ORIGINAL ARTICLE

Filipino Translation and Cross-cultural Adaptation of the Diabetic Foot Knowledge Subscale (DFKS) and Foot Self-Care Behavior Scale (FSCBS) and its Content Validation and Reliability Testing

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ABSTRACT

Background. Type 2 diabetes is the most common type of diabetes in the Philippines. Diabetic foot complications represent a prevalent and significant chronic concern for individuals with type 2 diabetes. This poses an immediate community health concern, as diabetic complications may threaten an individual's well-being.

Objective. This study intends to cross-culturally adapt the Diabetic Foot Knowledge Subscale (DFKS) and Foot Self-Care Behavior Scale (FSCBS) questionnaires into the Filipino language as an assessment tool among Filipinos with diabetes.

Methods. The study employed a psychometric research design, where it entailed Phase A and Phase B. Phase A involved the forward translation of the DFKS and FSCBS questionnaires, followed by the synthesis of the translations and backward translation. Subsequently, an expert committee reviewed the translations and concluded the final version. The final translated versions of the questionnaires ensured that it can be understood by an individual who has a Grade 6 level of reading proficiency. Phase B entailed the validity testing with the evaluation of the expert committee, and reliability testing of the said questionnaires with a sample size of 30 participants. A wash-out period of 24 hours was given for the test-retest reliability, followed by data analysis. The validity and reliability of the questionnaires were measured using the item and scale content validity indices and the internal consistency and test-retest reliability, respectively, to ensure their accuracy and appropriateness. The content validity of the questionnaires was evaluated individually by the experts using a Likert scale from 1-4, with 4 being the highest meaning the item was very relevant and succinct. Scores per item were between 3 and 4, which indicate that the translated version of the items were relevant and succinct or were relevant but needed minor revisions.

Results. The validity scores for the translated DFKS and FSCBS questionnaires were obtained using the Scale Content Validity Index (S-CVI) with a score of 0.96 and 0.92, respectively. Moreover, all items in the questionnaires obtained an Item Content Validity Index (I-CVI) of 0.88-1.00. The DFKS also has an acceptable internal consistency with a Cronbach's alpha of 0.72, while the FSCBS has a good internal consistency with a Cronbach's alpha of 0.85. The test-retest reliability shows an acceptable Spearman's correlation at 0.76 for the DFKS and a strong positive Pearson correlation coefficient at 0.73 for the FSCBS.

Conclusion. The validity of the two questionnaires was acceptable and the test-retest reliability showed a strong positive correlation among the items thereby making the cross-cultural adaptation of the questionnaires successful. The Filipino versions of the DFKS and FSCBS questionnaires accurately measure the knowledge and behavior of individuals with type 2 diabetes, respectively.

Keywords: type 2 diabetes, diabetic foot, public health, cross-cultural comparison

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INTRODUCTION

Diabetes Mellitus is a chronic, metabolic disease characterized by elevated levels of glucose in the blood, affecting various body systems.[1] In the Philippines, type 2 diabetes mellitus (T2DM) is the most common type of diabetes with a reported increase in prevalence from 5.9% in 2014 to 6.3% in 2019, and to 6.5% in 2021 among Filipinos aged 20-79 years old.[2] This significant increase in prevalence of diabetes indicates a serious health concern in the community that must be addressed, since complications associated with the disease can threaten an individual's quality of life.[3]

Diabetic foot problems are one of the most common chronic complications of T2DM, leading to limb loss if left untreated.[4] Diabetic foot ulcers (DFUs) amputations accounted for 16-20% of yearly emergency room admissions at the Philippine General Hospital.[5] Systemic diseases like peripheral neuropathy, peripheral vascular disease, and poor blood glucose control are risk factors for the development of DFUs. However, studies have shown that an individual's lifestyle, including foot self-care practices and behavior, are important factors to consider when it comes to the development of DFUs as it may or may not aggravate the condition to a point of amputation.[6-8]

These complications – DFUs and lower extremity amputations – are preventable with good knowledge and good practice of diabetic foot care.[9] According to the WHO, education should be the basis of diabetes care, wherein health education promotion has been established and widely practiced in the clinical setting.[10] Healthcare practitioners play a role in diabetic care by educating individuals with T2DM about programs for the control and prevention of disease aggravation, minimizing the impact of environmental factors, and helping individuals in returning to social roles.[11] Therefore, the goals of patient health education includes the attainment of knowledge, skills, and self-care behaviors that are established with known benefits to improve quality of life.[12] Thus, the use of valid and reliable outcome measure tools are essential for healthcare practitioners to be able to create an effective health education strategy for their patients.

Diabetic Foot Knowledge Scale (DFKS) and Foot Self-Care Behavior Scale (FSCBS) are questionnaires used to assess the improvement of knowledge and behavior in the prevention of foot ulcers. The Diabetic Foot Knowledge Scale is a self-administered 5-item questionnaire derived by Bicer from the Diabetic Knowledge Questionnaire-24 of Garcia et al. which assesses the level of understanding an individual with diabetes has on foot self-care.[12] Meanwhile, the Foot Self-Care Behavior Scale (FSCBS), which was derived by Bicer from the Foot Self-Care Observation Guide of Borges, has been used to assess the behavior of individuals with diabetes regarding their health behavior for the DFUs.[12]

The DFKS and FSCBS are originally written in the English language. It has been translated and culturally adapted into several languages (e.g., Spanish and Turkish languages). A study conducted in Turkey made use of the DFKS questionnaire in assessing the impact of patient education on the self-efficacy of patients with T2DM.[13] A similar study used the FSCBS to evaluate the knowledge of foot care patients had at 3-month intervals which showed that the scores of the experimental group have increased during follow-up.[12] At present, there is no Filipino version for these questionnaires. Therefore, the administration of the original questionnaires may not capture certain linguistic and cultural nuances when used in the Philippine setting. The Filipino version of the DFKS and FSCBS would help patients to better understand the context of the questions. With an increased understanding of the questionnaires, the results of the DFKS and FSCBS would be more accurate, helping the healthcare practitioners in the prevention of diabetic foot ulcers.

