Original Article

Development and Validation of the Brazilian Portuguese Version of the Cardiac Rehabilitation Barriers Scale

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Abstract

Background: Cardiovascular diseases show high incidence and prevalence in Brazil; however, participation in Cardiac Rehabilitation (CR) is limited and has been poorly investigated in the country. The Cardiac Rehabilitation Barriers Scale (CRBS) was developed to assess the barriers to participation and adherence to CR.

Objectives: To translate, cross-culturally adapt and psychometrically validate CRBS to Brazilian Portuguese.

Methods: Two independent initial translations were performed. After the reverse translation, both versions were reviewed by a committee. The new version was tested in 173 patients with coronary artery disease (48 women, mean age = 63 years). Of these, 139 (80.3%) participated in CR. Internal consistency was assessed by Cronbach's alpha, test-retest reliability by intraclass correlation coefficient (ICC) and construct validity by factor analysis. T-tests were used to assess criterion validity between participants and non-participants in CR. The applied test results were evaluated regarding patient characteristics (gender, age, health status and educational level).

Results: The Brazilian Portuguese version of the CRBS had Cronbach's alpha of 0.88, ICC of 0.68 and disclosed five factors, most of which showed to be internally consistent and all were defined by the items. The mean score for patients in CR was 1.29 (SD = 0.27) and 2.36 for ambulatory patients (SD = 0.50) (p <0.001). Criterion validity was also supported by significant differences in total scores by gender, age and educational level.

Conclusion: The Brazilian Portuguese version of CRBS has shown adequate validity and reliability, which supports its use in future studies. (Arq Bras Cardiol 2012;98(4):344-352)

Keywords: Cardiovascular diseases / rehabilitation; patient compliance; treatment outcome; patient participation; questionnaires.

Introduction

Cardiovascular diseases are the leading cause of death worldwide, in addition to significantly contributing with high morbidity rates[1] and high governmental health costs[2]. Cardiac Rehabilitation (CR) – a multidisciplinary treatment program that focus on secondary prevention[3] – effectively decreases cardiac risk, significantly reduces the recurrence of cardiac events, increases the quality of life of patients[4] and reduces mortality by 25%[5]. Although these benefits are known, cardiac rehabilitation is not widely used, with patient participation ranging between 7.5% and 29%[6-7] with low adherence and dropout rates ranging between 40% and 55%[8-9].

The reasons for the low participation and adherence to CR programs are described in the literature as barriers and may have personal (patient), professional (multidisciplinary team) or public

(system) features[10,11]. Among them we can mention: the process of referral to CR programs[11-14], patients' psychosocial and personal factors[10,13,15], logistic factors[16], patients' perception[10,15], sex[10,16-18], age[10,16,19,20], functional status and associated comorbidities[10,21], socioeconomic level[10,21] and smoking[10,22].

Brazil has a peculiar health system, of which cardiac rehabilitation programs may be public or private. The fact that this feature is different from countries where barriers to CR were studied, associated with lack of knowledge in the area, makes it necessary to have instruments to assess barriers, allowing better planning of programs, improvement of clinical training and increase participation and adherence of patients.

A literature search showed three scales (psychometrically validated) that evaluate barriers both in participation and adherence to CR: an English one (Beliefs on Cardiac Rehabilitation)[23], an Australian one (CREO - Cardiac Rehabilitation Enrollment Obstacles)[24] and a Canadian one (CRBS - Cardiac Rehabilitation Barriers Scale)[25]. The scale that assesses the beliefs[23] incorporates only some barriers identified by the literature and is applied only to adherence, and not to participation in CR. The scale that assesses the obstacles[24], in addition to having low validity, was tested with a sample of patients after percutaneous coronary

intervention, and therefore its use in other groups of patients with coronary disease has not been tested and is not known.

The Cardiac Rehabilitation Barriers Scale (CRBS) was developed in Canada and validated in two languages (English[25] and French[26]), in order to assess the barriers to participation and adherence to CR programs in relation to the patient, healthcare professional and health system factors. The CRBS can be used to assess the reasons why patients with heart problems do not to use RC, even when such treatment is indicated by health professionals[25].

