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Cross-cultural adaptation of the Disability of Arm, Shoulder, and Hand questionnaire: Spanish for Puerto Rico Version

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Abstract

The purpose of this study was to perform a cross-cultural adaptation of the Disability of Arm, Shoulder, and Hand (DASH) questionnaire to Spanish for Puerto Rico. Five steps were followed for the cross-cultural adaptation: forward translations into Spanish for Puerto Rico, synthesis of the translations, back translations into English, revision by an expert committee, and field test of the prefinal version. Psychometric characteristics of reliability and construct validity were evaluated for the final version. Internal consistency of the final version was high (Cronbach's $\alpha = 0.97$) and item-to-total correlations were moderate (range from 0.44 to 0.85). Construct validity was evaluated by correlating the DASH with the scales of the Functional Assessment of Cancer Therapy - Breast. Fair to moderate correlations found in this study between the DASH and most scales of the Functional Assessment of Cancer Therapy - Breast support the construct validity of the Puerto Rico-Spanish DASH. The final version of the questionnaire was revised and approved by the Institute for Work and Health of Canada. Revisions to the original DASH English version are recommended. This version of the DASH is valid and reliable, and it can be used to evaluate outcomes in both clinical and research settings.

Keywords

cross-cultural adaptation; Disability of Arm; Shoulder; and Hand questionnaire; Puerto Rico; upper extremity evaluation

Introduction

A common problem when conducting rehabilitation research studies in Puerto Rico is the lack of measurement tools translated into Spanish and adapted for our culture. In particular, when conducting clinical trials examining upper extremity function, existing Spanish questionnaires such as the SF-36 and Functional Assessment of Cancer Therapy – Breast (FACT-B) have a limited number of items specific to this area. The Disability of the Arm, Shoulder, and Hand (DASH) questionnaire (Hudak *et al.*, 1996) is a reliable and valid measure used to evaluate upper extremity function in clinical trials.

Culturally adapting a health questionnaire, rather than developing a new one, is preferred, as it is more economical, faster, and it may facilitate future comparisons among populations (Escobar, 2004). The mere translation of a questionnaire might not suffice to maintain content validity of the instrument, as important cultural differences can produce a translated version that lacks experiential and thus conceptual equivalence. Therefore, a more complex process

must be performed that requires forward translation, back translation, consensus among experts, and field testing, to complete a cultural adaptation process of the questionnaire being translated.

The purpose of this study is to describe the process used to translate the DASH into Spanish and culturally adapt for Puerto Rico. Furthermore, an analysis of its psychometric characteristics is presented.

Methods

Instrument

The DASH questionnaire was originally developed in English (Hudak *et al.*, 1996). It is a self-report measure on physical and social role function. It consists of 30 items related to three areas: 21 items on physical function, six items on symptoms, and three items on social/role function. The items are to be rated in an ordinal scale from 1 (no difficulty) to 5 (unable). An overall score is calculated using a formula that transforms the sum of the items into a score that ranges from 0 to a maximum score of 100; where the lower scores indicate less disability. It includes two optional modules of four items each, which measure function at work, in sports, and performing arts.

The DASH questionnaire had already been translated into Spanish for Spain. However, a pretest of that version, followed by probing various health professionals, raised concerns in the meaning and terminology used in some items. Therefore, the need for a cross-cultural adaptation was established.

Setting

Puerto Rico is an island in the Caribbean, part of Latin America; politically, a commonwealth of the United States of America. Its official language and the one used in everyday life is Spanish, with English as a second language. It is common in the spoken Spanish language in Puerto Rico to use anglicisms, such as ‘closet’, ‘blower’, ‘parking’, ‘mattress’, and ‘freezer’.

Procedures

The guidelines for the cross-cultural adaptation of health status measures supported by the American Academy of Orthopedic Surgeons (AAOS) and the Institute for Work and Health (Beaton *et al.*, 2002) were followed. These guidelines require five stages for the adaptation process, with a final, sixth stage, in which test has to be submitted to the AAOS for appraisal. Before conducting this research, it was submitted and approved as adhering to the established ethical standards of the Institutional Review Board of the University of Puerto Rico, Medical Sciences Campus.

