A systematic approach for accurate translation of instruments: Experience with translating the Connor–Davidson Resilience Scale into Arabic

Ghazwan Toma¹, Timoty C Guetterman¹, Tareq Yaqub², Nizar Talaat³ and Michael D Fetters¹

Introduction

Translating existing instruments accurately is a challenge for health researchers (Garcia-Castillo and Fetters, 2007; Maneesriwongul and Dixon, 2004). When conducting research in languages besides English, researchers often turn to existing instruments for efficiency. It is potentially less resource intensive to adapt an existing instrument with reliability and validity evidence than to develop an entirely new one. Researchers who make the decision to translate an existing instrument should consult carefully with cultural-content experts regarding appropriateness of making such a decision, and consider whether there are any compelling reasons for expanding or creating a new instrument. Once an informed decision has been made about the appropriateness of using an existing instrument written originally in a different

Keywords

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¹University of Michigan, Ann Arbor, MI, USA
²Medical College of Wisconsin, Milwaukee, WI, USA
³Beaumont Hospital, Dearborn, Dearborn, MI, USA

Corresponding author:
Ghazwan Toma, University of Michigan, 1018 Fuller Street, Ann Arbor, MI 48104, USA.
Email: gtoma@umich.edu
language, the most critical issue is ensuring the accuracy of translation. Although a number of techniques have been described in the use of cross-cultural surveys, the quality of many translations and methodological approaches is open to criticism (Garcia-Castillo and Fetters, 2007; Maneesriwongul and Dixon, 2004). For example, errors arise from differences between cultures in the particular phenomenon being assessed by the instrument, different versions (e.g. dialects) of the target language that lead to misunderstanding among respondents, and the modification of words in ways that are no longer semantically equivalent. Methodological criticisms include unclear procedures for translations and the lack of appropriate testing of the translated instrument (Maneesriwongul and Dixon, 2004).

Researchers have several available approaches for developing translations: forward-translation, back-translation, and cognitive testing. In forward-translation, one or more language experts translate an instrument to the target language. With back-translation, one or more language experts translate from the target language back to the original language to check for discrepancies. Common variations of translation include single translator forward-translation and back-translation by a second translator, and comparison of the back-translation with the original document; this is an approach that is well adopted by the World Health Organization (WHO) to translate health-related instruments (WHO, 2016). Another variation involves independent forward-translation by two translators and reconciliation without back-translation. What remains unclear is whether there would be value added by conducting independent forward-translation using two translators, followed by reconciliation, and then completing back-translation.

Cognitive testing is a process to check the understanding of the translated instrument by individuals representing intended users of the instrument. DeVellis (2012) defines cognitive testing as a qualitative approach for understanding how potential respondents will interpret and understand items. Broadly speaking, cognitive testing examines instructions, responses, and items (Sousa and Rojjasirirat, 2011). It can uncover problems related to language, comprehension, and cultural relevance. Recent advances in translation procedures have called for combining all of these approaches to produce a comprehensive and accurate translation (Sousa and Rojjasirirat, 2011).

Although translation techniques have been described, less is known about the pitfalls that may arise and how quality checks can be employed throughout the process to address these problems. In this article, we illustrate a qualitatively driven approach to the translation of an instrument and demonstrate how each step contributes to a best-quality translation. We discuss the details of using this comprehensive process as applied to a specific resilience instrument, illustrate how different steps contribute to refinement of a translation, and present procedures to overcome conflicts that arise. We discuss the critical role of a cross-cultural research methodologist and checking the intended meaning with the original author when discrepancy arises. In this example, we were particularly fortunate to actively collaborate with the original instrument’s author throughout the process, but recognize that such an advantage will not always be possible.

The impetus for this study derived from our own interest in research on acculturation in an Arab population of immigrants and refugees. The United States and Canada have witnessed a continuous influx of refugees from Iraq and the Middle East. In 2009 and 2010, Iraqi refugees were the most common group of refugees in the United States and they were third in 2011 (Martin and Yankay, 2014). The topic is salient because increased resilience appears to protect against diminished mental health. Refugees are not only more likely to experience physical and mental health problems when compared to the population generally (Kinzie et al., 2008; Mills et al., 2008; Naeem et al., 2005; Ouimet et al., 2008; Sabin et al., 2006; Stauffer et al., 2002), but they also face language- and culture-related barriers in accessing health-care (de Anstiss et al., 2009; Mizra et al., 2014; Morris et al., 2009; Saadi et al., 2012; Saechao et al., 2012; Steel et al., 2005). While effective acculturation appears to improve access, diminished resilience may limit a refugee’s ability to effectively acculturate and integrate in their new society (Almedom, 2008; Smith, 2009). Attending to a person’s resilience, therefore, may prove an effective leverage point in facilitating acculturation and improving one’s ability to access needed health/mental health services.

