Original Article

Psychometric Properties of the Perceived Diabetes Self-Management Scale in Turkish Patient with Type 2 Diabetes

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Abstract

Background: Success of perceived self-management has been highlighted and researched in relation to patient with diabetes, as it may have a positive impact on their treatment adherence.
The purpose of this study was to investigated the psychometric properties of Perceived Diabetes Self-Management Scale (PDSMS) in Turkish people with type 2 diabetes.
Methods: This study design is methodological. The study recruited 263 patients. Language validity of PDSMS was tested. The psychometric properties of the Turkish PDSMS (T-PDSMS) were examined through internal consistency, stability, construct validity, confirmatory factor analysis, concurrent validity, and predictive validity.
Results: Internal consistency of the total scale was 0.77 (coefficient α). Findings identified that exploratory factor analysis revealed with 47.96% of total variance explained. The factor loading ranged from 0.39 to 0.65 for 7 items. The confirmatory factor analysis had good fitness indices; the norm χ^2 was 19.11, χ^2/df value was lower than 2, GFI was 0.95, CFI was 0.99, SRMR was 0.02, and RMSEA was 0.037. The instrument showed good reliability and concurrent validity with Health Belief Model Scale and Diabetes Self-Efficacy Scale (p:0.000). Assessment of predictivity of the scale, PDSMS scores correlated with diabetes outcomes such as BMI, FBG, PPG, and HbA1c ($p< 0.001$).
Conclusions: The T-PDSMS which is consist of 7 items and one dimension is a valid and reliable measurement tool that is ready for clinical use by health professions.

Keywords: Diabetes mellitus, Self-efficacy, Perceived diabetes self-management, Psychometrics, Reliability, Validity, Turkey.

Introduction

Diabetes is one of the largest global health emergencies of the 21st century. Diabetes is among the top 10 causes of deatth globally and together with the other three major noncommunicable (NCD) diseases (cardiovascular disease, cancer and respiratory disease) account for over 80% of all premature NCD deaths (Global Burden of Diseases Study, 2015). The International Diabetes Federation (IDF) states that there are 425 million patients with diabetes mellitus in the world by 2017 and that it this number will reach to 629 million with an increase of 48% in 2045. Again, according to estimations in the IDF diabetes atlas, the prevalence of diabetes in the 20-79 age group is 12.8% Turkish community has a prevalence of 12.8% diabetes and this figure is the third highest number after Germany and Russian Federation in Europe (IDF, 2017). In the Turkey Diabetes Epidemiology study (TURDEP-II), it was determined that the prevalence of diabetes is 16.5% in the Turkish population, and that the deterioration of glucose tolerance (IGT) increased by 106% in the last 12 years (Satman, Omer, Tutuncu & Kalaca, et al., 2013) Diabetes requires a comprehensive management plan about diet, exercise, and weight; effectively

monitor their blood glucose, lipids, blood pressure and cholesterol; access and correctly use medications; and regularly attend screening for complications (American Diabetes Association, 2019). In addition, patients with diabetes mellitus need to self-manage their condition for optimal outcomes (Wallston, Rothman & Cherrington 2007). When not well managed, all types of diabetes can lead to complications in many parts of the body, resulting in frequent hospitalisations and early death especially cardiovascular diseases, stroke and renal diseases (IDF, 2017, ADA, 2019a).

Self-efficacy beliefs of the patients with diabetes play an important in role in coping with diabetes process and in the self-care management (Grinslade, Paper, Jing & Quinn, 2015; Lee, van der Bijl, Shortridge-Baggett, Han, & Moon, 2015). Self-efficacy is defined as the belief that one can successfully execute a behavior necessary to produce a given outcome (Bandura, 1998). Self-efficacy is a key construct within Social Cognitive Theory (SCT) (Bandura, 2004) a theory that identifies multiple, interacting determinants of human behavior and behavior change (Andrew & Vialle, 1998). Self-efficacy influences the individual's choice of behaviors. Self-efficacy also influences how people motivate themselves in the tasks that they undertake. That is, people with a strong sense of self efficacy view their tasks or behaviors as challenges to be mastered, even if they are difficult. Efficacious people tend to set challenging goals and maintain commitment to them (Bandura, 2004).

