Abstract and Keywords

This chapter reviews the translation process for six health literacy instruments: Rapid Estimate of Adult Literacy in Medicine, Test of Functional Health Literacy in Adults (TOFHLA), European Health Literacy Survey Questionnaire (HLS-EU-Q), All Aspects of Health Literacy Scale, Newest Vital Sign, and Functional, Communicative and Critical Health Literacy. Some instruments, developed in the United States and the United Kingdom, targeted English-speaking populations only. Later, researchers translated several into the languages of immigrant and refugee groups with limited English proficiency. For example, the TOFHLA was translated and adapted to target Korean and Vietnamese Americans. Some instruments were translated and employed for conducting health literacy research worldwide. One example is the HLS-EU-Q for health literacy research conducted in Indonesia, Kazakhstan, Malaysia, Myanmar, Taiwan, and Vietnam. This chapter describes how health literacy instruments were translated into various languages and revised to account for cultural and health system differences across countries and population groups.

Keywords: health literacy measurement, questionnaire, language translation, culture, health system

Health literacy is the ability to "obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Institute of Medicine, 2004; Ratzan & Parker, 2000). Study findings have supported the close association of health outcomes to health literacy. Thus, poor health literacy may lead to poor health outcomes, thereby creating financial stress on individuals, families, as well as communities (Chen, Goodson, & Acosta, 2015).

Improving health literacy begins with assessing people's current levels of health literacy. A crucial first step is to identify precise health literacy measurement instruments that produce reliable and trustworthy scores. The assessment process provides the foundation and building blocks for conducting needs assessments, tailoring health interventions, and developing program evaluation criteria (McCormack, Haun, Sørensen, & Valerio, 2013). Thus, critical evaluations of health literacy measurement instruments, which are often translated into multiple languages, are vital for promoting health, worldwide.

Poor health literacy is a challenge for industrialized countries such as the United States as well as nonindustrialized ones. For example, results from the 2003 National Assessment of Adult Literacy showed that 36% of the US adult population, ages 18 and older, have basic or below basic health literacy levels. Only 12% of US adults have proficient health literacy (Kutner, Greenburg, Jin, & Paulsen, 2006). According to the Institute of Medicine (2004), nearly half of all American adults (approximately 90 million people) have difficulty understanding health information. Of those, nearly 40 million cannot read complex texts at all (Institute of Medicine, 2004).

Other examples include Canada, New Zealand, Australia, Hungary, Italy, and Nuevo Leon. The 2003 International Adult Literacy and Life Skills Survey results showed that over 40% of the adult populations in the named countries had limited health literacy skills (Satherley, Lawes, & Sok, 2008). Another project, the European Health Literacy Survey from 2009 to 2012, indicated that approximately 47% of adults in Austria, Bulgaria, Germany, Greece, Ireland, The Netherlands, Poland, and Spain had limited health literacy (Sørensen et al., 2015). In brief, health literacy is a global challenge.

Many well-known health literacy instruments, such as the Rapid Estimate of Adult Literacy in Medicine (REALM), the Test of Functional Health Literacy in Adults (TOFHLA), the All Aspects of Health Literacy Scale (AAHLS), and Newest Vital Sign (NVS), were originally developed for English-speaking populations. Given the validity and reliability of the assessment data from these instruments, researchers conducted translation and cultural adaptation studies of these instruments so that those instruments could be used for assessing health literacy among various populations globally.

This chapter introduces six health literacy instruments and describes how they have been translated and adapted. Specifically, we examine how translations and adaptations were applied to account for differences in culture and health system across countries and population groups. Additionally, we provide suggestions and cautions when conducting cross-cultural translations in health literacy research.

The Rapid Estimate of Adult Literacy in Medicine

Davis and colleagues (1991; Davis, Long, Jackson, Mayeaux, & Crouch, 1993) established the first commonly used measurement tool for identifying people with limited health literacy skills—the REALM. The REALM is a word recognition test with three lists in ascending order of difficulty. Test words are commonly used medical terms. Test takers must pronounce the words correctly. The original version contains 125 words (Davis et al., 1991), and the shortened version contains 66 words (Davis et al., 1993).

Korean

Han, Kim, Kim, and Kim (2011) translated the REALM (66 words) from English to Korean to assess health literacy among Korean American women. The translation process included back-translation. However, the authors concluded that the translation of REALM into Korean did not lead to a valid assessment of health literacy because the REALM-Korean scores were negatively skewed and did not correlate with participants' education levels (Han et al., 2011).

Based on the REALM, Lee, Rozier, Lee, Bender, and Ruiz (2010) developed the Rapid Estimate of Adult Literacy in Dentistry (REALD), which contains test words from the American Dental Association Glossary of Common Dental Terminology. There were two versions of REALD: REALD-99 contains 99 words and REALD-30 contains 30 words (Lee et al., 2010; Richman, Lee, Rozier, Gong, & Vann, 2007).

Chinese

Wong and colleagues (2012) translated the REALD-99 from English to traditional Chinese for assessing oral health literacy in Hong Kong. Four trilingual (Cantonese/Mandarin/English) and biliterate (Chinese/English) researchers translated the REALD-99 following the forward–backward process. One translator was a dental hygienist, and two were pediatric dentists. They developed the translations both independently and collaboratively. The translated version was pretested among 85 individuals to adapt test word order in the traditional Chinese version of the REALD-99. Test words were ordered according to their difficulty. For example, the word *bite* was ranked 1/99 in the English version because it is a well-recognized, monosyllabic English word. The researchers put this word to 18/99 in the Chinese version because it is difficult to recognize due to its complex set of characters in Chinese (Wong et al., 2012).

Persian/Farsi

Pakpour, Lawson, Tadakamadla, and Fridlund (2016) developed an Iranian version of the REALD-99. They translated the English version to Persian/Farsi. The translation also followed the forward–backward process in the following steps. First, two translators developed two versions of the forward translation independently. Second, the project manager compared the two versions and reconciled discrepancies. Third, another two native English translators independently developed two versions of the back-translation from Persian/Farsi to English. Fourth, the project manager compared the original English version with the English back-translated version and reconciled discrepancies. Last, the Persian/Farsi questionnaire was pretested among 12 adults to further revise the wording (Pakpour et al., 2016).