The objective of the study is to provide a Filipino translation and cross-cultural adaptation of DFKS and FSCBS. This study also aims to determine the content validity and test-retest reliability of the translated questionnaires. The data was collected between January 2023 to March 2024.

METHODS

Study Design

The study employed a cross-cultural adaptation in translating the DFKS and FSCBS questionnaires, while a psychometric research design was used to determine the validity and reliability of the translated questionnaires. The study is essential for ensuring that research instruments are effective and appropriate for diverse populations. The researchers utilized a psychometric research design as a preliminary phase before engaging participants with limited educational literacy in a further study.

Participants

The translation phase of the study has a group of expert committee, composed of a set of translators each composed of two translators (T1 & T2 for forward translation and B1 & B2 for backward translation) who are preferably certified, bilingual in the source and target languages, and preferably bicultural, with deep experience in both cultures[14], one cardiologist, one endocrinologist, one physical therapist currently practicing in the Philippines with at least 5-year experience of working in any adult setting catering to diabetic clients, and one language professional with any degree in Filipino studies[15].

For the analysis of the study's psychometric properties, the study's inclusion and exclusion criteria are seen in Table 1. Individuals with cognitive impairments (MMSE score of ≤24) were excluded as they may give inconsistent results during the reliability testing.

To secure participants for the study, the step-by-step recruitment process included:

Table 1. Inclusion and Exclusion Criteria Guidelines

Inclusion Criteria	Exclusion Criteria
• Males and females aged 20-79 • Medically diagnosed with type 2 diabetes ◦ Fasting blood sugar of 126 mg/dL or higher [16]	• Medically diagnosed with type 1 diabetes • Individuals with cognitive impairments (MMSE score of ≤24)

1. Recruitment materials were posted through social media pages (e.g., Facebook)
2. Interested participants were contacted by the researchers through Facebook Messenger or SMS
3. Screening procedures were done based on the inclusion and exclusion criteria
4. The informed consent form was explained and signed by the participants
5. Participants were included in the study

Once the participants were included in the study, they were given a Google Form link containing a copy of the translated questionnaires. After 24 hours, the questionnaires were sent again to the participants to answer and were sent back to the researchers for analysis. For participants who do not have adequate Internet access, they were given Internet data subscriptions in their respective mobile networks to be able to access the Google Form link. The option to answer the questionnaires through pen and paper for those without Internet access was also given. The hard copy was sent to the participants through a courier service. Afterwards, the hard copies of the answered questionnaires were sent back to the assigned student researchers. The costs of both expenses for the courier service were shouldered by the researchers.

Purposive sampling technique was used to select participants to yield relevant results investigated in the study. Furthermore, this method was timely and cost-effective which was beneficial to the researchers given the limited duration of the study and lack of funding. General guidelines recommend a minimum sample size of 100 to meet acceptable reliability standards.[17] However, a sample size of 30 participants was utilized as recommended by Sousa and Rojjnasrirat for the reliability testing, as it is stated that smaller samples, especially when the items being measured are homogenous, can still yield stable reliability coefficients, and is generally more practical when preliminary findings are being explored.[15] Furthermore, this sample size may also be used to measure reliability if there is strong correlation between the items.[17] The researchers opted to follow the recommendations of the last two sources.

Tools

The two questionnaires that were cross-culturally adapted into Filipino are the Diabetic Foot Knowledge Subscale (DFKS), and the Foot Self-Care Behavior Scale (FSCBS) (Appendices A and B). The DFKS is a 5-item questionnaire derived from the Diabetes Knowledge Questionnaire-24 (DKQ-24) which assessed the foot self-care knowledge of individuals with diabetes, with response choices on each question being (1) "Yes", (2) "No", and (3) "I don't know".[13] The subscale has a Cronbach's alpha of 0.70.[18] Meanwhile, the FSCBS is a 15-item questionnaire created from the Foot Self-Care Observation Guide to assess the behavior of an individual with diabetes about foot care.[12] Each item has five options ranging from 1-5 depending on how frequently the individual performs the foot care task. The internal consistency of the scale had a Cronbach's alpha of 0.83.[13]

The Mini-Mental State Examination (MMSE) was also employed as part of the inclusion criteria to screen for cognitive impairments during the reliability testing of the questionnaires. The MMSE is an 11-item screening tool used to assess and record cognitive performance through simple questions and tasks. It can be administered by individuals without specialized training, which has certainly contributed to its popularity and widespread use among healthcare providers and even non-healthcare professionals in certain situations.[18] Scores between 24 to 30 were considered to classify a person with no cognitive impairment.[19]

Data Gathering Procedures

The study has been reviewed and received approval of the Ethics Review Committee of UST-CRS for version 4 of the protocol (SI-2022-048). This study is also registered in the Philippine Health Research Registry with ID number PHRR230215-005435.

The study encompassed two phases, namely Phase A and Phase B. Phase A involved the forward translation of the DFKS and FSCBS questionnaires, followed by the synthesis of the translations and backward translation. Subsequently, an expert committee reviewed the translations and concluded the final version. The second phase, Phase B, entailed the validity and reliability testing of the translated questionnaires, followed by data analysis (Figure 1).

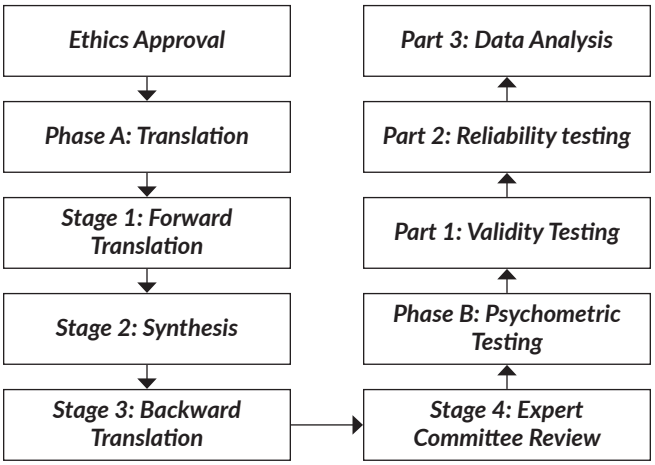

Figure 1. Summary of procedures of the study.