While the definition of resilience has evolved over time, the key components of resilience relate to a person’s ability to positively adapt to a changing or unpredictable environment and maintain or regain positive mental health while facing or confronting adversity (Herrman et al., 2011). Resilience can predict an individual’s adaptation ability (Herman, 2012; Smith, 2009; Thompson et al., 2011). Measuring a person’s resilience has important clinical utility: it can help identify those struggling to adapt to a new environment and inform interventions to alleviate stress, anxiety, or depressive symptoms (Herman, 2012; Hermann et al., 2011; Smith, 2009).

Few studies have explored resilience among Arabic-speaking individuals in the United States (Arnetz et al., 2013; Morris et al., 2009; Saechao et al., 2012). As the number of Arabic-speaking refugees is increasing, researchers need a validated measure of resilience for the Arabic-speaking population. We deemed the Connor–Davidson Resilience Scale (CD-RISC-Arabic) to be a particularly good choice as it is a widely utilized instrument available in many languages (Connor and Davidson, 2003). The CD-RISC instrument has been tested in many populations as well as different psychiatric disorders and is well applicable to Arab-speaking individuals who live in the United States (more information is available at www.connordavidson-resiliencescale.com/about.php). Given the widespread use across multiple linguistic and cultural groups, the first author (bilingual investigator) and
senior author (culture research methodologist) along with the instrument developer reached the conclusion that developing a resilience instrument de novo was not needed. An additional advantage of focusing on the CD-RISC would be an ability to compare our own results to the findings of researchers working with refugees who use other languages such as comparing resilience scores of different populations and illnesses.

Cognizant of the lack of a detailed literature illustrating translation procedures and detailed examples of the kinds of challenges that emerge, we endeavored to fully document methodologically our state-of-the-art procedure for translation while developing the CD-RISC-Arabic. The purpose of this research is to demonstrate the qualitatively driven approach for developing an accurate translation using the example of our development of an Arabic version of the CD-RISC resilience instrument. We clearly discuss the details of this process using matrices with actual Arabic translations and their English equivalents to illustrate what kinds of challenges can arise and a culturally informed approach for overcoming these challenges.

**Methods**

**Design**

All translators are healthcare professionals who were born in Arab-speaking countries. They live and work in the United States at the time of translation was underway. After obtaining the translation approval from the author, we used double, independent forward-translation, reconciliation, and then independent back-translation and reconciliation followed by cognitive testing to develop a novel Arabic translation of the CD-RISC. Two bilingual people, “forward translators 1 (director of community mental health center originally from Syria) and 2 (an internist original from Sudan),” independently forward translated the 28 segments of the CD-RISC instrument into Arabic (title, instructions, scoring, and 25 items). A third bilingual person who is a family and geriatric physician in the United States originally from Iraq (G.T., the first author and the “bilingual investigator”) combined the two forward-translations to produce a reconciled version. He also recorded the challenges and solutions that were discussed with culture research methodologist (M.D.F., senior author). Then a fourth bilingual person, the “back translator” who was a medical student in the US at the time of translation and originally from Palestine, back-translated the reconciled Arabic into English. The culture research methodologist who is also a physician with wide experience in methodology and linguistics and bilingual investigator then compared the original English and the back-translated English, and recorded any concerns with the back-translation. Together, the research methodologist and bilingual investigator examined and resolved the identified differences. This project was reviewed by the University of Michigan Human Subject Review Committee and approved as exempt research.

**Setting.** The project team was based at the University of Michigan in the midwestern United States. We collaborated with Dr Jonathan Davidson who developed the CD-RISC instrument for content-related questions, and Dr Hammad from a community agency partner (ACCESS—Arab Community Center for Economic and Social Services) to develop this translation. This research was conducted to support a parent project on acculturation of Arabic refugees. The translation process started in June 2013 and was completed in March 2014.