Portuguese

Junkes and colleagues (2015) developed a Brazilian Portuguese version of the REALD-30. A Brazilian translator, fluent in English, conducted a forward translation of the REALD-30 from English to Portuguese. A native English speaker, fluent in Portuguese, back-translated the instrument from Portuguese to English. Both were experienced translators of health questionnaires. A committee reviewed the original and back-translated versions and provided suggestions for revision. The committee was formed by a group of dental specialists who were familiar with health education assessment. Then, the revised translated instrument was pretested among 10 individuals with different education levels. Some words in the original instrument were replaced to maintain the same proportion of easy, moderate, and difficult words (Junkes et al., 2015).

As the fields of dentistry and medicine have become more interconnected, Atchison, Gironda, Messadi, and Dermartirosian (2010) developed the REALM-D. It contains 84 words for assessing individuals' ability to read both medical and dental words. Gironda, Der-Martirosian, Messadi, Holtzman, and Atchison (2013) created a short version with 20 words (REALMD-20). Later, Cruvinel and colleagues (2017) developed a Brazilian Portuguese version of the REALMD-20. Three bilingual health professionals independently developed forward translations from English to Portuguese. Some words such as *insurance* and *directed* were not representative of health-related terms in Brazil; therefore, these words were replaced by equivalent terms in Portuguese under guidance of a language and communication specialist. The translated version was pilot-tested for further revision.

The Test of Functional Health Literacy in Adults

The REALM-based instruments are criticized for assessing only a limited component of health literacy—word pronunciation. Thus, the TOFHLA was developed and used to assess functional health literacy among various population groups (Parker, Baker, Williams, & Nurss, 1995).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines *functional literacy* as the "ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts" (UNESCO, 2004, p. 13). According to Parker and colleagues (1995), functional health literacy refers to the ability to apply literacy skills to health-related contexts such as prescriptions, medicine labels, and appointment cards. Reading, writing, and numeracy skills are essential components of functional health literacy (Parker et al., 1995). As shown from these definitions, functional literacy is the basic dimension of many literacy domains, including health literacy (Frisch, Camerini, Diviani, & Schulz, 2012).

Translation in Health Literacy Research

The TOFHLA is considered the gold standard for measuring functional health literacy because of its strong reliability and validity data in English (Mancuso, 2009). It was originally developed in English in the United States (Parker et al., 1995). The original TOFHLA comprises two subtests with 66 multiple-choice items that assess two components of functional health literacy: reading comprehension (measured by 50 items) and numeracy (measured by 16 items). The reading comprehension subtest contains three passages with the following: (1) instructions for the preparation of an upper gastrointestinal series, (2) a Medicaid application form, and (3) a standard hospital informed consent form. These three passages use a Cloze format (Taylor, 1953), which omits every fifth to seventh word in a passage and asks test-takers to select the correct choice from three incorrect choices. The numeracy subtest assessed test takers' ability to understand instructions for taking medicines, monitoring blood glucose, keeping clinic appointments, and getting financial assistance using actual hospital forms and prescription labels.

The S-TOFHLA is a short version (40 items) of the TOFHLA (Baker, Williams, Parker, Gazmararian, & Nurss, 1999). The reading comprehension subtest contains 36 items (measured by two passages), and the numeracy section contains four items. An example question for the reading comprehension section is as follows: "Your doctor has sent you to have a ____ X-ray [a. stomach; b. diabetes, c. stitches; d. germs]." An example question for the numeracy section is as follows: "Normal blood sugar is 60–150. Your blood sugar today is 160. Question: If this was your score, would your blood sugar be normal today? [yes, no]."

A growing number of ethnicity-specific translations of the TOFHLA have been developed, yet these instruments suffer from measurement problems due to language translation and cultural adaptations. Given these problems, there is a critical need to review how the non-English TOFHLA instruments were translated and/or adapted. Nguyen and colleagues (2015) point out that some items in the original TOFHLA are specific to the culture and healthcare system in the U.S. Therefore, these items might not be applicable in other countries (Nguyen et al., 2015). For example, the reading comprehension passage with Medicaid applications contains acronyms (e.g., TANF [Temporary Assistance for Needy Families]) unique to the US healthcare system.

Another example is one of the numeracy items that assesses test takers' interpretation of a clinic appointment card. However, many countries do not use appointment cards. Thus, the health literacy instrument translation process might inflate measurement errors. Further, researchers used the non-English TOFHLA to assess health literacy in 15 languages across 13 countries with different translation processes. These populations of interest included racial/ethnic minorities in the United States (e.g., Hispanics, Koreans, and Vietnamese); Swiss residents in Switzerland who speak German, Italian, and/or French; as well as individuals in Puerto Rico, Brazil, Iran, Turkey, Serbia, Kosovo, Albania, Denmark, Iraq, and China.

When the original English TOFHLA was developed in the United States, the research team (Parker et al., 1995) also translated it into Spanish and pilot-tested the Spanish ver-

sion using a sample of Spanish-speaking Hispanic Americans. The reading comprehension passages and numeracy questions were translated into Spanish and back-translated into English. Several bilingual staff members and a Spanish literacy expert worked together to correct discrepancies. The Spanish version of the reading comprehension passages did not use the same word deletions and options as the English version. Instead, the Cloze procedure was performed to achieve difficulty comparable to the English version.

TOFHLA Translation Using Beaton and Colleagues' Translation Guidelines

The Spanish TOFHLA used to assess health literacy in the United States was not adapted for health system or culture differences. However, it was necessary to conduct item adaptation for the Spanish TOFHLA used outside the United States. Researchers adapted Parker and colleagues' Spanish TOFHLA to test health literacy among Puerto Ricans living with HIV/AIDS (Rivero-Méndez et al., 2010). Rivero-Méndez's research team followed the guidelines of Beaton, Bombardier, Guillemin, and Ferraz (2002) to evaluate the Spanish TOFHLA for cultural equivalence. When Hæsum, Korsbakke, Ehlers, and Hejlesen (2015) translated the TOFHLA to assess health literacy among patients with chronic disease in Denmark, they also adapted the original American version of the TOFHLA following the guidelines of Beaton et al. (2002) for cross-cultural adaptation.