Phase A: Translation

The four stages of Phase A were adapted from the Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures.[19] The researchers sought the approval of the original developer of the two questionnaires, the Diabetic Foot Knowledge Subscale (DFKS) and the Foot Self-Care Behavior Scale (FSCBS), regarding their use in the study and was given permission for their use in the study.

Stage 1: Forward Translation

Forward translation is the process wherein a professional linguist translates the document from its original language to its target language.[15] This was done to produce a translation of the English version of the Diabetic Foot Knowledge Subscale (DFKS) and the Foot Self-Care Behavior Scale (FSCBS) to Filipino, the target language. The two questionnaires were translated from the original language (English) to the target language (Filipino) by two independent translators (T1 & T2). In addition to this, one of the translators (T1) was aware and familiar with the concepts examined in the questionnaire. Meanwhile, the other translator (T2) had no medical or clinical background and was unaware and uninformed of the given concepts on diabetes.

Stage 2: Synthesis

The second stage was composed of synthesizing the two translations that were produced by T1 & T2. This was performed by the researchers and a faculty co-author who identified inconsistencies such as complex word choices, sentences, and phrases seen in writing. The output documented the synthesis process and how the identified issues were resolved. The synthesis produced by T1 and T2 was termed 'T12', which served as the standard translation of the questionnaires from English to Filipino.

Stage 3: Backward Translation

Backward translation is the process whereby a professional linguist would translate the document from the target language back to its original language.[15] The translated version was sent to the back translators (B1 & B2) who were blinded to the original version of the DFKS and FSCBS scales. The two translators translated the synthesis, T12, into the original language (English) to produce two backward translations.

Stage 4: Expert Committee Review

The expert committee evaluated all the translations (T1, T2, T12, BT1, & BT2) of the questionnaires along with the written reports that justified the decisions made in the preceding stages. The committee was tasked to consolidate and resolve any inconsistencies in the translations to produce the pre-final version of the FSCBS and DFKS. A corresponding thorough written documentation about its decisions was produced. The committee assessed the equivalence of the questionnaires in four areas: (1) Semantic Equivalence, which focused on the structure, meaning, and grammar; (2) Idiomatic Equivalence, which involved formulation of equivalent expressions for difficult-to-translate idioms or colloquialisms; (3) Experiential Equivalence, which entailed replacing items that do not reflect daily life experiences of the target culture; and (4) Conceptual Equivalence, which checked the conceptual meanings of words in the target culture.[20] The committee ensured that the translated questionnaires can be understood by an individual who has a Grade 6 level of reading proficiency.[20]

Phase B: Validity and Reliability Testing

Validity

The FSCBS and DFKS were tested for their content validity using the Item-Content Validity Index (I-CVI) and Scale-Content Validity Index (S-CVI) as recommended by the guidelines of Sousa and Rojjanasrirat.[15] The expert committee, which was comprised of nine professionals, evaluated each item using the following scale: 1 = not relevant; 2 = unable to assess relevance; 3 = relevant but needs minor alteration; 4 = very relevant and succinct.[20] Items rated as 1 or 2 would undergo further revision.

Reliability

The reliability testing of the final version of the FSCBS and DFKS was performed on 30 participants. Test-retest reliability was employed and a washout period of 24 hours was allotted, where the translated questionnaires were readministered to test for stability.[21] Establishing test-retest reliability ensures that observed changes are meaningful and not due to inconsistencies in measurement.[21]

Setting

The validity testing was conducted online via Google Meet, which involves the expert committee to discuss and finalize the translation of the two questionnaires. Moreover, the reliability testing was conducted asynchronously online via Google Forms and through hard copies of the questionnaires sent through a courier, as necessary, which involved 30 participants with T2DM. Prior to both tests, MMSE administration and the informed consent process were conducted and facilitated by the student researchers.

Statistical Analysis

All data were extracted from the forms and were tabulated using MS Excel 2020. In analyzing qualitative data obtained from the translation phase of the study, a narrative analysis was done to examine the accounts provided by the translators regarding their experiences during the translation process.[22] This described the decisions made in certain items of the questionnaire and their rationale, along with any challenges or disagreements faced by the translators. Meanwhile, for the quantitative data, descriptive statistics such as mean, standard deviation, and frequency were used to describe the

demographic variables of the participants. Content validity and reliability were analyzed through inferential statistics to determine if the questionnaire was valid and reliable. Content validation was performed by the experts committee. The relevance of each item was rated using this scale: 1 for not relevant; 2 for unable to assess relevance; 3 for relevant but needs minor alterations; 4 for very relevant and succinct. Content validity index per item (I-CVI) and at scales (S-CVI/Ave) were calculated. With eight experts, the I-CVI of 0.78 or above and S-CVa/Ave of 0.90 or above was the minimum acceptable indices.[16] Items that will not attain the minimum adequate indices were revised and re-evaluated until acceptable indices of content-related validity were attained.

For internal consistency, the researchers agreed that Cronbach's alpha values of 0.70 demonstrate adequate internal consistency.[23] Test-retest reliability was evaluated using Spearman's coefficient. A correlation coefficient (r) value of r ≥0.70 was already considered good.[24]

Ethical Considerations

The Declaration of Helsinki and the Philippine Health Research Ethics Board (PHREB) standards for good clinical practice were implemented in this study. The study has sought the approval of the Ethics Review Committee of UST-CRS prior to the implementation of the study.

The researchers administered the informed consent form process. The participants signed an informed consent form prior to participating in the study, which requires researchers to explain the aim of the study while maintaining the participant's privacy and confidentiality in compliance with the Data Privacy Act of 2012.

The study's participants were the vulnerable group in the study. To address the vulnerability issues, the student researchers administered the informed consent form process to prevent coercion or any undue influence. The questions asked in the questionnaire and/or the interview may be sensitive or personal. The participants were free to decline the questions if they were uncomfortable answering them. The responses gathered in the study remained anonymous to protect the privacy and confidentiality of the participants. To prevent any data breach during the study, the data was only accessible to the researchers. It was stored in a password-protected Google Drive Folder and can be accessed by the team through their emails. All hard copies of the data will be shredded and disposed of properly five years after the conclusion of the study.

