

Recommendations for the Cross-Cultural Adaptation of Health Status Measures

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Introduction

With the increase in the number of multi-national and multi-cultural research projects, the need to adapt health status measures for use in other than the source language has also grown rapidly. Most questionnaires are developed in English speaking countries (Guillemin, 1993), but even within these countries, researchers must consider immigrant populations in studies of health especially when their exclusion could lead to a systematic bias in studies of health care utilization or quality of life (Guillemin, 1993).

The cross-cultural adaptation of a health status self-administered questionnaire for use in a new country, culture and/or language requires a unique methodology in order to reach equivalence between the original source and target languages. It is now recognized that if measures are to be used across cultures, the items must not only be translated well linguistically, but also be adapted culturally in order to maintain the content validity of the instrument across different cultures. In this way, we can be more confident that we are describing the impact of a disease or its treatment in a similar manner in multi-national trials or outcome evaluations. The term “cross-cultural adaptation” is used to encompass a process which looks at both language (translation) and cultural adaptation issues in the process of preparing a questionnaire for use in another setting.

Cross-cultural adaptations should be considered important to do in several different scenarios, in some cases this is more obvious than in others. Guillemin (1993) suggests five different examples of when attention should be paid to this adaptation by comparing the target (where it is going to be used) and source (where it was developed) language and culture. The first scenario is that it is to be used in the same language and culture in which it was developed. No adaptation is necessary. The other scenarios are summarized in Table 1, and reflect situations when some translation and/or adaptation will be required.

Table 1. Possible scenarios where some form of cross-cultural adaptation is required (adapted from Guillemin, 1993).

	Wanting to use a questionnaire in a new population described as follows:	Results in a change in....			Adaptation Required	
		Culture	Language	Country of use	Translation	Cultural adaptation
A	Use in same population. No change in culture, language or country from source	---	---	---	---	---
B	Use in established immigrants in source country	U	---	---	---	U
C	Use in other country, same language	U	---	U	---	U
D	Use in new immigrants, not English speaking, but in same source country	U	U	---	U	U
E	Use in another country and another language.	U	U	U	U	U

The guidelines described in this document are based on a review of cross-cultural adaptation in the medical, sociological and psychological literature. This review led to the description of a thorough adaptation process aiming to maximize the attainment of semantic, idiomatic, experiential and conceptual equivalence between the source and target questionnaires (Guillemin, 1993). Further experience in cross-cultural adaptation of generic and disease-specific instruments, and alternative strategies driven by different research groups (Lepège A, 1994) have led to some refinements in the methodology since the 1993 publication. These changes make the process a little more time consuming; however the benefit is that the end product will be of better quality in terms of content and face validity.

The objective of the American Academy of Orthopaedic Surgeons (AAOS) is to provide guidelines for translating and adapting one or more of the AAOS outcome measures for use in another country, language or culture. In this way, potential users of the instrument can verify first, whether they need to go through the cross-cultural adaptation process, and second, how they should proceed with the adaptation.

These guidelines will serve as a template for the adaptation process. The process involves the adaptation of individual items, the instructions for the questionnaire, response options and the scoring documentation. The text in the next section outlines the methodology suggested (Stages I - V). The subsequent section suggests an appraisal process whereby an advisory committee to the AAOS will assess whether or not the procedure recommended has been followed (Stage VI). If it has, it will be assumed that this is a satisfactory translation/adaptation of the questionnaire and the version will be approved as an “official” translation.

The process of cross-cultural adaptation strives to produce equivalency based on content. This suggests the other statistical properties such as internal consistency, validity and reliability might be retained. However, this is not necessarily the case. For example, if the new culture has a different way of doing a task included within a disability scale that makes it inherently more or less difficult to do relative to other items in the scale, the validity would likely change, particularly in terms of item-level analyses (such as item response theory, Rasch). Further testing should be done on an adapted questionnaire to verify the psychometric properties. Interesting research is ongoing in Europe, where an urgent need is being addressed to have health status measures available to use across the many countries.

Guidelines for the cross-cultural adaptation process.

The following figure outlines the cross-cultural adaptation process being recommended by the AAOS Evidence Based Medicine Committee. Each stage in the process, including a summary of resources needed and reports required by the AAOS, is described in detail below. AAOS approval of the final version of the outcome measure is dependent on provision of enough evidence that the described stages have been successfully followed in the adaptation process.