Beaton and Colleagues' Translation Guidelines

According to Beaton and colleagues' translation guidelines (2002), the cross-culture adaptation process includes six stages (stage I, initial translation; stage II, synthesis of these translations; stage III, back-translation; stage IV, expert committee; stage V, test of the pre–final version; and stage VI, submission of documentation for appraisal).

Stage I is the initial forward translation; guidelines suggest at least two forward translations from the original language to the target language. Two bilingual translators with the target language as their mother tongue independently develop the two forward translations. The guidelines also recommend that these two bilingual translators have different profiles or backgrounds. For example, one translator might have a medical/clinical background, while the other does not. In this way, the two translators can identify more discrepancies and discuss solutions.

Stage II synthesizes these translations and records how each discrepancy was solved. This stage requires that the two translators and a recording observer work together to reach consensus.

Stage III is back-translation. Another two translators, with the original language as their mother tongue, independently back-translate the questionnaire into the original language. This stage is to ensure that the translated version is conveying the same content

as the original version. The guidelines recommend that the two translators in this stage should have no medical background, to avoid information bias.

Stage IV requires an expert committee working together to reach consensus on any discrepancy. The members of the expert committee are critical to achieve cross-cultural equivalence. Beaton et al.'s guidelines (2002) recommend that the minimum composition of the committee include methodologists, health professionals, language professionals, and translators.

The developers of the original questionnaire communicate closely with the expert committee during this stage. The responsibility of the expert committee is to achieve equivalence between the original language version and the target language version in four areas: semantic, idiomatic, experiential, and conceptual equivalence. *Semantic equivalence* focuses on word meanings. *Idiomatic equivalence* focuses on colloquialisms and idioms. *Experiential equivalence* focuses on daily life experiences in the target country or culture. For example, when adapting an item asking about experiences of eating with a fork, it is possible that the people from the target country/culture do not eat with a fork. If that is the case, that item should be replaced. *Conceptual equivalence* focuses on identifying different conceptual meanings between cultures (e.g., definition of *family*).

Stage V pretests the pre–final version among 30–40 people from the target setting. After completing the questionnaire, these individuals should be interviewed to probe their understanding of each item. Stage VI, the final stage, is submitting all reports and forms to the American Academy of Orthopaedic Surgeons committee for verification.

TOFHLA Translation Using Sperber and Colleagues' Translation Methodology

Besides following Beaton and colleagues' guidelines (2002), several research teams used the recommendations of Sperber, Devellis, and Boehlecke (1994) for cultural adaptation when translating the TOFHLA into other languages.

Turkish

When assessing health literacy among diabetes patients in Turkey (Eyüboglu & Schulz, 2015), a philologist whose mother tongue was Turkish translated the S-TOFHLA (the short version of TOFHLA) into Turkish. Another philologist, fluent in English, back-translated the questionnaire to identify discrepancies. This translation process used a forward and back-translation procedure (Sperber et al., 1994). Some items had to be changed because the language structures between English and Turkish are quite different. The conceptual equivalents of words and phrases were treated as the priority rather than providing a literal translation (Eyüboglu & Schulz, 2015).

The cultural adaptation of the questionnaire comprised the following. Eyüboglu and Schulz (2015) changed some idiomatic expressions regarding health issues by adapting them to Turkish. They also made minor changes to account for differences in the US and

Turkish healthcare systems. Eyüboglu and Schulz (2015) reported that the translation excluded four numeracy items from the original S-TOFHLA. The authors did not provide the rationale. The translated version was pilot-tested among 120 participants using cognitive interviews for further revision (Eyüboglu & Schulz, 2015).

Serbian

When accessing health literacy among patients with chronic conditions in Serbia using the TOFHLA, Jovic-Vranes, Bjegovic-Mikanovic, and Marinkovic (2009) translated the original TOFHLA English version into Serbian. A multidisciplinary team conducted the translation procedure following Sperber and colleagues' (1994) methodology. The research team also pretested the Serbian TOFHLA among 10 patients and adapted the Serbian version according to the culture and healthcare system in Serbia (Jovic-Vranes et al., 2009). For example, they adapted the questions regarding US healthcare insurance to the Serbian healthcare insurance system and changed the US dollars to Serbian dinars (Jovic-Vranes et al., 2009).

Albanian

When assessing health literacy among adult primary care users in Kosovo, Kamberi, Hysa, Toçi, Jerliu, and Burazeri (2012) translated the original TOFHLA English version into Albanian. The translation procedure followed Sperber and colleagues' (1994) methodology. The research team adapted questions regarding US healthcare insurance to the healthcare insurance system in Kosovo and changed the US dollars to Euros (Kamberi et al., 2012). When assessing health literacy among adults in Albania, Toçi, Burazeri, Sørensen, Kamberi, and Brand (2015) used the translated Albanian TOFHLA version developed by Kamberi and colleagues (2012) in Kosovo. The research team invited a panel of experts to adapt the items to the Albanian context because of the differences in healthcare insurance systems and currency in Kosovo and Albania (Toçi et al., 2015).

German, French, and Italian

When assessing health literacy in the German-, French-, and Italian-speaking regions of Switzerland (Connor, Mantwill, & Schulz, 2013), the S-TOFHLA was translated from English to the respective languages following Sperber and colleagues' (1994) methodology. The translated versions were further adapted to account for differences related to the culture and healthcare systems in the United States and Switzerland (Connor et al., 2013).

Sperber and Colleagues' Translation Methodology

Sperber and colleagues (1994) invited a bilingual physician who was also an experienced translator in the United States to translate an instrument from English to Hebrew. The Hebrew version was sent to Israel for translation back into English by an expert specializing in medical and scientific translating and editing. This translator did not see the origi-

nal English questionnaire. Sperber and colleagues (1994) documented detailed strategies to compare the original English version with the back-translated English version.