The results were presented to the participants in a face-to-face forum. It was presented in a public forum through a poster and paper presentation.

RESULTS

Translation

The summary of the translation process of the DFKS and FSCBS which was adapted from Sousa and Beaton can be found on Appendices C and D.[15,19] The expert committee had to agree on a translation that accurately conveys the original version of the DFKS and FSCBS questionnaires. Some of the issues during the translation process were the following:

1. Some of the terms used in the questionnaires have no direct translation such as *"moisturizing lotion."*
2. Some of the translated terms have different meanings compared to the original version of the questionnaires.
3. Some of the translated terms may not be commonly used or heard locally.
4. Some of the translated items are not in line with our requirement of Grade 6 level of reading proficiency.

Validity

The results have shown a high correlation with the I-CVI scores for both questionnaires ranging from 0.88 to 1.00, and the S-CVI scores with a mean of 0.96 for DFKS and 0.92 for the FSCBS. The summary of the content validity for both questionnaires can be found on Appendices E and F.

Reliability

Table 2 shows the demographic profile of the participants recruited for the reliability testing. A total of 30 individuals, all medically diagnosed with T2DM participated in the study, wherein 40% were males and 60% were females. The mean range of the age for both males and females is 45-68 years old. The reliability testing posted a 100% response rate with all 30 participants answering on both days.

The five-item DFKS has an acceptable internal consistency with Cronbach's alpha of 0.72.[25] Meanwhile, the 15-item FSCBS has a good internal consistency with a Cronbach's alpha of 0.85.[25]

The test-retest reliability of the DFKS questionnaire shows a strong Spearman's coefficient of 0.87.[24] Table 3 shows the Spearman's coefficient of each item, ranging from 0.60-1.00 with items 3 and 4 having a very strong correlation, items 1 and 5 having a strong correlation, and item 2 having a moderate correlation. The Spearman's coefficient of the DFKS and each questionnaire item are statistically significant ($p < 0.01$).

Meanwhile, the test-retest reliability of the FSCBS questionnaire shows a strong Spearman's coefficient of 0.84.[24] Table 4 shows the Spearman's correlation coefficient of each item of the questionnaire, ranging from –0.10 to 0.95 wherein all items have a positive correlation except for Item

Table 2. Demographic Profile of Individuals with Diabetes

Characteristic	N	(%)
Sex		
Male	12	40%
Female	18	60%
	X ± SD	
Age (years)	56.43 ± 11.47	

N – number of participants, X – mean, SD – standard deviation

Table 3. Summary of Results for Test-Retest Reliability Using Spearman's Coefficient of each Item of the DFKS

	Spearman's Coefficient
Item 1	0.75 **
Item 2	0.60 **
Item 3	1.00 **
Item 4	0.90 **
Item 5	0.87 **

*** Correlation is significant at the 0.01 level (2-tailed)*

Table 4. Summary of Results for Test-Retest Reliability Using Spearman's Correlation Coefficient of each Item of the FSCBS

	Spearman Coefficient
Item 1	0.69 **
Item 2	0.59 **
Item 3	0.95 **
Item 4	-0.10
Item 5	0.53 **
Item 6	0.53 **
Item 7	0.68 **
Item 8	0.81 **
Item 9	0.78 **
Item 10	0.64 **
Item 11	0.52 **
Item 12	0.57 **
Item 13	0.46 **
Item 14	0.60 **
Item 15	0.81 **

*** Correlation is significant at the 0.01 level (2-tailed)*

4 which has a negligible negative correlation. The Spearman's coefficient of the FSCBS and fourteen (14) items of the questionnaire are statistically significant ($p < 0.01$).

DISCUSSION

The DFKS and FSCBS were cross-culturally adapted to assess the foot self-care knowledge and behavior of Filipinos with T2DM. Proper cross-cultural adaptation of the questionnaires are essential to ensure that the translated questionnaires are valid and reliable, and to prevent confounding results due to the inapplicability of the original items to the target population.[26] A cross-cultural study has discussed that translating an assessment tool developed in another country ensures linguistic accuracy; however, beyond translation, cultural adaptation is essential to ensure the tool reflects the values, norms, and experiences of the target population.[27] The same study also concluded that the tool demonstrated good internal consistency and was valid at both face and content levels, which helped therapists provide interventions that reduced their stress levels, addressed their concerns, and improved their quality of life. With the increased prevalence of T2DM in the Philippines, patient education and the establishment of the level of knowledge and behavior of Filipinos with T2DM can aid in the prevention of chronic complications such as DFUs and amputation.[4]

The expert committee decided on the pre-final version of the questionnaires with some recommendations and suggestions raised regarding the translated texts in terms of the equivalence. The requirement of Grade 6 level of reading proficiency was also considered in the process. Initially, "taong may diabetes" was used to translate "diabetics" or "persons with diabetes" in the DFKS. However, the word "tao" was removed since the phrase "ang mga may diabetes" would already pertain to persons with diabetes. On the contrary, given that the questionnaires in the FSCBS are more descriptive than commanding, words such as "suriin" were changed to "tinitignan". Furthermore, the word "halumigmigan" was initially used in the synthesized translation of the questionnaire, but was changed to "maalinsangang panahon" to fit the climate in the country. Lastly, words such as "*moisturizing lotion*", "*iodine*", and "*alcohol*" which have no direct Filipino translation were left as is and were instead italicized.

Before securing the final scores for the content validity, the researchers obtained an S-CVI of 0.89 and 0.88 for the DFKS and FSCBS questionnaires, respectively. This prompted the researchers to revise items 1, 3, and 4 for the DFKS and items 1, 5, 11, 12, and 13 for the FSCBS, coinciding with the suggestions from the expert review committee. The resolutions in creating the final version of the questionnaires, which is then reevaluated by experts A1, 2, and 5, are summarized and tabulated in Appendices C and D. The final scores for the content validity (Appendices E and F) of the questionnaires have shown to have excellent validity properties with an S-CVI of 0.96 (DFKS) and 0.92 (FSCBS). It was determined that these convey a comparable meaning to the English translation derived from the original Turkish version of the questionnaire and are sufficiently readable and easily understood in the target language. By achieving this level of comparability, the assessment tool remains effective in measuring the intended constructs without introducing biases or misunderstandings due to cultural or language differences.

After completing the translation and validity phase, reliability testing was done to determine the accuracy and replicability of the data. The researchers allotted two days for data collection done online via Google Forms. A 24-hour washout period was provided in between for the test-retest reliability.

The results of the Cronbach's alpha showed that the five-item DFKS and 15-item FSCBS have an acceptable and good internal consistency, respectively, which is similar to the English translation derived from the Turkish version (0.70 and 0.83, respectively) of the questionnaires.[12,18] Moreover, the

Spearman coefficient of the DFKS and FSCBS questionnaires has a strong correlation at 0.87 and 0.84, respectively. For the per-item reliability of the DFKS questionnaire, Items 3 and 4 has a very strong correlation, Items 1, 4, and 5 are classified as strong correlation, and Item 2 has a moderate correlation. Overall, the results of the Test-retest reliability of the DFKS suggests a strong relationship between the variables. For the FSCBS questionnaire, Item 3 has a very strong correlation, Items 8, 9, and 15 has a strong correlation, Items 1, 2, 3, 5, 6, 7, 10, 11, 12, 13, and 14 has a moderate correlation, and Item 4 with a negligible correlation. It is important to note that Item 4 has a negligible negative correlation to the other variables within the items and suggests that responses of the participants exhibit significant variability, with notable disparities observed among their individual contributions. The negligible negative correlation suggests that there may be other factors at play, and further investigation is necessary to understand the underlying relationship between Item 4 and the other variables. A possible explanation for this would be confusion of the wording "Hindi naglalagay ng *lotion* sa pagitan ng mga daliri sa paa" and was succeeded by another item that also talks about *"lotion."* All this data is crucial for the success of our research study as it suggests that the items in the questionnaires are similar and comparable with one another.

Translated and culturally adapted questionnaires such as the DFKS and FSCBS, can be used to measure the baseline knowledge and behavior of Filipinos with T2DM. Evaluating their knowledge, perceptions, attitudes, beliefs, and outcome expectations are crucial in imposing behavioral changes which is one of the managements in diabetes prevention and health education.[26]

Limitations

The study has several limitations during the translation process. First, the researchers were only able to recruit one linguistic expert as part of the expert committee. Moreover, the translated questionnaires are limited to individuals who are fluent in Filipino, particularly in Tagalog.

Recommendations

One of the recommendations for future research is to test other relevant psychometric properties, such as construct and face validities, to ensure that the translated questionnaires are accurate and consistent with the findings of the other translated versions of the DKFS and FSCBS questionnaires. It is also recommended to administer the translated questionnaires to the target population to establish the patient's baseline knowledge and self-care behavior for better and effective health education. Moreover, further studies regarding the use of the translated questionnaires are recommended to individuals with type 1 diabetes. Aside from the Filipino translation, it is recommended that future studies explore translating the questionnaires into other dialects.

CONCLUSION

The DFKS and FSCBS were cross-culturally adapted to Filipino with the internal consistencies similar to the English translations from the original versions (e.g., Spanish and Turkish languages). The translation and cultural adaptation were carried out not just by focusing on a literal translation of the items, but also by prioritizing clarity to enhance understanding for both the healthcare providers and the clients. The content validity of the two questionnaires was acceptable and the test-retest reliability of the whole questionnaires showed strong positive correlation among the items. A full testing of the psychometric properties of the two questionnaires should still be done to ensure its validity and reliability in determining the foot self-care knowledge and behavior of Filipinos with T2DM. A culturally adapted tool with validated psychometric properties will support the development of tailored return-to-work interventions that will benefit Filipino healthcare professionals and the stakeholders in the profession.

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Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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APPENDICES

Appendix A1. Diabetic Foot Knowledge Subscale (DFKS) – Original

	Yes	No	I Don't Know
1. Diabetes often causes poor circulation			
2. Cuts and abrasion on diabetes heal more slowly			
3. Diabetes should take extra care when cutting their toenails			
4. A person with diabetes should cleanse a cut with iodine and alcohol			
5. Diabetes can cause loss of feeling in my hands, finger, and foot			
Total Score:			

Appendix A2. Diabetic Foot Knowledge Subscale (DFKS) – Filipino

	Oo	Hindi	Hindi ko alam
1. Madalas na nakapagpapabagal ng daloy ng dugo ang diabetes			
2. Mas mabagal gumaling ang sugat ng mga may diabetes			
3. Dapat maging mas maingat sa pagpuputol ng mga kuko ang mga may diabetes			
4. Dapat gumamit ng iodine at alcohol sa paglilinis ng sugat ang may diabetes			
5. Puwedeng magdulot ng pamamanhid sa kamay, daliri at paa ang diabetes			
Kabuuang Puntos:			

Appendix B1. Foot Self-Care Behavior Scale (FSCBS) – Original

Foot Self-Care Items	Always (5)	Often (4)	Sometimes (3)	Rarely (2)	Never (1)
1. Checks temperature of water					
2. Dries between toes after washing					
3. Use moisturizing lotion for my feet					
4. Does not apply lotion between toes					
5. Cuts toenails "straight"					
6. Checks toenails in terms of thickening, ingrowth and length					
7. Checks between toes for denudation, fungus, and rash due humidity					
8. Checks feet sole for callus, rash, blister, and wound					
9. Checks inside the shoes for foreign matters like nail, dust, or stone					
10. Does not walk barefoot. (e.g., at home, outdoor, or on the beach)					
11. Wears shoes whose width, length, and heels are appropriate an that grasp the foot as a whole					
12. Wears shoes with soft leather and smooth internal surface					
13. Socks are clean, cotton, and soft					
14. Socks fit well – not tight or loose					
15. Does not use sharp instruments on foot (i.e., razor, scissors, etc.)					