Diabetes is a chronic diasase progressing with macrovascular and microvascular complications (cardivoascular, retinopathy, nephropathy, neuropathy, diabetic foot ulceration, encephalopathy etc.) (IDF, 2017). To make a multitude of daily self-management decisions and to perform complex care activities are important part of successfully preventing acute complications and reducing the risk of long term complications (ADA, 2019b). Many studies on diabetes reported that self efficacy as related to diabetes self care activities of management positively correlated with diabetes self care behaviours (Grinslade, Paper, Jing & Quinn, 2015; Lee, van der Bijl, Shortridge-Baggett, Han, & Moon, 2015). Self-efficacy has been identified as an important factor in self-care behaviors and health outcomes including Body Mass Index (BMI), Fasting Blood Glucose (FBG), Post-prandial glucose (PPG), and HbA_{1c} (Houle, Beaulieu, Chiasson, et al., 2015; Chang, Song, & Im, 2014; Al-Khawaldeh, Al-Hassan, & Froelicher, 2012). In the study assessing the relationship between self-efficacy and self-care strengths of diabetic patients, it has been found that the level of self-efficacy related to nutrition and insulin treatment increased in cases who participated in diabetes training programs and who were visited by a home care nurse (Bernal, Woolley, Schensul & Dickinson, 2000). In another study, individuals with a low self-efficacy level have been reported to have insufficient diabetes-related self-care behaviors and to fail in diabetes management (Johnston-Brooks, Lewis & Garg, 2002). It is thought that the evaluation of disease-related self-efficacy levels of individuals will be useful for an effective and successful diabetes self-care.

The Perceived Diabetes Self-Management Scale (PDSMS) was modified from the Perceived Health Competence Scale (PHCS) by Wallston et al. (2007). The scale has one dimension. The scale consists of 8 items about how the diabetic individual perceives oneself on diabetes-specific health outcomes and self-management (self-efficacy) (Grinslade, Paper, Jing & Quinn, 2015). There are various scales that evaluate diabetes-related self-efficacy and self-care behavior responses in Turkish community. Health Belief Model Scale (HBMS) and Self Efficacy Scale (DSES) for self efficacy, of patient with Diabetes Mellitus, which have been translated and validated in Turkish culture (Kara, Bijl, Shorridge-Bagget Astı, & Erguney, 2006; Kartal, Altug-Ozsoy; 2007). Both scales are frequently used in studies in Turkish community. However, both scales are too long for use in clinical practice and research. It is difficult to use both scales for field studies with a large sample size. With epidemic increase of diabetes and its burden, health professionals need to spend more effort to improve diabetes self-management of people (Mensing, Boucher, Cypress, et al., 2007). Therefore, there is a need for shorter and more practical tools to assess self-management behaviours of Turkish people with diabetes. In this study, it was aimed to investigate the Turkish validity and reliability of PDSMS which enables to evaluate the diabetes self-efficacy perception with 8 items in a short time.

Methods

Design: A two-phase design was used for this methodological study. Phase I included the

translation of the English version of PDSMS into Turkish, and Phase II consisted of the psychometric testing of Turkish version of perceived diabetes self management scale (T-PDSMS). A survey design was applied, and a series of tools, including Demographic Information Questionnaire, PDSMS, The Diabetes Self-Efficacy Scale (DSES) and The Health Belief Model Scale (HBMS) were used to collect data through direct observation, informal interview and review of the medical records.

Setting and sample: The universe of the study was chosen from a Medical Faculty's Diabetes Outpatient Clinic. People with type 2 diabetes who consented to voluntarily participate in the study, who had no physical or psychiatric barriers to communication, who at least graduated from primary school, and who were 20-79 years old were included in the study. Consequently, a total of 263 people with type 2 diabetes were included in the study.

The translation processes (Figure 1) were guided by Bracken and Barona (1991)'s method that included translation, blind back-translation, committee review and pilot testing for the cross-cultural adaptation of an instrument (Bracken & Barona, 1991). This method has been widely used in studies on cross-cultural adaptation of an instrument for Turkey. It was first translated from English into Turkish by two people who know English and Turkish quite well.

