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Translation, cross-cultural adaptation, and validation of the heart disease fact questionnaire among the Brazilian population

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SUMMARY

OBJECTIVE: This study aimed to translate, cross-culturally adapt, and validate the Heart Disease Fact Questionnaire into Brazilian Portuguese.

METHODS: The Brazilian version of the Heart Disease Fact Questionnaire was developed through the processes of translation, back-translation, review committee, and pre-test. Test-retest reliability was measured using the intraclass correlation coefficient and the kappa coefficient. Internal consistency was measured using Cronbach's alpha. For construct validity, the total Heart Disease Fact Questionnaire score was correlated with the Diabetes Knowledge Scale and the Diabetes Attitudes Questionnaire. Ceiling and floor effects were also evaluated in this study.

RESULTS: For construct validity and floor and ceiling effect measurements, a total of 100 participants were selected. Reliability was measured using a sub-sample of 30 participants from the total sample. We identified adequate values of reliability (kappa between 0.22 and 1.00 and ICC=0.75) and internal consistency (Cronbach's alpha=0.79). We observed adequate correlations of the Heart Disease Fact Questionnaire score with Diabetes Knowledge Scale (r=0.348) and Diabetes Attitudes Questionnaire (r=0.136). No ceiling or floor effects found.

CONCLUSION: Brazilian Portuguese version of the Heart Disease Fact Questionnaire has adequate psychometric properties according to the best scientific recommendations.

KEYWORDS: Diabetes mellitus. Questionnaire design. Primary health care. Risk factors.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) and cardiovascular diseases (CVD) share many similar pathophysiological characteristics, especially insulin resistance[1], inflammation[2], systemic arterial hypertension[3], and obesity[4]. These characteristics increase the risk of complications and mortality[5,6]. The most recent epidemiological data points to a significant increase in the prevalence of diabetes worldwide, considering that in the past three decades, the number of people diagnosed has more than doubled, with this growing prevalence being associated with a 60% increase in the risk rate attributable to CVDs due to diabetes[7,8]. In addition, it is estimated that by 2035, the number of individuals affected by the pathology will reach the order of 592 million worldwide[9]. Brazil currently ranks fourth in the number of people living with the disease worldwide and first among Latin and Central American countries[10].

In this context, especially in primary care, the use of simple and cost-effective strategies has been desired and encouraged, thus trying to prevent the coexistence of diseases that have high morbidity and mortality and high cost not only for the health system but also for patients[11], as is the case with DM and CVD.

Therefore, the use of questionnaires has been extensively explored not only in the screening and/or screening of various diseases, such as FINDRISK[12], used to screen the risk of developing T2DM, but also as an assessment tool, investigating the level of knowledge about a certain disease and the risk of developing it, such as the Heart Disease Fact Questionnaire (HDFQ).

The Heart Disease Fact Questionnaire (HDFQ) is a 25-item questionnaire that was developed to explore/assess individuals'

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knowledge about the main risk factors for the development of CVD, with a greater focus on diabetics[13]. The HDFQ has already been validated for Turkish[14] and Chinese[15], but has not yet been published for Brazilian Portuguese. Thus, considering the importance of this tool in measuring the level of knowledge about the risk of CVD, this study aimed to translate, cross-culturally adapt, and validate the HDFQ into Brazilian Portuguese.

METHODS

Study design

This was a cross-sectional study on translation and cross-cultural adaptation of a questionnaire. It was conducted in accordance with the Guidelines for the Process of Cross-cultural Adaptation of Self-Report Measures[16] and the COSMIN[17]. This study was approved by the research ethics committee, under opinion number 2.853.570. Participants were recruited through social media, text messages, and emails. All volunteers confirmed their participation after signing the informed consent form.

Participants

The sample size for this study was 100 individuals based on the COSMIN[17]. Individuals of both genders, aged over 18 years, with report of clinical diagnosis of T2DM and regular use of hypoglycemic drugs, without cognitive deficits, or with difficulty reading or writing were included. Exclusion criteria include any situations that made it impossible to answer the questionnaire.

Translation and cross-cultural adaptation of heart disease fact questionnaire

The process of translation and cross-cultural adaptation of HDFQ for Brazilian Portuguese followed the criteria of Beaton et al.[16] and was performed in the following five stages:

1. Translation: Two independent translators, both with Brazilian Portuguese as their native language and fluent in English, translated the original version of the HDFQ into Brazilian Portuguese.
2. Synthesis of translations: After discussions and revisions, the two translators, under observation by one of the researchers, synthesized the two independently translated versions of the questionnaire and produced a single consensual version of HDFQ.
3. Back-translation: Two independent translators (without technical knowledge of the field of health care), both with English as their mother tongue and fluency in Portuguese, translated the Portuguese version of HDFQ back into English, without previous knowledge of the original version of the questionnaire. These translators were not the same as those in phase 1 (English to Portuguese language translation).
4. Expert committee review: Three experts reviewed all the translated and back-translated versions for corrections of possible discrepancies, thus reaching the pre-final version of the HDFQ. At this stage, the criteria for including experts were as follows: time availability, fluency in both languages, clinical expertise with diabetes and heart disease, and interest in collaborating in the study. The pre-final version of HDFQ questionnaire was agreed among all the committee members.
5. Pre-final test: The pre-final version of HDFQ was applied to 30 individuals with diabetes and with Brazilian Portuguese as their mother tongue. The participants read and completed the questionnaire and, at the end of the questionnaire, established that they had understood the pre-final version of HDFQ by selecting check boxes containing "yes" or "no" answers to each question on the questionnaire. To be considered having an adequate degree of understanding, the items must be understood by at least 80% of the participants. After analyzing the pre-final version, the coordinator of the adaptation process thus established the final version of the HDFQ in Brazilian Portuguese.

Heart disease fact questionnaire

Being developed by Wagner et al.[13], the HDFQ is composed of 25 items and assesses how much knowledge an individual has about the risks of developing heart disease, especially in relation to diabetics. The language of the original scale is English. The sentences that build the scale can be true or false with three response options: "Yes," "No," or "I don't know." For each correct answer, a score of 1 is received, while each incorrect or "I do not know" answer receives a score of 0. The total score is calculated by multiplying the number of correct responses by 4. Score on the scale ranges from 4 to 100. Six sentences have different punctuations. The total score is calculated by multiplying the number of correct responses by 4. The higher the final score, the higher the knowledge level.

Other questionnaires

Two other questionnaires that had already been adapted and validated for use in Brazilian Portuguese were applied to verify the validity of the construct concomitantly with HDFQ. Diabetes Knowledge Scale (DKN-A) was validated for the Brazilian population by Torres et al[18]. It is composed of 15 multiple-choice questions on various aspects of general knowledge

related to T2DM. The higher the score, the greater the respondent's knowledge about T2DM.

The Diabetes Attitudes Questionnaire ATT-19 was also validated for Brazilian Portuguese by Torres et al.[18]. It is a self-administered questionnaire about the measure of psychological adjustment for DM. It consists of 19 items arranged in 6 domains: (1) stress associated with DM; (2) receptivity to treatment; (3) confidence in the treatment; (4) personal effectiveness; (5) perception of health; and (6) social acceptance. Questions 11, 15, and 18 start with the reverse score. Each response is measured by a five-point Likert scale. The total score ranges from 19 to 95 points. The higher the score, the greater the positive attitude toward the disease.

Statistical analysis

To characterize the sample, descriptive statistics were performed with the presentation of quantitative data through mean and standard deviation, and qualitative data through absolute number and percentage. The HDFQ reliability analysis was performed using the kappa test with linear weighting, interclass correlation coefficient (ICC), standard error of measurement (SEM), and minimal detectable change (MDC). Internal consistency was assessed using Cronbach's alpha.

For the kappa values, the following interpretations were considered: <0, no agreement; 0.01–0.20, slight; 0.21–0.40, reasonable; 0.41–0.60, moderate; 0.61–0.80, substantial; and 0.81–1, almost perfect[15]. For the ICC values, the following interpretations were considered: <0.40, low reliability; 0.40–0.75, moderate; 0.75–0.90, substantial; and >0.90, excellent[16]. For SEM percentage, the following interpretations were considered: very good: 5% or less; good: >5% and <10%; doubtful: >10% and <20%; and negative: >20%[17]. Pearson's (r) correlation was used to determine construct validity in the correlation between HDFQ and DKN-A, and between HDFQ and ATT-19, following the COSMIN recommendations. The floor and ceiling effect was analyzed.

Data processing was performed using SPSS software, version 17.0 (Chicago, IL, USA).

RESULTS

During the translation and cross-cultural adaptation phase, there were no disagreements or suggested changes to the questionnaire. The translated and adapted version of the HDFQ was unanimously established by the expert committee. This adapted version was then applied to 30 diabetics to assess the level of understanding of the questions. We observed 100% comprehension for all survey items. Thus, we defined the final Brazilian Portuguese version of the HDFQ.

A total of 165 diabetics were recruited and included in the study. From this total sample, a sub-sample with 30 participants was used for the test-retest reliability calculations. Table 1 presents the characteristics of the sample, and it was observed that most of the participants were women, married, overweight, and with more than 10 years of DM. Regarding the reliability (Table 2), when considering each item of HDFQ, we observed adequate values of reliability (kappa ≥0.22). The items 9, 15, 20, 22, and 25 were the least reliable (kappa=0.22), and the items 6, 12, 13, and 16 were the most reliable (kappa=1.00). Considering the total score, we observed adequate reliability (ICC=0.75) and internal consistency (Cronbach's alpha=0.79).