The aim of this study was to translate, culturally adapt and validate the CRBS to Brazilian Portuguese.

Methods

Participants

The participants were patients of both sexes, with any disease/comorbidity that required cardiac rehabilitation treatment, who participated or not in these programs. The following exclusion criteria were used in the study: 1) age younger than 18 years; 2) illiterate individuals; 3) any visual, cognitive or psychiatric condition that would prevent the individual from answering the instrument.

Data were collected between March and June 2011 and patients were selected from cardiac rehabilitation programs and outpatient clinics, both public and private, in the metropolitan region of the city of Florianópolis, state of Santa Catarina, Brazil. The instrument was applied through monitored self-administration. The researchers maintained a neutral stance during the administration, answering questions about the research and encouraging participants to answer all questions.

Participants were categorized according to gender, age, health status (diagnosis, associated comorbidities, acute events and surgical procedures performed), educational level and type of treatment (cardiac rehabilitation and outpatient clinic, public and private). The characteristics were collected after patients had given their consent, through their medical records.

The research was carried out according to the standards required by the Declaration of Helsinki and was approved by the Ethics and Research Committee of Instituto de Cardiologia de Santa Catarina (#020/2011), in accordance with CNS Resolution #196/96. All subjects were informed about the research objectives, data confidentiality and signed the free and informed consent form.

Cardiac Rehabilitation Barriers Scale (CRBS)

The CRBS assesses patients' perception of barriers in relation to the personal level (patient), professional (healthcare professional) and institutional (system) that affect participation and adherence to CR programs. One example of the patient's level is the item: "Because I find exercise tiring or painful"; of the professional level: "Because my doctor did not feel it was necessary", and of the system level: "Because I think I was referred, but the rehab program didn't contact me". The scale can be applied to patients in outpatient consultations, to inpatients or those participating in CR programs.

The scale is based on a pilot study that resulted in a revised version with 21 items, psychometrically validated by Shanmugasegaram e cols. [25] in English. The items are divided into four subscales, each related to a group of barriers: perceived needs / health care factors (9 items), logistic factors (5 items), conflicts with work schedule/time (3 items), and comorbidities/functional status (4 items)[25].

Participants in studies involving the CRBS are asked to rate their level of agreement with the items through a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. High scores indicate strong barriers to the participation or adherence to CR programs[25].

Translation and cultural adaptation

The initial process - translation and cultural adaptation - was carried out to provide the CRBS for the Brazilian population, as equivalent to cultural differences. This step of the translation of the scale from English to Portuguese followed strict norms approved by the author and was based on the protocol proposed by Guillemin et al[27]: initial translation, back translation and review by a committee of experts.

The initial translation of the scale (in English) to the target language (Brazilian Portuguese) was performed by two independent health professionals, both fluent in English, whose mother tongue is Brazilian Portuguese. The translators were aware of the objectives and concepts underlying the study and sought to detect ambiguities and unexpected meanings in the original items.

After the two translations had been performed, the researchers met to create the first version of the instrument. In the second phase, the first version was retranslated into English by a native translator, blinded to the initial objectives of the study and the original version, generating the second version. After this process, an evaluation committee, consisting of bilingual researchers in the field, evaluated the second version and the original instrument in order to verify the semantic, idiomatic, cultural and conceptual equivalence. Through this process the third version was created and submitted to the next stage of validation, being applied to study participants.

Psychometric Validation

The SPSS - Statistical Package for Social Sciences - release 17.0 was used for storing, sorting and analyzing data. The level of significance for all tests was set at 0.05. When more than 20% of the items were not completed by the participant, their data were excluded from the analysis.

Psychometric analyses were performed to assess the validity (of the construct and the criterion), the internal consistency and reliability of the Brazilian Portuguese version of CRBS.