Initial translation into Spanish for Puerto Rico—The first step in the adaptation consisted of a translation of the questionnaire from US English into Puerto Rico Spanish by two independent translators who are native speakers of Spanish in Puerto Rico. Both translators were graduates from a master in arts program in translation. One of the translators was knowledgeable about the concepts being examined in the questionnaire, as she is a librarian in a major medical sciences university. The other translator, considered as a naive translator, was unaware and uninformed of the concepts. Each translator produced a written report of their translation, identifying concepts, phrases, or words that represented a challenge in the translation, along with a rationale for their final selection of wordings. Two Spanish versions of the translated DASH were produced in this step.

Synthesis of translations—The second step that followed was an integration of the two forward translations into one Spanish version. A methodologist, holding a doctorate in academic research psychology, mediated the differences between the two translators so that consensus was arrived at to produce a synthesis. A report was written, noting the discrepancies addressed and their resolution.

Back translation—Third, this Spanish version, produced by synthesis, was back translated into English by two independent translators, native US English speakers, naive to the health sciences field. One translator held a doctorate in comparative literature and worked as a faculty member at a graduate program in translation; the other was a certified translator and interpreter with postgraduate studies in linguistics. Two independent versions were produced. Each translator submitted a written report of the difficulties encountered in the translation and the rationale for their final choices, similar in format to the reports submitted by the initial translators. The back translation process served as a validity check, to identify inconsistencies or conceptual errors.

Expert committee—In the fourth step, an expert committee met to develop a prefinal version. The committee was composed of the four translators, the methodologist, a linguist, a research subject advocate, and two physical therapists; all were bilingual in English and Spanish. The methodologist served as facilitator and moderator of the discussion held to reach consensus. The principal investigator served as the translation synthesis recorder. The committee met as a group in a 1-day session. The source questionnaire and the four versions (two in Spanish and two in English) were used as working tools, discrepancies were discussed, and consensus was achieved to consolidate all the versions into one. The expert committee evaluated equivalence of the source and the target version in four areas: semantic equivalence (ensuring meaning and grammatical correctness), idiomatic equivalence (formulating equivalent expressions for colloquialism or idioms), experiential equivalence (ensuring cultural relevance of tasks and examples being used in the test), and conceptual equivalence (ensuring conceptual meaning for the Puerto Rico population). In the discussion, reference was made to translations of the instrument in the French language and Spanish for Spain to see how the experiential and conceptual equivalence was addressed in some items. A final version was produced to be field tested.

Test of the prefinal version—The prefinal version of the Puerto Rico-Spanish DASH was administered individually to a nonprobability sample of 32 normal participants. Healthy individuals, over 21 years old, born and raised in Puerto Rico, and Spanish speakers were selected in this phase. The principal investigator administered the questionnaire, followed by a structured interview using a probing technique by which the participants were asked for their understanding of each item. Their opinions and suggestions for improvements were recorded. If two or more participants reported difficulty with understanding an item, that item was revised with the expert in linguistics and the research methodologist for reformulation.

Evaluation of psychometric properties—After completing the field test and a final version of the Puerto Rico-Spanish DASH was approved by the translators, its psychometric properties of reliability and validity were evaluated. For this purpose, the test was administered to a nonprobability sample of 44 women with a diagnosis of breast cancer, who have had a surgical intervention and completed treatment within the past 36 months. Reduced upper extremity function is a significant complication of breast cancer treatment (Hayes *et al.*, 2005). All women self-identified themselves as Hispanics, from Puerto Rico, whose native language was Spanish.

After a single administration of the test, its reliability was assessed by evaluating both interitem correlation and item-to-total correlation. Construct validity was tested by correlating the DASH

with the FACT-B, to its individual scales (physical scale, functional scale, and additional concerns scale). The FACT-B is a self-report of health-related quality of life for people with breast cancer, available in Spanish (Cella *et al.*, 1998). The questionnaire contains four general subscales: physical well-being, social/family well-being, emotional well-being, and functional well-being, as well as an additional scale of concerns, developed specifically for patients with breast cancer. Its psychometric properties have been evaluated and it was found to be reliable and valid (Brady *et al.*, 1997).