**Instrument being translated.** The CD-RISC is a tool comprising 25 items rated on a 5-point scale (0–4), with higher scores reflecting increased resilience. It has existing evidence of reliability (coefficient $\alpha = .89$) and validity of scores (Connor and Davidson, 2003). An exploratory factor analysis showed that the CD-RISC has five distinct factors: personal competence, high standards, and tenacity; trust in one’s instincts, tolerance of negative affect, and strengthening effects of stress; the positive acceptance of change and secure relationships; control; and spiritual influences (Connor and Davidson, 2003).

**Data collection and analysis of translation procedures.** The bilingual investigator kept meticulous records of all forward-translation, reconciliation, and back-translation procedures using tables to compare and analyze each of the 28 segments. The bilingual investigator was in close contact with forward and backward translators to clarify any ambiguous issues. We recorded in tables all issues that arose, the point in the process when the issues occurred, and how problems were resolved. We examined patterns of the type of issues that arose across all segments for both the forward- and back-translation. Based on the similarities of solutions of translation dilemmas (e.g. different word choice, making it easy to understand, adding a word, and so on), these findings were incorporated into Table 1 for forward-translation procedures and Table 2 for back-translation procedures. Roles of investigators were clearly defined in the process. The bilingual investigator identified the concerns in the forward-translation. In addition, the culture research methodologist guided the process on how to resolve the issues identified. Table 1 categorizes the issues and solution types (see Table 1). The cultural research methodologist played a similar crucial role in organizing the data as represented in columns in the Table 2. Due to copyright issues, only examples where translation concerns arose from the 28 segments were presented in the tables.

**Clarification of meaning with the instrument developer.** For the items we deemed ambiguous that could not be resolved without clarification of the intent of the English meaning, the bilingual investigator and the culture research methodologist then discussed disputed items with the instrument developer (Dr Davidson), and resolved these concerns based on a more
Table 1. Independent forward-translation in Arabic of the CD-RISC: Problems identified and resolution of the problems.

| Text segment | Original English | Arabic translation from forward translator #1 | Arabic translation from forward translator #2 | Final forward-translation after reconciliation by bilingual investigator | Bilingual investigator concerns about two forward Arabic translations | Reconciliation solution type | Explanation of reconciliation |
|--------------|------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------|------------------------------------------------------------------|-----------------------------|---------------------------------|
| Instructions | For each item, please mark an "x" in the box below that best indicates how much you agree with the following statements as they apply to you over the last month. If a particular situation has not occurred recently, answer according to how you think you would have felt. | لكل جواب، الرجاء وضع علامة "x" في المربع أدناه. في المربع أدناه، يمكنك عن طريق الاختيار من واقيات محددة في النص الذي نقلته إلى العربية أن تشير إلى أغلب مواقفك على المواقف المتصلة في النص الأخضر. إذا لم يحدث ذلك معي.DE | #2 chose better wording for the concept of "how much do you agree."—wording of #2 was more easily understood by an Arabic reader. | Chose more natural expression<sup>a</sup> | #2 chose better wording for the concept of "how much do you agree"—wording of #2 was more easily understood by an Arabic reader. | #2 chose better wording for the concept of "how much do you agree"—wording of #2 was more easily understood by an Arabic reader. | #2 chose better wording for the concept of "how much do you agree"—wording of #2 was more easily understood by an Arabic reader. |
| Scoring “15” | Not true at all | ليس صحيحا على الإطلاق | #1 is more easily understood as #2 paraphrased; needed other minor modifications. | Combined both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |
| #6 | I try to see the humorous side of things when I am faced with problems. | أحاول أن أنتباه إلى الجانب المرح من المشاكل عندما أواجهها. | Combined with both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |
| #7 | Having to cope with stress can make me stronger. | تضطراري للتعامل مع التوتر والاحباط النفسي يمكن أن يجعلني أقوى. | Combined both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |
| #8 | I tend to bounce back after illness, injury, or other hardships. | أميل إلى استعادة توازني بعد مرض أو إصابة أو أي صعوبة أخرى. | Combined both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |
| #24 | I work to attain my goals no matter what roadblocks I encounter along the way. | أنا أعمل على تحقيق أهدافي، في حالما أواجه صعوبات تعرقلني. | Combined both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |
| #25 | I take pride in my achievements. | أنا فخور بإنجازاتي | Combined both, and modified to make it easier to understand; added the word "نافسا" which means "psychological." | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق | Combined both; added نادراً ما يكون صحيحاً على الإطلاق |