Table 1. Sociodemographic and clinical characteristics of the participants.

Characteristics	Reliability phase (n=30)	Validity phase (n=165)
Age (years)	56.55 (12.78)	58.09 (12.25)
Gender (female)	15 (50%)	105 (63.6%)
Marital status		
Single	7 (23.3%)	48 (51.5%)
Married	22 (73.3%)	85 (51.5%)
Divorced	0 (0%)	14 (8.5%)
Widower	1 (3.3%)	18 (10.9%)
Weight (kg)	69.34 (16.11)	71.31 (13.73)
Height (m)	1.58 (0.08)	1.60 (0.08)
BMI (kg/m^2)	27.67 (6.64)	27.53 (4.88)
Schooling		
Basic education	9 (30%)	67 (40.6%)
High school	19 (63.3%)	64 (38.8%)
Higher education	2 (6.7%)	34 (20.6%)
Medical diagnosis		
SAH and DM	15 (50%)	75 (54.5%)
DM	15 (50%)	90 (54.5%)
Chronicity of DM (years)	10.96 (8.66)	12.12 (9.42)
Type of DM (type 2)	30 (100%)	163 (98.8%)
Physical activity (yes)	14 (46.7%)	60 (36.3%)
Smoker (yes)	3 (10%)	16 (9.7%)
DKN-A (score)	7.51 (2.92)	7.58 (3.03)
ATT-19 (score)	48.44 (9.08)	51.26 (10.68)
HDFQ (score)	79.11 (11.33)	75.61 (14.32)

Values presented in mean (standard deviation) or number (percentage). BMI: body mass index; SAH: systemic arterial hypertension; DM: diabetes mellitus; DKN-A: Diabetes Knowledge Scale; ATT-19: Diabetes Attitudes Questionnaire; HDFQ: Heart Disease Fact Questionnaire.

Table 2. Reliability and internal consistency of items and total score of the Heart Disease Fact Questionnaire (HDFQ) with presentation of mean values, standard deviation (SD), kappa, and Cronbach's alpha.

HDFQ items	Mean (SD)		Kappa	Cronbach's alpha if item excluded
	Test	Retest		
Item 1	0.76 (0.43)	0.76 (0.43)	0.81	0.78
Item 2	0.76 (0.43)	0.90 (0.30)	0.30	0.78
Item 3	0.60 (0.49)	0.76 (0.43)	0.33	0.80
Item 4	0.96 (0.18)	0.93 (0.25)	0.65	0.78
Item 5	0.88 (0.40)	0.93 (0.25)	0.44	0.78
Item 6	1.00 (0.00)	1.00 (0.00)	1.00	0.79
Item 7	0.93 (0.25)	0.93 (0.25)	0.46	0.78
Item 8	0.90 (0.30)	0.93 (0.25)	0.78	0.77
Item 9	0.63 (0.49)	0.93 (0.25)	0.22	0.78
Item 10	0.40 (0.49)	0.36 (0.49)	0.36	0.78
Item 11	0.90 (0.30)	0.90 (0.30)	0.63	0.78
Item 12	0.96 (0.18)	0.96 (0.18)	1.00	0.77
Item 13	0.96 (0.18)	0.96 (0.18)	1.00	0.77
Item 14	0.66 (0.47)	0.76 (0.43)	0.27	0.80
Item 15	0.80 (0.40)	0.93 (0.25)	0.22	0.78
Item 16	0.93 (0.25)	0.93 (0.25)	1.00	0.79
Item 17	0.80 (0.40)	0.96 (0.18)	0.26	0.79
Item 18	0.83 (0.37)	0.66 (0.47)	0.26	0.79
Item 19	0.90 (0.30)	1.00 (0.00)	0.90	0.79
Item 20	0.66 (0.47)	0.46 (0.50)	0.22	0.78
Item 21	0.90 (0.30)	0.93 (0.25)	0.78	0.77
Item 22	0.40 (0.49)	0.26 (0.44)	0.22	0.80
Item 23	0.90 (0.30)	0.96 (0.18)	0.32	0.78
Item 24	1.00 (0.00)	0.96 (0.18)	0.90	0.79
Item 25	0.43 (0.50)	0.23 (0.43)	0.22	0.78

Reliability of the total score of the Heart Disease Fact Questionnaire (HDFQ)

Test	Retest	ICC (95%CI)	SEM (absolute)	SEM (%)	MDC (absolute)	MDC (%)	Cronbach's alpha
79.33 (10.87)	81.60 (12.00)	0.75 (0.48–0.88)	5.72	7.11	15.85	19.70	0.79

ICC: intraclass correlation coefficient; CI: confidence interval; SEM: standard error of measurement; MDC: minimum detectable change.

