Translation and Psychometric Analysis of the Malaysian Version of Medication Understanding and Use Self-Efficacy Scale (M-MUSE) for Diabetes Mellitus

Safaa A.Al Abboud[1], Sohail Ahmad[1,2], Mohamed B.L. Bidin[3], Nahlah E. Ismail[1,2]

[1]Clinical BioPharmaceutics Research Group (CBRG), Faculty of Pharmacy, Universiti Teknologi MARA, Bandar Puncak Alam, Malaysia, [2]Faculty of Pharmacy, MAHSA University, Bandar Saujana Putra, Malaysia, [3]Endocrine Unit, Medical Department, Hospital Kuala Lumpur, Kuala Lumpur, Malaysia

Abstract

Introduction: Enhancing diabetes self-efficacy (SE) level can improve the self-management behaviour in patients living with diabetes mellitus (DM). This study aimed to translate and assess the psychometric properties of Malaysian version of diabetes Medication Understanding and Use Self-Efficacy Scale (M-MUSE). **Methods:** Following the translation of English version of MUSE to Malay language using established international standard translation guidelines, 252 adult diabetics ($\geq$ 18 years old; DM type 1 or 2) attending the Endocrine Clinic at Hospital Kuala Lumpur, Malaysia, were recruited in this cross-sectional study. After testing the face and content validity, the psychometric properties of the final M-MUSE were evaluated using the Classical Test Theory (CTT) for reliability (Cronbach's alpha (α) and intra-class correlation coefficient (ICC)) and construct validity (factor analysis (FA)). **Results:** The semantic and conceptual problems in M-MUSE were identified and modified by a qualified professional translation committee. The final version showed good reliability values for internal consistency (Cronbach's $\alpha = 0.89$) and one month test-retest reliability (ICC $= 0.72$). The Bartlett's test of sphericity and the Kaiser-Meyer-Olkin tests proved the suitability of M-MUSE for factor analysis. The extracted single component M-MUSE (eigenvalue > 1) explained a total variance of 57.58% with an eigenvalue of 4.60. The two factor structures; namely taking medication (item # 1, 6, 7 and 8) and learning about medication (item # 2, 3, 4 and 5) explained a total variance of 59.25% with good factor loading values (ranged from 0.63 to 0.89 for taking medication, and 0.66 to 0.83 for learning about medication). **Conclusion:** The M-MUSE appears to be a linguistically reliable and valid measure that is conceptually equivalent to the original version. The M-MUSE can be used in Malaysian healthcare settings to evaluate the SE in understanding and using prescribed diabetes medications.

Keywords: Diabetes, MUSE, reliability, self-efficacy, validity, malaysian version

INTRODUCTION

Diabetes mellitus (DM) is one of the major public health concerned worldwide.[1] The patients living with DM are expected to perform daily self-management activities to manage diabetes-related morbidity.[2] Therefore, the primary goal of DM management guidelines is to prevent and minimize the acute or chronic complications, mainly by following the self-care practices which include regular exercise, taking recommended diet, proper intake of prescribed medications and regular monitoring of blood glucose levels.[3]

Self-management is the cornerstone of diabetic care, and it is believed that improving patient's self-efficacy (SE)

is a critical pathway to improved self-management.[4,5] Majority of diabetes patients encountered difficulties in maintaining good glycaemic control due to poor SE in understanding and using diabetes medications. The (SE) is the belief in one's capability to organize and execute the courses of action required to manage the health condition prospectively.[6] The SE is also the determinant of how patients think, behave, and change their behaviour to adapt

Address for correspondence: Professor Dr. Nahlah Elkudssiah Ismail, Faculty of Pharmacy, Level 9, Pharmacy Building, MAHSA University, Jalan SP2, Bandar Saujana Putra, 42610 Jenjarom, Kuala Langat, Selangor, Malaysia
E-mail: elkudssiah77@yahoo.com

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the disease.[7] Therefore, the SE of DM patients should be considered in diabetes management programmes.

The assessment of the levels of SE among diabetes patients is very subjective. Over the last few decades, various measurement scales have been developed to measure different aspects of SE among diabetes patients.[8,9,10] In spite of availability of these SE measurement scales, the SE among Malaysian DM patients will be assessed lessen directly by using English version of these measures due to language barrier. Therefore, this study aimed to translate and assess the psychometric properties of Malaysian version of Medication Understanding and Use Self-Efficacy Scale (M-MUSE) that can be used among Malaysian patients living with DM.