CD-RISC: Connor–Davidson Resilience Scale.
<sup>a</sup>Chose a more natural expression, for example, flow of the phrasing, making it more colloquial: instructions, 3, 5, 7, 9, 11, 16, 22, 24.
<sup>b</sup>Used both for final wording, nearly identical: scoring, 10, 12, 13, 15, 17, 18, 19.
<sup>c</sup>Expanded wording needed for words difficult to translate—added modifier or used two words to describe: title, 2, 6, 7, 11.
<sup>d</sup>Better matched the meaning, for example, problem with accuracy of translation: items 4, 8, 14, 23.
<sup>e</sup>Better literal match to English, for example, both phrasings accurate, but one closer literally to English: 1, 20, 21, 25.
Table 2. Backward-translation in Arabic of the CD-RISC: Problems identified and resolution of the problems with input of the investigator and instrument developer.

| Text segment in English | Final forward-translation after reconciliation by bilingual investigator | English wording of original tool | Resulting English back-translation from back-translation to English from Back Translator (English translation backward) | Back translator’s concern and bilingual investigators’ solutions about the back-translation of Arabic to English | Culture research methodologist’s concerns about differences between original English and English from back-translation and the resolution | Resulting semi-final Arabic based on discussion with instrument developer about ambiguous text segments | Final back-translation of text segments after ambiguity discussion with the instrument developer |
|-------------------------|--------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| **Instruction** **لكل عنصر، الرجاء في المرجع أدناه مشيرًا إلى أي مدى تنطبق العبارات التالية مع حالتك خلال الشهر الماضي. إذا لم يحدث موقف معين مؤخراً، اجب وفقاً لاعتقادك كيف قد تشعر تجاه ذلك موقف** | For each item, please mark an "x" in the box below that best indicates how much you agree with the following statements as they apply to you over the last month. If a particular situation has not occurred recently, answer according to how you would most likely feel if it did apply to you. | Backward translator noted (halalan) "حالتك" — that in the Arabic translation, it was problematic because of stigma associated with this word (implied you have a condition). Resolution removing "general state" and using the term "you." | Backward translator noted halalan (ghaliban) in #4 and mutham (mutham) in #5 seem similar, rather mean often. Is one option meant to be "always"? Resolution: Item 5 had two different forward Arabic translations. Chose an alternate wording (trans #1) which upon reflection was better. | For each item, place an "x" in the box indicating the statement that most applies to your general state of being over the past month. If a statement does not currently apply to you, respond with how you would most likely feel if it did apply to you. | Is there a difference between "current" and "recent"? Resolution: Confirmed that the Arabic accurately reflects the idea of "recently," and the use of "currently" by the back-translation was sub-optimal choice. Resolved by switching currently back to recent "moakharan." | For each item, place an "x" in the box indicating the statement that most applies to your general state of being over the past month. If a statement has not applied to you recently, respond with how you would most likely feel if it did apply to you. |
| **Scoring** **“1–5”** | 1: Not true at all 2: Rarely true 3: Sometimes true 4: Often true 5: True nearly all the time | Backward translator noted halalan (ghaliban) in #4 and mutham (mutham) in #5 seem similar, rather mean often. Is one option meant to be "always"? Resolution: Item 5 had two different forward Arabic translations. Chose an alternate wording (trans #1) which upon reflection was better. | Backward translator noted halalan (ghaliban) in #4 and mutham (mutham) in #5 seem similar, rather mean often. Is one option meant to be "always"? Resolution: Item 5 had two different forward Arabic translations. Chose an alternate wording (trans #1) which upon reflection was better. | 1: never true 2: rarely true 3: sometimes true 4: frequently true 5: almost always true | 1: never true 2: rarely true 3: sometimes true 4: frequently true 5: almost always true | 1: never true 2: rarely true 3: sometimes true 4: frequently true 5: almost always true | 1: never true 2: rarely true 3: sometimes true 4: frequently true 5: almost always true |