Content validity procedure: The Turkish form of the scale was revised with the opinions of expert panel members consisting of 16 diabetes professionals. The diabetes experts were asked to evaluate the linguistic suitability (relevance, clarity and comprehensiveness) of each scale item on a rating scale of 1-4 according to Davis (1992) technique. [(1 point: *unsuitable*, 2 points: *partially suitable/item needs to be corrected*, 3 points: *suitable/but minor corrections need to be done*, 4 points: *absolutely suitable*)] In this technique, the item-related "content validity index" is calculated by divinding the number of experts who selected "*absolutely suitable* " and " *suitable/but minor corrections need to be done* " with the total number of experts (Davis, 1996). A value of 0.80 is acceptable (Polit & Beck, 2006). Accordingly, it was expected that 80% of the items to receive 3 and 4 points (Bontempo, 1993) In line with expert opinions and suggestions, the 2nd item of the PDSMS was modified for adaptation to Turkish and easy understanding by Turkish patients. Subsequently, the questionnaire was translated back from Turkish to English by a bilingual language expert. The backtranslated and original forms of the PDSMS were then compared. After completing the translation process, to check for equivalence using a pilot test, ten adults with type 2 diabetes were asked to complete the T-PDSMS.

Pretest study: In order to test whether the measurement items were understood by Turkish people with diabetes, a questionnaire was applied to 10 people with diabetes before the study. The questionnaires used in the pretest were not included in the study. The test-pretest study was conducted by calling the same 40 patients on the telephone after 2 weeks. These 40 patients also completed the other scales

Data collection: After preparing the T-PDSMS, data collection was conducted by the researchers. When a possible participant was interested in the study, researchers provided information on the study including the purpose, time to complete questionnaires and took informed consent. If a patient wanted to participate in the study, the researchers reviewed and signed the informed consent sheet with the participant. The participants filled out the questionnaires by themselves; however, if they needed help to fill out the questionnaires, the researchers assisted them. After approximately two weeks from the first interview, the second interview for collecting data from a total of 40 participants who participated in the first interview was conducted to determine the test–retest reliability of the T-PDSMS. To obtain the inter–rater reliability, the researchers interviewed the same participant at the same time and engaged in a discussion until they reached a consensus. In this study, a total of four tools are administered.

Demographic information questionnaire : To collect general characteristics of the participants, four questions on age, gender, time passed since diabetes diagnosis and current treatment modality were asked. The time passed since diabetes diagnosis was measured in years, and current treatment modality was categorised into three types: (1) only oral hypoglycaemic agent(s), (2) only insulin injection and (3) both oral hypoglycaemic agent(s) and insulin injection. In addition to this information, body mass index (BMI), fasting plasma glucose (FPG), post prandial blood glucose (PPG) and glycosylated hemoglobin A1c (HbA1c) were measured. BMI: Body Mass Index was calculated as weight (kilograms) divided by square of height (meters) (National Heart, Lung

and Blood Institute, 2019). Fasting Plasma Glucose (FPG): The level of glucose in a venous blood sample collected after at least 10 hours of hunger. Post Prandial Blood Glucose: (PPBG): The glucose level in the blood when measured 2 hours after a meal. Glycosylated hemoglobin A1c (HbA1c): The average of blood sugar in three months (ADA, 2019c). In the study, the diabetes-related health outcomes were determined as the period of diagnosis, BMI (Body Mass Index), FBG (Fasting Blood Glucose), Plazma Blood Glucose (PBG), Hemoglobin A1 c (HbA1c) (National Heart, Lung and Blood Institute, 2019). Analyses were conducted using an Archi- tect C 1600 (Abbott, USA) in a laboratory affiliated to Diabetes and Endocrinolgy Outpatient Clinic of Istanbul University Medical Faculty. Biochemical measurements and implementation of questionnaires were conducted simultaneously.