The construct validity was assessed through exploratory factorial analysis. Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests were performed to indicate the degree of susceptibility data to factorial analysis. The factor extraction was performed using the method of main components, considering only those with eigenvalues greater than 1.0. After the factors were selected, a correlation matrix was generated using the method of varimax rotation with Kaiser normalization, which

Original Article

showed the relationships between items and factors, by means of factorial loads, considering those > 0.3[28,29].

To estimate the internal consistency, Cronbach's alpha of the scale and subscales was calculated. In this analysis, Alpha values greater than 0.60 were considered acceptable, reflecting the correlation of the items among themselves and with the total score of [28,29].

Reliability was assessed using the intraclass correlation coefficient (ICC) using a test-retest with an interval of two and a half months between applications in 17 study participants.

To assess the criterion validity of the CRBS, *t* tests verified differences between the means of the total scores of the scale and subscales in cardiac rehabilitation participants and nonparticipants.

To verify the results of applying the scale in relation to patient characteristics (gender, age, health status and educational level) we used one-way analysis of variance and chi-square test, after confirming the normal distribution of data (p> 0.1) using the Kolmogorov-Smirnov test[28,29].

Results

Characteristics of the participants

The sample comprised 173 patients, of which 48 were women. Regarding treatment, 139 were participants in cardiac rehabilitation programs and 34 were outpatients. Age ranged from 38 to 85 years (mean = 63.01, SD = 9.5). In relation to health status, 50.9% had a diagnosis of coronary artery disease (CAD), 31.2% had had a previous acute myocardial infarction (AMI) and 28.9% had undergone Percutaneous Coronary Angioplasty Procedure (PTCA) .

Regarding the degree of schooling, it was observed that the majority of the sample had finished College/University (54.3%). When evaluated regarding the treatments, 65.4% of the patients undergoing cardiac rehabilitation have a university degree and 58.8% of the outpatients had only elementary education.

The questionnaire took between 15 and 20 minutes to be completed and the characteristics of participants are shown in Table 1.

Table 1 – Participants' characteristics

Characteristic	Category	CharacteristicSample (n = 173)		Rehabilitation (n = 139)		Ambulatory (n = 34)	
		n	%(total)	n	%(total)	n	%(total)
Gender	Male	125	72.3%	107	76.9%	18	52.9%
	Female	48	27.7%	32	23%	16	45%
Health status*	CAD	88	50.9%	88	63.3%	0	-
	AMI	54	31.2%	47	33.8%	7	20.6%
	CHF	7	4%	3	2.1%	4	11.8%
	SAH	77	44.5%	63	45.3%	14	41.2%
	DM	44	25.4%	39	28%	5	14.7%
	Dyslipidemia	46	26.6%	44	31.6%	2	5.9%
	Arrhythmias	20	11.6%	10	7.2%	10	29.4%
	COPD	2	1.2%	2	1.4%	0	-
	PVD	6	3.5%	6	4.3%	0	-
	Obesity	10	5.8%	9	6.5%	1	2.9%
	Angioplasty	50	28.9%	47	33.8%	3	8.8%
	MR	34	19.7%	29	20.9%	5	14.7%
Degree of schooling	Illiterate	7	4%	1	0.7%	6	17.6%
	Incomplete Grade School	26	15%	6	4.3%	20	58.8%
	Complete Grade School	6	3.5%	2	1.4%	4	11.8%
	Incomplete High School	4	2.3%	4	2.9%	0	-
	Complete High School	29	16.8%	28	20.1%	1	2.9%
	Incomplete College/ University	7	4%	7	5%	0	-
	Complete College/ University	94	54.3%	91	65.4%	3	8.8%

*CAD - Coronary Artery Disease; AMI - Acute Myocardial Infarction; CHF - Congestive Heart Failure; SAH - Systemic Arterial Hypertension; DM - Diabetes Mellitus; COPD - Chronic Obstructive Pulmonary Disease; PVD - Peripheral Vascular Disease; MR - Myocardial Revascularization .

Translation and cultural adaptation

During the process of translation and cultural adaptation, it was observed that all questions could be used for the Brazilian context, and the Portuguese version of the CRBS also consisted of 21 items. Table 2 shows the items of CRBS translated into Portuguese.

