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Original article

Translation and validation of the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) into Portuguese

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ABSTRACT

Objective: To translate and validate the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) into Brazilian Portuguese.

Methods: Certified translators translated and back-translated Quest. Content validity (CVI) was determined by 5 experts and, after the final version of B-Quest, a pre-test was applied to users of manual wheelchairs, walkers and crutches. The psychometric properties were tested to assure the validity of items and the reliability and stability of the scale.

Results: Data were obtained from 121 users of the above-mentioned devices. Our study showed a CVI of 91.66% and a satisfactory factor analysis referent to the two-dimensional structure of the instrument that ensured the representativeness of the items. The Cronbach's alpha of the items device, service and total score of B-Quest were 0.862, 0.717 and 0.826, respectively. Test-retest stability conducted after a time interval of 2 months was analyzed using Spearman's correlation test, which showed high correlation ($\rho > 0.6$) for most items.

Conclusion: The study suggests that the B-Quest is a reliable, representative, and valid instrument to measure the satisfaction of users of assistive technology in Brazil.

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Tradução e validação do Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) para o idioma português do Brasil

RESUMO

Objetivo: Traduzir e validar o Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) para o idioma Português do Brasil.

Métodos: Tradutores juramentados traduziram e retrotraduziram o Quest. A validade do conteúdo (IVC) foi determinada por cinco especialistas e, após a versão final do B-Quest, foi aplicado um pré-teste a usuários de cadeiras de rodas manuais, andadores e muletas. As propriedades psicométricas foram testadas como garantia da validade dos itens, confiabi-

Palavras-chave:

Estudos de validação

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Questionários

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lidade e estabilidade da escala.

Resultados: Foram obtidos dados de 121 usuários dos dispositivos mencionados. Nosso estudo demonstrou um IVC de 91,66% e uma análise de fatores satisfatória com referência à estrutura bidimensional do instrumento, o que assegurou a representatividade dos itens. Os coeficientes alfa de Cronbach dos itens “dispositivo”, “serviços” e “escore total” do B-Quest foram 0,862, 0,717 e 0,826, respectivamente. A estabilidade de teste-reteste, realizada após terem transcorrido dois meses, foi analisada com o uso do teste de correlação de Spearman, tendo sido demonstrada elevada correlação ($\rho > 0,6$) para a maioria dos itens. **Conclusão:** O estudo sugere que o B-Quest é um instrumento confiável, representativo e válido para a medição da satisfação de usuários de tecnologia assistiva no Brasil.

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Introduction

Satisfaction regarding the use of assistive technology is defined as a critical evaluation about the user concerning several aspects of a device. It is considered a multidimensional concept because it is influenced by expectations, perceptions, attitudes and personal values.¹ The abandonment of an assistive device is still common among users, particularly when it does not promote better quality of life.² This fact leads to high levels of social and economic loss, as it has been observed in studies conducted in developed countries with high investments in assistive technology.³⁻⁵

The successful use of these tools requires training, special skills and strategies,⁶ which has led to increased research in the area, making accessibility possible for people with disabilities. Measures adopted to evaluate the impact of a specific assistive device regarding the satisfaction of a disabled person must be flexible enough, suitable for use in a particular country, and developed within a cultural context.⁷

Cross-cultural equivalence is needed to use health assessment measures that have been developed and used in another language, making it unnecessary to create and validate another instrument to assess the condition of interest when there is a previously tested instrument.⁸

QUEST 2.0 was developed in English and French in Canada to evaluate user satisfaction with assistive technology in various aspects, justifying the need for the actual use of these devices.⁹ The translation of QUEST 2.0 into Brazilian Portuguese may assist rehabilitation professionals, researchers and managers of public and private services to analyze the cost-benefit, cost-effectiveness and cost-utility, favoring technical improvement, cost reduction and quality improvement of the services provided.

The overall goal of the present study was to validate and translate QUEST 2.0 into Brazilian Portuguese.