Appendix B2. Foot Self-Care Behavior Scale (FSCBS) – Filipino

Mga Paraan sa Pag-aalaga ng Paa	Palagi (5)	Madalas (4)	Minsan (3)	Bihira (2)	Hindi Kailanman (1)
1. Inaalam kung mainit o malamig ang tubig					
2. Pinapatuyo ang pagitan ng mga daliri ng paa pagkatapos maghugas					
3. Gumagamit ng moisturizing lotion					
4. Hindi naglalagay ng lotion sa pagitan ng mga daliri sa paa					
5. Hindi sagad ang pagputol sa kuko					
6. Tinitingnan kung may pangangapal ng kuko, ingrown, at haba nito					
7. Tinitingnan ang pagitan ng mga daliri ng paa para sa pagtuklap ng balat, alipunga, at pamumula dahil sa maalinsangan na panahon					
8. Tinitingnan ang talampakan kung mayroong kalyo, pamumula, paltos, at sugat					
9. Tinitingnan ang loob ng sapatos para sa mga bagay na nakakasugat, tulad ng pako at bato					
10. Hindi naglalakad nang nakayapak (halimbawa: sa bahay, sa labas, o sa tabing dagat)					
11. Nagsusuot ng sapatos na tama ang sukat at taas ng takong					
12. Nagsusuot ng sapatos na yari sa malambot na balat at may makinis na panloob at malambot na swelas					
13. Malambot at malinis ang ginagamit na medyas					
14. Sakto ang sukat ng medyas					
15. Hindi gumagamit ng matataas na gamit sa paa tulad ng pang-ahit, gunting, at iba pa					

Appendix C. Summary of Forward and Backward Translations of DFKS

Item number	Original	Forward Translation 1	Forward Translation 2	Synthesis	Backward Translation 1	Backward Translation 2	Final Version	Resolution of Expert Panel
1	Diabetes often cause poor circulation.	Kadalasang nagiging dahilan nang mabagal na sirkulasyon ng dugo ang diyabetis.	Madalas na nagdudulot ng mahinang sirkulasyon ang diabetes.	Madalas na nagdudulot ng mahinang sirkulasyon ng dugo ang diabetes.	Diabetes often causes poor blood circulation.	Diabetes often leads to low blood circulation.	Madalas na nakapagpa-pabagal ng daloy ng dugo ang diabetes.	"Mahina" was changed to *"mabagal".* *"Daloy"* was chosen over "sirkulasyon". "Tao" was removed.
2	Cuts and abrasions on diabetes heal more slowly.	Mabagal ang paggaling ng mga sugat at galos sa may diyabetis.	Mas mabagal ang paghilom ng mga sugat at gasgas na dulot ng diabetes.	Mas mabagal ang paghilom ng mga sugat at gasgas na dulot ng diabetes.	Wounds and scrapes caused by diabetes heal more slowly.	Diabetes slows down the healing speed of wounds and abrasions.	Mas mabagal gumaling ang sugat ng mga may diabetes.	*"Sugat"* was used to refer to both "cuts and abrasions." *"Gumaling"* was used instead of "hilom".
3	Diabetics should take extra care when cutting their toenails.	Dapat maging maingat sa paggugupit ng mga kuko ang mga may diyabetis.	Dapat na hustong mag-ingat ang mga diabetic sa paggupit ng kanilang mga kuko.	Dapat na maging mas maingat sa paggugupit ng mga kuko ang mga taong may diabetes.	People with diabetes should be more careful in cutting their nail.	People with diabetes should be more mindful in trimming their nails.	Dapat maging mas maingat sa pagpuputol ng mga kuko ang mga may diabetes.	*"Putol"* was used instead of "gupit". "Tao" was removed for consistency.
4	A person with diabetes should cleanse a cut with iodine and alcohol.	Dapat linisin ng alkohol at iodine ang mga sugat ng taong may diyabetis.	Dapat gumamit ang taong may diabetes ng iodine at alcohol sa paglilinis ng sugat.	Ang taong may diabetes ay kailangang gumamit ng iodine at alcohol sa paglilinis ng sugat.	People with diabetes must use iodine and alcohol in cleaning their wound.	People with diabetes should use iodine and alcohol in cleaning their wounds.	Dapat gumamit ng iodine at alcohol sa paglilinis ng sugat ang may diabetes.	"Kailangan" was changed to *"dapat"*. "Taong" is removed.
5	Diabetes can cause loss of feeling in my hands, finger and feet.	Maaaring magdulot ng kawalang pakiramdam sa mga kamay, daliri at paa dulot ng diyabetis.	Maaaring magdulot ng kawalan ng pakiramdam sa kamay, daliri, at paa ang diabetes.	Maaaring magdulot ng kawalan ng pakiramdam sa mga kamay, daliri, at paa ang diyabetes.	Diabetes can cause numbness on the hands, fingers, and feet.	People with diabetes may experience numbess of hands, fingers, and feet.	Puwedeng magdulot ng pamamanhid sa kamay, daliri, at paa ang diabetes.	"Maaring" is changed to *"puwedeng"*. "Kawalan ng pakiramdam" was changed to *"pamamanhid"*.
6	Total score	Kabuuang puntos	Kabuuang iskor	Kabuuang puntos	Total Points	Total points	Kabuuang puntos	Accepted
7	Yes	Oo	Oo	Oo	Yes	Yes.	Oo	Accepted
8	No	Hindi	Hindi	Hindi	No	No.	Hindi	Accepted
9	I don't know	Hindi ko alam	Hindi ko alam	Hindi ko alam	I don't know.	I don’t know.	Hindi ko alam	Accepted

