrate when they develop hypoglycemia, they may get rid of these anxieties and worries.

Ensuring the right attitudes and behaviors in diabetes is as important as all complications in hypoglycemia. Correct attitudes and behaviors include taking the right insulin dose or oral antidiabetic, proper nutrition, and appropriate physical activity. When good glycemic control was provided, it was observed that the hypoglycemia-related anxiety and concern of the person decreased. When patients with type 2 diabetes have low diabetes self-management and low health-related quality of life, they experience fear of hypoglycemic events, which leads patients to avoid hypoglycemia, and thus actually have further deterioration in diabetes control. Hypoglycemia is one of the most important obstacles in adapting to insulin treatment in people with diabetes.^{9,10,11}

In this sense, it is widely considered that there are no scales that explore attitudes and behaviors towards hypoglycemia. However, in our search of the literature, we found that Polonsky (2015) designed such a scale. To adapt this scale to Turkish society, the author was contacted. With this scale, patients' attitudes and behaviors can be assessed, and individualized nursing interventions, training, and counseling can then be offered according to the results given by the scale.

Starting from this point, this study was conducted to adapt the Hypoglycemic Attitudes and Behavior Scale (HABS) developed by Polonsky et al. (2015) to Turkish society.

Research Question: Are the psychometric properties (reliability and construct validity) of the HABS acceptable for Turkish patients with Type 2 diabetes mellitus?

Methods

Study design

This study was conducted with a descriptive and methodological design.

Setting and sample

The study was carried out in the diabetes outpatient clinic of a private hospital located in Çankırı. Based on the notion that for adequate validity and reliability, the sample size should be 5–10-times the number of item of the scale^{13,14}, we aimed to achieve a sample size of 110 people (the HABS is an 11-item scale). The sample consisted of 150 people who agreed to participate in the study (n = 150). Test-retest analyses typically require a group of at least 30 participants. In the present study, 30 patients who agreed to participate in the retest were given the HABS 15 days after the first application.^{13,14,15} The inclusion criteria of the study were being diagnosed with Type 2 diabetes, participating voluntarily in the study, having a command of Turkish, having no hearing or speech impairment, being aged 18 years or over, and being diagnosed with diabetes at least one year ago.

Data Collection

The data of the study were collected from the diabetes outpatient clinic of a hospital located in the city of Çankırı between November 2017 and February 2018. The sample of the study consisted of those who had had Type 2 diabetes for at least one year, were literate, did not have any communication problems, and accepted to join the study. The time required to complete the form was approximately 20 minutes.

Instruments

The form for demographic and care-related characteristics.

This form includes eight questions about patients' sociodemographic characteristics such as age, gender, educational status, occupation, ages of diabetes, the presence of complications of diabetes, BMI, and the presence of signs and symptoms of hypoglycemia within the last week.

Ethical Consideration: Written permission was obtained by e-mail from the author of the HABS to carry out the reliability and validity of the Turkish version of HABS. Written permissions from the Ethics Committee of Çankırı Karatekin University (22.05.2017/06) and Çankırı Karatekin Hospital were also obtained. The participants were informed about the purpose of the study, and their written consents were obtained. Data of the study were collected in line with the principles set out by the Declaration of Helsinki.

HABS

This scale was prepared for individuals with Type 2 diabetes and consists of 14 items. This scale aims to measure the hypoglycemic attitude and behavior of individuals with Type 2 diabetes using three subscales: Avoidance (four items), confidence (five items), and anxiety (five items). The anxiety subscale asks about individuals' anxieties concerning hypoglycemia. The avoidance subscale asks about attitudes and behaviors adopted in order to avoid hypoglycemia. The confidence subscale consists of questions to determine the degree of comfort felt in not having problems caused by hypoglycemia. There is no total score for the scale: the avoidance and anxiety subscales are scored directly (1 = I definitely disagree, 5 = I definitely agree), while the confidence subscale is scored in reverse (1 = I definitely agree, 5 = I definitely disagree). A score is calculated for each subscale. The mean score is calculated by dividing the total subscale score by the number of items.