Methods

The authors of QUEST 2.0 authorized the validation and translation into Brazilian Portuguese. The study followed the international norms and was divided into five stages:¹⁰

Stage 1. The initial translation from English into Portuguese was conducted by two independent, certified translators and

with knowledge of the original language of the questionnaire, aware of the purpose of the study, and born in the country where the scale was being translated. The translations were compared, and the discrepancies were solved by consulting the translators generating version 1 of the two translations.

Stage 2. The back-translation was performed by two certified translators who had not had access to the original questionnaire, and who were native English speakers and fluent in Portuguese. After reaching a consensus, a 2nd version of the back-translations was obtained.

Stage 3. An expert committee composed of two physiotherapists, an occupational therapist, a speech therapist and a psychopedagogue, who all had experience of caring for people with disabilities and were fluent in both languages, received all the versions of the questionnaire and instructions for the application of the scale. Semantic, idiomatic and cultural equivalence was assessed by analyzing the consistency of the items, as well as the content validity index using the following formula:

$$CVI = \frac{\text{number of items evaluated as equivalents}}{\text{total of items of the scale}}$$

Stage 4. The pre-test was applied to a sample composed of 25 users of assistive devices at a rehabilitation center, who answered the questionnaires alone and were interviewed soon after to verify if they had understood the meaning of the questions. The mean time of the application of the questionnaire was 15 minutes. No respondents had any doubts.

After the qualitative assessment of the scale, all 12 items of the Brazilian version of Quebec User Evaluation of Satisfaction with Assistive Technology (B-QUEST) were kept and applied to a larger sample.

Stage 5. One hundred and twenty-one individuals were randomly selected from March to September 2012, of both sexes, aged between 18 and 80 years, users of manual wheelchairs, crutches and walkers for more than one month and less than five years. Eligibility criteria for inclusion were individuals who could read, write, and had good cognition to provide reliable answers when completing the questionnaire. The interviews were conducted at four public and four private sectors for healthcare services in the city of Aracaju, in the state of Sergipe. Individuals who had associated disorders that could prevent them from using the device properly or those who had abandoned use recently were excluded. All the

individuals were interviewed by a physiotherapist with experience in assistive technology services.

Each individual was personally contacted, informed about the study and invited to participate. Two dates for the evaluation were established (Time 1 and Time 2) with a two-month interval. The first evaluation was conducted on the same day they had been contacted at the rehabilitation centers. For the second interview, a previous phone call was made to the centers to confirm the presence of the individual. The questionnaire was applied during an individual interview with examiner and without any interference. An enlarged version of the scale showing the 5 degrees of satisfaction was used for better visualization of the scores.

The project was submitted to the Research Ethics Committee of Bahian School of Medicine and Public Health (Protocol No 127/2011), and every participant voluntarily signed the free and informed consent in accordance with Resolution 196/96 of CNS.

The first version of QUEST had 24 items, but the updated version (QUEST 2.0), which has better measurement properties, has 12 items, and in each area there is a scale from 0 to 5 to measure the degree of satisfaction. The first stage consists of 8 items related to the use of assistive technology (dimensions, weight, adjustments, safety, durability, ease of use, comfort, and efficacy), and the second stage consists of 4 items related to the provision of services (delivery process, repairs and technical assistance, professional services and follow-up). The questionnaire can be applied to adolescents, adults and seniors. Each item is scored using a 5-point scale ranging from 1 to 5, where: 1 (dissatisfied), 2 (somewhat satisfied), 3 (more or less satisfied), 4 (very satisfied), to 5 (totally satisfied). The examiner must record the number of invalid answers. The subscale scores of each domain are calculated by adding the valid answers and dividing the sum by the number of items for each subscale. The total score of the questionnaire is obtained by adding the scores of valid answers from 1 to 12 and dividing the sum by the number of valid items. Moreover, the questionnaire lists these 12 satisfaction items and prompts the user to choose the three most important items.¹¹