(Continued)
| Text segment in English | Final forward-translation after reconciliation by bilingual investigator | Resulting English back-translation from back-translation to English from Back Translator (English translation backward) | Back translator’s concern and bilingual investigators’ solutions about the back-translation of Arabic to English | Culture research methodologist’s concerns about differences between original English and English from back-translation and the resolution | Resulting semi-final Arabic based on discussion with instrument developer about ambiguous text segments | Final back-translation of text segments after ambiguity discussion with the instrument developer |
|------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 6 أحاول أن أرى الجانب الفكاهي أو الهزلي من المشاكل عندما أواجهها | I try to see the humorous side of things when I am faced with problems. | Backward translator: “Humorous” may be misunderstood in this context so “comic” was added. Debating to use a more colloquial “I try to see the funny side of things…” | Was there a better choice in the Arabic for “comedic” versus “humorous”? Resolution chose best word, “hezeley” after discussion with instrument developer. | | | |
| 7 اضطراري للتعامل مع التوتر الإجهاد النفسي يجعلني أقوى | Having to cope with stress can make me stronger. | Being placed in situations that cause me stress and tension make me stronger. | Were there two words in Arabic that caused the person to write “stress” and “tension”? Yes, Comment: Used a different additional word here: “tension” to capture “stress.” Resolution: Best word is “Tawator.” Note that it came up naturally in both places, items 2 and 7. | | | |
| 24 أعمل على تحقيق أهدافي بعض التوتر عن الصعوبات التي تعترض طريقي | I work to attain my goals no matter what roadblocks I encounter along the way. | I work toward achieving my goals regardless of the hardships that I face along the way. | “Hardships” versus “roadblocks”? “Roadblocks” in Arabic are more physical barriers compared to “hardships” which have a psychological overtone. Resolution: Did instrument developer mean “obstacle” or “hardship” in the choice of “roadblocks.” Answer: “obstacle” so we changed to “Akabat” as in #11. | | | |

CD-RISC: Connor–Davidson Resilience Scale.
nounced understanding of the intent of the English. The outcome of this discussion was a reconciled, semi-final Arabic translation edited by the bilingual investigator. As a final step, the back translator developed English for the disputed items from the semi-final Arabic translation. These specific statements were then compared and approved by the investigators for equivalence. That semi-final Arabic Instrument was then subjected to cognitive testing.

**Cognitive testing and analysis.** We conducted cognitive testing with six adults who were native Arabic-speaking individuals to ensure the final version was understood by them as intended (DeVellis, 2012). Their participation was voluntary and only verbal consent was obtained. The participants in cognitive testing, a combination of staff and clients, were randomly selected from a community agency partner (ACCESS), which has diverse Arabic-speaking clients. Participants’ gender was evenly distributed and included different levels of education. Cognitive testing entailed the bilingual investigator administering the instrument individually to each participant. With each segment, the researcher paused and checked for understanding and whether any concerns arose. The cognitive testing process involved an iterative analysis of each item to check for understanding. If participants did not seem to interpret the item the same way, the difference indicated a need to clarify. If a participant did not understand, the researcher rephrased the item and recorded the item for further analysis—this only happened with the introduction. Based on their feedback and analysis from the bilingual investigator and culture research methodologist, the finalized, fully reconciled Arabic version was produced. For analytics, we tracked the number and types of issues.

**Results**

**Findings from independent forward-translation**

There are 28 text segments in total on the CD-RISC: title, instruction, scoring, and the 25 items. Among the 28 text segments, the bilingual investigator analyzed eight segments from forward translator 1 for items 1, 4, 8, 11, 20, 21, 24, and 25, and eight segments from forward translator 2, specifically, title, instructions, and items 3, 5, 14, 16, 22, and 23. Given the similarity of the forward-translation of both versions, we combined/integrated the remaining 12 segments, specifically, scoring and items # 2, 6, 7, 9, 10, 12, 13, 15, 17, 18, and 19.

The forward-translation process, including the specific translation and semantic equivalence concerns as well as resolution procedures, is summarized in Table 1. After reviewing the two forward-translations, the bilingual investigators reconciled each of the 28 segments of the instrument with continuous discussion of the forward translators. The results of the translation with the feedback of the cultural research methodologist were organized by item into Table 1. Then, we used this table as tool for checking translation accuracy (final forward-translation). There were five occurrences where expanded wording was needed of a word difficult to translate, for example, using an additional clarifying word as a modifier or in case of using two words to capture nuance. There were nine occurrences when a more natural expression was needed. The solutions included the flow of the phrasing, and making the language more colloquial. There were eight occurrences where the final wording was nearly identical, but some integration was needed for the final phrasing. There were four occurrences where a better literal match to the original English was chosen. There were four occurrences when there was a problem with the accuracy of a translated word (i.e. the word choice). There were two occurrences (items 7 and 11) where there were two necessary solutions (expanded wording and need of more natural phrasing).