The Perceived Diabetes Self-Management Scale (PDSMS): The PDSMS was designed by Wallston through the modification of the Perceived Competence Health Scale (PHCS) (Smith, Wallston & Smith, 1995). This scale could easily be made disease-specific and be used in any medical condition requiring self-management. The PDSMS has 8 items and was evaluated with a 5-point likert type scale. The response categories were "strongly disagree" (1), "disagree" (2), "neutral"(3), "agree"(4), and "strongly agree" (5). Four items of the scale were negative questions. Therefore, these 4 items were reverse scored. The total PDSMS score can range from 8 to 40, with higher scores indicating more confidence in one's diabetes self-managament (Wallston, Rothman & Cherrington, 2007). It was aimed to evaluate the criterion-related validity of the PDSMS using other scales (concurrent validity) and diabetes outcomes (predictive validity). Therefore, the Diabetes Self-Efficacy Scale (DSES), and the Health Belief Model Scale (HBMS), which represents self-care management behaviors in diabetes, were utilized. These scales have been adapted to the Turkish population (Kara, Bijl, Shorridge-Bagget Astı, & Erguney, 2006; Kartal, Altug-Ozsoy; 2007).

Self-Efficacy: The DSES was developed by Jaap van der Bijl et al. (1999) for people with type-II diabetes and administered to Dutch and British populations. The DSES was adapted to Turkish by Kara et al. (2006) and its reliability and validity were established. The scale consists of 20 items. The response categories of the DSES items include "No, I'm not sure" (1), "no" (2), "Neither yes or no" (3), "Yes" (4), and "Yes, I'm sure" (5). Each item receives a score ranging from 1 to 5. In factor analysis, a total of 3 dimensions were found, which are diet and foot control (12 items), medical treatment (5 items), and physical exercise (3 items). The scale consists of 20 items and does not include any negative items. A minimum of 20 and a maximum of 100 points can be obtained from the total scale (Kara, Bijl, Shorridge-Bagget, Astı, & Erguney, 2006; Van der Bijl, van Poelgeest-Eeltink & Shortridge-Baggett, 1999; Sturt, 2010).

Health Belief Model : The HBMS was adapted for people with type-II diabetes by Tan (2004). The HBMS was then adapted to Turkish by Kartal & Altug-Ozsoy in 2007. The HBMS contains 5 components of the health belief model including sensitivity perception (4 items), seriousness/caring perception (3 items), benefit perception (7 items), barrier perception (9 items), and health motivation (10 items). The HBMS includes 5 Likert-type response categories including "Strongly disagree" (1), "disagree" (2), "neutral" (3), "agree" (4), and "strongly agree" (5). The HBMS consists of 33 items, and 12 items were reverse scored. Thus, a minimum of 33 and a maximum of 165 points can be obtained from the total scale (Kartal A, Altug-Ozsoy, 2007; Tan, 2004). The validity and reliability study of this scale was conducted by Kartal and Altug-Ozsoy (2007).

Data analysis: All data was entered and double-checked and any discrepancies were resolved by referring to the original survey. To analyze data, SPSS 16.0 and LISREL 8.50 programs were used (Simsek, 2007; Tezbasaran, 2008). Demographical informations were analysed using descriptive statistical analysis. Cronbach's a coefficient was used to evaluate internal consistency reliability of the PDSMS. For testing construct validity, exploratory factor analysis and confirmatory factor analysis were carried out. In order to test the criterion - related validity of the scale, Spearman correlations were calculated. Relevant diabetes outcomes such as period of diagnosis, BMI, FBG, PBG, HbA1c were used in order to assess the predictive validity of the scale, as well.

Ethical considerations: Primarily, the necessary permission was obtained from Kenneth A. Wallston to use the PDSMS in the Turkish adaptation study. In order to establish the criterion related validation of the scale, the DSES

and the HBMS were used. We received permissions from Magfiret Kara for using the DSES and Asiye Kartal for using the HBMS. The required ethics approvals were obtained from the Ethics Committee of the Medical Faculty (IRB number 2008/1331). Participants were informed about the research purpose and confidentiality according to the Helsinki Declaration and written consents were obtained for their voluntary participation in the study.

Results

Descriptive statistics for T-PDSMS: The mean age of the participants was 55.8 years (SD 7.3) and 68.4% of the participants were female. The participants have been living with type 2 diabetes for 10.9 years (SD 6.8) and most participants (52.2%) were taking oral hypoglycaemic agents as a treatment type. Demographical and medical characteristics of the participants were shown in Table 1.

Content validity: All items received 3 and 4 points. Relevance at the item level had a mean result of 3.60 of 4. CVI is accepted as 0.80 when the majority of scale items are scored 3 and 4 points (Polit & Beck, 2006). Minor revisions were receommended for Item 2 by the expert panel ("I find efforts to change things I don't like about my diabetes are ineffective" was modified as "I do not believe in the necessity for changes that I must do in my disease").

This item was changed based on the expert panel's recommendations since it was not appropriate for Turkish culture.

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Step 1
Forward Translation

Translation process

The original PDSMS translated English to Turkish by two translators and combined into one after consensus.

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Step 2
Backward Translation

Turkish PDSMS in step 1 translated back to English by four translators and combined into one after consensus.

Step 3
Committee Review

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Committee discussions with the original scale developers to develop the pre-final T-PDSMS.

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Step 4
Pretest study

Ten patients with type 2 diabetes completed the pre-final T-PDSMS.

Figure 1. Flow Chart Describing the Development of the Turkish Version of the PDSMS

Table 1. Sociodemografic and Clinical Characteristics of Participants (n=263)

Characteristics	Mean±SD or n (%)
Age (years)	55.8 (± 7.3)
Gender	
Male	83(31.6)
Female	180 (68.4)
Time passed since diabetes diagnosis (years)	10.9 (±6.8)
Treatment modality	
Only oral hypoglisemic agent	130 (52.2)
Only insulin injection	35 (14.1)
Oral hypoglisemic agent and insulin injection	84 (33.7)
FPG	157.8 (57.9)
PPG	193.8 (64.8)
HbA1c	7.9 (4.2)
BMI	30.0 (±5.1)

FPG: Fasting plasma glucose, PPG: Post prandial blood glucose and HbA1c: Glycosylated hemoglobin A1c
BMI: body mass index

Table 2. PDSMS Item-Total Correlations and Cronbach's Alpha Coefficients*

PDSMS Item Wording	Mean (SD)	Corrected item total correlation	Cronbach alpha if item deleted
1. It is difficult for me to find effective solutions for problems that occur with managing my diabetes.	**3.14 (1.19)**	**0.38**	**0.77**
2. I find efforts to change things I don't like about my diabetes are ineffective.**	**3.88 (1.03)**	**0.27**	**0.77**
3. I handle myself well with respect to my diabetes.	**3.84 (0.85)**	**0.51**	**0.74**
4. I am able to manage things related to my diabetes as well as most other people.	**3.97 (0.77)**	**0.59**	**0.73**
5. I succeed in the projects I undertake to manage my diabetes.	**3.86 (0.83)**	**0.61**	**0.72**
6. Typically, my plans for managing my diabetes don't work out well.	**3.31(1.10)**	**0.44**	**0.75**
7. No matter how hard I try, managing my diabetes doesn't turn out the way I would like.	**3.34 (1.14)**	**0.38**	**0.77**
8. I'm generally able to accomplish my goals with respect to managing diabetes.	**3.46 (1.07)**	**0.65**	**0.70**

* T-PDSMS with 7 items correlations and Cronbach's Alpha Coefficients

Table 3. Factor Analysis of PDSMS

	Factor 1		Factor 2	
	PDSMS 1	0.42	PDSMS 3	0.92
	PDSMS 5	0.57	PDSMS 4	0.70
	PDSMS 6	0.53		
	PDSMS 7	0.45		
	PDSMS 8	0.77		
Eigenvalue		1.73		1.63
The variance		24.71		23.25

PDSMS: Perceived Self Management Scale

Table 4. Relationship of T- PDSMS and Diabetes Control

		T - PDSMS
Period of diagnosis	r	0.10
	p	0.088
BMI	r	- 0.28
	p	0.000
FBG	r	- 0.29
	p	0.000
PBG	r	-0.25
	p	0.000
HbA1c	r	-0.34
	p	0.000

p< 0.001 r: Spearman's correlation coefficient *PDSMS with 7 items in the current study*

Table 5. The relationship between HBMS, DSES, and PDSMS (n=263)

		HBMS Score	DSES Score	T-PDSMS Score
HBMS Score	**r**	**1**		
	p	**.**		
DSES Score	**r**	**0.256**	**1**	
	p	**0.000**	**.**	
T-PDSMS Score	**r**	**0.226**	**0.530**	1
	p	**0.000**	**0.000**	**.**

HBMS: Health Belief Managament Scale, DSES: Diabetes Self Management Scale, T-PDSMS: Turkish-Perceived Self Management Scale

Reliability

Test-retest reliability: Fifteen percent of the participants were complied to fill out the scale for the second time after 2 weeks at the telephone. As a result of the two week test–retest reliability, the overall intraclass correlation coefficient (ICC) was 0.89 (p< 0.001) (95% CI; 0.80- 0.94).

Internal consistency reliability: Item to total correlation coefficient was calculated for the items of the tool used in the research. In this way all of the tool's items were determined to be consistent with the whole (Table 2). Cronbach alpha was examined to evaluate the homogeneity of the items in the tool. In the evaluation one item had correlation coefficients that was below 0.30 (Table 2). Because the correlation coefficient values for these one item on the tool (item 2) were low (r: 027). It was removed from the tool. The remaining items were within acceptable limits and had significant correlation (0.70–0.77).

Construct validity: Based on the results of the exploratory factor analysis, confirmatory factor analysis was conducted to determine construct validity using structural equation modeling.

Exploratory factor analysis: Sample size was found suitable for factor analysis (Bryant & Yarnold, 1998; Sharma & Petosa, 2014) according to the Kaiser-Meyer-Olkin value (KMO=0.785) and data was found suitable according to the Barlett test (p<0.001). The results of the explanatory factor analysis is shown in Table 3. Two factors of the T-PDSMS with an eigenvalue >1.00 were extracted from the exploratory factor analysis. Factor 1 consisted of five items with factor loadings >0.30, and it accounted for 24.71% of the variance. Factor 2 consisted of two items, which accounted for 23.25% of the variance. Overall, two factors accounted for 47.96% of the total variance.

Confirmatory factor analysis: Structural equation modeling was used to conduct confirmatory factor analysis based on the results of explaratory factor analysis. Construct validity was determined with the Robust Maximum Likelihood method of confirmatory factor analysis (Simsek, 2007; Bryant & Yarnold, 1998). Two items (Q3–Q4) were significantly caused by the maintaining behavior dimension (p< 0.01), and the responses to five items from Q1,Q5,Q6,Q7,Q8 were also significantly caused managing diabetes (p < 0.01). In the study, χ^2/df (χ 2 divided by degree of freedom) value was used since it is less influenced by the sample. This valu should be 2 or below [30,34]. Root Mean Square Error of Approximation (RMSEA): It is a measure for approximate fitness in the main sample. It ranges between zero and one (Schumacker & Lomax, 2010) Goodness of Fit Index (GFI): It shows the extent to which the model measures the covariance matrix in the sample. The GFI value ranges between 0 and 1. A GFI value greater than 0.90 indicates a good model (Waltz, Strcikland & Lenz 2010]. Comparative Fit İndex (CFI): It is the model that predicts that there is no relationship between variables. It ranges between 0 and 1 (Munro, 2005). Standart Root Mean Square Residual (SRMR): The model has better goodness of fit as this value approaches to 0 (Wang &Wang 2012). The confirmatory factor analysis had good fitness indices; the norm χ^2 was 19.11, χ^2/df value was lower than 2, GFI was 0.95, CFI was 0.99, SRMR was 0.02, and RMSEA was 0.037. The GFI (0.95) was over 0.8, while RMSEA (0.037) and SRMR (0.02) were under 0.05 [34].

Criterion - related validity: Criterion validity is the degree of correlative asssociation of an instrument with another instrument (concurrent validity) or another criterion of the same observable fact (predictive validity) (Sharma & Petosa, 2014).

Predictive validity: The correlations between diabetes self management scores and the parameters related to diabetes were examined (Table 4). There was a positive relationship between diagnosis duration (r:0.10) and T-PDSMS scores (p<0.001), and a negative relationship between BMI (r: -0.28), FPG (r: -0.29), PBG (r: -0.25), HbA1c (r: -0.34) values and T-PDSMS scores (p<0.001).

Concurrent validity: The compliance between scale scores and DSES and HBMS scores were evaluated through correlations (Table 5). A positive meaningful relationship between T-PDSMS and DSES and HBMS was found (p<0.001).

Discussion

The aim of this study was to examine the psychometric properties of the T-PDSMS by testing its reliability, construct, concurrrent and criterion related validities. The current study

presented a cultural adaptation of the T-PDSMS, following international methodological procedures. The findings of the study established the good psychometric properties of the Turkish version of the Perceived Diabetes Self Management Scale (T-PDSMS), which consists of 7 items.

Reliability is one of the most important criterions to evaluate a scale. In order to determine the reliability of the scale, the test-pretest method was used and internal consistency was examined. Hooper et al. (2008) suggested that an intraclass correlation coefficient >0.75 meant excellent reproducibility and a value from 0.40–0.74 indicated fair to good reproducibility. The test-pretest reliability of the scale was good.

According to Hooper et al. (2008), item-total correlation coefficients are at least >0.30 and cronbach coefficients >0.50 are desirable for the instrument. Total item correlation coefficient (between 0.39 and 0.69) of 2nd item had a correlation coefficient of r= 0.27. In this study, the reliability of the T-PDSMS was good. The Cronbach's alpha coefficient of the T-PDSMS was determined to be 0.77 after excluding the 2nd item (I find efforts to change things I don't like about my diabetes are ineffective). An item analysis of all eight PDSMS items revealed a Cronbach's alpha of 0.834, with corrected item-total correlations ranging from 0.390 to 0.707 (Wallston, Rothman & Cherrington 2005]. An item analysis of all eight PDSMS items revealed a Cronbach's alpha of 0.77, with corrected item-total correlations ranging from 0.42 to 0.77. The item analysis also showed that alpha could not be meaningfully improved by dropping any one item from the scale. In addition, the results of this study demonstrated high reliability of the instrument with a correlation of 0.89 showing the stability of findings measured with 2 weeks interval.

The data for the adequacy of the sample (the KMO), the appropriateness of the factor model (the Bartlett's test of sphericity), eigenvalues, factor loadings found in the exploratory factor analysis and model fit indices of the confirmatory factor analysis was well within the statistical standard for each value (Sharma & Petosa, 2014; Hooper, Coughlan & Mullen, 2008). The scale has a two-dimensional structure both in this study and the study conducted by Wallston et al. In this study, two dimensions accounted for 47.9% of the total variance. Additionally, a factor should include at least 3 items (Simsek, 2007). Therefore, as in the original scale, the total score of this scale without low item numbers was used in this study, and sub-group scores were not needed. Factor loads obtained from confirmatory factor analysis provided sufficient evidence for the validity of all items since they had a sufficiently high load on the structures to which they corresponded. The confirmatory factor analysis indicated good fit of the final model with 7 items.

The model fit should be examined according to multiple indicators. To examine the measurement models, indices of model fit, the chi-square to degrees of freedom ratio ($\chi 2/df$) [34]. Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA), the Good Fit Index (GFI), and Standardized Root Mean Residual (SRMR) (Wang &Wang 2017) were used in this study. RMSEA values should be less than 0.05 to indicate good fit (Schumacker, Lomax, 2010). Well fitting models obtained through SRMR will have values less than 0.05 (Wang &Wang 2017). .CFI values above 0.90 indicategood model fit Standardized Root Mean Residual (SRMR) values greater than 0.08 (Wang &Wang 2017) are meaningful. Because $\chi 2$ has been found to be too sensitive to an increase in sample size and to the number of observed variables, the ratio of $\chi 2$ to its degree of freedom ($\chi 2/df$) was used, with a range of not more than 3.0 being indicative of an acceptable fit between the hypothetical model and sample data [34]. The confirmatory factor analysis had good fitness indices; the norm χ^2 was 19.11, χ^2/df value was lower than 2, GFI (0.95) was over 0.90, CFI (0.99) was over 0.90, SRMR (0.02) was under 0.08, and RMSEA (0.037) was under 0.05. In the study in which the original scale was used, no confirmatory factor analysis was performed (Wallston, Rothman, Cherrington, 2007).