To assess the construct validity by means of correlation with a validated questionnaire (Table 3), we observed adequate correlations of the HDFQ score with DKN-A (r=0.348) and ATT-19 (r=0.136).

Only, 2 (1.2%) participants achieved a HDFQ maximum score of 100. No participant reached the minimum score of 0 points. Therefore, the ceiling and floor effects were not observed.

Table 3. Correlation between the total score of Heart Disease Fact Questionnaire (HDFQ) and the other questionnaires applied in the study sample (n=165).

Questionnaires	HDFQ
DKN-A	r_s=0.348, p<0.001*
ATT-19	r_s=0.136, p=0.008*

DKN-A: Diabetes Knowledge Scale; ATT-19: Diabetes Attitudes Questionnaire. *Statistically significant correlation (p<0.05, Spearman's correlation coefficient).

DISCUSSION

The HDFQ in the Brazilian Portuguese version showed an adequate level of understanding according to the study sample. The values for internal consistency, validity, and reliability proved to be acceptable. In reliability, the kappa values, when considered item by item, ranged from 0.22 to 1; when considering the total score, a substantial ICC value (0.75) was found. Internal consistency, measured using Cronbach's alpha, was 0.79.

This questionnaire was translated, cross-culturally adapted, and validated for other countries, with a Turkish[14] and a Chinese[15] version. Other psychometric properties were also verified, such as reliability, internal consistency, and construct validity.

The translation and back-translation processes were used to create the Turkish and Chinese versions (C-HDFQ). Method similar to the guidelines used in the translation and cross-cultural adaptation process of this version is based on COSMIN criteria. Both versions adapted relevant expressions, present in the scale, to terms more suited to their own culture.

The Turkish version[14] used the Rasch measurement model to verify reliability, considering the Person Separation Index (PSI). A value of 0.77 was found for reliability, according to the Rasch analysis model. The C-HDFQ reliability was assessed using a test-retest; however, Chow and Wong did not make it clear which values were considered in this measurement. According to him, the Chinese version has good reliability (r=0.92), according to Kuder-Richardson Formula 20 internal consistency coefficient analysis. The reliability of the Brazilian version of the HDFQ was verified by test-retest, according to the C-HDFQ; however, unlike these studies, the values of kappa, ICC, SEM, and MDC were considered, following the international recommendations for psychometric analysis of instruments, i.e., the COSMIN[17].

However, the construct validity was analyzed using Pearson's coefficient correlated to two other instruments, i.e., DKN-A and ATT-19. However, as mentioned above, this method has been used to verify the reliability of the Chinese version. The HDFQ in the Turkish version used confirmatory factor analysis (CFA) as a verification method, considering a supposed unidimensionality of the construct.

The factor loadings found in the Turkish version of the HDFQ were higher than 0.51, according to the CFA, which is considered adequate in the literature. However, according to the study by Prinsen et al.[17], CFA is recommended to verify the internal factor structure of an instrument. This occurs with the aim of investigating whether the items that make up the tool reflect its dimensionality and respond to its construct[19].

Internal consistency, measured using Cronbach's alpha in the Brazilian version, was 0.79. Chow et al.[15] analyzed the internal consistency of the Chinese version of the HDFQ through the Kuder-Richardson Formula 20 and found the resulting value as 0.86, which was considered adequate.

Finally, the clinical implications of this questionnaire are supported by the fact that the diabetic population is more susceptible to developing CVD[20] and the focus of this questionnaire is on the knowledge of this population about the main risk factors for the development of CVD. Additionally, it is known that the greater the knowledge about the disease and its consequences, the smaller the impaired of the same can be.

This study has some limitations. We did not verify the accuracy or response capacity for the HDFQ. In addition, the sample in this study was specific to a city in the Northeast of the country. It is recommended that other psychometric properties be verified, such as the structural validity of the HDFQ, and we suggest that this instrument be applied to larger samples and different regions of the country.

CONCLUSION

Brazilian Portuguese version of the HDFQ has adequate psychometric properties according to the best scientific recommendations.

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AUTHORS' CONTRIBUTIONS

DBD: Conceptualization, Funding acquisition, Formal Analysis, Investigation, Methodology, Resources, Supervision, Writing – original draft preparation, Writing – review & editing. **WSB:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **MCF:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **MJSR:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **NCC:** Formal Analysis, Investigation, Writing – original draft preparation. **RCC:** Formal Analysis, Investigation, Writing – original draft preparation. **AHMP:** Formal Analysis, Investigation, Writing – original draft preparation. **AKFG:** Formal Analysis, Investigation, Writing – original draft preparation. **BNA:** Formal Analysis, Investigation, Writing – original draft preparation. **ADSA:** Methodology, Writing – review & editing.

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