TOFHLA Translation Using Wild and Colleagues' Translation Methodology

When assessing health literacy among pharmacy consumers in Iraq, Al-Jumaili, Al-Rekabi, and Sorofman (2015) translated the S-TOFHLA from English into formal Arabic using Wild and colleagues' (2005) translation methodology. The research team conducted a pilot study among 25 participants to further revise the translation (Al-Jumaili et al., 2015).

Wild and Colleagues' Translation Methodology

According to Wild and colleagues' translation methodology (2005), the cross-cultural adaptation process comprises 10 steps. Step 1 is preparation. It includes obtaining permission to use the instrument, inviting instrument developers to participate, developing an explanation of concepts in the instrument, and recruiting key persons to the project. Step 2 is forward translation. It includes developing at least two independent forward translations and providing key persons and forward translators with a clear explanation of concepts in the instrument. Step 3 is reconciliation. It involves a reconciliation of the forward translations into a single forward translation. Step 4 is back-translation. It involves back-translation of the reconciled translation into the source language.

Step 5 is back-translation review. It involves a review of the back-translations against the source language to ensure the conceptual equivalence of the translation. Step 6 is harmonization. It represents comparing all translations with each other and the original version to further ensure equivalence. Step 7 is cognitive debriefing. Step 8 is a review of cognitive debriefing results and finalization to improve the performance of the translation. Step 9 is proofreading to check for minor errors that have been missed during the translation process. Step 10 is a final report to record the development of the translation.

TOFHLA Translation with No Specific Methodological Citations

Some studies did not cite specific translation guidelines or methodologies. Authors reported how they translated the original TOFHLA or S-TOFHLA into target languages. For example, when assessing health literacy among Brazilians, Carthery-Goulart and colleagues (2009) translated the S-TOFHLA from English and Spanish into Portuguese. The research team reported that they adapted the reading comprehension texts according to the Brazilian health system: "When sentences needed to be adapted for this purpose, the same structure was kept, using stimuli in the alternatives which were either phonetically similar to the target or that belonged to the same grammar class" (Carthery-Goulart et al., 2009, p. 633).

When assessing health literacy among Korean American women, Han and colleagues (2011) translated the S-TOFHLA from English into Korean. They conducted back-translation to ensure translation accuracy (Han et al., 2011). They rewrote the reading compre-

hension texts because of structural differences between the English and Korean languages: English has a subject–verb–object word order, but Korean has a subject–object–verb word order (Han et al., 2011).

When assessing health literacy among Chinese diabetes patients in Hong Kong, Tang, Pang, Chan, Yeung, and Yeung (2008) did not literally translate the reading comprehension texts of the S-TOFHLA; however, they followed the S-TOFHLA format and created two passages based on Chinese reality. The first passage is about the preparation for a colonoscopic examination series. The second one is about the patient rights and responsibilities section of a Medicaid application, which is normally completed upon admission into hospital (Tang et al., 2008). The authors translated the numeracy items from English into traditional Chinese but did not mention the translation process in detail.

Later, Mantwill and Schulz (2015) converted the traditional Chinese instrument into Simplified Chinese and used it in mainland China. They reported that a native Mandarin speaker translated the traditional Chinese version (Tang et al., 2008) into Simplified Chinese. This version was reviewed by three native Chinese speakers; two were medical doctors (Mantwill & Schulz, 2015).

The TOFHLA has been translated into Persian/Farsi to assess health literacy among older adults in Iran (Javadzade et al., 2012). The S-TOFHLA also has been translated into Persian/Farsi to assess health literacy among diabetes patients in Iran (Reisi et al., 2016) and into Vietnamese for Vietnamese in the United States with chronic diseases (Shaw, Armin, Torres, Orzech, & Vivian, 2012). Nonetheless, these studies did not provide information about the translation process.

The European Health Literacy Survey Questionnaire

Sørensen and colleagues (2013) developed the European Health Literacy Survey Questionnaire (HLS-EU-Q) to assess health literacy among European nations. The HLS-EU-Q contains 47 self-reported items on a four-point Likert scale (very easy, fairly easy, fairly difficult, very difficult) measuring three domains of health literacy: healthcare, disease prevention, and health promotion (Sørensen et al., 2013).

During the survey development, the English-based version was translated to Bulgarian, Dutch, German, Greek, Polish, and Spanish. For each language version, two translators independently translated the English version to the target language. A panel consisting of national research partners, the European Health Literacy Survey Coordinator, translators, and other relevant health professionals evaluated these two translations and generated a formal translated version.

Albanian

Toçi and colleagues (2015) translated the English HLS-EU-Q to Albanian. They back-translated the Albanian version into English to check the translation quality. The Albanian version was then pilot-tested among 12 individuals for further revision (Toçi et al., 2015).

Japanese

Nakayama and colleagues (2015) translated the English HLS-EU-Q to Japanese. Two translators whose native language was Japanese forward-translated the HLS-EU-Q from English to Japanese. Another three bilingual translators reviewed all translations and generated the final Japanese version (Nakayama et al., 2015). Three translators whose native language was English back-translated the Japanese to English.

Turkish

Abacigil and colleagues (2018) translated the English HLS-EU-Q to Turkish. Three English lecturers forward-translated the English version into Turkish, and another three English lecturers back-translated the Turkish version to English. Afterward, two researchers compared all translated versions and generated a final Turkish version (Abacigil et al., 2018). Duong and colleagues (2017) translated the HLS-EU-Q into seven languages (Indonesian, Kazakh, Russian, Malay, Myanmar/Burmese, Mandarin Chinese, and Vietnamese) to assess health literacy in six Asian countries. Each language version was pilot-tested in the target country and reviewed by country experts (Duong et al., 2017).

Later, multiple short versions of the HLS-EU-Q were developed: HLS-EU-Q16, HLS-EU-Q12, and HLS-EU-Q6, containing 16, 12, and 6 items, respectively (Finbråten et al., 2018; Pelikan, Röthlin, & Ganahl, 2014).