The most direct argument for the validity of the PDSMS, however, comes from its correlation with most of the self-care activity scores, BMI, and glycemic control (A1C and blood glucose levels) (ADA, 2019c; NHLBI, 2019). In the present study, the predictive validity of the scale was tested by examining the relationships between the scale score and diabetes related parameters. As the diagnosis duration increases in diabetes, so does self management perception (T-PDSMS) scores. Except from this, as

expected, the BMI, FPG, PPG, and HbA1c values of people with high self management perception scores were all low. This type of evidence was also found in other studies. Patients would feel more successful as their consciousness about diet, exercise, blood glucose control and accordance to medical suggestions increase (Al-Khawaldeh, Al-Hassan & Froelicher, 2012; Bayindir Cevik, 2010). A positive effect on BMI, FPG, and HbA1c was also found in a study by Wallston et al. High levels of self efficacy also have a positive effect on the metabolic controls of people with diabetes. Prior studies have been reported in many studies about self-efficacy, health beliefs and diabetes self-management (Grinslade , Paper, Jing & Quinn; 2015; Kara, Bijl, Shorridge-Bagget, Astı, & Erguney, 2006; Kartal A, Altug-Ozsoy, 2007). Self-efficacy and health belief of the diabetic individual increase as one perceives oneself successful in diabetes self-management (Kara, Bijl, Shorridge-Bagget, Astı, & Erguney, 2006; Bayindir Cevik, 2010). The concurrent validity of the PDSMS was evaluated using the HBMS, the DSES and PDSMS (Kara, Bijl, Shorridge-Bagget, Astı, & Erguney, 2006; Kartal A, Altug-Ozsoy, 2007; Tezbasaran, 2018). Likewise, in Wallston et al.'s study, the subdimensions of the Diabetes Self Care Activities Scale (DSCAS) correlated with perceived diabetes self-management. Therefore, it is concurrent validity the Turkish version of the PDSMS was supported.

Determination of perceived diabetes self-management is an important issue for diabetes health professional in terms of planning patient education which aim to increase self-care activities and patients' capability of fighting against diabetes (Al-Khawaldeh, Al-Hassan, & Froelicher, 2012). The success of patients in performing different aspects of diabetes self-care activities is evaluated using the instruments for measuring diabetes self-efficacy in the world and in the Turkish community (Grinslade, Paper, Jing & Quinn, 2015; Bayindir Cevik, 2019). In this study, the original PDSMS developed by Wallston et al. was questioned in terms of how an individual perceives oneself in the management of diabetes and motivation (Wallston, Rothman & Cherrington, 2019; Bayindir Cevik, 2019). This version of the PDSMS, unlike the others, The current study will contribute to the care and education of people with diabetes.

Limitations of study : As a result of the analysis one item (Item 2) was found low. Translated instrument may have lower reliability scores. In addition, cultural difference in response patterns have statistical methodological implications. Looking specially at the item in the Turkish instrument compared with the original scale, the cultural characteristics may have been an influencing factor in the result. Because the research was conducted in one region of Turkey with patients registered in a diabetes center the results cannot be generalized. For this reason it is recommended that research be done with different sample groups.

Conclusion and Recommendations : In conclusion, The T-PDSMS which is consist of 7 items and one dimension is a valid and reliable measurement tool that is ready for clinical use by health professions. The effect of culture on the protective health behavior of people with diabetes can only be measured through measurement tools that are valid and reliable for that culture. As data revealed, low perceived self management leads to poor diabetes self-management. For the success of diabetes management, improving and the evaluation of perceived self management should be health applications.

Further research needs to be done with the PDSMS to determine the degree to which it is stable in the absence of any self-management intervention and, more importantly, sensitive enough to measures changes in perceived competence in the presence of interventions designed to increase self-management skills. In addition, using the PDSMS longitudinally would allow tests of the predictive validity of the instrument to measure changes over time in perceived diabetes competence as well as the relationship of those changes to changes in self-care behavior and diabetes outcomes.

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