METHODS

A cross-sectional study involving in-person self-administered survey was conducted among adult diabetes patients attending the Endocrine Clinic at Hospital Kuala Lumpur (HKL), Kuala Lumpur, Malaysia. All study procedures were approved by the Research Ethics Committee (REC), Research Management Institute (RMI), UiTM Shah Alam and the Medical Review and Ethics Committee (MREC), Ministry of Health (MOH), Malaysia. From March 2014 to August 2014, a total of 277 consecutive patients were approached; 252 consented to participate. The patients were considered eligible for this study if they were aged 18 years old and above, diagnosed with either type 1 or type 2 DM and able to understand and speak Malay. A uniform approach was employed in administering the questionnaire for all participants.

This study was conducted in two steps. The first step aimed to make a cross-culturally equivalent M-MUSE using the protocol of international standard translation guidelines adapted for Malaysian culture.[11,12,13,14] The second step determined the psychometric properties of M-MUSE.

Step 1 Translation of MUSE

The English version of MUSE was translated into Bahasa Malaysia by two independent local professional bilingual experts. One of them was a clinical expert and second was a linguistic expert. The clinical expert was provided with sufficient information to make him aware of the purpose and the concepts underling this step; whereas, the other translator was intentionally blinded to the intent and concept of the study. These two Malay versions were back-translated into English version by other two independent translators who were totally blinded to the intent and purpose of the study. The aim of this step was to check that the translated version was a clear representation of the original English version. As a result, the translated version would have to reflect the same content as the original without any errors, omissions, vagueness or inaccuracies to reduce any cultural and social bias. Through this step, the review panel were able to verify the content validity and finalized a harmonized version by

modifying or rejecting inappropriate items/words for final consensus. The finalized questionnaires were distributed to ten respondents who were not a part of the targeted sample of this study. Each subject completed the questionnaire and was interviewed about the meaning of each item, instruction and response choice to identify and resolve the semantic and conceptual problems in M-MUSE. The translated questionnaires were adapted according to Malaysian culture especially with relation to demographics such as ethnic groups, household income, education system, and health insurance systems.

Step 2 Psychometric Analyses of M-MUSE

The cross-cultural equivalence does not imply equivalence of psychometric properties. These properties may change while adapting and translating the intended version of questionnaire (M-MUSE) from the original version (MUSE). In present study, the psychometric analyses were conducted by using principal component analysis (factorial validity), internal consistency (reliability), and one month test-retest repeatability.

All analyses were performed using the Statistical Package for Social Science (SPSS®) version 20. The demographic profiles of the participants were described using mean (standard deviation (SD)) for continuous variables, and frequency and percentage for categorical variables. Content, face and construct validation were performed. The principal component analysis was carried out using varimax rotation with Kaiser normalisation. Internal consistency was assessed using Cronbach's alpha (α); whereas, one month test-retest reliability was assessed by intra-class correlation coefficient (ICC).

RESULTS

Majority of the patients diagnosed with type 2 DM (n = 182; 72.2%) and were married (n = 169, 67.1%). The overall mean age of the participants was 45.97 (SD = ±14.90) years old and the mean value for glycaemic control was 9.26% (SD = ±2.29). Table 1 shows the details of socio-demographic and medical data of the respondents. The overall mean score of M-MUSE was 27.29 (SD = ±5.43), 26.80 (SD = ±4.15), and 27.26 (SD = ±4.84) for overall, type 1 DM and type 2 DM patients, respectively, as shown in Table 2.

The Bartlett's test of sphericity (p < 0.001) and the Kaiser-Meyer-Olkin tests indicated that the M-MUSE was suitable for factor analysis. M-MUSE one component was extracted (eigenvalue > 1) comprising all eight items together. The single factor structure explained a total variance of 57.58%. The factor loading for each item ranged from 0.68 to 0.82 with an excellent loading value as a single factor that had an eigenvalue of 4.60. The two factor structures namely taking medication (item # 1, 6, 7 and 8) and learning about medication (item # 2, 3, 4 and 5) explained a total variance of 59.25% with good factor loading

Sr. no.	Items	Category	Mean (±SD)	*n* (%)
Table 1: Socio-demographic and medical data for participants (*n* = 252)				
1	Age (years old)		45.97 (14.90)	
2	Marital status	Single		63 (25.00)
		Married		169 (67.10)
		Widow		9 (3.60)
		Divorced		11 (4.40)
3	Gender	Male		127 (50.40)
		Female		125 (49.60)
4	Ethnicity	Malay		158 (62.70)
		Chinese		28 (11.10)
		Indian		61 (24.20)
		Other		5 (2.00)
5	Monthly income per household (RM)	<1000		50 (19.80)
		1001–2000		61 (24.20)
		2001–3000		63 (25.00)
		>3000		78 (31.00)
6	Highest completed education level	Primary school		11 (4.40)
		Secondary school		122 (48.40)
		College/polytechnic		51 (20.20)
		University		63 (25.00)
		Other		5 (2.00)
7	Occupation	Professional		64 (25.40)
		Non-professional		39 (15.50)
		Self-employed		35 (13.90)
		Unemployed		55 (21.80)
		Student		15 (6.00)
		Retired		27 (10.70)
		Housewife		13 (5.20)
		Other		4 (1.60)
8	Smoking status	Smoker		28 (11.10)
		Non-smoker		191 (75.80)
		Ex-smoker		33 (13.10)
9	Insurance status	Own		79 (31.30)
		Disown		173 (68.70)
10	Frequency of emergency visit due to DM	Never		188 (74.60)
		One time		26 (10.30)
		Two times		9 (3.60)
		Three times		2 (0.80)
		More than three times		27 (10.70)
11	Frequency of hospitalization due to DM	Never		185 (73.40)
		One time		21 (8.30)
		Two times		7 (2.80)
		More than three times		39 (15.50)
12	Duration on diabetes medication (years)		10.73 (8.00)	
13	Number of years diagnosed as DM (years)		11.28 (8.12)	
14	History of diabetes in the family	Yes		184 (73.00)
		No		68 (27.00)
15	Diabetes education/counseling	Yes		182 (72.20)
		No		70 (27.80)
16	Frequency of diabetes education/counseling		1.20 (1.25)	
17	Diabetes medication	Oral antihyperglycemic		42 (16.70)
		Insulin		86 (34.10)
		Oral and insulin		124 (49.20)
18	Number of diabetes medication	One		35 (13.90)
		Two		125 (49.60)
		Three		81 (32.10)
				(*Continued*)

Table 1 (*Continued*)

Sr. no.	Items	Category	Mean (±SD)	*n* (%)
		Four		11 (4.40)
19	HbA1c (%)		9.26 (2.29)	
20	FBS (mmol/L)		9.23 (4.13)	
21	BMI (kg/m^2)		28.18 (6.39)	
22	DM-complication	Never		205 (81.30)
		Neuropathy		16 (6.30)
		Nephropathy		16 (6.30)
		Retinopathy		8 (3.20)
		More than one of the above		7 (2.80)
23	Other diseases	Nil		63 (25.00)
		Hypertension		28 (11.10)
		Other cardiovascular disease		0 (0)
		Dyslipidemia		42 (16.70)
		More than one of the above		109 (43.30)
		Others		10 (4.00)

Table 2: Mean (±SD) scores of M-MUSE (*n* = 252)

Level	Range of scores	Type 1 DM	Type 2 DM	Overall
		n (%)	*n* (%)	*n* (%)
Low	<16	0 (0)	5 (2.3)	5 (2.0)
Intermediate	16–23	18 (25.7)	26 (11.7)	44 (17.5)
High	24–32	52 (74.3)	151 (68.0)	203 (80.6)
Mean (±SD)		26.80 (4.15)	27.26 (4.84)	27.29 (5.43)

values (ranged from 0.63 to 0.89 for taking medication, and 0.66 to 0.83 for learning about medication).

M-MUSE proved to be internally consistent as an overall scale ($\alpha = 0.89$) with corrected item-total correlation ranging from 0.59 to 0.74. Tables 3 and 4 show the summary of exploratory factor analysis and reliability of items, respectively. The test–retest reliability of eight items M-MUSE indicated good stability of the instrument for one month test re-test repeatability (ICC = 0.72).

DISCUSSION

The use of questionnaire in hospital based research has been increasing in Malaysian healthcare facilities after the considerable emphasis on promoting research in clinical settings to optimize the desired outcomes in the patients. Various questionnaires have been newly devised, adapted and translated from English version to Malaysian version to use in Malaysian healthcare settings.[15,16,17,18,19] In order to measure SE in understanding and using prescribed medication, MUSE was developed by Cameron and co-workers (2010) in English language.[10] This MUSE scale differs from the existing medication-specific SE scales as it focuses on learning about one's prescribed regimen and taking medications at the same time. MUSE consists of eight items that evaluates two distinct domains of SE: taking medication (n = 4 items; item number 1, 6, 7 and 8)

and learning about medication (n = 4 items; item number 2, 3, 4 and 5). Responses to each items were scored on a four point Likert scale (1 = strongly disagree, 2 = slightly disagree, 3 = slightly agree, and 4 = strongly agree). The range of the total score can be from 8 to 32. In previous studies, the English version of MUSE showed acceptable reliability and validity.[10]

The main purpose of this study was to translate and assess the psychometric properties of the Malaysian version of MUSE for adult DM patients. The questionnaire translation procedure is different from literal word to word translation using formal standard vocabulary and grammatical rules. The disease-based questionnaire strives for conceptual rather than literal equivalence. Therefore, the internal standard procedure of translation was adapted in the context of Malaysian culture as established in recent linguistic validation studies in Malaysian healthcare settings and all the semantic and conceptual problems in M-MUSE were identified and modified. The qualified professional translation committee resolved numerous translation discrepancies. In case of confusing translated items, meeting between researchers and consultation with expert translators were carried out. These actions helped the translation committee to solve these obstacles and choose the most suitable expressions for the confusing items. M-MUSE proved to be a reliable scale with good Cronbach's α value of 0.89, whereas the reliability values in subscales were also high (0.88, 0.84). The good reliability

Table 3: Summary of exploratory factor analysis result for M-MUSE (items, $n = 8$)

Sr. no.	Items	Factors		
		Single	Taking medicines	Learning about medicines
1	It is easy for me to take my diabetes medicine on time	0.743	0.627	
2	It is easy for me to ask my pharmacist questions about my diabetes medicine	0.738		0.814
3	It is easy for me to understand my pharmacist's instructions for my diabetes medicine	0.759		0.834
4	It is easy for me to understand instructions on diabetes medicine bottles/packaging	0.682		0.744
5	It is easy for me to get all the information I need about my diabetes medicine	0.729		0.662
6	It is easy to remember to take all my diabetes medicines	0.788	0.798	
7	It is easy for me to set a schedule to take my diabetes medicines each day	0.806	0.842	
8	It is easy for me to take my diabetes medicines every day	0.817	0.887	
	Eigenvalue	4.60		4.74
	% proportion of variance explained	57.58		59.25
	Construct reliability (Cronbach's α)	0.893		0.878

Table 4: Reliability analysis of M-MUSE (eight items) ($n = 252$)

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
1	24.20	13.564	0.656	0.882
2	24.09	14.109	0.649	0.882
3	23.94	14.315	0.678	0.880
4	24.03	14.276	0.589	0.888
5	24.06	14.306	0.641	0.883
6	24.09	13.838	0.708	0.877
7	24.19	13.520	0.723	0.875
8	24.08	13.583	0.740	0.873

values for individual factors were relatively higher than those reported Cronbach's α values of Cameron and co-workers (0.77, 0.68).[10] One month test re-test repeatability showed the scale had good reliability over the time (ICC = 0.72). The test–retest reliability was not assessed in prior studies. The construct validation yielded first a single factor based on eigenvalue. However, the principal component analysis (varimax rotation) suggested two factors with 4 items in each factor. Interestingly, some items surpassed the good loading value of 0.6 in each factor; such items were judged to be placed in the factor where those items had the highest loading. The two factor structures were similar to the previous study in English version yielding to factors taking medication (items # 1, 6, 7 and 8) and learning about medication (item # 2, 3, 4 and 5).

The M-MUSE can be used in Malaysian healthcare settings to evaluate the SE in understanding and using prescribed diabetes medication. The DM patients having low SE can be targeted by a personalized educational or behavioural intervention. In future, the healthcare policy makers should focus on expanding the reach of diabetes Medication Therapy Adherence Clinics (Diabetes-MTAC) in the context of improvement in SE across the spectrum of self-management in this chronic illness.

CONCLUSION

The M-MUSE appears to be a linguistically reliable and valid measure that is conceptually equivalent to the original version, easy to understand for the Malaysian diabetes patients. In order to ensure the retention of good reliability and validity profile, the findings of the study should be replicated in other states of Malaysia.

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Conflicts of interest

There are no conflicts of interest.

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