Psychometric Validation

Construct validity was assessed by means of exploratory factorial analysis. The significance values of Bartlett's Sphericity (< 0.0001) and KMO (0.845) tests were appropriate for the use of factorial analysis in data processing. Through varimax rotation with Kaiser normalization, five factors were obtained, extracted by the method of main components. These factors, considered together, account for 63% of the total variance and factor 1 is responsible for 36% of the variance. All factors were defined by items and three were considered internally consistent (Cronbach's alpha > 0.6)[28]. The first factor reflects items related to comorbidities and functional status (Alpha = 0.876). The second factor includes items related to perceived needs (Alpha = 0.812). The third factor reflects personal and family problems (Alpha = 0.625). The fourth factor refers to items that address travel and conflicts with work schedule (Alpha = 0.554). The fifth and last factor corresponds to the items related to access (Alpha = 0.567).

Table 3 shows the factor loading of each question in the five raised factors, whereas factor loadings < 0.3 are not significant[28].

Cronbach's alpha was also used to estimate the internal consistency of the instrument, and value was calculated at 0.88.

The intraclass correlation coefficient (ICC) was extracted to assess the reliability of the instrument in Brazilian Portuguese, through test-retest, with a two and a half-month interval between applications on 17 study participants. The ICC found was 0.68.

Criterion validity was assessed through the differences between the means of the total scores of the scale and subscales between cardiac rehabilitation participants and nonparticipants. Regarding the means of the total scores, the barriers to cardiac rehabilitation were significantly higher among outpatients than among patients already in CR (p < 0.001), as expected[13,14,16,25]. Furthermore, outpatients had statistically higher mean scores (p < 0.001) in four of the five factors of CRBS in Portuguese (comorbidities/functional status, perceived needs, family/personal problems, travel/conflicts with work schedule), when compared with the CR group. These results are shown in Table 4.

When the means of the items are analyzed according to the groups (patients in cardiac rehabilitation and outpatient treatment), there were significant differences in all items, and

Table 2 – CRBS Items in Brazilian Portuguese

Items	I do not attend a cardiac rehabilitation program, or if I do attend, I missed some sessions because:
1	of the distance (e.g., the program is located too far from where I live);
2	of the cost (e.g., gas, parking, bus tickets);
3	of transportation problems (e.g., I do not drive, I have nobody to drive me and public transportation is inaccessible or deficient);
4	of family responsibilities (e.g., I have to take care of grandchildren, children, spouse, housework);
5	I didn't know about cardiac rehab (e.g., doctor didn't tell me about it)
6	I don't need cardiac rehab (e.g., feel well, heart problem treated, not serious);
7	I already exercise at home, or in my community;
8	bad weather;
9	I find exercise tiring or painful;
10	travel (e.g., holidays, business);
11	I have little free time (e.g., too busy, inconvenient rehabilitation time);
12	of work responsibilities;
13	I don't have the energy;
14	other health problems prevent me from going (specify:_____)
15	I am too old;
16	my doctor did not feel it was necessary;
17	many people with heart problems don't go, and they are fine;
18	I can manage my heart problem on my own;
19	I think I was referred, but the rehab program didn't contact me;
20	it took too long to get referred and start the program;
21	I prefer to take care of my health alone, not in a group;
22	Other reason (s) for not attending a cardiac rehabilitation program:

Original Article

Table 3 – **Factorial structure of the instrument**

Itens	Factor 1 Comorbidities/ functional status	Factor 2 Perceived Needs	Factor 3 Personal / family problems	Factor 4 Travel/ work appointments	Factor 5 Access
			Components		
9	.843				
15	.795				
13	.793				
21	.777				
14	.721				
17	.530				
8	.360				
5		.810			
6		.705			
16		.675			
3		.644			
11		.638			
4			.723		
7			.625		
18			.592		
12				.793	
10				.792	
2					.638
1					.494
19					-.474
20					-.337

