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Translation and Validation of the Walking Impairment Questionnaire in Brazilian Subjects with Intermittent Claudication

Raphael Mendes Ritti-Dias[1], Luis Alberto Gobbo[1], Gabriel Grizzo Cucato[2], Nelson Wolosker[3], Wilson Jacob Filho[3], José Maria Santarém[3], Celso Ricardo Fernandes Carvalho[3], Cláudia Lúcia de Moraes Forjaz[2], Maria de Fátima Nunes Marucci[1]

Faculdade de Saúde Pública - USP[1], Escola de Educação Física e Esporte - USP[2], Faculdade de Medicina - USP[3], São Paulo, SP - Brazil

Summary

Background: The Walking Impairment Questionnaire (WIQ) has been used to evaluate walking impairment in subjects with intermittent claudication (IC). However, this questionnaire has yet to be translated to Brazilian Portuguese, which limits its use in Brazilian subjects.

Objective: To translate and analyze the validity and reliability of WIQ in Brazilian subjects with IC.

Methods: Forty-two patients with IC, determined by the ankle-brachial index < 0.90, participated in the study. After translation and re-translation, carried out by two independent translators, the construct validity of the WIQ was analyzed by correlating the WIQ scores with the Medical Outcome Study Questionnaire Short Form 36 (SF-36) scores and the physical fitness performance (treadmill and strength tests). The reliability was analyzed with a 7-day interval between two questionnaire applications.

Results: Significant correlations between the WIQ domains and the SF-36 (functional capacity, physical aspects, bodily pain and emotional aspects) and physical fitness performance (treadmill and strength tests) were observed. Moreover, the intraclass coefficient correlation ranged from 0.72 to 0.81, and there were no differences in WIQ scores between the two questionnaire applications.

Conclusion: The Brazilian Portuguese version of the WIQ is valid and reliable to be used in Brazilian subjects with IC. (Arq Bras Cardiol 2009;92(2):136-142)

Key Words: Intermittent claudication; validation studies; exercise tolerance; mobility limitation.

Introduction

The intermittent claudication (IC), one of the most common symptoms of peripheral arterial disease, is characterized by pain, spasm or numbness in the lower limbs that occur during the practice of physical activity and that cease with rest[1]. Consequently, individuals with IC present intolerance to physical exercise[2].

The measurement of the walking capacity has been largely used to characterize the functional limitation caused by the disease and to analyze the effect of intervention programs. In order to do that, several continuous and progressive walking protocols[3,4], specific for this population, can be used. However, the performance of walking tests generally involves the use of ergometers, higher operational costs and the need for follow-up by a specialized professional (considering that it is a maximal test in an at-risk population), which limits its use in a population scale.

Considering these difficulties, the Walking Impairment Questionnaire (WIQ)[5] has been used, alone or in combination with walking tests, to obtain information on the ambulation capacity of individuals with IC. This questionnaire addresses aspects regarding the last month and consists of three domains: distance (distances that the individual can walk), velocity (velocity at which the individual can walk) and stairs (number of stairs an individual can climb).

Although the WIQ has been validated in other languages[6,7], this questionnaire has not been translated to Brazilian Portuguese, which limits its use in Brazilian subjects. Thus, the objective of the present study was to translate and verify the validity and reliability of the WIQ in a Brazilian sample.

Methods

Sample

A total of 42 individuals of both sexes, with IC symptoms for more than six months, voluntarily participated in the study. The inclusion criteria were: individuals with stage II of peripheral artery disease, according to Fontaine's criteria[8] and being able to walk for at least two minutes at a velocity of 3.2 km/h. Individuals that had undergone revascularization surgery or angioplasty less than one year before and were

able to walk more than 20 minutes, uninterruptedly, were excluded from the study.

The individuals were questioned regarding the habit of smoking and associated diseases. Smoking was identified as the current habit of smoking cigarettes, cigars or a pipe. The presence of systemic arterial hypertension was identified by systolic arterial pressure values $\geq$ 140 mmHg and/or diastolic arterial pressure values $\geq$ 90 mmHg, or with a previous diagnosis and use of anti-hypertensive drugs[9]. Diabetes mellitus was defined as fasting glycemia values $\geq$ 126 mg/dl, or with a previous diagnosis and use of medication for the treatment of diabetes[10]. The presence of cardiopathy was determined by the history of myocardial infarction, coronary ischemia, angina or coronary revascularization.