Appendix D. Summary of Forward and Backward Translations of FSCBS

Item number	Original	Forward Translation 1	Forward Translation 2	Synthesis	Backward Translation 1	Backward Translation 2	Final Version	Resolution of Expert Panel
1	Foot care items	Mga Aytem sa Pag-aalaga ng Paa	Mga gamit sa pag-aalaga ng paa	Mga Aytem sa Pag-aalaga ng Paa	Items about Taking Care of Feet	Items on Foot Care	Mga Paraan sa Pag-aalaga ng Paa	"Paraan" is used instead of "Aytem".
2	Checks temperature of water	Suriin ang temperatura ng tubig	Inaalam ang temperatura ng tubig	Suriin ang temperatura ng tubig	Check water temperature	Check the water temperature	Inaalam kung mainit o malamig ang tubig	"Temperatura" is changed to "*mainit o malamig*". "Suriin" is changed to *"inaalam"*.
3	Dries between toes after washing	Tinutuyo ang pagitan ng daliri ng paa pagkatapos maghugas	Tinutuyo ang pagitan ng mga daliri ng paa matapos itong linisin	Tinutuyo ang pagitan ng daliri ng paa pagkatapos maghugas	Dry the spaces between the toes after washing	Dry the feet completely including the spaces between the toes	Pinapatuyo ang pagitan ng mga daliri ng paa pagkatapos maghugas	"Tinutuyo" is changed to *"pinapatuyo"*.
4	Use moisturizing lotion for my feet	Gumagamit ng moisturizing na losyon sa paa	Gumagamit ng moisturizing lotion sa mga paa	Gumagamit ng moisturizing na losyon sa paa	Use moisturizing lotion on feet	Apply moisturizing lotion to one's feet	Gumagamit ng moisturizing lotion	Retain the spelling of *"moisturizing lotion"*. "Paa" is removed.
5	Does not apply lotion between toes	Hindi dapat pahiran ng losyon ang pagitan ng mga daliri sa paa.	Hindi naglalagay ng lotion sa pagitan ng mga daliri ng paa	Hindi dapat maglagay ng losyon sa pagitan ng mga daliri ng paa	Do not put lotion between the toes	Avoid applying lotion on the spaces between the toes	Hindi naglalagay ng lotion sa pagitan ng mga daliri sa paa	"Hindi naglalagay" instead of "hindi dapat maglagay". "Lotion" instead of "losyon".
6	Cuts toenails "straight"	Gupitin nang tuwid ang kuko sa paa	“Tuwid” ang paggupit sa mga kuko ng paa	Gupitin nang tuwid ang mga kuko sa paa	Cut toe nails straight	Cut the toenails straight across	Hindi sagad ang pagputol sa kuko	"Hindi sagad" instead of "tuwid" "Putol" instead of "gupit"
7	Checks toenails in terms of thickening, ingrowth and length	Suriin ang mga kuko sa paa kung may pangangapal, ingrowth at haba nito.	Sinisilip ang mga kuko sa paa pagdating sa kanilang pagkapal, ingrowth, at haba	Suriin ang mga kuko sa paa pagdating sa kanilang pagkapal, ingrowth, at haba nito	Check toe nails for thickening, ingrowth, and length.	Check the toenails for thickness, ingrown, and length.	Tinitingnan kung may pangangapal ng kuko, ingrown, at haba nito	"Tinitignan" instead of "suriin" "Pangangapal" instead of "pagkapal" "Ingrown" instead of "ingrowth"

Appendix D. Summary of Forward and Backward Translations of FSCBS *(continued)*

Item number	Original	Forward Translation 1	Forward Translation 2	Synthesis	Backward Translation 1	Backward Translation 2	Final Version	Resolution of Expert Panel
8	Checks between toes for denudation, fungus and rash due to humidity	Suriin ang pagitan ng mga daliri ng paa para sa denudasyon, *fungus*, at pantal dahil sa kahalumigmigan.	Sinisilip ang pagitan ng mga daliri ng paa para sa pagbabalat, impeksyon, at pantal dulot ng halumigmig	Suriin ang pagitan ng mga daliri ng paa para sa denudasyon, fungus, at pantal dahil sa kahalumigmigan.	Check between the toes for denudation, fungus, and rash caused by humidity.	Check the spaces between the toes for denudation, fungus, and rashes due to moisture.	Tinitignan ang pagitan ng mga daliri ng paa para sa pagtuklap ng balat, alipunga, at pamumula dahil sa maalinsangan na panahon	"Denudasyon" is changed to *"pagtuklap ng balat"*. "Pantal" is changed to *"pamumula"*. "Kahalumig-migan" is changed to *"maalinsangan na panahon"*.
9	Checks feet sole for callus, rash, blister and wound	Suriin ang talampakan kung mayroong kalyo, pantal, paltos, at sugat.	Sinisilip ang talampakan ng paa para sa kalyo, pantal, paltos, at sugat	Suriin ang talampakan kung mayroong kalyo, pantal, paltos, at sugat.	Check feet for callus, rash, blister, and wound.	Check the soles for calluses, rashes, blisters, and wounds.	Tinitignan ang talampakan kung mayroong kalyo, pamumula, paltos, at sugat	"Suriin" is changed to *"tinitignan"*. "Pantal" is changed to *"pamumula"*.
10	Checks inside the shoes for foreign matters like nail, dust or stone.	Suriin ang loob ng sapatos para sa mga bagay na hindi dapat nasa loob tulad ng kuko, alikabok, o bato	Sinisilip ang loob ng sapatos para sa mga kakaibang bagay tulad ng kuko, alikabok, o bato	Suriin ang loob ng sapatos para sa mga bagay na hindi dapat nasa loob tulad ng kuko, alikabok, o bato	Check the insides of shoes for foreign objects such as nails, dust, or stones.	Check the shoes for unwanted objects such as nails, dusts, and rocks.	Tinitignan ang loob ng sapatos para sa mga bagay na nakakasugat, tulad ng pako at bato	"Suriin" is changed to *"tinitignan"*. "Mga bagay na hindi dapat nasa loob" is changed to *"mga bagay na nakakasugat"*. "Alikabok" is removed from the translation.
11	Does not walk barefoot. (e.g., at home, outdoor or on the beach)	Hindi dapat maglakad nang nakapaa (hal. sa bahay, sa labas o sa tabing-dagat)	Hindi naglalakad nang nakayapak (halimbawa: sa bahay, sa labas, o sa dagat)	Hindi dapat naglalakad nang nakapaa (halimbawa: sa bahay, sa labas, o sa tabing dagat)	Do not walk barefoot. (e.g., in the house, outside, or at the beach)	Avoid walking barefoot (e.g. at home, outdoors, or along the seashores).	Hindi naglalakad nang nakayapak (halimbawa: sa bahay, sa labas, o sa tabing dagat)	"Dapat" is removed. "Nakapaa" is changed to *"nakayapak"*.
12	Wears shoes whose width, length and heels are appropriate and that grasp the foot as a whole.	Magsuot ng sapatos na ang lapad,haba at takong ay tama at kasya talaga sa paa sa kabuuan.	Nagsusuot ng sapatos na may angkop na haba, lapad, at taas, at mainam na kumakapit sa paa sa kabuuan	Magsuot ng sapatos na ang lapad, haba at takong ay tama at kasya talaga sa paa sa kabuuan.	Wear shoes that have the right width, length, and heel.	Wear shoes with the right width, length, and heels.	Nagsusuot ng sapatos na tama ang sukat at taas ng takong	"Magsusuot" is replaced with *"nagsusuot"*. "Ang lapad, haba, at takong ay tama at kasya talaga sa paa sa kabuuan" is replaced with *"tama ang sukat"*.