For the statistical analysis, the SPSS software – Statistical Package for Social Sciences –, version 19.0, was used. This study chose the analytic factor technique using the method of principal components and communalities to assess the validity of the composition of the domains of QUEST 2.0 with respect to the total scores. A factor is a construct, a non-observed variable, that is submitted to tests, scales or items in accordance with Pasquali (2009).¹²

The reliability or internal consistency of the items of the instrument were tested by Cronbach's coefficient alpha for each factor for each item removed and for the total score. For analysis of exactness during the application of the test-retest, Spearman's correlation was used, and a relationship between the first and the second application of the instrument was found. A psychometric theory of Nunnally (1978)¹³ recommends a minimum of 10 subjects for each existing item on a scale to validate a questionnaire.

With regard to the criterion of validity, the comparison with a gold standard questionnaire was not possible due to the lack of similar validated instruments in the country.

Results

The clinical and demographic characteristics of the participants are shown in Table 1. The length of time to complete a questionnaire was 10 to 15 minutes due to variation in the amount of spoken feedback of the users. The content validity index (validation of the judges) was 91.66%. The KMO test was applied to confirm if the data were good enough to perform factor analysis. The value considered relevant was 0.835. Thus, the validity of the instrument can be ensured by the factor analysis that indicates how the item represents the factor, i.e., it ensures that the items adequately represent what is being measured as described in Table 2.

The construct validity was well established and supported the adequacy measure emphasizing the dimensional structure according to Fig. 1. The factor load of the 12 items was well represented by the two constructs. It is important to mention that the only item in which a low load factor was observed was related to the delivery services. Among the items of the factor resource, all results were considered reliable with values above 0.800, none significantly exceeding the Cronbach's alpha factor. As for the factor services, excluding the item delivery service, Cronbach's alpha of the device increased from 0.717 to 0.774, a remarkable change in the improvement of internal consistency. These data are shown in Table 2.

The communalities, which also represent validity index, reveal a value below 0.6 in most items, except for the item ease of use that was of 0.65, representing good validity, as shown in Table 2. The factor resource was 37.28% of the explained variance, and factor service was 16.00%, totaling 53.28%. Based on the analysis of the main axis, the total explained variance per item was 44.84%. The data obtained after Spearman's correlation analysis to verify the exactness of the scale are shown in Table 3.

Discussion

The findings of this study show high content validity index that certifies the quality of the items to represent the concept measured. These data are in agreement with those found by Wessels et al.⁸ All items were considered easy to understand, and no item was added or removed showing that this is a possible universal instrument. The content validity of the

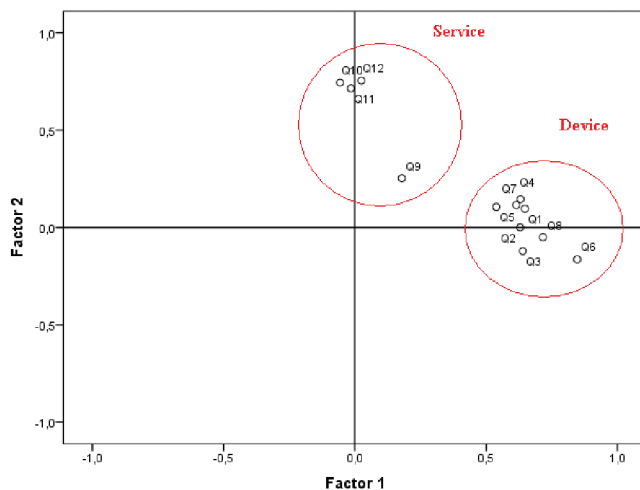
Table 1 – Sample characterization of users of assistive technology

	N=121	Frequency	Percentage
Gender	Men	74	61.2
	Women	47	38.8
Acquisition	SUS	55	45.5
	Private	66	54.5
Device	Walker	8	6.6
	Wheelchair	76	62.8
	Crotches	37	30.6
Sequelae	Neurological lesion	90	74.4
	Orthopedic lesion	31	25.6
Total		121	100.0