Data analysis

To evaluate internal consistency, two reliability coefficients were calculated: interitem consistency using the Cronbach's coefficient α and item-to-total correlation using the Pearson product-moment correlation coefficient (Portney and Watkins, 2000). To evaluate correlations for construct validity, nonparametric statistics, Spearman rank correlation coefficients, were calculated. The criterion used to assess correlation was as follows: correlations ranging from 0.00 to 0.25 indicated minimal to no relationship; those from 0.25 to 0.50 indicated fair correlation; those from 0.50 to 0.75 indicated moderate to good; and those above 0.75 indicated good to excellent (Portney and Watkins, 2000). All data were entered and analyzed using Statistical Package for the Social Sciences (SPSS), version 13.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

Results

During the translation and cultural adaptation process, it is expected to find discrepancies with the original version. These discrepancies were thoroughly discussed among the team members until consensus was achieved for a resolution; examples of discrepancies and their resolutions are presented in Table 1.

For the test of the prefinal version, 32 participants were interviewed after they completed the questionnaire (13 men, 19 women; mean age 45 years; age range 21–80 years). During the testing of the prefinal version, few items were changed as they raised confusion. For example, item 3, the word '*llave*' can be understood as referring to either a key or a faucet, so adding the phrase '*within the lock*' was needed to clarify that it was referring to a key (i.e. '*Hacer girar una llave dentro de la cerradura*'). Another example, item 20, was originally translated to '*Resolver dificultades para ir de un lugar a otro*'. This translation was frequently confused as almost every participant understood something different: to move across rooms to find the closest bus stop, to walk from the car to the office, to either drive or walk to the store, among many others. It was finally translated to '*Poder moverse en transporte público o en su propio auto (tomar guagua, taxi, guiar su carro, etc.)*', providing specific examples of transportation means.

A description of the sample of 44 women who are breast cancer survivors revealed an age range from 34 to 84 years; mean age was 52.59 years. Additional sample characteristics are presented in Table 2.

The mean score in the 30-item function/symptom scale of the DASH was 22.83 (SD=16.98); scores ranged from 1.67 to 74.17. The level of internal consistency revealed a Cronbach's α value of 0.97. Item-to-total correlation ranged from 0.50 to 0.81 (Table 3). The Spearman rank correlation coefficients of the FACT-B subscales to the DASH questionnaire are shown in Table 4; values ranged from 0.096 to 0.682. The DASH questionnaire correlated fairly to moderately with all but one of the subscales of the FACT-B.

Discussion

The procedure used in this study for the translation and cultural adaptation was extensive and complex. Extreme care was taken in selecting the translators and experts involved in the process.

Two issues were raised in the expert committee discussion regarding the Optional Module for Athletes/Performing Arts, based on the title and the instructions: first, whether the module is addressed to professional or to amateur athletes, including the weekend sports player; second, whether all genres of performing arts were considered because the module specifically refers to music and does not mention any other performing art genre. A consultation was made with the Institute of Work and Health of Canada, as they are the organization appraising the translation and cross-cultural adaptation process. Clarification was provided by the Institute as follows: the module is intended for anyone who considers sports as an important activity for themselves – amateurs or professionals – but not for the recreational player; and although the module is intended for all genres of performing arts, it addresses only musicians. We were instructed not to add specific questions regarding other performing arts; therefore, this module only addresses the genre of music. We felt this is not an issue of translation; rather a characteristic of the original DASH; therefore, we recommend that the Institute of Work and Health consider other genres of performing arts.

Two items in the original DASH questionnaire (8 and 13) evaluate two activities in the same question, for example, washing and blowing hair. Participants were confused as to which one to respond to, because for them, washing hair was not a problem, but drying hair posed difficulty. A consultation was made to the Institute of Work and Health and we were informed that for these items it is expected that the participant rate the items based on the most difficult activity. Again, this is not an issue of translation; it is an issue in the original DASH that becomes evident during the translation and adaptation process.

Two independent samples were studied: one sample of normal participants to pretest the prefinal version and one sample of women who were survivors of breast cancer to test the psychometric characteristics of the test. During pretesting, changes were made to few items based on the participants' understanding and their comments and suggestions. After the changes of the items were made, the items were discussed with the linguist for correctness and the final questionnaire was sent to the translators for their feedback and approval. This final version was then evaluated for its psychometric properties.

Women who have undergone breast cancer surgery usually present functional impairments due to limitations in strength and mobility in the upper quadrant following surgery. The DASH is scored so that a total value of 0 represents the least disability, and a value of 100 represents the most disability. Norm-based scores for the general population of United States have been reported as a mean of 10.10, standard deviation of 14.68 (Hunsaker *et al.*, 2002). No norm-based scores are reported for women who are survivors of breast cancer. Our results showed that a sample of Puerto Rican women who are breast cancer survivors had a higher mean than that of the normal population, that is 22.83, indicating an increased level of disability as compared with the normal population.

Internal consistency refers to how related or homogeneous the items in the scale are. In this study, the correlation among all items, as indicated by the statistics of Cronbach's α was excellent at 0.97, indicating that the items measure the same attribute. The α coefficient for this version is slightly higher than reported Cronbach's α for other cultural adaptations of the DASH: 0.95 for the Dutch version (Veehof *et al.*, 2002); 0.95 for the Spanish for Spain version (Rosales *et al.*, 2002); 0.94 for the Cantonese Chinese version (Lee *et al.*, 2004); and 0.94 for

the Canadian French version (Durand *et al.*, 2005). A Cronbach's α value of 0.97 has been reported for the original DASH English version (Solway *et al.*, 2002).

Internal consistency was also assessed by conducting an item-to-total correlation, examining how each item on the test relates to the instrument as a whole (Portney and Watkins, 2000). The values ranged from 0.44 to 0.85 indicating moderate to good correlation. In the original DASH English version, values ranged from 0.49 to 0.85 (Hunsaker *et al.*, 2002). The obtained values in this study were higher than the reported item-to-total correlations of other versions of the DASH, for example, the Cantonese Chinese version (Lee *et al.*, 2004), the values ranged from 0.29 to 0.74; and for the Canadian French version (Durand *et al.*, 2005), the values ranged from 0.27 to 0.88.

Quality of life instruments have been used in the past to assess the construct validity of the DASH, such as establishing its correlation with the SF-36. Several studies have established moderate correlations between the DASH and the physical function and pain dimension subscales of the SF-36, ranging from 0.43 to 0.73 (Solway *et al.*, 2002; SooHoo *et al.*, 2002; Imaeda *et al.*, 2006). A functional status measurement has been defined as an instrument that evaluates how health, strength, vitality, symptoms, or emotions affect the performance of daily activities, recreation, social relations, and work (Salerno *et al.*, 2002). On the basis of this definition, it was considered that both the DASH and FACT-B measure similar concepts of function and health status. The fair to moderate correlations found in this study between the DASH and most scales of the FACT-B support the construct validity of the Puerto Rico-Spanish DASH. The low correlation between the DASH and the subscale social/family well-being of the FACT-B might indicate that social/family function is not a major construct measured in the DASH; in fact, there are only three items in the DASH related to social or role function items (interference with normal social activities or work).

This cross-cultural adaptation was limited to Puerto Ricans and it cannot be generalized to be used in other countries in Latin America or the Caribbean. Linguistic and cultural differences are seen among people in each of these countries. This version of the DASH is intended to be used only for Puerto Rican Spanish speakers in Puerto Rico. The language in this version reflects the uses in Puerto Rico in wordings, such as 'mapear' (to mop), 'guagua' (bus), and an anglicism was added to clarify content ('blower'). A pretest of this version should be done before using it with another Spanish-speaking culture. Cultural differences are seen between the English version and this version such as the functional activities used to illustrate the items on household chores and recreation, as presented in Table 1.

The DASH is intended to assess physical function at the disability level, based on the disablement process (Solway *et al.*, 2002). Silva *et al.* (2007) compared the measurement constructs and content of the DASH items to the concepts of activity, participation, and environment used in the International Classification of Functioning, Disability and Health (ICF), developed by the World Health Organization. Their analysis showed a link between the items of the DASH and the ICF concepts. Therefore, the DASH can be used as a functional outcome assessment that supports the ICF framework.

Conclusion

In this study, we described the translation and cultural adaptation process of a health questionnaire. Although it is a complex and demanding process, it proved to be feasible, following the guidelines proposed by the AAOS and the Institute for Work and Health (Beaton *et al.*, 2002). The Puerto Rico-Spanish DASH questionnaire has been appraised and approved, and it is published in the official DASH Outcome Measure website, sponsored by the Institute for Work and Health of Canada and the American Academy of Orthopaedic Surgeons

(<http://www.dash.iwh.on.ca/translate.htm>). An evaluation of its psychometric properties indicated that the instrument has adequate internal consistency and construct validity. The availability of a functional evaluation translated and culturally adapted for the Spanish-speaking population in Puerto Rico is thought to facilitate the examination of upper extremity function for both clinical and research purposes, as well as cross-cultural comparisons of people from diverse backgrounds. During the cross-cultural adaptation process, issues, such as the exclusion of other forms of performing arts besides music, were identified in the original DASH English version that suggest a need to revise the instrument.