Appendix D. Summary of Forward and Backward Translations of FSCBS *(continued)*

Item number	Original	Forward Translation 1	Forward Translation 2	Synthesis	Backward Translation 1	Backward Translation 2	Final Version	Resolution of Expert Panel
13	Wears shoes with soft leather and smooth internal surface.	Magsuot ng sapatos na yari sa malambot na balat at may makinis na panloob.	Nagsusuot ng sapatos na may malambot na goma at malambot na panloob na apakan	Magsuot ng sapatos na yari sa malambot na balat at may malambot na panloob na apakan	Wear shoes that are made of soft materials and are comfortable.	Wear comfortable shoes with soft insoles.	Nagsusuot ng sapatos na yari sa malambot na balat at may makinis na panlood at malambot na swelas	"Magsuot" is replaced with *"nagsusuot"*. "Malambot" is replaced with *"makinis"*.
14	Socks are clean, cotton and soft	Mga medyas na malilinis, malambot at gawa sa cotton.	Malinis, cotton, at malambot ang mga medyas	Malinis, gawa sa cotton, at malambot ang mga medyas	Socks are clean, soft, and made of cotton.	Use clean, soft and cotton socks.	Malambot at malinis ang ginagamit na medyas	*"Cotton"* is removed.
15	Socks fit well not tight or loose	Mga medyas na kasya hindi masikip at hindi rin maluwag.	Maayos ang sukat ng medyas sa paa at hindi ito mahigpit o maluwag	Maayos ang sukat ng medyas sa paa at hindi ito mahigpit o maluwag	Socks fit well - not tight or loose	Wear comfortable socks that are not too tight nor too loose	Sakto ang sukat ng medyas	Changed "maayos ang sukat' to "*sakto"* ang sukat. Removed "hindi ito mahigpit o maluwag"
16	Does not use sharp instruments on feet (i.e., razor, scissors, etc.)	Hindi gumagamit ng matatalim na mga instrumento sa paa (hal. razor, gunting, at iba pa.)	Hindi gumagamit ng mga matatalas na gamit sa paa (halimbawa: labaha, gunting, at iba pa)	Hindi gumagamit ng mga matatalim na gamit sa paa tulad ng labaha, gunting, at iba pa	Do not use sharp objects on feet such as razor, scissors, and others	Avoid using sharp objects such as razors, scissors, etc. to one's feet	Hindi gumagamit ng matatalas na gamit sa paa tulad ng pang-ahit, gunting, at iba pa	Changed "matatalim" to *"matatalas"*. *"Pang-ahit"* is used instead of "labaha".
17	Always	Palagi	Palagi	Palagi	Always	Always	Palagi	Accepted
18	Often	Madalas	Madalas	Madalas	Often	Often	Madalas	Accepted
19	Sometimes	Minsan	Minsan	Minsan	Sometimes	Sometimes	Minsan	Accepted
20	Rarely	Bihira	Madalang	Bihira	Rarely	Seldom	Bihira	Accepted
21	Never	Hindi kailanman	Hindi kailanman	Hindi Kailanman	Never	Never	Hindi Kailanman	Accepted

Appendix E. Summary of results for content validity of the DFKS questionnaire

	Relevant (ratings ≥3)	Non-Relevant (ratings ≤2)	I-CVI	Interpretation	S-CVI
Item 1	8	0	1.00	Appropriate	
Item 2	8	0	0.88	Appropriate	
Item 3	8	0	0.88	Appropriate	
Item 4	8	0	1.00	Appropriate	
Item 5	8	0	0.88	Appropriate	0.96
Item 6	8	0	1.00	Appropriate	
Item 7	8	0	1.00	Appropriate	
Item 8	8	0	1.00	Appropriate	
Item 9	8	0	1.00	Appropriate	

I-CVI – item-level content validity index, S-CVI – scale-level content validity index

Appendix F. Summary of results for content validity of the FSCBS questionnaire

	Relevant (ratings ≥3)	Non-Relevant (ratings ≤2)	I-CVI	Interpretation	S-CVI
Item 1	8	0	1.00	Appropriate	
Item 2	8	0	0.88	Appropriate	
Item 3	8	0	0.88	Appropriate	
Item 4	8	0	0.88	Appropriate	
Item 5	8	0	0.88	Appropriate	
Item 6	8	0	0.88	Appropriate	
Item 7	8	0	0.88	Appropriate	
Item 8	8	0	0.88	Appropriate	
Item 9	8	0	0.88	Appropriate	
Item 10	8	0	0.88	Appropriate	
Item 11	8	0	0.88	Appropriate	0.92
Item 12	8	0	0.88	Appropriate	
Item 13	8	0	0.88	Appropriate	
Item 14	8	0	0.88	Appropriate	
Item 15	8	0	0.88	Appropriate	
Item 16	8	0	1.00	Appropriate	
Item 17	8	0	1.00	Appropriate	
Item 18	8	0	1.00	Appropriate	
Item 19	8	0	1.00	Appropriate	
Item 20	8	0	1.00	Appropriate	
Item 21	8	0	1.00	Appropriate	

I-CVI – item-level content validity index, S-CVI – scale-level content validity index