**Independent back-translation and reconciliation**

Table 2 explains the back-translation as well as the reconciliation with the culture research methodologist and instrument developer. Independent back-translation provided an additional check of semantic equivalence of the translation. The introduction, scoring, and five items (#2, 6, 7, 11, and 24) were modified based on the back-translation. The back-translation found two sub-optimal items in the forward-translation (scoring and introduction) and helped the word choice (item #24) and finding the best literal match for four items (using one word in items 2, 6, 7, and 11 instead of two).

Consultation with the instrument developer Dr Davidson about the exact intent of the original English clarified the introduction and three items (6, 21, and 24).

**Cognitive testing and reconciliation**

The cognitive testing through interviews with individuals who would be similar to a target population in an actual study using the instrument served as a final check of the accuracy of both translation procedures. Saturation, the point during data collection when no substantively different ideas emerged, was attained after the six interviews. Based on feedback with each of six individuals about each of the 28 segments, the final translation ended with seven revisions. The introduction and five items were slightly modified to make them easier to understand. There were two changes in the introduction, one grammatical and one that involved word choice. A word was added to three items (items 2, 7, and 20) to clarify them further. There was one word choice change (item 18) and one typographical correction (item 10).

**Discussion**

Developing a very accurate translation of a tool is both a cumbersome process and challenging undertaking, yet explaining the process and the transparency of the work produced is
crucial in order to produce a state-of-the-art translation. This research illustrates the value added by conducting independent forward-translation using two translators, followed by reconciliation, and then back-translation. There were notable differences in the independent forward-translations. Clearly, the back-translation was valuable. The fact that semantic equivalence was not achieved after forward-translation further highlighted the importance of including a cultural expert and conducting the independent back-translation. The cognitive testing then further refined the instrument through testing with participants representing the target audience.

Among the challenges the research team encountered were developing a clear understanding of the intent of each item in the original English version and summarizing the resolution types by the investigators. In contrast to this example, most authors who produce a second-language version do not provide sufficient information to understand translation procedures. We believe this may be due to several reasons. First, researchers do not really have many venues for making public details of their translations. Moreover, making public the details could be seen as creating vulnerability for the accuracy of the translation. Second, lead researchers on projects, especially researchers who are monolingual, may not understand the complexity of translation and may want simply a quick fix. There may be a naïve understanding that there are natural equivalencies of constructs across languages.

This research thus raises questions about accuracy of many translated instruments that have used less intense translation procedures and the extent cultural context was considered and accounted for by the translators. Challenges are likely to arise when conducting any translation. Based on this research, there are now clear illustrations of procedures for addressing problems that arise during translation and back-translation and how each problem can be solved.

A unique contribution of this discussion of translation procedures is the role of a team regularly communicating throughout the translation process. The periodic meetings provided a format to address each challenge, and a team approach to translation proved particularly useful by providing multiple perspectives to resolve discrepancies. By including three individuals who conducted forward and backward translation, each with a different Arabic dialect (Syrian, Sudanese, and Palestinian) in addition to the bilingual investigator (Iraqi), we were able to identify problematic items and ensure broader applicability to an Arabic-speaking population. As there are many Arabic dialects, they all share common official “broadcast” Arabic language. Therefore, having extensive representation on the team from multiple nationalities may be particularly important, especially if the intent is to use the instrument with Arabic speakers of multiple backgrounds.

Working with the original instrument developer ensured the translation did not change the intended meaning of items. As illustrated here, the original developer can assist with word choice when the meaning of a particular item is in question because the original developer is most familiar with the construct being measured. Cognitive testing with the target audience can provide a rigorous qualitative method to discuss each item and talk about understanding. Although it yielded a relatively small number of corrections, the research team strongly recommends cognitive testing as a final check of translation accuracy and fluency. Finally, this research explored the critical added value of review by a methodologist specializing in cultural research.

In our experience, most original instrument developers appreciate other researchers developing their instrument into other languages in order to extend the “reach” to other populations. Original instrument developers are most receptive when the proposal includes details on using a best-quality approach. This translation has been designated as the standard Arabic language translation by the tool’s copyright holder, Dr. Jonathon Davidson.

This research illustrates that investigators face significant costs when producing high-quality translations of instruments, primarily due to human labor costs. In the research team’s consulting experiences with grant application development, candidates often short-change the process, such as when faced with tight budgets. Unfortunately, compromised equivalency at the translation level could compromise conclusions drawn from comparison of results across groups that have used different language translations of an instrument. We advise budgeting adequately to use best-quality translation practices.

The availability of the CD-RISC-Arabic instrument on resilience is very timely for our own research and that of others. The waves of refugees from the Middle East highlight the need for researchers and human services organizations to have a resilience instrument available, and its potential use in a variety of applications for measuring and monitoring adaptations to acculturation stress. The research team hopes availability of the CD-RISC-Arabic will enhance the resources for researchers engaged with Arabic-speaking refugees and other populations. This instrument can also be used by clinical psychologists while assessing mental health of clients from Arab-speaking countries.

With regard to potential study limitations, there were four diverse bilingual individuals involved in this translation (they were from different Arab countries with different dialects), but there were not any translators from North African countries. Using official “broadcast” Arabic language should have adjusted for this issue. The cognitive testing was conducted with six individuals. While no new issues were being identified, we may have made minor changes if we had tested the instrument on a larger number of subjects. Feedback from those six subjects was constructive even though it involved mostly minor changes.
Conclusion

In conclusion, this research illustrates detailed procedures for developing a high-quality and accurate translation. Given the changes that were incorporated based on having independent forward-translations, back-translation, and cognitive testing, we recommend this as a value-added endeavor meritorious of pursuing and funding when conducting research requiring adaptation of an instrument into a second language. In addition, engaging a cultural research methodologist overseeing the process and conducting cognitive testing can help to ensure that the instrument is not only accurate but also remains culturally relevant. Regular communication of the team is critical throughout the process. A natural extension of this research is to conduct a validation study of the CD-RISC-Arabic. Moreover, future methodological research should continue to develop the systematic procedures to ensure a culturally relevant and accurate translation. We anticipate increased need for these procedures because of continued global immigration, the increase in research conducted in developing nations that do not yet have instruments available, and the growing awareness of problems with simple forward- or backward-translation procedures. The robust translation procedures detailed here could be used by researchers in a variety of fields to develop best-quality translations.

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References

Almedom AM (2008) Resilience research and policy/practice discourse in health, social, behavioral, and environmental sciences over the last ten years. African Health Science 1: S5–S13.

Arnetz J, Rofa Y, Arnetz B, et al. (2013) Resilience as a protective factor against the development of psychopathology among refugees. Journal of Nervous and Mental Disease 201(3): 167–172.

Connor KM and Davidson JRT (2003) Development of a new resilience scale: The Connor–Davidson Resilience Scale (CD-RISC). Depression and Anxiety 18(2): 76–82.

De Anstiss H, Zaian T, Procter N, et al. (2009) Help-seeking for mental health problems in young refugees: A review of the literature with implications for policy, practice, and research. Transcult Psychiatry 46(4): 584–607.

DeVellis RF (2012) Scale Development: Theory and Applications (3rd edn). Thousand Oaks, CA: SAGE.

Garcia-Castillo D and Fetters MD (2007) Quality in medical translations: A review. Journal of Health Care Poor Underserved 18(1): 74–84.

Herman H (2012) Promoting mental health and resilience after a disaster. Journal of Experimental & Clinical Medicine 4(2): 82–87.

Herman H, Stewart DE, Diaz-Granados N, et al. (2011) What is resilience? Canadian Journal of Psychiatry (Revue Canadienne De Psychiatrie) 56(5): 258–265.

Kinzie JD, Riley C, McFarland B, et al. (2008) High prevalence rates of diabetes and hypertension among refugee psychiatric patients. Journal of Nervous and Mental Disease 196(2): 108–112.

Maneesrivongwul W and Dixon JK (2004) Instrument translation process: A methods review. Journal of Advanced Nursing 48: 175–186.

Martin DC and Yankje YE (2014) Refugees and asylees: 2013. Available at: https://www.dhs.gov/sites/default/files/publications/ois_rfa_fr_2013.pdf

Mills E, Singh S, Roach B, et al. (2008) Prevalence of mental disorders and torture among Bhutanese refugees in Nepal: A systematic review and its policy implications. Medicine, Conflict, and Survival 24(1): 5–15.

Mizra M, Luna R, Matthews B, et al. (2014) Barriers to healthcare access among refugees with disabilities and chronic health conditions resettled in the US midwest. Journal of Immigrant and Minority Health 16(4): 733–742.

Morris MD, Popper ST, Rodwell TC, et al. (2009) Healthcare barriers of refugees post-settlement. Journal of Community Health 34(6): 529–538.

Naeeem F, Mufti KA, Ayub M, et al. (2005) Psychiatric morbidity among Afghan refugees in Peshawar, Pakistan. Journal of Ayub Medical College, Abbottabad: JAMC 17(2): 23–25.

Ouimet M-J, Munoz M, Narasiah L, et al. (2008) Current pathologies among asylum seekers in Montreal: Prevalence and associated risk factors. Canadian Journal of Public Health (Revue Canadienne De Sante Publique) 99(6): 499–504.

Saadi A, Bond B and Percac-Lima S (2012) Perspectives on preventive health care and barriers to breast cancer screening among Iraqi women refugees. Journal of Immigrant and Minority Health 14(4): 633–639.

Sabin M, Sabin K, Kim HY, et al. (2006) The mental health status of Mayan refugees after repatriation to Guatemala. Revista Panamericana De Salud Publica = Pan American Journal of Public Health 19(3): 163–171.

Saechao F, Sharrock S, Reichertor D, et al. (2012) Stressors and barriers to using mental health services among diverse groups of first-generation immigrants to the United States. Community Mental Health Journal 48(1): 98–106.

Smith PR (2009) Resilience: Resistance factor for depressive symptom. Journal of Psychiatric and Mental Health Nursing 16(9): 829–837.

Sousa VD and Roujjanasrirat W (2011) Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. Journal of Evaluation in Clinical Practice 17(2): 268–274.

Stauffer WM, Kamat D and Walker PF (2002) Screening of international immigrants, refugees, and adoptees. Primary Care 29(4): 879–905.

Steel Z, Silove D, Chey T, et al. (2005) Mental disorders, disability and health service use amongst Vietnamese refugees and the host Australian population. Acta Psychiatrca Scandinavica 111(4): 300–309.

Thompson RW, Arnkoff DB and Glass CR (2011) Conceptualizing mindfulness and acceptance as components of psychological resilience to trauma. Trauma, Violence & Abuse 12(4): 220–235.
World Health Organization (WHO) (2016) Process of translation and adaptation of instruments. Available at: http://www.who.int/substance_abuse/research_tools/translation/en/ (accessed 30 October 2016).

Author biographies

Ghazwan Toma MD, MPH is an assistant professor at the department of family medicine at the University of Michigan. He is also a geriatrician and has clinical interest in complex patient care and transitional care. He has research interest in minority health as well as incorporating spiritual beliefs into patient care.

Timothy C Guetterman, PhD, is an applied research methodologist and Assistant Professor at the University of Michigan. His research interests, scholarship, and teaching are in research methodology, namely general research design and mixed methods research. His empirical work uses mixed methods research to investigate the use of virtual human technology to enhance health communication.

Tareq Yaqub, MD, is a resident in psychiatry at the Medical College of Wisconsin. He has research interests in refugee mental health and the determinants of resilience within the context of trauma, particularly trans-generational trauma. He is also interested in the interplay between psychoanalytic theory and neurobiology.

Nizar Talaat, MD is a senior gastroenterology fellow at East Carolina University, Brody School of Medicine. He completed his residency training in Dearborn, Michigan where one of the largest Arab American communities exists and was involved in several projects to improve Arab Americans awareness to screening test. His research interest includes disparities in health and health care among immigrants especially in the field of liver diseases.

Michael D Fetters, MD, MPH, MA, is a professor at the department of family medicine at the University of Michigan. He is family medicine researcher, health services researcher, and applied research methodologist. His empirical research interests focus on health care communication, and cross-cultural influences on decision making. He has a particular methodological interest in integration dimensions in mixed methods research.