The Cronbach's alpha values of the HABS were as follows: 0.85 for those using insulin and 0.83 for those not using insulin in the avoidance subscale; 0.77 for those using insulin and 0.74 for those not using insulin in the confidence subscale, and 0.80 for those using insulin and .073 for those not using insulin in the anxiety subscale. The HABS does not have a total Cronbach's alpha value, and alpha values are only available for its subscales.¹²

Research Procedure

The translation process for HABS

Language validity of the scale was examined as the first step to test the validity of the scale for Turkish society. Two linguists translated the scale from English into Turkish. Then, two experts who are native English speakers translated the scale from Turkish back to English.^{13,14}

Content validity of HABS

The translated Turkish version of the scale was submitted to a group of experts (five faculty members from the faculty of nursing, two diabetes nurses and two doctors), asking for their opinions about the validity of the content. Each of these specialists has been working on diabetes or endocrinology for at least 10 years.

These experts were given the original version of the HABS. They evaluated the appropriateness of the HABS items on a scale of 1 to 4 (1 = not appropriate at all, 4 = completely appropriate). The researchers suggest that at least three experts give their opinions to determine whether or not the translation form is equivalent to the original version, as well as calculating the content validity index (CVI). According to their responses, the scale level CVI (S-CVI) and item level CVI (I-CVI) were calculated. The SCVI and I-CVI of > 0.75 were interpreted as indicative of high content validity.^{13,15,16} Following this phase, scale items were corrected according to recommendations.

Validity

The validity of the scale was examined in terms of concordance validity, construct validity, and contrasted group comparison. I-CVI was used to assess concordance validity. Confirmatory factor analysis (CFA) was used to analyze construct validity. Contrast group comparison was performed within the scope of validity analysis. The model verification of the comparative fit index (CFI) was carried out by Chi-square test, degree of freedom, root mean square error of approximation (RMSEA), CFI, and normal fit index (NFI).^{13,14}

Reliability of HABS

Cronbach's alpha value and item-total correlation were utilized within the scope of reliability analysis. The minimum acceptable Cronbach's alpha value is 0.70. An item-total correlation coefficient of >0.20 is suggested for an item to be at an acceptable level.^{13,14,15}

Pilot Study

After the translation stage, HABS was administered to a sample group, including 20 individuals who had similar characteristics with those who would be included in the sample group of the study. Those participating in the pilot study were not included in the study. They gave their feedback about the items of the scale so that they were corrected. The scale was then put into its final format. This procedure was repeated for each translation.^{13,14}

Results

Sociodemographic Characteristics

The sample of the study consisted of 150 patients with Type 2 diabetes. The mean age of the participants was 60.2 ± 13.9 years. Of the sample, 54% were female, 46% were primary school graduates, and 34% were civil servants, the age of diabetes onset was 15.1 ± 6.5 years, 85% were being treated with insulin only, their mean body mass index was 34.3 ± 8.2 kg/m², and hemoglobin A1c was $7.9 \pm 2.1\%$ (Table 1).

Validity of HABS

To determine the factor structure of the scale, a literature review was conducted, and a structure was formed. Expert opinions were obtained to determine the suitability of this structure. The content validity ratio/index for each item was calculated to assess the answers from the experts. This was 0.75 for nine experts based on the content validity index. The experts' scores varied between 0.85 and 1.00.

Construct validity of HABS

First and second-order confirmatory factor analysis (CFA) was used to investigate whether or not the structure finalized according to the expert opinions was verified. Confirmatory factor analysis (CFA) aims to assess how much a factorial model formed with factors (latent variables) formed by many observable variables complies with actual data. In this part, CFA was applied to evaluate whether the 14-item structure of the three subscales of the scale was verified. Since the error variances in the first CFA were negative, items 2 and 4 were omitted from the scale. Also, a total score cannot be obtained from the scale since the error variance of the correlation of anxiety subscale with the total score is negative. Items having t values that were not statistically significant ($t > 1.92$) were also examined. M14 was omitted from the scale since it had an insignificant t value. The analyses were repeated over the remaining 11 items. Figure 1 shows the path-diagram. Items with a load number close to one explain the factor better.