Table 4 – **Validity of Criterion of CRBS in Brazilian Portuguese (n = 173)**

	Cardiac Rehabilitation (n = 139)		Ambulatory (n = 34)		p
	Mean	SD	Mean	SD	
Scores Totals	1.29	0.27	2.36	0.50	<0,001
Factor 1	1.40	0.56	2.98	1.12	<0,001
Factor 2	1.33	0.30	3.30	0.89	<0,001
Factor 3	0.89	0.21	1.49	0.65	<0,001
Factor 4	0.95	0.42	1.48	0.66	<0,001
Factor 5	0.83	0.47	0.67	0.29	0,06

SD - Standard deviation.

the group of patients undergoing outpatient treatment had the highest means (or, as described, the biggest barriers). Table 5 shows the results of the means of the scores of each item in the overall sample and in the groups.

Regarding the characteristics of the participants according to the means of the total scores, there were significant differences between the categories of age (p = 0.01), schooling (p < 0.001) and sex (p < 0.001). The elderly had significantly higher barriers than younger individuals. Patients with low levels of education also had higher barriers to participate in CR. Women had significantly lower barriers than men, which may be related to the low perception of their health status as shown in certain studies[17,18].

Table 5 – **Mean of scores of each item, in the general sample and in the groups**

Items	General (n = 173)	Cardiac Rehabilitation (n = 139)	Ambulatory (n = 34)	p*
	Mean (SD)	Mean (SD)	Mean (SD)	
1	1.80(1.4)	1.45(1.1)	3.21(1.7)	0.00
2	2.24(1.5)	2.15(1.4)	2.59(1.7)	0.00
3	1.47(1.1)	1.07(0.3)	3.12(1.7)	0.00
4	1.45(0.9)	1.34(0.9)	1.91(1.2)	0.00
5	1.69(1.4)	1.17(0.7)	3.79(1.6)	0.00
6	1.31(0.8)	1.02(0.1)	2.47(1.2)	0.00
7	1.22(0.6)	1.05(0.3)	1.91(1.2)	0.00
8	1.23(0.6)	1.13(0.5)	1.62(0.7)	0.00
9	1.65(1.2)	1.35(0.9)	2.88(1.6)	0.00
10	2.24(1.3)	2.42(1.4)	1.50(0.5)	0.00
11	1.45(0.9)	1.28(0.7)	2.15(1.2)	0.00
12	1.76(1.2)	1.74(1.2)	1.85(1.2)	0.00
13	1.57(1.2)	1.19(0.7)	3.12(1.5)	0.00
14	1.56(1.1)	1.24(0.8)	2.88(1.5)	0.00
15	1.23(0.5)	1.07(0.2)	1.88(1.0)	0.00
16	1.60(1.3)	1.06(0.4)	3.76(1.4)	0.00
17	1.29(0.6)	1.13(0.4)	1.94(1.0)	0.00
18	1.32(0.8)	1.08(0.3)	2.29(1.3)	0.00
19	1.07(0.4)	1.00(0.0)	1.35(0.9)	0.00
20	1.08(0.4)	1.04(0.3)	1.24(0.7)	0.03
21	1.27(0.8)	1.05(0.2)	2.18(1.5)	0.00

SD - Standard deviation. * p - comparison between means of patients in cardiac rehabilitation and ambulatory treatment.

Discussion

The process of translation and validation of an instrument in the health area requires a greater effort than simply idiomatic and semantic analysis. It is necessary to adapt the language from the cultural and conceptual points of view, aiming at bringing it as close as possible to the reality of the target population[30]. In Brazil, particularly, regional, social and cultural differences make this task somewhat even more difficult[31]. These aspects were all considered in this study.

This study sought to validate the CRBS scale assessing barriers to participation and adherence to cardiac rehabilitation programs, on multiple levels, and can be applied to subjects participating in these programs or not. The factorial analysis revealed five factors, called comorbidities/functional status, perceived needs, personal/family problems, travel/ conflicts with work schedule and access. All factors were defined by items and three were considered internally consistent (Cronbach's alpha > 0.6)[28]. The scale scores were significantly related to participation or not in CR programs, so that the criterion validity was established. Finally, the instrument's internal consistency was established (alpha = 0.88) and instrument reliability was verified by test-retest.