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Table 1
Examples of discrepancies and their resolution

Issue	Resolution
Adjustment of English idioms to avoid their influence on the final Spanish translation	<p>Elimination of the use of possessive pronouns when referring to body parts – such as ‘your arm’, ‘your hair’, which are not used in Spanish</p> <p>In Spanish, the word ‘please’ is not used as often as it is used in English in written questionnaires. It was decided to be used only four times, at the beginning of the major instructions. In the English version, the word ‘please’ is used 10 times</p>
Selection of vocabulary that responds to the uses and customs of Puerto Rico	<p>Item 1: the translation of ‘jar’ can be ‘pote’, ‘recipiente’, ‘frasco’. The word ‘pote’ is selected as more representative of the language used in Puerto Rico</p> <p>Item 13: the term ‘blower’, although it is an English one, is preferred as it is more generally used than the equivalent term in Spanish</p>
Experiential equivalence: selection of functional activities equivalent to the Puerto Rican culture	<p>Item 7: examples of household chores are given that are common in Puerto Rico, such as mop the floors and clean the windows</p> <p>Items 18 and 19: recreational activities commonly used in Puerto Rico are provided as examples, such as using a baseball bat to hit a ball, and throwing a ball, in substitution of activities such as hammering and playing badminton</p>

Table 2
Demographic and clinical characteristics of the sample ($n = 44$)

Age in years, mean (SD)	52.59 (9.86)
Type of surgery, % (frequency)	
Lumpectomy	47.7 (21)
Partial mastectomy	25.0 (11)
Radical mastectomy	20.5 (9)
Bilateral mastectomy	6.8 (3)
Lymph node dissection, % (frequency)	
Yes	81.8 (36)
No	11.4 (5)
Unavailable	6.8 (3)
Number of nodes dissected, mean (range)	6.95 (1–18)
Overall histological stage, % (frequency)	
I	15.9 (7)
II	29.5 (13)
III	29.5 (13)
IV	2.3 (1)
Unavailable	22.7 (10)

Table 3
Item-to-total correlation

	Pearson coefficient
1 Open a tight or new jar	0.73
2 Write	0.67
3 Turn a key	0.50
4 Prepare a meal	0.72
5 Push open a heavy door	0.74
6 Place an object on a shelf above your head	0.82
7 Do heavy household chores (e.g. wash walls, wash floors)	0.79
8 Garden or do yard work	0.74
9 Make a bed	0.63
10 Carry a shopping bag or briefcase	0.77
11 Carry a heavy object (over 10 lbs)	0.76
12 Change a lightbulb overhead	0.69
13 Wash or blow dry your hair	0.78
14 Wash your back	0.80
15 Put on a pullover sweater	0.64
16 Use a knife to cut food	0.78
17 Recreational activities that require little effort (e.g. card playing, knitting, etc.)	0.72
18 Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g. golf, hammering, tennis, etc.)	0.80
19 Recreational activities in which you move your arm freely (e.g. playing frisbee, badminton, etc.)	0.78
20 Manage transportation needs (getting from one place to another)	0.80
21 Sexual activities	0.48
22 During the past week, 'to what extent' has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbors, or groups?	0.76
23 During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder, or hand problem?	0.81
24 Arm, shoulder, or hand pain	0.75
25 Arm, shoulder, or hand pain when you performed any specific activity	0.81
26 Tingling (pins and needles) in your arm, shoulder, or hand	0.44
27 Weakness in your arm, shoulder, or hand	0.85
28 Stiffness in your arm, shoulder, or hand	0.65
29 During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder, or hand?	0.65
30 I feel less capable, less confident, or less useful because of my arm, shoulder, or hand problem	0.44

Table 4
Correlation of the DASH questionnaire to the FACT-B subscales

FACT-B subscale	Spearman rank correlation coefficient to DASH
Physical well-being	0.682 ^a
Social/family well-being	0.096 ($P=0.537$)
Emotional well-being	0.506 ^a
Functional well-being	0.499 ^a
Additional concerns	0.476 ^a

DASH, Disability of Arm, Shoulder, and Hand; FACT, Functional Assessment of Cancer Therapy – Breast.

^aCorrelation is significant at the 0.01 level (two-tailed).