The fit indices were $\chi^2 = 112.23$, $X^2/sd = 2.24$, $RMSEA = 0.071$, $CFI = 0.92$, $IFI = 0.93$, $NNFI = 0.93$, and $NFI = 0.92$. When the coefficients showing the correlation between the factors and the observed variables of the model showing the factorial structure of this scale were examined, it was concluded that all coefficients were sufficient. When the fit indices calculated by CFA were considered, it was decided that the previously determined structure of the scale had a high level of fit with the collected data.

Reliability of HABS

To determine the reliability of the scale, the Cronbach's alpha value, which is the internal consistency coefficient, was calculated. Cronbach's alpha values were determined as 0.71 for the avoidance subscale, 0.72 for the confidence subscale, and 0.85 for the anxiety subscale. It is stated that a reliability coefficient should be as close to 1 as possible in order to be regarded as sufficient in a Likert type scale.

The test-retest was applied to 30 patients 15 days later. For HABS, the correlation coefficient was 0.95 and the p-value was < 0.001, which was significant to the highest degree ($r = 0.95$; $p < 0.001$). According to these results, it can be asserted that the assessment tool used for the study has a sufficient level of reliability.

Table 1. Description of Sample Demographic Variables (N = 150).

Variables	Range	M (SD)	% (n)
32-48 years of age			69 (46 %)
49-60 years of age			54 (36 %)
61-88 years of age			27 (18 %)
Gender			
Male			69 (46 %)
Female			81 (54 %)
Educational level			
Literate			30 (20 %)
Primary school			69 (46 %)
High school			36 (24 %)
University			15 (10 %)
Occupation			
Housewife			48 (32 %)
Civil servant			51 (34 %)
Artisan			15 (10 %)
Farmer			21 (14 %)
Retired			15 (10 %)
Age of diabetes onset (range:1-28 years; M \pm SD = 15.1 \pm 6.5 years)			
< 5 years			36 (24 %)
5-10 years			48 (32 %)
>10-15 years			42 (28 %)
>15-28 years			24 (16 %)
The number of hypoglycemia symptoms during the last week?			
0			90 (60 %)
1-2			45 (30 %)
More than 3 times			15 (10 %)

Table 2. Regression and T Values of the Scale

		Regression values	t values
I1	I am terrified that I might pass out in public due to a low blood sugar episode	0.34	3.97
I3	I am terrified that I might injure myself or someone else because of a low blood sugar episode.	0.31	3.57
I5	I spend so much time worrying about the possibility of a low blood sugar episode that it interferes with my ability to do the things I really want to do.	0.41	5.13
I6	I am confident that I can stay safe from serious problems with low blood sugar while driving.	0.29	2.27
I7	I am confident that I can stay safe from serious problems with low blood sugar while exercising.	0.66	8.80
I8	I am confident that I can avoid serious problems due to low blood sugar when I'm alone.	0.83	11.64
I9	I am confident that I can catch and respond to low blood sugar before my blood sugars get to low.	0.71	9.73
I10	I am confident that I can stay safe from serious problems with low blood sugar while out in public.	0.95	9.58
I11	To avoid serious problems with low blood sugar, I tend to keep my blood sugars higher than I probably should.	0.98	14.76
I12	Without even bothering to test, I take quick action to raise my blood sugars at the first hint of any funny feelings	0.98	15.12
I13	To avoid serious problems due to low blood sugar, I eat or drink a lot more often than I really need to.	0.68	7.43

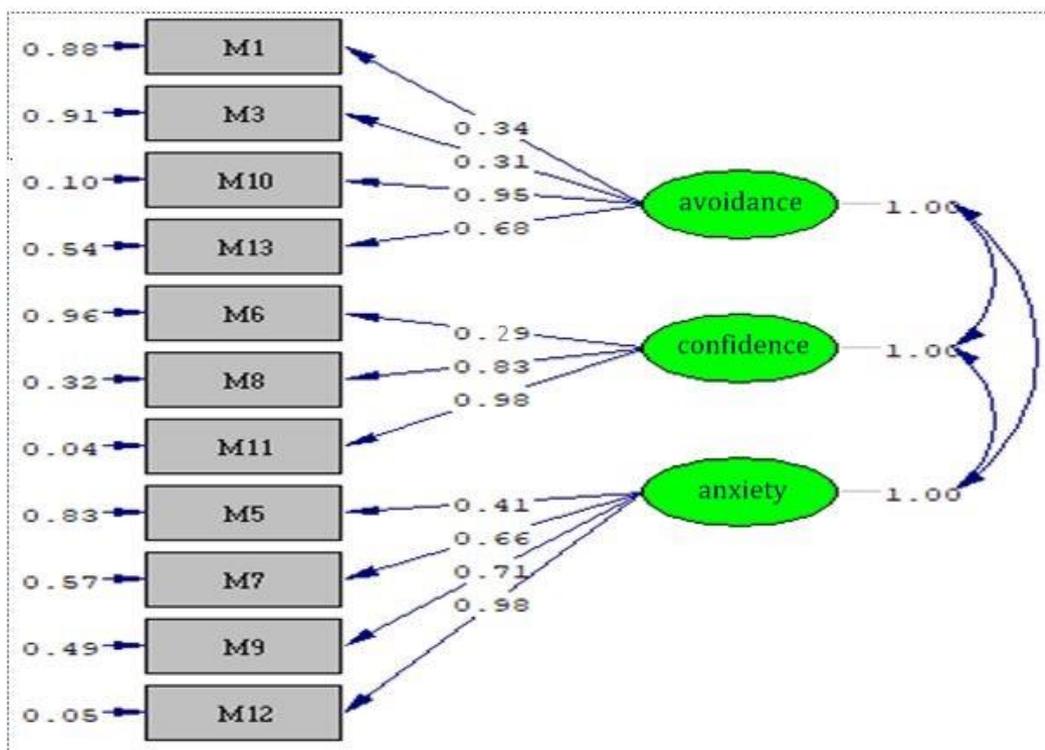


Figure 1. HABS confirmatory factor analysis model.

Discussion

A group of experts analyzed the HABS, and it was revised during the content validity stage according to their suggestions.^{13,14-16} Experts can be given a questionnaire to rate the coherence of items, and the consensus of most experts can be accepted as an indicator of content validity.^{13,14} If the consensus of experts is higher than 0.75, this signifies a high content validity. In this study, CVI values were found to be higher than 0.75. The analysis revealed that the expert scores were coherent. Therefore, the items of the HABS are deemed suitable for Turkish culture.

A number of fit indices are used to assess the validity of the model in CFA. Among these indices, the most commonly used are^{14,15,16,17} Chi-square Goodness Test (Chi-square Goodness, χ^2), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Non-normed Fit Index (NNFI), Normed Fit Index (NFI), and Goodness of Fit Index (GFI). When the values observed in the scale model are between $X^2/d < 3$; $0 < RMSEA < 0.05$; $0.97 \leq NNFI \leq 1$; $0.97 \leq CFI \leq 1$; $0.95 \leq GFI \leq 1$ and $0.95 \leq NFI \leq 1$, this indicates a perfect fit. When the values are between $4 < X^2/d < 5$; $0.05 < RMSEA < 0.08$; $0.95 \leq NNFI \leq 0.97$; $0.95 \leq CFI \leq 0.97$; $0.90 \leq GFI \leq 0.95$ and $0.90 \leq NFI \leq 0.95$, this indicates an acceptable fit (13,14, 15). The fit indices in the present study were $\chi^2=112.23$, $X^2/sd = 2.24$, $RMSEA = 0.071$, $CFI = 0.92$, $IFI = 0.93$, $NNFI = 0.93$, and $NFI = 0.92$. When examining the coefficients showing the correlation between the factors and variables observed in the model showing the factorial structure of this scale, it was concluded that all coefficients were sufficient. 18 When considering the fit statistics calculated by CFA, it was decided that the previously determined structure of the scale complied well with the collected data.