Table 2 – Factor analysis of the 12 items from QUEST 2.0

	KMO Sample adequacy measurement = 0.835	Factor load		Cronbach's alpha		Communalities
		1	2	1	2	
Sizes		0.648*	0.097	0.845		0.471
Weight		0.629*	0.000	0.847		0.396
Adjustments		0.639*	-0.121	0.852		0.372
Safety		0.614*	0.116	0.849		0.438
Durability		0.539*	0.106	0.853		0.339
Ease of use		0.847*	-0.163	0.834		0.652
Comfort		0.631*	0.145	0.843		0.480
Efficacy		0.716*	-0.050	0.841		0.492
Delivery process		0.179	0.253*		0.774	0.126
Repair and technical assistance		-0.056	0.744*		0.622	0.529
Professional service		-0.015	0.714*		0.616	0.503
Follow-up service		0.025	0.755*		0.562	0.583
Cronbach's alpha (total=0.826)				0.862	0.717	

*The values in bold indicate the items that belong to each device.

**Fig. 1 – Space of rotated factors**

*Components of each factor identified by individual factor load.

original study of QUEST 2.0 was provided by 12 international experts from the United States, Netherlands and Canada. As in the original study, the results of this study show that the scale items present important aspects of satisfaction with assistive technology.¹⁴

The target population was composed of heterogeneous groups, but representative of the population of users of assistive technology. It was found that the Brazilian version of QUEST 2.0 showed good levels of internal consistency, reliability and temporal stability. The existence of acceptable levels of validity regarding the construct was observed.

The Cronbach's alpha of the instrument was sensitive to capture the change in the values after each item was removed. The values found for the scale reliability were equivalent to validation studies conducted in other countries, such as Canada,⁹ Netherlands,⁸ China,¹⁵ and Taiwan.¹⁶ It is noteworthy that in all these studies, the factor services also showed low reliability values for the factor resource, yet the total value showed good internal consistency and indicated an acceptable level of reliability.

Table 3 – Spearman's test for evaluation of exactness

	r	Sig.
Sizes	0.706	p<0.01
Weight	0.698	p<0.01
Adjustments	0.543	p<0.01
Safety	0.793	p<0.01
Durability	0.597	p<0.01
Ease of use	0.658	p<0.01
Comfort	0.705	p<0.01
Efficacy	0.577	p<0.01
Delivery process	0.685	p<0.01
Repair/Maintenance	0.846	p<0.01
Professional service	0.672	p<0.01
Follow-up service	0.751	p<0.01

This evaluation tool proved to be sufficient to identify items related to resources and assistive technology services, with the exception of the item "delivery service" that showed low representativeness for this item in the construct. The original analysis tool also confirmed that the reliability of the item "delivery service" should be further tested, and it may be missing in the scale.¹ However, due to the need for a greater control of the situation, improvements in this service in Brazil, in addition to the fact that this item is an indicator of quality, it should be maintained in the Brazilian version of QUEST 2.0.

The psychometric properties of QUEST 2.0 that were tested on a specific group of individuals with multiple sclerosis, users of several devices, such as walkers, manual wheelchairs, electric wheelchairs and scooters, reinforce the relevance of the subscale resource as an important outcome measurement for users of assistive technology. It was found that the subscale service has not led to a significant impact, and the author also reinforces the need for further evaluation of this aspect.¹⁷

This aspect is also pointed out as significant in other countries, as found in studies conducted in the United States and Europe that discuss satisfaction of wheelchair and scooter users regarding the delivery services,^{18,19} respectively, and how this item affects the delivery service process, which interferes in the scores of the service subscales. With regard to the two-

dimensional structure, our study also identified results similar to those found by Demers et al.⁹ Additionally, cross-validation of the measurement conducted in the Netherlands,¹³ and studies conducted in China and Taiwan were also consistent in identifying the two factors on the instrument.^{15,16} Our result for factor analysis shows strong support for the adequacy and stability of the measurement of satisfaction. The item durability of the factor resource in this study also showed a median representativeness when compared with other items in the aforementioned studies.