According to the decree 196, established by the National Health Council, all individuals were appropriately informed about the objectives and procedures of the study and, subsequently, those who agreed to participate in the study signed the Free and Informed Consent Form. The present study was approved by the Ethics Committee in Research with Human Beings of the institution where it was developed, process #1370 on December 14, 2005.

Translation of the WIQ

The translation of the WIQ was carried out by a qualified professional, specialist in translations, whose native language is Brazilian Portuguese, fluent in English and experienced in the translation of manuscripts in the medical area. The translator was informed about the proposal of the study and the target-population to whom the questionnaire would be applied. Additionally, the translator was advised to carry out a semantic translation and not just a literal one, as well as to use words that would cause the same impact in our cultural context, aiming at the reproduction of the same emotional response.

After the translation of the questionnaire, the test phase was carried out, which evaluated the comprehension of the questionnaire by the individuals with IC. In order to do that, an additional sample (that did not participate in the process of validation and reliability), consisting of 50 individuals with IC, was selected. At this phase, the individuals with IC were asked to comment on questionnaire questions, pointing out difficulties and suggesting terms that would be easier to understand. Taking into account the suggestions made by the individuals, the questionnaire was then re-analyzed by a healthcare professional, who made small alterations with the objective of improving the questionnaire comprehension.

After the alterations, the questionnaire underwent back-translation to English by a different bilingual translator who, similarly to the first one, was also a qualified professional, specialist in translations, whose native language is Brazilian Portuguese, fluent in English and experienced in the translation of manuscripts in the medical area both in Portuguese and English languages. It is important to mention that the translator in charge of the back-translation was blinded to the original English version of the WIQ.

The translated and back-translated versions were then appraised by the authors, through the comparison with the original text for the correction of discrepancies and creation of a consensus version. In order to create this version, we were careful to preserve the semantic equivalencies (words with the same meaning) and idiomatic ones (equivalent slang and colloquial expressions), presenting a simple and direct vocabulary (Appendix 1).

Validation of the WIQ

To analyze the validity of the construct, the data obtained in the three domains of the WIQ (distance, velocity and stairs) were compared with the data obtained with the Medical Outcome Study Short-Form 36 (SF-36) questionnaire, and with the performance at the maximal strength and walking tests.

The data from the WIQ were obtained through interviews, carried out by a single examiner. The scores were calculated for each domain of the WIQ, which varied from 0-100, with 0 score representing incapacity and 100 representing full capacity.

The SF-36 data were obtained through interviews, carried out by a single examiner. The scores were calculated for each one of the SF domains (functional capacity, physical aspects, pain, general health status, vitality, social aspects, emotional aspects and mental health), which varied from 0-100, with zero corresponding to the worst health status and 100 representing the best health status.

The stress test was carried out through a maximal ergospirometric test on a treadmill (Inbrasport, ATL model). The stratified protocol was used for the test, which is specific for individuals with IC, with a constant velocity of 3.2 km/h and increased by 2 degrees of inclination every two minutes until the patient reached exhaustion[11].

During the test, oxygen consumption was continuously measured at every respiratory cycle by a computerized gas analyzer (MGC – CP2D). The peak oxygen consumption (VO_2 peak) was established as the highest value obtained during the stress test in 60-second means. The individual was instructed to report the moment when the pain started in the lower limb, that is, the claudication distance (distance at which the patient first experiences pain with exertion) (CD). The maximum walking distance (MWD) was also recorded.

Muscular strength was measured using the one repetition maximum test (1-RM). The 1-RM test was carried out unilaterally during the knee extension exercise in both limbs. The test session started with the warming-up (10 repetitions), with approximately 50% of the estimated load for the first attempt at the 1-RM test. The individuals had to perform the knee extension movement until they reached a mark that corresponded to 85º of range of movement. This procedure was repeated until the load corresponding to 1-RM had been determined.

For the data analysis, strength was classified according to the severity of the disease in each leg. Thus, the strength in the leg with the lower ankle-brachial index (ABI) and with the higher ABI was analyzed separately.

Reliability of the WIQ

To analyze the reliability of the WIQ, a sub-sample, consisting of 21 individuals, was interviewed at two different moments: moment 1 and moment 2, with a seven-day

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interval. The interviews were carried out by the same examiner at both moments.

Statistical analysis

The analysis of the association between the three domains of the WIQ and the eight domains of the SF-36, the CD and the MWD, the VO_2 peak and the maximal strength was carried out using Spearman's coefficient of correlation.

The intraclass coefficient of correlation was used to verify the correlation between WIQ scores at moment 1 and 2. Wilcoxon's test was used to verify the existence of differences the scores in the three domains of the WIQ between moments 1 and 2.

The level of significance was set at $p < 0.05$.

Results

Table 1 shows the general characteristics of the sample. The majority of the sample consisted of male overweight, non-smokers, hypertensive, non-diabetic and non-cardiopathic individuals.

Table 2 shows Spearman's coefficients of correlation between the three domains of the WIQ and the domains of the SF-36. The three domains of the WIQ presented a significant correlation with the functional capacity and pain domains of the SF-36 (0.33 and 0.54). The velocity and stair domains of the WIQ also presented a significant correlation with the domains of physical (only for the stair domain) and the emotional aspects of the SF-36.

Table 3 shows the coefficients of correlation between the three WIQ domains and the stress test and maximal strength test variables. The three WIQ domains presented a significant correlation with CD, the VO_2 peak and the muscular strength of both limbs (0.32 to 0.47). The distance and stair domains also presented a significant correlation with the MWD (0.34 to 0.35).

Table 4 shows the data related to the reliability of the WIQ. Significant intraclass coefficients of correlation were observed between moments 1 and 2, which varied from 0.72 to 0.81 for the three WIQ domains. Additionally, no statistically significant difference was observed in the scores of the three WIQ domains between moments 1 and 2.

Discussion

The objective of the present study was to translate the WIQ into Brazilian Portuguese and verify its validity and reliability in a Brazilian sample. The results obtained indicated that the Brazilian Portuguese version of the WIQ presented validity and reliability in a sample of Brazilian individuals.

The WIQ, in its Spanish[6] and English[5] versions, has been largely used to assess the ambulation limitations in individuals with IC and have been validated in these languages[6,7]. However, this questionnaire has been scarcely used in Brazil, due to the inexistence of its Brazilian Portuguese version and the lack of validation in a national sample.

The translation of the WIQ presented some difficulties regarding the understanding of some questions, especially

Table 1 - Characteristics of the sample

Variables	
Age (yrs)	65.2 ± 8.3
Weight (kg)	72.5 ± 14.0
Height (cm)	161.5 ± 7.8
BMI (kg/m²)	27.8 ± 4.8
ABI	0.62 ± 0.12
Gender (% men)	69.0
Smoking (%)	23.8
Hypertension (%)	90.5
Diabetes (%)	40.5
Obesity (%)	31.0
Cardiopathy (%)	26.2

ABI - ankle-brachial index

Table 2 - Correlation between the three domains of the Walking Impairment Questionnaire (distance, velocity and stairs) and the domains of the SF-36 Medical Outcome Study Questionnaire (functional capacity, physical aspects, pain, general health status, vitality, social aspects, emotional aspects and mental health)

	Domains		
	Distance	**Velocity**	**Stairs**
Physical health			
Functional capacity	0.54*	0.50*	0.33*
Physical aspects	0.22	0.23	0.34*
Pain	0.40*	0.37*	0.34*
General health status	0.17	0.12	0.14
Vitality	0.02	0.13	0.08
Social aspects	0.11	0.25	0.06
Emotional health			
Emotional aspects	0.25	0.31*	0.32*
Mental health	0.09	0.28	0.02

* Significant correlation (p<0.05)

related to the fourth part, concerning the stair domain. The difficulties presented in the stair domain were related to the definition of the number of steps that corresponded to a "flight of stairs". About this subject, the authors of the original version of the questionnaire were contacted and they elucidated that point by stating that a "flight of stairs" corresponds to eight steps. Thus, to minimize the doubts and improve the comprehension of the questionnaire, the number of steps was added to each question of this section.