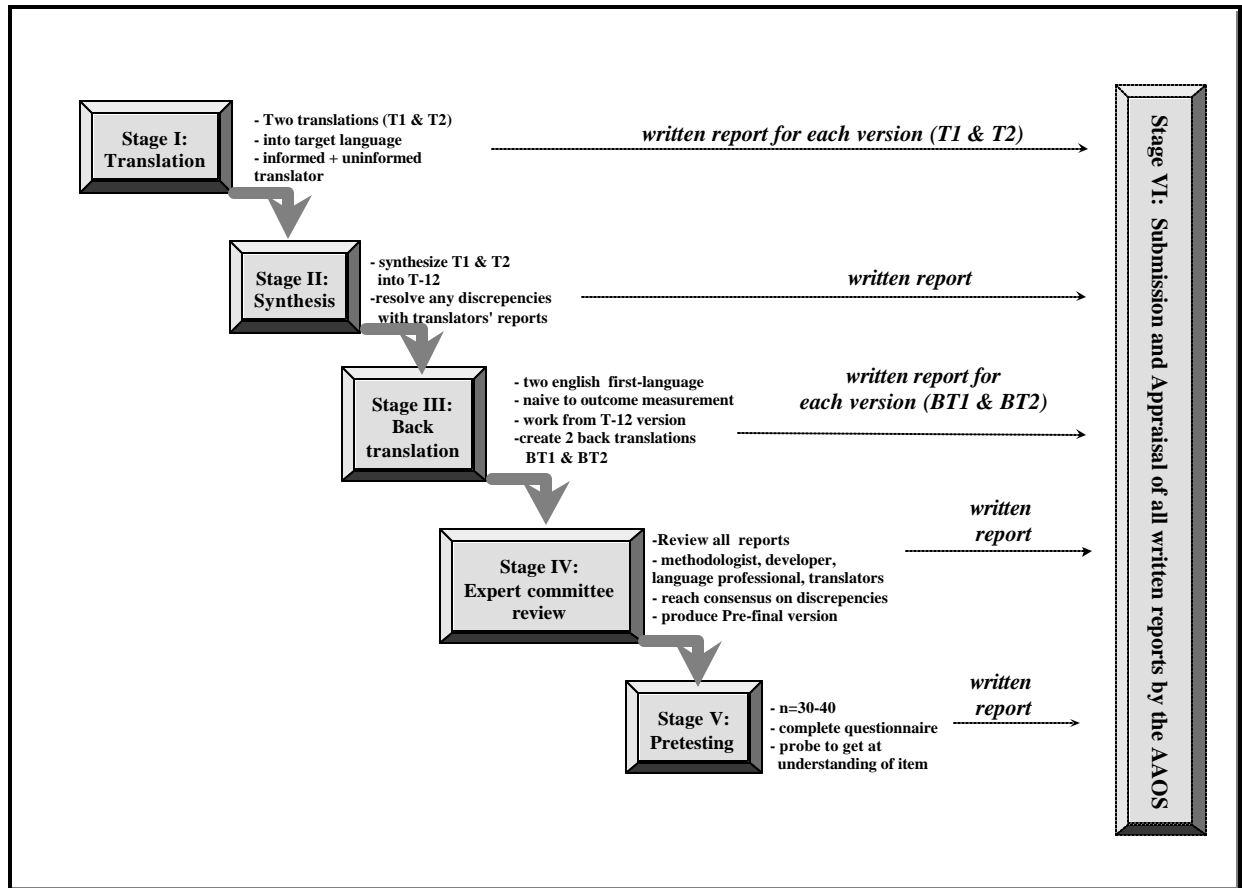


Figure 1. Graphic representation of the stages of cross-cultural adaptation recommended for approval of a translated version of an outcome measure by the AAOS.

Stage I: Initial Translation:

The first stage in adaptation is the forward translation. At least two forward translations should be made of the instrument from the original language (source language) to the target language. In this way, the translations can be compared, and discrepancies which may reflect ambiguous wording in the original language, or discrepancies in how a word is translated can be identified. Poorer wording choices can then be discussed and resolved as the best translation between the translators.

The two independent translations are produced by bilingual translators who have the target language as their

mother tongue. Translations into the mother tongue, or first language of the translator, are more likely to accurately reflect the nuances of that language (Hendricson, 1989).

The translators each produce a written report of the translation which they did. Comments are included to highlight challenging phrases or uncertainties along with the rationale for final choices. Item content, response options, instructions and scoring documentation are all translated using the same process.

The two translators should have different profiles or backgrounds to ensure the best possible translation.

Translator # 1: One of the translators should be knowledgeable about the type of concepts the questionnaire being translated addresses (e.g., functional disability or neck and shoulder disorders). Translator #1 adaptations will be aimed at equivalency from a more clinical perspective, and may produce a translation that is a more reliable equivalence to the original from a measurement perspective.

Translator # 2: The other translator should neither be aware nor be informed of the concepts being quantified, and preferably have no medical/clinical background. As the so-called “naive” translator, he or she is more likely to detect the more subtle differences in meaning of the original than the first translator. Translator #2 should not be influenced by an academic goal, and offer a translation that reflects the language used by the common population. This second translation will often highlight more ambiguous meanings in the original questionnaire than is found in the first translation (Guillemin, 1993).

Stage II: Synthesis of these translations.