The items "ease of use" in the first construct and "follow-up services" in the second are more appropriate representations for their respective constructs when they are compared with other items. The factor load and communalities show the representativeness of the item as well as reliability in Cronbach's alpha. These findings indicate that these items are representative, consistent and valid for this measurement.

The composition of the factors below 0.6 of the commonalities found in our study was similar to the original study, in which only the item adjustments showed a value of 0.658, higher than the one found in our study.¹¹ Thus, we chose to consider the validity of the items by the factor load because it best represented the construct.

The importance of an outcome measurement of user satisfaction with assistive technology refers to benefits to the professionals involved, both clinicians and researchers. Among the most significant clinical results, the following must be pointed out: satisfaction, clinical outcomes, functional status, quality of life, and cost.¹³ Moreover, the researchers share that experimentation is a key factor to adapt and improve resources, since each need is unique and must be carefully analyzed in an endeavor to contemplate and overcome perceived difficulties.²⁰

This aspect was examined in the study by Lancioni et al.,²¹ in which students with multiple disabilities were encouraged to choose and test microswitches connected to a computer system to access environmental stimuli providing autonomy within the educational context and a more focused engagement with their caregivers.

The prescription of assistive technology cannot be solely based on the technical opinion of the professional expert. The usability of the resource involves the promotion of a new situation experienced by the person with disabilities. It should therefore include the perception of the user who presents a series of adaptive responses dependent on several factors such as satisfaction with the act of doing, excellence in performing a certain activity, and the positive and negative experiences between the individual and the environment.²²

When assessing reliability, the test-retest that measured the association of the two observations made by the same individuals within a time interval showed a high correlation ($p > 0.6$) on most items, except for adjustments, durability, and efficacy, which showed a moderate concept between the time intervals. These data were equivalent after the scale was applied to the same individuals at different time intervals, assuring the stability of the measurement of satisfaction.

QUEST 2.0 can also be used in combination with other tools that evaluate outcome measurements as shown in a study with patients with degenerative disease, users of electronic aids to daily living (EADLs) through The Functional

Independent Measure (FIM instrument), Personal Profile and QUEST 2.0 at two time intervals. The results were satisfactory and remained stable over time, that is, the instrument can also be used in combination with other outcome measurements.²³

The similar correlation may be found in the validation study and reliability of the scale of computer task performance (PTCA) to assess children and young people with intellectual and developmental disabilities associated with the evaluation of teachers' satisfaction with the prescribed devices using QUEST 2.0.²⁴

Based on the above-mentioned causes, the results support the psychometric properties of the original scale showing the relevance of using a measurement of satisfaction for users of assistive technology (QUEST-B) in Brazil. The data found in this study may cause a technical impact on professionals involved in the field of assistive technology, providing a quantitative, valid and reliable analysis, but also it may improve the efficiency of services provided to this population by providing direct and satisfactory participation of the final consumer in the assessment and continuous use of the equipment.

This study was conducted in a single capital in the Brazilian Northeast (Aracaju), and this may result in small differences when the questionnaire is applied in other parts of the country, although no significant semantic differences are found in the instrument. Studies involving other states can be developed to increase the assurance of its immediate applicability in different cultural conditions. We recommended applying the instrument in clinical studies at a larger time interval to ensure the capability of B-QUEST 2.0 in a longitudinal evaluation.

From the above, the results of this research suggests that the B-Quest is a reliable instrument with valid and representative items to measure user satisfaction with assistive technology in relation to resources and services, particularly of users of manual wheelchairs, crutches and walkers, and patients with other pathologies in Brazil.

Conflicts of interest

The authors declare no conflicts of interest.