In addition to the Portuguese language, the CRBS has been validated in English (original validation[25]) and translated into French and Punjabi. However, this was the first study in which the scale was applied outside Canada and, in addition to being translated and psychometrically validated, the instrument was adapted to the Brazilian culture.

The results of this study are consistent with those presented in the original validation[25], particularly in relation to the number of items (21 in each version) and criterion validity (the biggest barriers cited by those not participating in CR). Also, the reliability of the CRBS in English was demonstrated by an ICC of 0.64.

The original validation[25] had four factors (perceived needs / health care factors, logistic factors, conflicts with work schedule/ time and comorbidities / functional status). However in our study five factors were identified, which were described earlier. The difference between the number of factors may be associated with different realities between the countries where the original validation (Canada) and the Brazilian Portuguese one (Brazil) were performed. According to Daly et al[10], the social environment, the traditions, mean and sociodemographic variables of each region and their health

Original Article

systems can modify the identification and organization of the barriers to participation and adherence to CR programs. In this study, although two factors are not considered internally consistent, the solution of five factors was considered adequate, as it showed greater internal consistency among the items.

When validating the CRBS in Portuguese, the factor "comorbidities and functional status" had a greater number of items (n = 7) compared to the original instrument. Studies show that patients with more comorbidities and lower functional status are less likely to participate in CR[21,32], particularly when they generate high costs for hospitals and health systems[33]. The factor "access" was created to supply certain items of logistic factors encompassing the barriers of public character (system). The factor "personal and family problems" was created to encompass factors directed at family and personal matters, such as the item "Because I can manage my heart problem on my own." The factor "perceived needs" was differentiated from the original instrument's "perceived needs/healthcare factors", with the healthcare items distributed in the factor "comorbidities and functional status." Also differentiated was the factor "travel and conflicts with work schedule," called in the original instrument of "conflicts of work schedule/ time."

Regarding the characteristics of the participants, we observed differences between the means of scores by gender, age and educational level. Although the participated less often in CR programs, overall women have a low perception of barriers to participate in these programs, when compared to men[17,18]. Moreover, the nature of their barriers differs, especially among non-participants[17]. Regarding age, the fact that elderly patients are less aware of the benefits of CR and have other complaints and comorbidities result in more barriers to the treatment[19,20]. The level of schooling - characterizing the socioeconomic level in this study – showed to be related to participation in CR programs, as described in other studies. Individuals with higher levels of education had lower mean scores and higher participation in CR programs[10,34].

One of the consequences of using CRBS in research, although its construction and validation have research purposes, is its use for clinical and political purposes, as described in the original validation[25]. The use of this scale may facilitate the identification of barriers between different regions and different health organizations, and works as a "dairy", describing different barriers in different stages of patient care.

The limitations of this study are related mainly to the characteristics of the studied population: higher number of patients in cardiac rehabilitation programs and higher degree of schooling. Another point is the fact that patients were reporting barriers not only of a personal level, but at the professional and system levels, which can generate errors. Also, when they are evaluated, it is important to describe at what stage of treatment the patients are, in order to identify the period in which barriers are acquired. As in the original instrument, this study was conducted in a specific region (southern Brazil) and these results generalize only patients from this area and it is necessary to perform further studies in other regions of the country.

Although the objective of this study is the validation of the instrument into Brazilian Portuguese, future researches are suggested in order to compare the barriers to participation and adherence to CR programs with different socioeconomic levels and stages of treatment.

Conclusions

Although there are other scales to assess barriers to participation and adherence to CR programs, the CRBS is the first that evaluates these barriers at multiple levels (personal, professional and public) in participants and nonparticipants of these programs. The results presented here indicate that the CRBS in Brazilian Portuguese has adequate indices of reliability and validity. Its use allows the identification of barriers that can be used to establish strategies to increase participation and adherence to CR programs, focusing on the actual needs of patients.

To access the instrument and obtain more information, visit the electronic address: http://www.yorku.ca/sgrace/crbarriersscale.html.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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Original Article

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