To produce a synthesis of the two translations, a third, unbiased person is added to the team. The role of this person is to serve as a mediator in discussions of translation differences, and to produce a written documentation of the process. Working from the original questionnaire as well as the first translator’s version (T1) and the second translator’s (T2), a synthesis of these translations is produced, resulting in one common translation (T-12). A written report carefully documenting the synthesis process, each issue addressed, and how it was resolved is completed. It is important that all issues be resolved by consensus rather than one person compromising their feelings.

Stage III: Back-translation:

Working from the T-12 version of the questionnaire, and totally blind to the original version, the questionnaire is then translated back into the original language. This is a process of validity checking to make sure the translated version accurately reflects the item content of the original version. The back translation process often magnifies unclear wording in the translations. However, agreement between the back translation and the original source version does not guarantee a satisfactory forward translation version (T-12), as an incorrect, but consistent translation could occur (Leplege, 1994). Back translation is only one type of validity check, and is best at highlighting gross inconsistencies or conceptual errors in the translation.

As with forward translations, two back-translations are considered a minimum. The back-translations (BT1 and BT2) are produced by two bilingual persons with the source language (English) as their mother tongue. The two

translators should neither be aware nor be informed of the concepts explored, and preferably without medical background. The main reasons for this are to avoid information bias and to elicit unexpected meanings of the items in the translated questionnaire (T-12) (Guillemin, 1993; Leplege, 1994), thus increasing the likelihood of “highlighting the imperfections”(Leplege, 1994).

Stage IV: Expert Committee:

The composition of the Expert Committee is crucial to achieving cross-cultural equivalence of the translated instrument. The minimum composition of the Expert Committee includes at least one each of a methodologist, health professional, language professional, as well as all translators (both forward and backward) and the translation synthesis recorder. The original developers of the questionnaire should be in close contact with the Expert Committee during this part of the process to respond to questions and provide input.

The Expert Committee’s role is to consolidate all the versions and components of the questionnaire, including the original instrument, instructions, scoring documentation, and all translated versions (T1, T2, T12, BT1, BT2), and develop the pre-final version of the questionnaire for field testing. The Committee will review all of the translations and reach a consensus on any discrepancy found. Corresponding written reports explaining the rationale of each decision at earlier stages of the process should also be available.

Critical decisions are made by the Expert Committee in finalizing the translated instrument, and full written documentation should be made of the issues and rationale for all decisions about any of the components (instrument, instructions or scoring).

Decisions will need to be made by this Committee to achieve equivalence between the source and target version in four areas (Guillemin, 1993):

Semantic equivalence: Do the words mean the same thing? Are their multiple meanings to a given item? Are there grammatical difficulties in the translation?

Idiomatic equivalence: Colloquialisms, or idioms, are difficult to translate. The committee may have to formulate an equivalent expression in the target version. For example the term “feeling downhearted and blue” from the SF-36 has often been difficult to translate, and an item with similar meaning would have to be found by the Committee.

Experiential equivalence: Items seeking to capture and experience of daily life often vary in different countries and cultures. In some instances, a given task may simply not be experienced in the target culture, even if it is translatable. To address this situation, a questionnaire item addressing a similar action or intent in the target culture would need to be identified to replace the original item. For example, the question “do you have difficulty eating with a fork?” may need to be replaced with another utensil, such as a chopstick, if that is the common utensil used for eating in the target culture.

Conceptual equivalence: Often words hold different conceptual meaning between cultures. For instance, the meaning of “seeing your family as much as you would like” would differ between cultures

based on the concept of what defines “family” (i.e., nuclear versus extended family).

The Expert Committee will need to examine the source and back-translated questionnaires for all of these types of equivalence items. Consensus among Committee members should be reached on all items, and if necessary, the translation/back translation process repeated to clarify how another wording of an item would work. The advantage of having all translators present on the Committee is that discrepancies or changes in wording could be done immediately. Items, instructions, response options and scoring documentation must all be considered. The final questionnaire should be able to be understood by the equivalent of a 12-year-old (roughly a grade six level of reading), as this is the general recommended reading level for questionnaires.

Stage V: Test of the pre-final version:

The final stage of the adaptation process is the pretest. This field test of the new questionnaire uses the pre-final version with subjects/patients, ideally between 30 and 40 persons, from a target setting.

Each subject first completes the questionnaire, and is then interviewed to probe what they thought was meant by each questionnaire item and their response. Both the meaning of the items and responses would be explored. This ensures that the adapted version is still retaining its equivalence in an applied situation. The distribution of responses is examined to look for a high proportion of missing items or single responses.

The results of this stage are summarized and submitted with the other documents to the AAOS Committee for review.

It should be noted, that while this stage does provide some useful insight into how an individual person interprets the items on the questionnaire, it does not address the construct validity, reliability or item response patterns which are also critical to describing a successful cross-cultural adaptation. The described process provides for some measure of quality in the content validity. Additional testing for the retention of the psychometric properties of the questionnaire is highly recommended, however not required for approval of the translated version. This is in keeping with other guidelines for the translation and adaptation of other measures.

Stage VI: Submission of documentation to the AAOS Committee for Appraisal.

The final stage in the adaptation process is a submission of all the reports and forms to the AAOS Committee. The Committee will check for verification that the recommended stages were followed, and that the reports seem to reflect this process well. In effect, this is a process audit to ensure that all the steps were followed and necessary reports written and submitted. It is *not* the responsibility of this Committee and review process to alter the content; it will be assumed that by following the prescribed process that a reasonable translation has been achieved.

Once the appraisal is complete, the AAOS Evidence Based Medicine Committee will render one of three decisions: 1) approved, 2) translation and documentation requires clarification, or 3) not approved. In the case of the second response, the applicants will have the opportunity to resubmit their application with the needed

revisions. If approved, the adapted version of the questionnaire will be considered the “authorized” translation and will be made available to others who might be able to make use of it.

Common Questions & Answers

Can I avoid the translation process by just working on cultural adaptation from a version already available in my language, but in a different culture/country?

The first thing to do is to see if the previously adapted version has cultural equivalency in your population. This can be done by pretesting the adapted version in a sample of your patients and then probing (speaking to the patients in detail) as to the meaning and relevance of the items. If there are any concerns (e.g., consistently missing items, or reported confusion over a given question) then a cross-cultural adaptation should be done. It is recommended to start with the original US-English version of the questionnaire for this process in order to be as close to the original as possible with the final product.

Why do I need to go through this extensive process?

Although this seems like a lot of work, following the guidelines produces a questionnaire which should be close to the original questionnaire. Having a cross-culturally adapted health outcome measure means that one is closer to having equivalent “rulers” to measure health across different cultural groups. This would mean that multinational studies could use the same health status measure, or patients who speak different languages could still be contributing to the outcome database or case series review in a clinical practice. Exclusion of these patients because of their lack of ability to complete a questionnaire in English is a concern as they may not have the same results (ie, satisfaction with care) as native language speakers. As a result, any quality improvement activities may exclude their perspective by necessity.

What about the reliability and validity of the new version?

Cross-cultural adaptation tries to ensure a consistency in the content and face validity between source and target versions of a questionnaire. It should therefore follow that the resultant version should have sound reliability and validity if the original version did. However, this is not always the case, perhaps because of subtle differences in the way things are done in different cultures that render an item more or less difficult than other items in the questionnaire. Such changes may alter the statistical or psychometric properties of an instrument.

It is highly recommended that after an adaptation process, investigators ensure that the new version has demonstrated the measurement properties needed for the intended application. Describing a group of patients with a given condition requires strong evidence of construct validity (is it measuring what it is supposed to be measuring?). Evaluating change over time requires not only construct validity, but also test-retest reliability (do the score’s stay the same when the patients have not changed?) and responsiveness (ability to detect change when it has occurred).

It is possible to work some of these tests of reliability and validity into the pre-testing process (stage V of the adaptation). If this has been done, include the results of that analysis in your final report.

Why isn't the AAOS doing all the translations and adaptations?

The answer is quite simple: the AAOS would have no idea which instrument or language to do first, and where to stop. By providing the guidelines, the market is taking the lead in terms of what adaptations have priority and are being used. This allows clinicians and researchers to move ahead with the adaptation process. It also makes the process easier in that the individual countries likely have access to the translators and back-translators in their communities more readily than the AAOS would be able to assemble such a committee.

What if I don't do the whole adaptation process, and/or don't submit my reports to the AAOS for appraisal?

Of course, the choice to follow these recommendations is up to you. However, the main implication is in the copyright. The final approval of the translated version (using the appraisal of the adaptation process described in these guidelines) is required for that version to be considered the "official" translation of the instrument for the language/culture. Only official, approved versions may use the name AAOS, or the specific name of the instrument, such as the DASH. The names themselves are under copyright. We would ask that you respect that copyright and follow the guidelines for quality translation. However if you refuse to do so, we ask that you refrain from using the name DASH, AAOS or COMSS with an unapproved version, even if you call it "modified" (e.g. you cannot use the term Modified-DASH).

What about translations of the instruments (like the DASH) that are already in circulation?

The AAOS and the Institute for Work & Health have discussed the cross-cultural adaptation process with several researchers in various countries. The process is also available in the literature in a slightly more detailed format (Guilleman, 1993). There are, therefore, versions that have pretty much followed these guidelines already, and others that have not. The already translated versions will be appraised in the same manner as is being suggested in these guidelines. Researchers will be asked to submit documentation of their translation process if they wish to use the name of the instrument or refer to the AAOS when describing their outcome measures in any way.

How do I get an "official" adapted version of a questionnaire?

The AAOS and the Institute for Work & Health (the latter for the DASH only) will be keeping an ongoing list of the approved versions of the questionnaire that are available in different languages or cultures. These will be made available for others to use in the same way that the outcome measures are currently made available.

References:

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Hendricson, WD, Russel IJ, Jacobson JM, Rogan H, Bishop GD, Castill R. Development and initial validation of a dual language English-Spanish format for the Arthritis Impact Measurement Scales. *Arthritis Rheum* 1989;32:1153-1159.

Lepège A, Verdier A. The adaptation of health status measures. A discussion of certain methodological aspects of the translation procedure. In: Shumaker S, Berzon R, Ed. *The international assessment of health-related quality of life: Theory, translation, measurement and analysis*. Rapid communications of Oxford, Oxford, 1994.

Anderson RT, Aaronson NK and Wilkin D. Critical review of the international assessments of health -related quality of life generic instruments. In: Shumaker S, Berzon R, Ed. *The international assessment of health-related quality of life: Theory, translation, measurement and analysis*. Rapid communications of Oxford, Oxford, 1994.

Acknowledgements: This document was based in large part on the work of Guillemin et al (1993). Readers are encouraged to review this article for more details on the development of this process, and the literature review conducted to do so.

Appendices:

The following appendices provide sample forms that may be used for the translation/adaptation process. Use of these forms is optional. However, they contain the information needed in the final appraisal (see appendix G), and provide a template for documentation. Appendices B, C & D in this document were created using the DASH outcome measure as an example. Similar forms may be generated to document the item content, instructions response options, and scoring documentation for any measure being adapted.

- A: Sample form for submission of adapted version to the AAOS
- summary sheet, checklist
- B: Translation form
- C: Synthesis of translated versions
- D: Back translation form
- E: Expert committee report
- F: Pilot testing report
- G: AAOS appraisal of adaptation process

Appendix A: Report on the Cross-Cultural Adaptation of an AAOS/COMSS/IWH Outcome Measure

Submission Date: _____ AAOS Review Date: _____
mm/dd/yyyy mm/dd/yyyy

Applicant Name: _____

Applicant Institution: _____

Applicant Address: _____

Street

City

Country

Delivery Code

Phone: _____ Fax: _____ Email: _____

Source Questionnaire: _____ Version _____

Target Group Information:

Country: _____ Culture: _____ Language: _____

Translation Participants

Phase	Name	Qualifications/Title
T1 Translator		
T2 Translator		
T12 Recorder		
B1 Translator		
B2 Translator		
Other Members of Expert Committee (in addition to translators)		
Methodologist		
Clinician		
Language Expert		
Other:		
Pre-Test Coordinator		

Documentation

Phase		Documentation Included		
		Instrument	Scoring	Instructions
Forward Translation	T1 Translation			
	T1 Documentation Report			
	T2 Translation			
	T2 Documentation Report			
	T12 Synthesis			
	T12 Documentation Report			
Backward Translation	B1 Translation			
	B1 Documentation Report			
	B2 Translation			
	B2 Documentation Report			
Expert Review	Pre-Final Translation			
	Expert Review Documentation Report			

Pretesting

Population Description	
Sample Size	
Probe Interview Notes	
Final Documentation, Notes, Comments	

AAOS USE ONLY: Final Status

<p>“ Approved as submitted. AAOS approval granted.</p> <p>“ Request resubmission with additional info (details in letter) .</p> <p>“ Refused. Not an official version of questionnaire.</p> <p>Signature: _____ Date: _____</p>

Appendix B. Forward Translation Into Target Language. Using the DASH Outcome Measure as an example.

Translator (*circle one*): #1 #2

Name of translator: _____

Profile of translator (*circle one*): Aware of health status concept Naive to concept

The DASH Questionnaire .

Original Version Item:	Forward Translated Version (T-1 or T-2)
<p>Instructions: This questionnaire asks about your symptoms as well as your ability to perform certain activities.</p>	
<p>Please answer every question, based on your condition in the last week, by circling the appropriate number.</p>	
<p>If you did not have the opportunity to perform an activity in the past week, please make your best estimate on which response would be the most accurate.</p>	
<p>It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.</p>	
<p>Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.</p>	
<p>1. Open a tight or new jar.</p>	
<p>2. Write.</p>	
<p>3. Turn a key.</p>	
<p>4. Prepare a meal.</p>	
<p>5. Push open a heavy door.</p>	
<p>6. Place an object on a shelf above your head.</p>	
<p>7. Do heavy household chores (e.g., wash walls, wash floors).</p>	
<p>8. Garden or do yard work.</p>	
<p>9. Make a bed.</p>	
<p>10. Carry a shopping bag or briefcase.</p>	
<p>11. Carry a heavy object (over 10 lbs.).</p>	

Original Version Item:	Forward Translated Version (T-1 or T-2)
12. Change a lightbulb overhead.	
13. Wash or blow dry your hair.	
14. Wash your back.	
15. Put on a pullover sweater.	
16. Use a knife to cut food.	
17. Recreational activities which require little effort (e.g., card playing, knitting etc.).	
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	
20. Manage transportation needs (getting from one place to another).	
21. Sexual activities.	
22. During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	
23. During the past week, were you limited in your work or other daily activities as a result of your arm, shoulder or hand problem?	
24. Arm, shoulder or hand pain.	
25. Arm, shoulder or hand pain when you perform any specific activity.	
26. Tingling (pins and needles) in your arm, shoulder or hand.	
27. Weakness in your arm, shoulder or hand.	
28. Stiffness in your arm, shoulder or hand.	

Original Version Item:	Forward Translated Version (T-1 or T-2)
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?	
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem.	
<p>Work Module: The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role). Please indicate what your job/work is: I do not work. (You may skip this section)</p>	
Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:	
1. Using your usual technique for your work?	
2. Doing your usual work because of arm, shoulder or hand pain?	
3. Doing your work as well as you would like?	
4. Spending your usual amount of time doing your work?	
<p>High performance sports/musicians The following questions relate to the impact of your arm, shoulder or hand problem on playing your musical instrument or sport or both. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you. Please indicate the sport or instrument which is most important to you. I do not play a sport or an instrument (you may skip this section)</p>	

Original Version Item:	Forward Translated Version (T-1 or T-2)
1. Using your usual technique for playing your instrument or sport?	
2. Playing your usual musical instrument or sport because of arm, shoulder or hand pain?	
3. Playing your usual musical instrument or sport as well as you would like?	
4. Spending your usual amount of time practicing or playing your instrument or sport?	

Translation of response categories

No difficulty Mild difficulty Moderate difficulty Severe difficulty Unable So much difficulty that I can't sleep	
Not at all Slightly Moderately Quite a bit Extremely	
Not limited at all Slightly limited Moderately limited Very limited Unable	
None Mild Moderate Severe Extreme	
Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	

Original Version Item:	Forward Translated Version (T-1 or T-2)
<i>Translation of scoring instructions</i>	
<p>The DASH is scored in two components: the disability/symptom questions (30 items, scored 1-5) and the optional high performance sport/music or work section (4 items, scored 1-5)</p>	
<p>Disability/symptom score At least 27 of the 30 items must be completed for a score to be calculated. The assigned values for all completed responses are simply summed and averaged, producing a score out of five. This value is then transformed to a score out of 100 by subtracting one and multiplying by 25. A higher score indicates greater disability.</p>	
<p>DASH disability/symptom score =</p> $\frac{[(\text{sum of } n \text{ responses}) - 1] \times 25}{n}$ <p>where <i>n</i> is equal to the number of completed responses</p>	
<p>Optional modules (sport/music or work) Each optional module consists of four items, which may or may not be used by individuals because of the nature of the questions. The goal of the optional modules is to identify the specific difficulties that professional athletes/performing artists or other groups of workers might experience but which may not affect their activities of daily living and consequently may go “undetected” in the 30-item portion of the DASH.</p>	
<p>The same procedure described above is followed to calculate the optional four-item module score. All four questions must be answered in order to calculate the score. Simply add up the assigned values for each response and divide by four (number of items); subtract one and multiply by 25 to get a score out of 100.</p>	

Original Version Item:	Forward Translated Version (T-1 or T-2)
<p>Missing Items If more than 10 percent of the items (that is, more than three items) are left blank by the respondent, you will not be able to calculate a DASH disability/symptom score. By this same rule (that is, no more than 10 percent of the items can be left blank), no missing values can be tolerated in the high-performance sports/performing arts or work module because the module consists of only four items.</p>	

Appendix C: Form summarizing the synthesis of the two forward translations (Version T-12)

** Submit notes on discrepancies and their resolution on separate form.

The DASH Questionnaire .

Original Version Item:	Final Translated Version (T-12)
<p>Instructions: This questionnaire asks about your symptoms as well as your ability to perform certain activities.</p>	
<p>Please answer every question, based on your condition in the last week, by circling the appropriate number.</p>	
<p>If you did not have the opportunity to perform an activity in the past week, please make your best estimate on which response would be the most accurate.</p>	
<p>It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.</p>	
<p>Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.</p>	
<p>1. Open a tight or new jar.</p>	
<p>2. Write.</p>	
<p>3. Turn a key.</p>	
<p>4. Prepare a meal.</p>	
<p>5. Push open a heavy door.</p>	
<p>6. Place an object on a shelf above your head.</p>	
<p>7. Do heavy household chores (e.g., wash walls, wash floors).</p>	
<p>8. Garden or do yard work.</p>	
<p>9. Make a bed.</p>	
<p>10. Carry a shopping bag or briefcase.</p>	
<p>11. Carry a heavy object (over 10 lbs.).</p>	
<p>12. Change a lightbulb overhead.</p>	
<p>13. Wash or blow dry your hair.</p>	

Original Version Item:	Final Translated Version (T-12)
14. Wash your back.	
15. Put on a pullover sweater.	
16. Use a knife to cut food.	
17. Recreational activities which require little effort (e.g., card playing, knitting etc.).	
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	
20. Manage transportation needs (getting from one place to another).	
21. Sexual activities.	
22. During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	
23. During the past week, were you limited in your work or other daily activities as a result of your arm, shoulder or hand problem?	
24. Arm, shoulder or hand pain.	
25. Arm, shoulder or hand pain when you perform any specific activity.	
26. Tingling (pins and needles) in your arm, shoulder or hand.	
27. Weakness in your arm, shoulder or hand.	
28. Stiffness in your arm, shoulder or hand.	
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?	

Original Version Item:	Final Translated Version (T-12)
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem.	
<p>Work Module: The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role). Please indicate what your job/work is: I do not work. (You may skip this section)</p>	
Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:	
1. Using your usual technique for your work?	
2. Doing your usual work because of arm, shoulder or hand pain?	
3. Doing your work as well as you would like?	
4. Spending your usual amount of time doing your work?	
<p>High performance sports/musicians The following questions relate to the impact of your arm, shoulder or hand problem on playing your musical instrument or sport or both. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you. Please indicate the sport or instrument which is most important to you. I do not play a sport or an instrument (you may skip this section)</p>	
1. Using your usual technique for playing your instrument or sport?	
2. Playing your usual musical instrument or sport because of arm, shoulder or hand pain?	
3. Playing your usual musical instrument or sport as well as you would like?	

Original Version Item:	Final Translated Version (T-12)
4. Spending your usual amount of time practicing or playing your instrument or sport?	
<i>Translation of response categories</i>	
No difficulty Mild difficulty Moderate difficulty Severe difficulty Unable So much difficulty that I can't sleep	
Not at all Slightly Moderately Quite a bit Extremely	
Not limited at all Slightly limited Moderately limited Very limited Unable	
None Mild Moderate Severe Extreme	
Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	

Original Version Item:	Final Translated Version (T-12)
<i>Translation of scoring instructions</i>	
<p>The DASH is scored in two components: the disability/symptom questions (30 items, scored 1-5) and the optional high performance sport/music or work section (4 items, scored 1-5)</p>	
<p>Disability/symptom score At least 27 of the 30 items must be completed for a score to be calculated. The assigned values for all completed responses are simply summed and averaged, producing a score out of five. This value is then transformed to a score out of 100 by subtracting one and multiplying by 25. A higher score indicates greater disability.</p>	
<p>DASH disability/symptom score =</p> $\frac{[(\text{sum of } n \text{ responses}) - 1] \times 25}{n}$ <p>where <i>n</i> is equal to the number of completed responses</p>	
<p>Optional modules (sport/music or work) Each optional module consists of four items, which may or may not be used by individuals because of the nature of the questions. The goal of the optional modules is to identify the specific difficulties that professional athletes/performing artists or other groups of workers might experience but which may not affect their activities of daily living and consequently may go “undetected” in the 30-item portion of the DASH.</p>	
<p>The same procedure described above is followed to calculate the optional four-item module score. All four questions must be answered in order to calculate the score. Simply add up the assigned values for each response and divide by four (number of items); subtract one and multiply by 25 to get a score out of 100.</p>	

Original Version Item:	Final Translated Version (T-12)
<p>Missing Items If more than 10 percent of the items (that is, more than three items) are left blank by the respondent, you will not be able to calculate a DASH disability/symptom score. By this same rule (that is, no more than 10 percent of the items can be left blank), no missing values can be tolerated in the high-performance sports/performing arts or work module because the module consists of only four items.</p>	

Synthesis process report of discrepancies (dealt with in Stage II to create T-12):

Issue: (specify item # and describe issue)	Resolution:

Appendix D: Back-Translation Into English.

*** Back translation is done *without looking* at this form, or the original DASH. Results are then summarized on this form. It is important that the back translator is blind to the original instrument.

Translator (*circle one*): #1 #2

Name of translator: _____

Country of origin (where was English spoken as first language): _____

The DASH Questionnaire.

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
Instructions: This questionnaire asks about your symptoms as well as your ability to perform certain activities.	
Please answer every question, based on your condition in the last week, by circling the appropriate number.	
If you did not have the opportunity to perform an activity in the past week, please make your best estimate on which response would be the most accurate.	
It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.	
Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.	
1. Open a tight or new jar.	
2. Write.	
3. Turn a key.	
4. Prepare a meal.	
5. Push open a heavy door.	
6. Place an object on a shelf above your head.	
7. Do heavy household chores (e.g., wash walls, wash floors).	
8. Garden or do yard work.	
9. Make a bed.	
10. Carry a shopping bag or briefcase.	
11. Carry a heavy object (over 10 lbs.).	