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Annex
Quebec User Evaluation of Satisfaction with Assistive Technology
B-QUEST (2.0)

Technological resource: _____
 User name: _____
 Date of evaluation _____

The goal of the QUEST questionnaire is to assess the degree of satisfaction with your assistive technology resource and related services that you used. The questionnaire consists of 12 items of satisfaction.

- For each of the 12 items, rate your satisfaction with the assistive technology resource and related services that you experienced, using the following scale from 1 to 5:

1	2	3	4	5
Dissatisfied	Somewhat satisfied	More or less satisfied	Very satisfied	Totally satisfied

- Circle or mark the number that best describes your level of satisfaction with each of the 12 items.
- Do not leave any question unanswered.
- In the case of any item with which you have not been “fully satisfied”, comment in the comments section.

Thanks for completing the QUEST questionnaire.

1	2	3	4	5
Dissatisfied	Somewhat satisfied	More or less satisfied	Very satisfied	Totally satisfied

ASSISTIVE TECHNOLOGY RESOURCE
 What is your level of satisfaction with:

1. The dimensions (size, height, length, width) of your assistive technology resource? Comments:	1	2	3	4	5
2. The weight of your assistive technology resource? Comments:	1	2	3	4	5
3. The ease of adjustment (fastening, buckling) the parts of your assistive technology resource? Comments:	1	2	3	4	5
4. The stability and safety of your assistive technology resource? Comments:	1	2	3	4	5
5. The durability (robustness and wear resistance) of your assistive technology resource? Comments:	1	2	3	4	5
6. The ease of use of your assistive technology resource? Comments:	1	2	3	4	5
7. The comfort of your assistive technology resource? Comments:	1	2	3	4	5

1	2	3	4	5			
Dissatisfied	Somewhat satisfied	More or less satisfied	Very satisfied	Totally satisfied			
ASSISTIVE TECHNOLOGY RESOURCE What is your level of satisfaction with: (continued)							
8. The efficacy of your assistive technology resource (the degree to which your resource suits your needs)? Comments:							
			1	2	3	4	5
SERVICES What is your level of satisfaction with:							
9. The delivery process (procedures, waiting time) by which you obtained your assistive technology resource? Comments:							
			1	2	3	4	5
10. Repairs and technical support (maintenance) provided for your assistive technology resource? Comments:							
			1	2	3	4	5
11. The quality of professional services (information, attention) that you received for the use of your assistive technology resource? Comments:							
			1	2	3	4	5
12. Follow-up services (continuous support services) received for your assistive technology resource? Comments:							
			1	2	3	4	5

- Next, we present a list with the same 12 satisfaction items. CHOOSE THE 3 ITEMS that you consider as the most important. Mark an X in 3 options of your choice.

- | | |
|---|---|
| 1) Dimensions <input type="checkbox"/> | 7) Comfort <input type="checkbox"/> |
| 2) Weight <input type="checkbox"/> | 8) Efficacy <input type="checkbox"/> |
| 3) Adjustments <input type="checkbox"/> | 9) Delivery process <input type="checkbox"/> |
| 4) Safety <input type="checkbox"/> | 10) Repairs and technical assistance <input type="checkbox"/> |
| 5) Durability <input type="checkbox"/> | 11) Professional services <input type="checkbox"/> |
| 6) Ease of use <input type="checkbox"/> | 12) Follow-up <input type="checkbox"/> |

B - QUEST
Score sheet

This page is intended to score your answers.

DO NOT WRITE ON THIS PAGE

• Number of invalid responses _____

• Subtotal score of **Resource** _____

In items 1-8, add the score of valid responses and divide this sum by the number of valid items in this scale.

• Subtotal score of **Services** _____

In items 9-12, add the score of valid responses and divide this sum by the number of valid items in this scale.

• QUEST Total _____

In items 1-12, add the score of valid responses and divide this sum by the number of valid items in this scale.

- The three most important items of satisfaction:

