

# Topical Review: Mind Your Language— Translation Matters (A Narrative Review of Translation Challenges)

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## Abstract

**Objective** Translation of developmental-behavioral screening tools for use worldwide can be daunting. We summarize issues in translating these tools. **Methods** Instead of a theoretical framework of “equivalence” by Pena and International Test Commission guidelines, we decided upon a practical approach used by the American Association of Orthopedic Surgeons (AAOS). We derived vignettes from the Parents' Evaluation of Developmental Status manual and published literature and mapped them to AAOS. **Results** We found that a systematic approach to planning and translating developmental-behavioral screeners is essential to ensure “equivalence” and encourage wide consultation with experts. **Conclusion** Our narrative highlights how translations can result in many challenges and needed revisions to achieve “equivalence” such that the items remain consistent, valid, and meaningful in the new language for use in different cultures. Information sharing across the community of researchers is encouraged. This narrative may be helpful to novice researchers.

**Key words:** child; cross-cultural; developmental-behavioral; screening tool; translation.

We know that when poorly validated or inaccurate measures are used, office visits may miss up to 70% of children with problems in development, behavior, social emotional skills, and mental health (Bethell, Reuland, Schor, Abrahms, & Halfon, 2011; Bierman, Connor, Vaage, & Honzik, 1964; Lavigne et al., 1993; Radecki, Sand-Loud, O'Connor, Sharp, & Olson, 2011). To determine which children are at risk of developmental and behavioral problems, accurate, validated screening tools are recommended for use in pediatrics (Council on Children with Disabilities et al., 2006). Many commonly used accurate screening tools, including developmental-behavioral measures used in children, were originally developed in

English-speaking nations. The American Academy of Pediatrics (AAP) encourages evidence-based screening, which means that “quality” translations are necessary to obtain accurate results when using these tools in non-English-speaking populations. Thus, there is a need not only to translate the tools into other languages, but also to use correctly translated tools to preserve the intended objectives of the measure. The correct translation is also crucial, given the diagnostic utility of several of these developmental-behavioral tools that are used to generate parent responses in pediatric populations from diverse backgrounds.

Good-quality translations require a rigorous and systematic multistep approach. Translations are

labor-intensive, are time-consuming, and can be fraught with difficulties. Novice researchers embarking on the task of translating a screening tool for use in their local population may find themselves using a trial-and-error process and seeking the advice of peers in an unstructured way. Despite adhering to the guidelines for undertaking the translation process, a seasoned researcher may still experience difficulties in attaining a valid translated document to ensure “equivalence” such that the items remain consistent, valid, and meaningful in the new language. There is an unacknowledged need for practical tips to help new researchers through the process of translation and to guide the translation *per se*. Unfortunately, there is sparse literature encompassing such tips.

In this narrative review, we cover issues encountered while translating several developmental-behavioral screening tools, although we primarily focus on Parents’ Evaluation of Developmental Status (PEDS) (Glascoe, 1997, 2015a) because it enjoys more than 41 translations (Glascoe, 2015b), is widely used in the United States and internationally, and because the instrument requires particularly thoughtful wording to elicit parents’ verbatim concerns about their child’s learning, development, and behavior.

There are a number of different approaches advocated in translation work. Our goal is to describe one of the more frequently adopted systematic approaches, highlight the problems encountered, and how these were addressed using vignettes on the translation experiences of the PEDS’ author along with those of the other developmental-behavioral screening tools. The developmental-behavioral tools were the ones identified as general developmental screeners by the AAP Council on Children with Disabilities (Council on Children With Disabilities; Section on Developmental Behavioral Pediatrics; Bright Futures Steering Committee; Medical Home Initiatives for Children With Special Needs Project Advisory Committee, 2006), such as Ages and Stages (ASQ; Squires, Twombly, & Bricker, 2009), Battelle Developmental Inventory Screening Test (BDIST; Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984), Bayley (Aylward, 1995), Brigance Screens (Brigance, 1986), Child Development Inventory (CDI; Ireton, 1992; Ireton & Glascoe, 1995), Child Development Review (CDR; Harold Ireton, 1990), Denver Developmental Screening Test (DDST; Frankenburg & Dodds, 1967), and Infant Development Inventory (IDI; Ireton, 1994). The translation experiences for the tools other than PEDS were derived from the published literature.

The International Test Commission (ITC) guidelines were prepared in 1992 for the translation and adaptation of tests and psychological instruments to establish “equivalence” across language and culture (International Test Commission, 2005). “Equivalence” refers to situations in which the translation carries the

“intended” meaning of the original questionnaire. Pena (2007) described four broad categories of “equivalence”: (1) Linguistic—describing the direct translation of a “word” or “phrase”. (2) Functional—focusing on ensuring that the item “construct” (properties) remain the same. This may involve very different wording from the “source” to be more user-friendly in the translated language. (3) Cultural—focusing on the different ways that cultural and linguistic groups view the “meaning” of an item. (4) Metric—describing a quantitative way to assess “equivalence” by measuring the psychometric properties of the original instrument compared with the translated version.

While ITC and Pena’s guidelines provide a theoretical framework for translation of instruments, they do not elaborate on the practical steps for carrying out the translation work in a systematic way to ensure “equivalence” so that the items remain consistent, valid, and meaningful in the new language. To aid in that process, we chose the guidelines used by the American Association of Orthopedic Surgeons (AAOS). The AAOS guidelines were proposed by Guillemin and Beaton and colleagues (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Guillemin, Bombardier, & Beaton, 1993), who were the first to review the cross-cultural adaptation and propose the guidelines for the process of cross-cultural adaptation of self-report measures. The AAOS was also identified as one of the three guidelines found in the literature for the cross-cultural adaptation of measures that were not specific to one particular tool (Acquadro, Conway, Hareendran, & Aaronson, 2008). AAOS also involved a more popular approach of back-translation.

AAOS guidelines describe a systematic six-step approach to translation work that we have used to highlight a practical approach to translating and adapting PEDS (Table 1). In the forward translation (Step 1), two independent versions of the questionnaire (T1 and T2) are created. The two versions are then synthesized as T12 (Step 2). In the back-translation stage, two versions are created independently called T12a and T12b (Step 3). An expert committee then meets to decide on the prefinal version (Step 4), which is then field-tested in Step 5. In Step 6, the final version is sent to the author of the questionnaire for approval and documentation.

In this narrative review, we summarize issues in translating the developmental-behavioral screening tools using vignettes and map them to a systematic approach to translation work using PEDS vignettes as an example of how easily meaning can be lost or misconstrued when a structured approach is not undertaken.

## Methods

PEDS consists of ten questions to be used with parents of children in the age range from birth through 8

**Table 1.** Applying the Six Steps: Using the PEDS Chinese Translation As an Example

The steps	Description of steps	PEDS item to be translated Q2. Do you have any concerns about how your child talks and makes speech sounds?	
Step 1	<p><b>Forward translation</b></p> <p>Bilingual translators who speak the translated language as mother tongue should produce two translations independently. It is highly recommended that at least one translator should be a provider, i.e., a professional in the field of child development who is familiar with the screening test under study, while the second translator should be a “colloquial” translator, i.e., new to the questionnaire but familiar with the target population.</p>	Version T1 New language version produced by a bilingual translator familiar with the tool, i.e., a provider who is a clinician or researcher (Translator 1).	T1 您对于孩子的说话及发音有任何担心 (dān xīn) 吗? Do you have any worries about your child's speech and speech sounds?
Step 2	<p><b>Synthesis of the translations</b></p> <p>The two translated versions of the questionnaire should be used to derive a single translated version through consensus and discussion about differences called T12.</p> <p><b>Back-translation</b></p> <p>The translated version should be back-translated independently into the original language by two translators who speak the original language (i.e., English) as mother tongue. These two translators should be different from the ones who completed the forward translation.</p>	Version T2 New language version produced by a bilingual translator familiar with the target community, i.e., a “colloquial” translator (Translator 2).	T2 您是否关注 (guān zhù) 您的孩子如何说话及发音? Do you pay attention to how your child speaks and his/her pronunciation?
Step 3	<p><b>Expert committee review</b></p> <p>The expert committee's goal is to achieve “equivalence” and to develop a version of the questionnaire for field testing. This committee should ideally be made up of health and language professionals, translators, and consensus reached on the “prefinal” version. An alternative may be to post the query in the online forum or online discussion with the expert panel and seek their input.</p>	Version T12 Produced from reconciling differences in Versions 1 and 2 (where Translators 1 and 2 agree on the most accurate version). Version T12(a) English version produced by back-translating T12 by another bilingual translator not familiar with the tool, i.e., naïve to the questionnaire (Translator 3). Version T12(b) English version produced by another bilingual translator familiar with the target community, i.e., a “colloquial” translator (Translator 4). Version 4 (prefinal version) Produced from reconciling differences in earlier versions with inputs from clinicians/researchers and professional translators to achieve consensus.	T12a Are you concerned or worried about your child's speech and speech sounds?  T12b Do you have concern or worry about your child's speaking and pronunciation?  V4 您有顾虑 (gù lǜ) 或担心 (dān xīn) 您的孩子的说话方法和发音吗? Do you have concerns or worries about your child's speech and speech sounds?
Step 5	<p><b>Test of the prefinal version</b></p> <p>This stage involves conducting a pilot study that aims to determine “equivalence” of the translated version in the target population. A small sample (focus group ideally 30–40 persons) can be recruited and each parent is asked about the meaning of each item. Field testing is critical for determining if “colloquial” terms or “idioms” in the translated language may have significantly altered the intended meaning of the screening questions.</p>	Version 4 Tested in the target population in a pilot study. May include small focus groups from the target population to ensure the translated items convey the intended meaning, i.e., “equivalence.”	V4 您有任何顾虑 (gù lǜ) 或担心 (dān xīn) 您的孩子的说话方法和发音吗? Do you have any worries or concerns about your child's speech and speech sounds?

Continued

Table 1. (continued)

The steps	Description of steps	PEDS item to be translated Q2. Do you have any concerns about how your child talks and makes speech sounds?
	Vetting occurs as part of field testing. It is a process where the original author of the questionnaire is consulted about the translation process and ensures there is “equivalence” in the translated versions. This process provides information on content validity.	
Step 6	<p><i>Submission of documentation to the original author for appraisal of the adaptation process</i></p> <p>The final step that also really precedes the first step is for translators to establish contact with the author of the screening tool to seek their advice and inputs. This should ideally take place before the translation work commences and typically continues into the final stages of field testing and beyond. The author is often consulted about responses from the translated screening tool, which may be unexpected, and seeks to help translators establish “equivalence.” This step is to ensure that all steps have been performed and fully documented.</p>	<p>Version 5 (final version)</p> <p>Consultation with the original author with findings from field testing based on translated questionnaire. Final changes to be made with inputs from the original author.</p> <p>V5</p> <p>您对于孩子如何说话及发音有任何顾虑 (gu lü) 或担心 (dān xīn) 吗? Do you have any concerns or worry about your child's speech and speech sounds?</p>

years, and has high specificity and sensitivity in detecting developmental-behavioral delays in young children (Glascoe, 2013). The PEDS questions use a common stem beginning with “Do you have any concerns about your child’s...” Parents indicate “yes,” “no,” or “a little” in their reply. Risk categories for developmental delay are stratified according to “high” risk, “medium” risk, “low” risk, or “no” risk, depending on the number of significant concerns reported and the child’s age (Glascoe, 2003).

### Data Sources, Study Selection, and Data Extraction

We wanted to explore the experiences of others in the field, focusing on the problems they encountered and the solutions they proposed. Thus, we conducted a literature search to look for the studies describing experiences of clinicians and researchers in translating and adapting developmental-behavioral questionnaires, the problems they encountered, and the solutions they proposed. We developed a search strategy in the PubMed (August 2015) that included nine developmental-behavioral screening tools (ASQ, Battelle, Bayley, Brigance, CDI, CDR, DDST, IDI, PEDS) as described in a recent review (El-Behadli, Neger, Perrin, & Sheldrick, 2015), combined with relevant terms such as translations, cross-cultural comparison, cross-cultural using the AND/OR Boolean operators.

### Search Strategy

The search strategy used was (ASQ OR Battelle OR Bayley OR Brigance OR “Child Development Inventory” OR “Child Development Review” OR “Denver Developmental” OR “Infant Development Inventory” OR “Parents Evaluation of Developmental Status” OR “developmental screen tool” OR “developmental behavioral screening tool”) AND (Translations OR Cross-Cultural Comparison OR cross cultural).

The search results comprising titles/abstracts of the studies were reviewed. Only studies in the English language that specifically highlighted or mentioned the problems, issues, or challenges faced during the process of translating the instrument and/or the strategies used to overcome them were shortlisted for retrieving the full texts.

Using the search strategy, we found scant peer-reviewed literature pertaining to translation experiences with developmental-behavioral survey tools, including the PEDS. Thus, we also visited publishers’ Web sites and sought manuals for each test and reviewed these for information on translations. The ASQ-3 User’s Guide (<http://agesandstages.com/resource/guidelines-cultural-linguistic-adaptation-asq-3-asqse/>) contains information on vetting with multiple bilingual English–Spanish speakers, field trials, and use of differential item functioning to check that

items performed as hoped in both languages. The ASQ Web site has a link to guidelines on translation and linguistic adaptation, though we did not find information on specific challenges encountered in translation work (Ages & Stages Questionnaires, 2013). El-Behadli et al. (2015) describe some of the challenges in cultural adaptation of the ASQ and the DDST. While there is limited information on translation and cultural adaptation on the Brigance Screens, we know that the Brigance Inventory of Early Development III is currently in the process of being adapted and normed for children aged 18 months to 6 years 11 months in Singapore (personal correspondence with Kenneth Poon, National Institute of Education, Singapore).

The PEDS manual collates the experience of the developer working with several researchers translating and validating the PEDS in multiple languages, cultures, and countries (Glascoe, 2013). The manual provided a great deal of insight into the content that described the experience of others in conducting translation of the PEDS or while using the translated versions of the PEDS. However, this important information source did not surface in our search for peer-reviewed literature for translation experiences. We extracted these experiences from the manual and included them as vignettes in the current review. Thus, through this narrative review, we summarize the challenges faced in the translation of the developmental-behavioral screening tools, primarily focusing on PEDS tool along with its solution through vignettes and how they map onto the AAOS guidelines and a few variations of the guidelines that may be useful.

## Results

We used AAOS guidelines as a framework for elaborating on problems that can occur while setting to do translation with the PEDS and other developmental-behavioral screening tools. We also propose some modifications to the AAOS guidelines to address frequent themes arising using this systematic approach. The AAOS steps and the vignettes described provide concrete illustrations on practical difficulties encountered and solutions found.

### Step 1. Forward Translation

A Somali PEDS translator, a social worker but long-time expatriate in the United States, was unfamiliar with the political climate in Somalia, i.e., that the word “concerns” was part of a war-lord slogan, frequently shown on billboards throughout Somalia, along the lines of “We have concerns about you.” It was not surprising that new immigrants from Somalia found this word scary and only about 2% of the parents answered the PEDS when it was administered (Glascoe, 2013). One parent finally plucked up the

courage to ask “Are you spying on our family members still living in Somalia?”

This vignette is an example of how the first step and seemingly most straightforward process in translation can already provide challenges. Ideally, bilingual translators who speak the translated language as mother tongue should produce two translations independently. It is highly recommended that at least one translator should be a provider, i.e., a professional in the field of child development who is familiar with the screening test under study, while the second translator should be a “colloquial” translator, i.e., new to the questionnaire but familiar with the target population. In this case, the “colloquial” translator was not familiar with the experiences of the target population, even though the same language was spoken and the under-reporting of concerns resulted. Further input from families resulted in questions that back-translated into “Do you have feelings about your child’s...” This wording worked well in immigrant Somali families who then began raising concerns with their child’s development at frequencies seen with the English PEDS (Glascoe, 2013). The translators need to ensure that grammar and syntax are appropriate in the new language.

### Step 2. Synthesis of Translation

When the Malay translation of the PEDS was first tested in Singapore, it yielded higher than expected rates of “high” risk results at 35% ( $N = 569$ , high risk = 199) (Kiing, Low, Chan, & Neihart, 2012). This translation omitted the word “have” from the stem of “Do you have any concerns?”, as only one version of the forward translation was produced (T1). When the same version was tested in Malaysia, parents had difficulties understanding the questions. The Malay PEDS, which read as “Adakah anda sebarang kebimbangan,” actually back-translated to “Is that you are concerned about...,” which some parents interpreted as “should you have concerns about?” and promptly answered “yes” (Lim et al., 2013).

In a revised translation of the forward translation in Malaysia, the word “mempunyai” (which means have) was added to the stem so that the new version read “Adakah anda mempunyai sebarang kebimbangan...,” which back-translated more accurately to “Do you have any concerns about...” This new translation yielded lower rates of “high” risk results at 29.9% ( $N = 77$ , high risk = 23) in a selective at-risk community (Lim et al., 2013). Comparisons of the two Malay translations revealed that the differences were not as significant with an odds ratio of 1.26 (95% CI: 0.75, 2.12,  $Z$  stats 0.88,  $p = 0.377$ ).

This vignette highlights the necessity of producing two translated versions of the questionnaire, which should be then used to derive a single translated version through consensus and discussion about differences

(T12, see Table). Having two versions on hand allows the translators to quickly detect differences that can alter the meaning and intent of the items and allow reconciliation early in the translation process.

### Step 3. Back-Translation

The US National Survey of Early Childhood Health (that used the Survey Version of PEDS, which consists of all close-ended questions) found that Latinos did not raise concerns as often as white or black Americans and suggested that Latinos did not attend much to language development. But their Spanish translation used “Inquieta sobre...,” which back-translated to “Are you disquieted about...” (Zuckerman, Boudreau, Lipstein, Kuhlthau, & Perrin, 2009). This was found to be language dating from the time of Shakespeare and not in current use! Similarly, when the Spanish version of PEDS was tested on families in the West Coast of the United States (e.g., California), the original translation of “Do you have concerns about...,” which was rendered as “Tiene preocupaciones...,” posed a problem. Although it back-translated nicely to “Do you have concerns,” this was not a typical way of asking for parents’ views and was not well-understood by families.

Back-translation is a step that ensures that the new language version of screening question remains as faithful to the source wording as possible. The translated version should be back-translated independently into the original language by two translators who speak the original language (i.e., English) as mother tongue. These two translators should be different from the ones who completed the forward translation to avoid carry-over effect and preconceptions about what the wording should be due to the bias associated with having worked on the original.

### Step 4. Expert Committee Review

To ensure that the four areas of “equivalence” (Pena, 2007) are achieved, the committee needs to be made up of “experts” and be prepared to modify items in the screening tool.

#### Step 4a. Panel of Experts

Typically, a panel of experts determines if any items or wording needs to be modified, added, or removed to preserve the original intent of questions. The expert committee can be wide-ranging and inclusive, comprising linguists, cultural experts, early childhood developmental experts, nurses, and community experts (D’Aprano et al., 2014).

Expert committee may modify the items using some of the following approaches:

1. *Changes to syntax and grammar:* In the Chinese and Japanese translations of the DDST, the item “uses plural-s” was excluded, as there is no difference in singular or plural use of nouns in these languages (El-Behadli, Neger, Perrin, & Sheldrick, 2015; Ueda, 1978). In the Korean cross-cultural adaptation of the ASQ, connecting words such as “a,” “the,” “am,” “is,” and “are” were modified, as they do not appear in Korean (Heo, Squires, & Yovanoff, 2008). In the Philippines translation of the DDST, the item “What is a spoon/shoe/door made of?” was misinterpreted by the children and had to be presented in analogy form as, “If a table is made of wood, a spoon/shoe/door is made of...” (Williams, 1984; Williams & Williams, 1987).
2. *Changes to semantics (words and word meanings):* When the ASQ-3 was adapted for use in the Australian aboriginal population, questions on the use of crayons and pencils had to be changed to “using a stick in the sand” to be culturally relevant (D’Aprano et al., 2014). In the cross-cultural adaptation of ASQ in northern India, small adjustments were made in the ASQ-3 following the discussion with local population. For example, “Does your child eat with a fork?” was changed to, “Does your child take chapatti with dal (lentils)?” (Kvestad et al., 2013).
3. *Using examples for greater clarity:* When the Chinese and Malay translations of the PEDS were field-tested in Malaysia, some parents had difficulties understanding what “preschool skills” actually were in Item 9 of the PEDS. Researchers had to include examples of preschool skills in Item 9 such as “... knowing words, numbers, colors, reading, spelling” to elicit concerns at the expected rates from parents (Lim et al., 2013).

#### Step 4b. Online and International Community of Experts

In the Spanish translation earlier described in Step 3, the issue in back-translation was alerted by the clinicians while using the PEDS tool in routine practice. The PEDS author posted a note on the Ambulatory Pediatric Association discussion list asking for advice. More than 20 clinicians agreed to comment and collectively agreed that the original wording should be changed to “Le preocupa sobre...,” which is closest in meaning to “Are you concerned about...” (Glascoe, 2013).

When the Charles B. Wang Child Health Center in New York City asked for a Chinese translation of the PEDS, the version tested in Singapore and Malaysia was offered as a version to start with, where “worries” was used instead of “concerns.” With frequent checking, which was more an informal process of going back to the researchers, the author of the PEDS found that the Chinese version of the PEDS did not result in excessive reporting of concerns and rates of concerns were commensurate with norms established in the original studies (Au, 2012). We propose that the international and online community can also be a very rich source of expert input and should be considered in every work of translation.

In some circumstances, though rarely, the expert committee may decide that the questionnaire cannot be suitably translated for the target population. The

adaptation of ASQ-II in Arabic precluded testing of 48- and 60-month intervals due to variability in the types of schooling and learning experiences among 4- and 5-year-old children. For example, many children were not yet taught the Arabic alphabets and numerals at the age of 4 or 5 (Charafeddine et al., 2013).

### Step 5. Test of the Prefinal Version (Field Testing)

#### Step 5a. Inputs From the Target Community

An initial translation of PEDS into Chinese rendered a >90% ( $N = 383$ , high risk = 358) rate of “high” risk results of two or more significant concerns (Kiing, Low, Chan, & Neihart, 2012). This is much higher than prevalence rates for disabilities and about eight times higher than the 11% at risk found in the U.S. norming sample (Glascoe, 2013). Although the word “concerns” was correctly translated as “关注” (gūan zhù), translators did not fully recognize that “concerns” is a synonym for “care” and so Chinese-speaking parents interpreted the question as, “Do you care about your child’s development?,” rather than “Are you worried about...?” Thus, differences in interpretation of synonyms explained the overwhelming over-reporting of “high” risk results, as parents did indeed “care” for their children. This prefinal version was not tested in a smaller focus group before the much larger sample size of 383 was recruited during the standardization study. This rendered the Chinese version of the PEDS unusable.

Though the translators achieved an accurate translation of the word “concerns,” the intended audience of Chinese-speaking parents viewed the “meaning” differently. By adopting the systematic translation approach of the AAOS, the problem of synonyms might have been addressed earlier in the initial translation process and could have been captured in the back-translation phase (Step 3, Table I) before the larger sample size of 383 was enrolled. This would have saved investigators much time, effort, and resources (Kiing, Low, Chan, & Neihart, 2012).

The purpose of testing a prefinal version is to ensure that unexpected responses, feedback from respondents, and inherent difficulties in understanding test items can be addressed and rectified before piloting in larger sample.

#### Step 5b. Inputs From Professionals Using the Tool

We propose that feedback from the professionals using the screening tools should be actively sought at the prefinal testing stage. While input from one or two professionals has already been sought in the expert committee step, a wider section of the professional community should have an opportunity to test the translated tool in the target group they work with. Professional feedback could be sought about ease of use, acceptability, and utility of the tool. This would

include feedback from professionals (e.g., clinicians, nurses, other healthcare workers, and early childhood educators) who use the developmental screening tools.

### Step 6. Submission to the Original Author for Approval and Documentation

In a subsequent Chinese translation of the PEDS (Glascoe, 2013), a decision was made to change the word from “concerns” to “顾虑” (gù lǜ), which was closer in meaning to “a little worry” than “concerns.” Discussion between the PEDS author and the PEDS researchers, who speak both the English and the translated language, was held to ensure that the change was acceptable and did not radically alter the properties of the tool. Not surprisingly, in this subsequent Chinese translation, the use of the word “顾虑” (gù lǜ) rendered risk rates far more reflective and commensurate with the prevalence of other language groups (19.8% for “high” risk results,  $N = 81$ , high risk = 16) (Lim et al., 2013). Comparison of both Chinese translations of the PEDS resulted in an odds ratio of 58.18 (95% CI: 29.45, 114.93,  $Z$  stats 11.70,  $p < 0.0001$ ). This further highlights that an incorrectly translated questionnaire will yield significantly different results, leading to a very high false-positive rate of developmental concerns and delays.

Getting inputs from the author of the tool is critical for planning and carrying out the translation work. The author can advise on a translation approach, share the experience of other researchers, and be a very helpful resource should problems be encountered. The assistance from the author of the tool should also be obtained to clearly document the steps the translator has taken to ensure equivalence. This will help new clinicians/researchers embarking on the translation work.

### Discussion

The importance of meaningfully translating screening developmental tools cannot be overstated. Any child who has been identified early to be at risk of developmental delays has the opportunity to have a dramatically different developmental trajectory if they receive early intervention in timely and appropriate manner. Nobel laureate James Heckman (accessed online, 2016) demonstrated quite dramatically in a cost-benefit analysis that programs directed in the preschool years had a highest rate of return on human capital.

An accurate well-translated and well-validated developmental screening tool will identify the children who are at risk of developmental delays and who are therefore most likely to benefit from the early intervention.

We used a systematic framework to address translation of widely used developmental screeners. Clinicians or researchers undertaking translation work may not be aware of challenges facing their peers in

the same field. Attempts taken to resolve problems may not yet be in the public domain or be difficult to find in a search output. This was also highlighted in the latest evidence mapping carried out by El-Behadli et al. (2015), who attempted to review existing literature regarding the translations of nine developmental screening instruments into languages other than English. Thus, we attempted, using screening manuals and published literature, to summarize through vignettes the challenges faced by several researchers in translation of the PEDS and other developmental screeners, the solutions proposed, and the learning points. We anticipate that the information summarized in this review will help the clinicians and researchers to acknowledge the possible challenges that may surface while embarking on the translation work, overcome them, and use the anecdotes to guide on producing a culturally valid translated tool.

### Research and Clinical Implications

While there are a number of models to achieve “equivalence” in translation work, i.e., Pena model and ITC guidelines, a practical step-by-step model for guiding translation work has greatest utility for a novice researcher. We used the AAOS model to provide a robust framework to help clinicians embarking on translation work. We would also suggest four changes to the AAOS model to address frequent themes that we encountered:

1. One of our main conclusions in reviewing experiences of translation of the PEDS was that of early (prior to forward translation; Step 1) and frequent consultation with the author of the tool. Several authors already provide information for new translations, for example, ASQ (Brooks publishing, <http://www.brookespublishing.com/resource-center/screening-and-assessment/asq/>), and PEDS has “site agreements” for translators, (<http://www.pedstest.com/default.aspx>), which provides an easy reference.
2. The expert committee (Step 4) could also include individuals in the international and online community who are doing similar work with invaluable experiences and insights to share.
3. The field testing step (Step 5) could include inputs from professionals who will be using the instruments.
4. Though we describe a systematic process to translation work, we find many instances described in the vignettes where there also needs to be a flexible approach in circumstances where translation yields unexpected results or when previously validated translations no longer work. We need to always ensure mutual intelligibility by avoiding over formal as well as vernacular expressions.

### Considerations for Authors of Developmental Screeners

In the course of looking at problems and solutions, we had some thoughts for authors of developmental-behavioral screeners—particularly those whose tools are used widely and translated in many languages.

Authors of the developmental-behavioral screeners may wish to consider the following:

1. Attach guidelines on translation work on their Web sites and propose approaches that might work well for their instrument, for instance, ASQ Web site has a resource guideline for researchers wishing to translate the instrument (<http://agesandstages.com/resource/guidelines-cultural-linguistic-adaptation-asq-3-asqse/>).
2. Author’s assistance with documentation: As not all of the translation-related work may find its way into peer-reviewed resources, but instead remain confined to the individual researchers, the author of the tool could make provisions to share the experiences of researchers around the world. This could be in the form of a dedicated platform, forum, webpage, or link to the author’s Web site. This is particularly important because negative and unexpected results, errors in translation that are commonly encountered, are equally important to guide the work of future researchers. The PEDS Web site has information on translation work conducted around the world by researchers (<http://www.pedstest.com/default.aspx>).

We find that translation work is challenging even when it appears as simple as translating one word “concerns.” Having a systematic approach that ensures “equivalence,” early consultation with the author of the tool, and having an experienced team of translators will increase the likelihood of having a valid and meaningful translation. Pena’s model and ITC guidelines provide a framework for the translation process, while the practical steps described above, as per the AAOS model and summarized in Table 1, allow for a systematic approach for translating a developmental-behavioral questionnaire. The experiences described in this review can make the process less daunting, further contributing to producing a valid translated tool.

### Limitations

We note several limitations of our review. Unlike a systematic review, this is a narrative review with vignettes chosen to highlight problems and solutions in translation work. Not all information described in this review has made it into peer-reviewed literature. Comparing translation work between countries also proved to be challenging. While an odds ratio calculation was used to compare the Malay and Chinese PEDS in Malaysia and Singapore, the Malay PEDS still yielded higher-than-expected prevalence in the high-risk groups, as described in Step 5, suggesting that further revisions on the translated version may be needed. In Step 3, we did not have information on the make-up of Latinos in the survey PEDS, though this was later addressed with the clinical PEDS re-translation into Spanish. It was also beyond the scope of the article to extensively review the translation experiences of all the developmental-behavioral screeners available.

## Conclusion

This qualitative review, mapping the problems and solution to the translation guideline steps, provides a cautionary tale to clinicians/researchers and can serve as a good resource and guide for those working on translations of developmental-behavioral screening tools. "Ignorance is not bliss." It can cost researchers much time, effort, and resources when they only find out that the screening tool is invalid after having completed translation work in a nonsystematic way.

The various qualitative studies on developmental-behavioral screening tools, including PEDS, provide useful examples of how translations can result in many challenges and needed revisions to achieve "equivalence" in different cultures and languages. A systematic approach to the translation of any instrument, simple as it may seem, is essential for avoiding costly mistakes when clinicians wish to adapt questionnaires for use in their local languages and communities. Expert advice from an online and international community, early consultation with the author of the screening tool for vetting, and inputs from the professionals who use the tool are all essential steps to ensure a systematic and valid translation.

Assistance from the author of the tool on guidelines on translation and clear documentation of the translation process would be an invaluable addition to a systematic translation experience.

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