Italian

Lorini and colleagues (2017) translated the HLS-EU-Q16 and HLS-EU-Q6 from English into Italian with forward and backward translation.

French

Rouquette and colleagues (2018) translated the HLS-EU-Q16 from English into French. An expert panel with six bilingual experts independently conducted the forward translation. These experts were from various disciplines: epidemiology, biostatistics, psychometrics, general medicine, public health, and psychiatry. This panel compared all translations and reached a consensus for the final French version.

The All Aspects of Health Literacy Scale

The AAHLS is a theory-based health literacy survey, originally developed in the United Kingdom in English. The AAHLS consists of 13 self-reported questions (Chinn & McCarthy, 2013). The survey assesses four factors related to an individual's health literacy: functional health literacy, interactive health literacy, information appraisal, and empowerment.

These constructs were based on Nutbeam's health literacy conceptual model (2000, 2008). According to Nutbeam (2000), the constructs of health literacy include functional health literacy, interactive health literacy, and critical health literacy. Functional health literacy represents the ability to understand factual information and use health services (Nutbeam, 2000). Examples of functional health literacy include health-related knowledge, prescription adherence, and health system navigation.

Interactive health literacy represents the ability to act independently in a supportive environment (Nutbeam, 2000). Examples of interactive health literacy include communication with others, social skills, and self-adjustment (e.g., improving motivation, building self-confidence, and changing behavior). Critical health literacy represents the ability to control health-related situations, such as cognitive abilities and skills to act on social, economic, and environmental determinants (Nutbeam, 2000). Later, Nutbeam (2008) further divided critical health literacy into three components: the critical analysis of information, an understanding of social determinants of health, and engagement in collective action.

Chinn and McCarthy (2013) created their AAHLS survey based on functional health literacy, interactive health literacy, information appraisal, and empowerment. The AAHLS (Chinn & McCarthy, 2013) contains three questions assessing functional health literacy (e.g., "Do you need help to fill in official documents?" [rarely, sometimes, often]). Three questions assess interactive health literacy (e.g., "When you talk to a doctor or nurse, do you ask the questions you need to ask?" [rarely, sometimes, often]).

Four questions assess information appraisal (e.g., "How often do you try to figure out whether information about your health can be trusted?" [rarely, sometimes, often]). Three questions assess empowerment (e.g., "Within the last 12 months have you taken action to do something about a health issue that affects your family or community?" [yes, no]).

Chen, Goodson, Acosta, Barry, and McKyer (2018) translated and adapted the original English AAHLS into Chinese (both traditional and Simplified Chinese) to assess health literacy among Chinese speakers living in the United States who have limited English proficiency. Their translation process followed Beaton and colleagues' (2002) and Wild and colleagues' (2005) cross-cultural translation guidelines and contains five steps (Chen et al., 2018).

First, two Chinese native speakers, who were bilingual health professionals, developed two versions of forward translation independently. Second, these two translators along with a third translator who did not participate in the forward translation reviewed and

compared the two versions of the forward translation to reach consensus. Third, a bilingual native English speaker back-translated the Chinese version into English.

To avoid information bias, this translator was not familiar with the health content. Fourth, all translators worked together to revise the Chinese version. Last, another 10 bilingual community health workers/professionals reviewed the translation and made suggestions for revisions. Chen and colleagues (2018) then conducted cognitive interviews among 10 participants to further revise the survey questions for accuracy and clarity.

The Newest Vital Sign

Weiss, Mays, Martz, Castro, and Hale (2005) developed the NVS, which contains a mock-up ice-cream nutrition label with six questions. Question examples include "If you eat the entire container, how many calories will you eat?" and "If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice-cream could you have?" Participants get one point for each correct answer.

Arabic

Al-Jumaili and colleagues (2015) translated the NVS from English to Arabic to assess health literacy in Iraq. The translation followed Wild and colleagues' (2005) methodology.

Japanese

Kogure and colleagues (2014) developed a Japanese version of the NVS and evaluated the validity and reliability of the instrument among patients with chronic pain in Japan. The translation followed Beaton and colleagues' (2002) guidelines. First, a professional native Japanese translator and a bilingual Japanese physician independently conducted forward translations. Second, an expert committee reviewed the two versions and reconciled discrepancies.

The committee was composed of specialists in pain management, public health, and methodology. Third, two native English translators conducted back-translations. Finally, an expert committee reviewed the back-translations to detect cultural bias. They found that the Japanese version of the NVS produced good validity and reliability data (Kogure et al., 2014).

Chinese

Xue and colleagues (2018) developed a Mandarin version of the NVS to assess health literacy in China. The translation followed multiple guidelines including Beaton and colleagues' methodology (Guillemin, Bombardier, & Beaton, 1993; Sidani, Guruge, Miranda, Ford-Gilboe, & Varcoe, 2010; Sousa & Rojjanasrirat, 2011).

Two native Chinese physicians, who were proficient in English, independently developed two versions of forward translation. Second, a third Chinese translator compared the two versions and reconciled discrepancies. Then, two native English speakers who were fluent in Chinese and had medical backgrounds conducted back-translations. The back-translation showed no discrepancies compared to the original English version.

Afterward, Xue and colleagues (2018) conducted cultural adaptations using the Delphi method (Graham, Regehr, & Wright, 2003) according to three principles. First, Chinese people should be familiar with the food products chosen. Second, the nutrition label format should follow the rules for Chinese nutrition labeling. Third, the translated version should be comparable to the original one. A panel of 25 experts participated in the web-based Delphi study. The panel was composed of specialists in health literacy research, nutrition management, statistics, education, public health, and clinical practice. They rated multiple translation versions and provided suggestions for adaptation. Last, the research team conducted cognitive interviews among 60 individuals to further revise the instrument (Xue et al., 2018).

The Functional, Communicative, and Critical Health Literacy Scale

The Functional, Communicative and Critical Health Literacy (FCCHL) scale, consisting of 14 items (Ishikawa, Takeuchi, & Yano, 2008), was also developed based on Nutbeam's health literacy conceptual model (2000). The FCCHL was originally developed in Japanese to assess health literacy among diabetes patients in Japan (Ishikawa et al., 2008). Five questions assess functional health literacy (e.g., "In reading instructions or leaflets from hospitals/pharmacies, you found that the print was too small to read.").

Five questions assess interactive health literacy (e.g., "Since being diagnosed with diabetes, you have collected information from various sources."). Four questions assess critical health literacy (e.g., "Since being diagnosed with diabetes, you have considered whether the information was applicable to your situation."). Each question was rated on a four-point scale, ranging from "never" to "often."

Swedish

Wångdahl and Mårtensson (2014) translated the functional health literacy section of the FCCHL scale from Japanese to Swedish to measure functional health literacy in Sweden. The translation process contained six phases (Wångdahl & Mårtensson, 2014). During the first phase, a group of four translators conducted the forward translation and back-translation. Two of them were recruited from a university and two from translation agencies. One of the translators evaluated the translations and provided feedback.

The research team revised the translation based on the translator's feedback. During the second phase, seven public health/primary health professionals and four members of the

target group reviewed the translation and provided feedback. During the third phase, the first version of the translation was tested and retested among 25 individuals who filled out the instrument twice, 2 weeks in a row.

During the fourth phase, the research team created a second version of the translation by revising the first version based on the feedback from professionals and test takers. During the fifth phase, six individuals from the target group reviewed the second version of the translation and provided feedback. During the last phase, a final version of the translation was established based on the feedback received from all the groups.

Dutch

The original FCCHL scale was developed and validated in Japanese, but it was also published in English (McDonald, Patterson, Costa, & Shepherd, 2016). Fransen, Van Schaik, Twickler, and Essink-Bot (2011) translated the FCCHL scale from English to Dutch to assess health literacy in The Netherlands. Their translation process contained eight steps (Fransen et al., 2011). First, two native Dutch speakers with epidemiological or clinical backgrounds developed two versions of forward translations independently. These two translators were fluent in English. Second, they identified discrepancies and revised the forward translations. Third, a native English speaker, also fluent in Dutch, back-translated the Dutch version into Japanese. Fourth, the back-translated version was compared with the original English version. Fifth, the Dutch translated version was reviewed. Sixth, the Dutch version was pretested among 34 patients with diabetes.

Seventh, the Dutch version was further reviewed based on the feedback received from the pretest stage. Last, the revised final Dutch version contains 18 items, but the original Japanese version contains 14 items. This change was based on the fact that the pretest takers indicated that they did not understand the term *various sources of information*; therefore, the researchers (Fransen et al., 2011) divided this question into five questions describing specific sources (e.g., healthcare professionals, books). The Dutch version also replaced *diabetes* with a more general term, *disease*.

Vaart, Drossaert, Taal, Klooster, and van de Laar (2012) translated another Dutch version of the FCCHL scale to assess health literacy among patients with breast cancer or rheumatic diseases. Their translation followed the World Health Organization (WHO) guidelines (https://www.who.int/substance_abuse/research_tools/translation/en/). According to WHO guidelines, the translation process includes four steps: (1) forward translation by a translator who is a health professional, (2) reviewing and revising the translation by a bilingual expert panel, (3) back-translation by a translator who has no knowledge of the questionnaire, and (4) pretesting and cognitive interviewing among at least 10 participants.

German

Dwinger, Kriston, Härter, and Dirmaier (2015) translated the FCCHL scale from Japanese into German. Two of the authors independently translated the original Japanese version into English. They compared the two versions and gave the consensus version to an English editing service to edit the final English version. Afterward, two native German speakers independently translated the English version into German. A native English speaker back-translated the consensus German version into English. This translator was not familiar with the original instrument. The original Japanese instrument author, Ishikawa, approved the English back-translation version.

French

Ousseine and colleagues (2018) translated the FCCHL into French. Three independent researchers developed the translation from English into French. These three translators, along with a bilingual psychologist, finalized the translated version. Cognitive interviews were conducted among six cancer patients to identify unclear wording. Minor changes were made after comparing their translation version with the translation from Japanese to French provided by other French researchers (Ousseine et al., 2018).

Based on the review of the translation process of six widely used health literacy instruments, this chapter provides insights for future studies that propose to asses new target populations by translating existing health literacy instruments. Conducting a forward–backward process alone does not ensure the quality of cross-cultural translation or lead to a valid assessment of health literacy.

Having a committee from diverse professional backgrounds to review the translated instrument and provide suggestions for revisions is critical for increasing translation quality and cultural equivalence. Conducting cognitive interviews for pilot-testing the instrument is also a key step. As discussed, Beaton and colleagues' translation guidelines (2002) as well as Wild and colleagues' translation methodology (2005) are commonly used approaches that provide detailed information for each step, specifically what to do, who should do it, and how to do it.

References

Abacigil, F., Harlak, H., Okyay, P., Kiraz, D. E., Gursoy Turan, S., & Saruhan, G., … Beser, E. (2018). Validity and reliability of the Turkish version of the European Health Literacy Survey Questionnaire. *Health Promotion International*, *34*(4), 658–667. doi:10.1093/heapro/day020

Al-Jumaili, A. A., Al-Rekabi, M. D., & Sorofman, B. (2015). Evaluation of instruments to assess health literacy in Arabic language among Iraqis. *Research in Social and Administrative Pharmacy*, *11*(6), 803–813.

Atchison, K. A., Gironda, M. W., Messadi, D., & Dermartirosian, C. (2010). Screening for oral health literacy in an urban dental clinic. *Journal of Public Health Dentistry*, *70*(4), 269–275.

Baker, D. W., Williams, M. V., Parker, R. M., Gazmararian, J. A., & Nurss, J. (1999). Development of a brief test to measure functional health literacy. *Patient Education and Counseling*, *38*(1), 33–42.

Beaton, D., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2002). *Recommendations for the cross-cultural adaptation of health status measures*. Rosemont, IL: American Academy of Orthopaedic Surgeons.

Carthery-Goulart, M. T., Anghinah, R., Areza-Fegyveres, R., Bahia, V. S., Brucki, S. M. D., Damin, A., … Jacinto, A. F. (2009). Performance of a Brazilian population on the test of functional health literacy in adults. *Revista de Saúde Pública*, *43*(4), 631–638.

Chen, X., Goodson, P., & Acosta, S. (2015). Blending health literacy with an English as a second language curriculum: A systematic literature review. *Journal of Health Communication*, *20*(Suppl. 2), 101–111.

Chen, X., Goodson, P., Acosta, S., Barry, A. E., & McKyer, E. L. J. (2018). Assessing health literacy among Chinese speakers in the U.S. with limited English proficiency. *Health Literacy Research and Practice*, *2*(2), e94–e106.

Chinn, D., & McCarthy, C. (2013). All Aspects of Health Literacy Scale (AAHLS): Developing a tool to measure functional, communicative and critical health literacy in primary healthcare settings. *Patient Education and Counseling*, *90*(2), 247–253.

Connor, M., Mantwill, S., & Schulz, P. J. (2013). Functional health literacy in Switzerland —Validation of a German, Italian, and French health literacy test. *Patient Education and Counseling*, *90*(1), 12–17.

Cruvinel, A. F. P., Méndez, D. A. C., Oliveira, J. G., Gutierres, E., Lotto, M., Machado, Maria Aparecida A. M., … Cruvinel, T. (2017). The Brazilian version of the 20-item Rapid Estimate of Adult Literacy in Medicine and Dentistry. *PeerJ*, *5*, e3744. doi:10.7717/peerj.3744

Davis, T. C., Crouch, M. A., Long, S. W., Jackson, R. H., Bates, P., George, R. B., & Bairnsfather, L. E. (1991). Rapid assessment of literacy levels of adult primary care patients. *Family Medicine*, *23*(6), 433–435.

Davis, T. C., Long, S. W., Jackson, R. H., Mayeaux, E. J., & Crouch, M. A. C. (1993). Rapid estimate of adult literacy in medicine: A shortened screening instrument. *Family Medicine*, *25*(6), 391–395.

Duong, T. V., Aringazina, A., Baisunova, G., Nurjanah, Pham, T. V., & Pham, K. M., … Chang, P. W. (2017). Measuring health literacy in Asia: Validation of the HLS-EU-Q47 survey tool in six Asian countries. *Journal of Epidemiology*, *27*(2), 80–86.

Dwinger, S., Kriston, L., Härter, M., & Dirmaier, J. (2015). Translation and validation of a multidimensional instrument to assess health literacy. *Health Expectations*, *18*(6), 2776–2786.

Eyüboğlu, E., & Schulz, P. J. (2015). Validation of Turkish health literacy measures. *Health Promotion International*, *31*(2), 355–362.

Finbråten, H. S., Wildelarsson, B., Nordström, G., Pettersen, K. S., Trollvik, A., & Guttersrud, O. (2018). Establishing the HLS-Q12 short version of the European Health Literacy Survey Questionnaire: Latent trait analyses applying Rasch modelling and confirmatory factor analysis. *BMC Health Services Research*, *18*(1), 506. doi:10.1186/s12913-018-3275-7

Fransen, M. P., Van Schaik, T. M., Twickler, T. B., & Essink-Bot, M. L. (2011). Applicability of internationally available health literacy measures in The Netherlands. *Journal of Health Communication*, *16*(Suppl. 3), 134–149.

Frisch, A. L., Camerini, L., Diviani, N., & Schulz, P. J. (2012). Defining and measuring health literacy: How can we profit from other literacy domains? *Health Promotion International*, *27*(1), 117–126.

Gironda, M., Der-Martirosian, C., Messadi, D., Holtzman, J., & Atchison, K. (2013). A brief 20-item dental/medical health literacy screen (REALMD-20). *Journal of Public Health Dentistry*, *73*(1), 50–55.

Graham, B., Regehr, G., & Wright, J. G. (2003). Delphi as a method to establish consensus for diagnostic criteria. *Journal of Clinical Epidemiology*, *56*(12), 1150–1156.

Guillemin, F., Bombardier, C., & Beaton, D. (1993). Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. *Journal of Clinical Epidemiology*, *46*(12), 1417.

Hæsum, E., Korsbakke, L., Ehlers, L., & Hejlesen, O. K. (2015). Validation of the Test of Functional Health Literacy in Adults in a Danish population. *Scandinavian Journal of Caring Sciences*, *29*(3), 573–581.

Han, H. R., Kim, J., Kim, M. T., & Kim, K. B. (2011). Measuring health literacy among immigrants with a phonetic primary language: A case of Korean American women. *Journal of Immigrant and Minority Health*, *13*(2), 253–259.

Institute of Medicine. (2004). *Health literacy: A prescription to end confusion*. Washington, DC: National Academies Press.

Ishikawa, H., Takeuchi, T., & Yano, E. (2008). Measuring functional, communicative, and critical health literacy among diabetic patients. *Diabetes Care*, *31*(5), 874–879.

Javadzade, S. H., Sharifirad, G., Radjati, F., Mostafavi, F., Reisi, M., & Hasanzade, A. (2012). Relationship between health literacy, health status, and healthy behaviors among older adults in Isfahan, Iran. *Journal of Education and Health Promotion*, *1*(31), 1–7.

Jovic-Vranes, A., Bjegovic-Mikanovic, V., & Marinkovic, J. (2009). Functional health literacy among primary health-care patients: Data from the Belgrade pilot study. *Journal of Public Health*, *31*(4), 490–495.

Junkes, M. C., Fraiz, F. C., Fernanda, S., Lee, J. Y., Paiva, S. M., & Ferreira, F. M. (2015). Validity and reliability of the Brazilian version of the rapid estimate of adult literacy in dentistry—BREALD-30. *PLoS One*, *10*(7), e0131600.

Kamberi, H., Hysa, B., Toçi, E., Jerliu, N., & Burazeri, G. (2012). Functional health literacy in primary health care users in Kosovo: A validation study. *Albanian Medical Journal*, *4*, 21–25.