The validity of the translated version of the WIQ in a Brazilian sample was carried out by construct validity. The construct validity is present when a measurement is correlated with a variable according with the theory. For that purpose, two aspects are considered: the convergent validity and the discriminant validity[12]. The convergent validity refers to what

Table 3 - **Correlation between the three domains of the Walking Impairment Questionnaire (distance, velocity and stairs) and the physical aptitude variables (walking and strength)**

	Domains		
	Distance	**Velocity**	**Stairs**
Walking			
Claudication distance	0.43*	0.42*	0.31*
Maximum walking distance	0.34*	0.30	0.35*
VO$_2$ peak	0.40*	0.42*	0.33*
Strength			
Leg with lower ABI	0.32*	0.31*	0.47*
Leg with higher ABI	0.40*	0.40*	0.48*

Significant correlation (p<0.05); ABI= ankle-brachial index

Table 4 - **Intraclass correlation coefficient (ICC) and difference between the scores of the three domains of the Walking Impairment Questionnaire (distance, velocity ad stairs) at the first (moment 1) and second assessments (moment 2) (n=21).**

	Moment 1	**Moment 2**	*P*	**ICC**
Distance	39 ± 33	32±29	0.92	0.72
Velocity	39±21	41±20	0.10	0.80
Stairs	65±36	66±37	0.48	0.81

extent two tools that propose to carry out the measurement of the same construct present similar results. On the other hand, the discriminant validity refers to what extent two methods that measure different constructs do not present similar results.

Therefore, in the present study, the construct validity was determined by comparing the scores of the three domains of the WIQ with the SF-36 scores and the performance at the maximal strength and walking tests.

Thus, following the theoretical presupposed, it would be expected that the three WIQ domains presented a correlation with the domains related to physical health of the SF-36 and with the performance at the muscular strength and walking tests. On the other hand, it would be expected that the WIQ did not present a correlation with the domains concerning the emotional aspects, especially the mental health domain of the SF-36.

The results of the present study confirmed the convergent validity. A significant correlation between WIQ domains and the domains related to physical health of the SF-36 and the performance at the physical aptitude tests was observed.

Considering that one of the main consequences of the peripheral arterial disease is the decrease in the capacity to perform activities of daily living due to pain during the walking activity, it would be expected that the domains of functional capacity, physical aspects and pain of the SF-36 presented a correlation with the WIQ domains.

These results corroborate the results obtained by Collins et al[6] when validating the Spanish version of the WIQ, who observed that the highest coefficients of correlation between the WIQ and those of the SF-36 occurred with these three domains.

Similarly, the association between the WIQ and the performance at the walking test has been broadly verified in the literature[6,7,13]. This association shows that the WIQ can be used as a subjective indicative to predict the performance at the walking test in individuals with IC. On the other hand, no previous study tried to correlate muscular strength with the WIQ domains. The inclusion of the strength test was due to the existing association between the strength and the levels of routine physical activity[14] and the functional capacity, thus suggesting a convergence between these two variables[15]. The results found in the present study confirmed the association between muscular strength and the capacity of ambulation of individuals with IC, demonstrating that the lower-limb strength seems to have a direct influence on the capacity of ambulation of individuals with IC.

The lack of a significant correlation between the WIQ scores and the scores of the mental health domain of the SF-36 confirms the presupposed for the discriminant validity of the WIQ. However, a significant correlation was observed between the WIQ and the emotional aspect domain of the SF-36, which, at first, was not expected. Nevertheless, these results were also observed by other WIQ validation studies[6,7], suggesting that, somehow, the ambulation limitations are related to the emotional status of the individuals with IC. In fact, studies have suggested that the functional limitation of the individuals with IC is related to the occurrence of emotional problems, such as depression[16,17] and stress[18].

For the process of validation to be complete, the present study also aimed at analyzing the reliability of the WIQ in its three domains[19]. Intraclass coefficients of correlation that varied from 0.72 to 0.81 were observed. These results were similar to those found by Coyne et al[20], who observed coefficients of reliability that varied from 0.58 to 0.82.

Additionally, there was no difference between the mean scores in three domains of the WIQ between the first and the second assessments. These results suggest that the WIQ is reproducible and thus meets the criteria for tool validation.

The main limitation of the present study is the sample representativeness. As Brazil is a country of continental dimensions and its population has different characteristics, demographic-biological as well as sociocultural ones, it is possible that the version of the WIQ that was translated in this study is not valid for Brazilians from other regions. Thus, it is possible that, in order to use the WIQ in some regions, the cultural adaptation of the questionnaire might be necessary to improve its validity.

In conclusion, the WIQ presented validity and reliability in a Brazilian sample, after its translation into Brazilian Portuguese. These results suggest that the Brazilian Portuguese version of the WIQ can be used in Brazilian patients with IC.

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Appendix 1 - Walking Impairment Questionnaire

1. <u>WALKING IMPAIRMENT</u>: These questions ask about the reasons why you have difficulty walking. We would like to know how much difficulty you have walking because of each of these problems during the past month. By difficulty, we mean how hard it was or how much physical effort it takes to walk because of each of these problems.

Leg (Please Mark One) □ Right □ Left □ Both

A. PAD SPECIFIC QUESTIONS	Degree of Difficulty				
	None	Slight	Some	Much	Very
1. Pain, aching, or cramps in your calves? (or buttocks)	⊙	⊙	⊙	⊙	⊙

B. DIFFERENTIAL DIAGNOSIS	Degree of Difficulty				
	None	Slight	Some	Much	Very
1. Pain, stiffness, or aching in your joints (ankles, knees, or hips)?	⊙	⊙	⊙	⊙	⊙
2. Weakness in one or both of your legs?	⊙	⊙	⊙	⊙	⊙
3. Pain or discomfort in your chest?	⊙	⊙	⊙	⊙	⊙
4. Shortness of breath?	⊙	⊙	⊙	⊙	⊙
5. Heart Palpitations?	⊙	⊙	⊙	⊙	⊙
6. Other Problems? (Please List)	⊙	⊙	⊙	⊙	⊙

Patient ID# ☐☐☐☐

2. <u>WALKING DISTANCE</u>: Report the degree of physical difficulty that best describes how hard it is for you to walk on level ground without stopping to rest for <u>each</u> of the following distances:

	Degree of Difficulty				
	None	Slight	Some	Much	Unable
1. Walking indoors such as around your home?	⊙	⊙	⊙	⊙	⊙
2. Walking 50 feet?	⊙	⊙	⊙	⊙	⊙
3. Walking 150 feet? (1/2 block)?	⊙	⊙	⊙	⊙	⊙
4. Walking 300 feet? (1 block)?	⊙	⊙	⊙	⊙	⊙
5. Walking 600 feet? (2 blocks)?	⊙	⊙	⊙	⊙	⊙
6. Walking 900 feet? (3 blocks)?	⊙	⊙	⊙	⊙	⊙
7. Walking 1500 feet? (5 blocks)?	⊙	⊙	⊙	⊙	⊙

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3. WALKING SPEED: These questions refer to how fast you are able to walk one city block on level ground during the last month. Tell us the degree of physical difficulty required for you to walk at each of these speeds without stopping to rest.

	None	Slight	Some	Much	Unable
			Degree of Difficulty		
1. Walking 1 block slowly?	⊙	⊙	⊙	⊙	⊙
2. Walking 1 block at an average speed?	⊙	⊙	⊙	⊙	⊙
3. Walking 1 block quickly?	⊙	⊙	⊙	⊙	⊙
4. Running or jogging one block?	⊙	⊙	⊙	⊙	⊙

4. STAIR CLIMBING: These questions refer to how many flights of stairs you are able to climb. Tell us the degree of physical difficulty required for you to climb stairs for each of these questions without stopping to rest.

	None	Slight	Some	Much	Unable
			Degree of Difficulty		
1. Climbing 1 flight of stairs	⊙	⊙	⊙	⊙	⊙
2. Climbing 2 flights of stairs	⊙	⊙	⊙	⊙	⊙
3. Climbing 3 flights of stairs	⊙	⊙	⊙	⊙	⊙

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