In the present study, the HABS had an acceptable internal consistency. Item analysis is among the methods utilized to assess the internal consistency in the adapted scales in terms of reliability. The adequate item score was 0.20. Also in the present study, item score correlation values were between 0.29 and 0.98. In a study by Polonosky et al., values below 0.30 were considered insignificant.

Another method used for assessing internal consistency is Cronbach's alpha reliability coefficient. A Cronbach's alpha value of < 0.40 signifies that the measurement tool is not reliable; a value between 0.40 and 0.59 indicates that the measurement tool has low reliability; a value between 0.60 and 0.79 indicates that the measurement tool is considered relatively reliable, and a value between 0.80 and 0.90 signifies that the tool is considered highly reliable^{13,14}. In the present study, it was determined that the Cronbach's alpha value of the scale was within reliable limits. The alpha values were determined as 0.71 for the avoidance subscale, 0.72 for the confidence subscale, and 0.85 for the anxiety subscale.

In their study, Polonosky et al. found that the Cronbach's alpha coefficients were 0.85 for those using insulin and 0.83 for those not using insulin in the avoidance subscale, 0.77 for those using insulin and 0.74 for those not using insulin in confidence subscale, and 0.80 for those using insulin and 0.73 for those not using insulin in the anxiety subscale.

The test-retest analysis is among the most common reliability analyses in assessing the invariance characteristic of the measurement tool. There was consistency between measurements performed at specific intervals, since there was no difference between test-retest mean scores. The test-retest reliability coefficient was above 0.95, and there were a statistically positive relationship and high correlation between test-retest scores.^{13,14} Thus, the Turkish version of HABS was determined to have a high level of reliability.

In the present study, the mean scores were determined as 1.97 ± 0.87 in the anxiety subscale; 2.47 ± 0.75 in the avoidance subscale, and 3.85 ± 0.65 in the confidence subscale. The mean total score of the scale was 3.8 ± 0.9 . In the study by Polonosky et al. (2015), it was found that the HABS subscale mean scores for insulin and non-insulin users were as follows: Anxiety = 1.93 ± 0.78 and 1.65 ± 0.64 , avoidance = 2.50 ± 0.92 and 2.37 ± 0.82 , and confidence = 3.75 ± 0.75 and 3.93 ± 0.70 .

Conclusion

In this study, we investigated the reliability and validity of the HABS for Turkish society. We showed that the Turkish version of the HABS is a reliable and valid instrument for evaluating hypoglycemia attitude behaviors. It was determined that the scale could be used in nursing practice and research in Turkey.

Limitations of this study

These results might not be generalizable to all patients with Type 2 diabetes mellitus since the present study was carried out in a single center. We recommend repeating this study with different units and centers, and more patients.

Because the 15-day test-retest interval in this study made it possible that the questions might be remembered, the Cronbach alpha value may have been higher. This is also a limitation of the study. For this reason, it is recommended that this interval should be increased in future studies.

In addition, because the sample was selected on the basis of voluntary participation, there were relatively few people with an education level of high school or more in the results. As the scale total score may have been affected at this point, this is felt to also be a limitation of the study. Therefore, it may be recommended that the study of the scale should be repeated with groups with a higher level of education.

Finally, it is recommended that this scale should be examined in Type 2 diabetes patients using and not using insulin, and with larger sample groups.

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