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
12. Change a lightbulb overhead.	
13. Wash or blow dry your hair.	
14. Wash your back.	
15. Put on a pullover sweater.	
16. Use a knife to cut food.	
17. Recreational activities which require little effort (e.g., card playing, knitting etc.).	
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	
20. Manage transportation needs (getting from one place to another).	
21. Sexual activities.	
22. During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	
23. During the past week, were you limited in your work or other daily activities as a result of your arm, shoulder or hand problem?	
24. Arm, shoulder or hand pain.	
25. Arm, shoulder or hand pain when you perform any specific activity.	
26. Tingling (pins and needles) in your arm, shoulder or hand.	
27. Weakness in your arm, shoulder or hand.	
28. Stiffness in your arm, shoulder or hand.	

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?	
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem.	
<p>Work Module: The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role).</p> <p>Please indicate what your job/work is: I do not work. (You may skip this section)</p>	
Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:	
1. Using your usual technique for your work?	
2. Doing your usual work because of arm, shoulder or hand pain?	
3. Doing your work as well as you would like?	
4. Spending your usual amount of time doing your work?	
<p>High performance sports/musicians The following questions relate to the impact of your arm, shoulder or hand problem on playing your musical instrument or sport or both. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you.</p> <p>Please indicate the sport or instrument which is most important to you.</p> <p>I do not play a sport or an instrument (you may skip this section)</p>	

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
1. Using your usual technique for playing your instrument or sport?	
2. Playing your usual musical instrument or sport because of arm, shoulder or hand pain?	
3. Playing your usual musical instrument or sport as well as you would like?	
4. Spending your usual amount of time practicing or playing your instrument or sport?	

Translation of response categories

No difficulty Mild difficulty Moderate difficulty Severe difficulty Unable So much difficulty that I can't sleep	
Not at all Slightly Moderately Quite a bit Extremely	
Not limited at all Slightly limited Moderately limited Very limited Unable	
None Mild Moderate Severe Extreme	
Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
<i>Translation of scoring instructions</i>	
<p>The DASH is scored in two components: the disability/symptom questions (30 items, scored 1-5) and the optional high performance sport/music or work section (4 items, scored 1-5)</p>	
<p>Disability/symptom score At least 27 of the 30 items must be completed for a score to be calculated. The assigned values for all completed responses are simply summed and averaged, producing a score out of five. This value is then transformed to a score out of 100 by subtracting one and multiplying by 25. A higher score indicates greater disability.</p>	
<p>DASH disability/symptom score =</p> $\frac{[(\text{sum of } n \text{ responses}) - 1] \times 25}{n}$ <p>where <i>n</i> is equal to the number of completed responses</p>	
<p>Optional modules (sport/music or work) Each optional module consists of four items, which may or may not be used by individuals because of the nature of the questions. The goal of the optional modules is to identify the specific difficulties that professional athletes/performing artists or other groups of workers might experience but which may not affect their activities of daily living and consequently may go “undetected” in the 30-item portion of the DASH.</p>	
<p>The same procedure described above is followed to calculate the optional four-item module score. All four questions must be answered in order to calculate the score. Simply add up the assigned values for each response and divide by four (number of items); subtract one and multiply by 25 to get a score out of 100.</p>	

Original Version Item:	Back-Translated Version (BT-1 or BT-2)
<p>Missing Items If more than 10 percent of the items (that is, more than three items) are left blank by the respondent, you will not be able to calculate a DASH disability/symptom score. By this same rule (that is, no more than 10 percent of the items can be left blank), no missing values can be tolerated in the high-performance sports/performing arts or work module because the module consists of only four items.</p>	

Appendix F: Pilot testing report.

Sample description

Sample Size: _____

Description: Disorder: _____

Age: (mean, std deviation) _____

Gender: # males = _____ # females = _____

Study description

Reliability: (internal consistency, test-retest reliability)

Please describe the methods used:

Please describe the results:

Validity:

Methods used (list constructs, how they were measured)

Summarize results for each construct:

Responsiveness:

Describe methods used:

Describe results:

Other psychometric testing (e.g. Rasch modelling)

Describe:

Describe results:

Appendix G: AAOS appraisal of the adaptation process.

** This evaluation is based on the guidelines given in Guillemin (1993).

Name of instrument: _____ (indicate name & version used)

	Source (original)	Target
Language	_____	_____
Culture:	_____	_____
Country:	_____	_____

	Evaluation <i>(circle one)</i>	Score <i>(number of "yes" checks)</i>
1. Translation technique Used two or more translations? Translating into their mother tongue? Was only one translator aware of concept & condition of clients?	Yes No Yes No Yes No	_____/3
2. Synthesis of translated versions. Synthesis of translations done	Yes No	_____/1
3. Back translation Used two or more translations? Translating into their mother tongue? Both not aware of concepts/condition?	Yes No Yes No Yes No	_____/3
4. Expert committee Committee review done? Membership of committee appropriate? Details of decisions & issues provided?	Yes No Yes No Yes No	_____/3
5. Pretesting Probe technique used and reported on? Psychometrics reevaluated?	Yes No Yes No	_____/3