Kogure, T., Sumitani, M., Suka, M., Ishikawa, H., Odajima, T., Igarashi, A., ... Kawahara, K. (2014). Validity and reliability of the Japanese version of the Newest Vital Sign: A preliminary study. *PLoS One*, *9*(4), e94582. doi:10.1371/journal.pone.0094582

Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. (2006). *The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy* (NCES 2006-483). Washington, DC: National Center for Education Statistics.

Lee, J. Y., Rozier, R. G., Lee, S. Y. D., Bender, D., & Ruiz, R. E. (2010). Development of a word recognition instrument to test health literacy in dentistry: The REALD-30: A brief communication. *Journal of Public Health Dentistry*, *67*(2), 94–98.

Lorini, C., Santomauro, F., Grazzini, M., Mantwill, S., Vettori, V., & Lastrucci, V. (2017). Health literacy in Italy: A cross-sectional study protocol to assess the health literacy level in a population-based sample, and to validate health literacy measures in the Italian language. *BMJ Open*, *7*(11), e017812. doi:10.1136/bmjopen-2017-017812

Mancuso, J. M. (2009). Assessment and measurement of health literacy: An integrative review of the literature. *Nursing & Health Sciences*, *11*(1), 77–89.

Mantwill, S., & Schulz, P. J. (2015). Health literacy in mainland China: Validation of a functional health literacy test in simplified Chinese. *Health Promotion International*, *31*(4), 742–748.

McCormack, L., Haun, J., Sørensen, K., & Valerio, M. (2013). Recommendations for advancing health literacy measurement. *Journal of Health Communication*, *18*(Suppl. 1), 9–14.

McDonald, F. E. J., Patterson, P., Costa, D. S. J., & Shepherd, H. L. (2016). Validation of a health literacy measure for adolescents and young adults diagnosed with cancer. *Journal of Adolescent and Young Adult Oncology*, *5*(1), 69–75.

Nakayama, K., Osaka, W., Togari, T., Ishikawa, H., Yonekura, Y., Sekido, A., & Matsumoto, M. (2015). Comprehensive health literacy in Japan is lower than in Europe: A validated Japanese-language assessment of health literacy. *BMC Public Health*, *15*(1), 505. doi: 10.1186/s12889-015-1835-x

Nguyen, T. H., Park, H., Han, H.-R., Chan, K. S., Paasche-Orlow, M. K., Haun, J., & Kim, M. T. (2015). State of the science of health literacy measures: Validity implications for minority populations. *Patient Education and Counseling*, *98*(12), 1492–1512.

Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259–267.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, *67*(12), 2072–2078.

Ousseine, Y. M., Rouquette, A., Bouhnik, A.-D., Rigal, L., Ringa, V., & Smith, A. B. (2018). Validation of the French version of the Functional, Communicative and Critical Health Literacy scale (FCCHL). *Journal of Patient-Reported Outcomes*, *2*(1), 3.

Pakpour, A. H., Lawson, D. M., Tadakamadla, S. K., & Fridlund, B. (2016). Validation of Persian Rapid Estimate of Adult Literacy in Dentistry. *Journal of Investigative and Clinical Dentistry*, *7*(2), 198–206.

Parker, R. M., Baker, D. W., Williams, M. V., & Nurss, J. R. (1995). The test of functional health literacy in adults. *Journal of General Internal Medicine*, *10*(10), 537–541.

Pelikan, J. M., Röthlin, F., & Ganahl, K. (2014, November). Measuring comprehensive health literacy in general populations: Validation of instrument, indices and scales of the HLS-EU study. Paper presented at the 6th Annual Health Literacy Research Conference, Bethesda, MD. Retrieved from **http://www.bumc.bu.edu/healthliteracyconference/ files/2014/06/Pelikan-et-al-HARC-2014-fin.pdf**

Ratzan, S. C., & Parker, R. M. (2000). Introduction. In C. R. Selden, M. Zorn, S. C. Ratzan, & R. M. Parker (Eds.), *National Library of Medicine current bibliographies in medicine: Health literacy* (pp. v–vii). Bethesda, MD: National Institutes of Health.

Reisi, M., Mostafavi, F., Javadzede, H., Mahaki, B., Sharifirad, G., & Tavassoli, E. (2016). The Functional, Communicative, and Critical Health Literacy (FCCHL) scales: Cross-cultural adaptation and the psychometric properties of the Iranian version. *Iranian Red Crescent Medical Journal*, *19*(1), e29700.

Richman, J. A., Lee, J. Y., Rozier, R. G., Gong, D. A., & Vann, W. F. (2007). Evaluation of a word recognition instrument to test health literacy in dentistry: The REALD-99. *Journal of Public Health Dentistry*, *67*(2), 99–104.

Rivero-Méndez, M., Suárez, E., Solís-Báez, S. S., Hernández, G., Cordero, W., Vázquez, I., … Bonilla, J. L. (2010). Internal consistency of the Spanish health literacy test (TOFHLA-SPR) for Puerto Rico. *Puerto Rico Health Sciences Journal*, *29*(1), 49–53.

Rouquette, A., Nadot, T., Labitrie, P., Van den Broucke, S., Mancini, J., Rigal, L., & Ringa, V. (2018). Validity and measurement invariance across sex, age, and education level of the French short versions of the European Health Literacy Survey Questionnaire. *PLoS One*, *13*(12), e0208091. doi:10.1371/journal.pone.0208091

Satherley, P., Lawes, E., & Sok, S. (2008). *The Adult Literacy and Life Skills (ALL) survey: Overview and international comparisons*. Wellington, New Zealand: Comparative Education Research Unit, Research Division, Ministry of Education.

Shaw, S. J., Armin, J., Torres, C. H., Orzech, K. M., & Vivian, J. (2012). Chronic disease self-management and health literacy in four ethnic groups. *Journal of Health Communication*, *17*(Suppl. 3), 67–81.

Sidani, S., Guruge, S., Miranda, J., Ford-Gilboe, M., & Varcoe, C. (2010). Cultural adaptation and translation of measures: An integrated method. *Research in Nursing & Health*, *33*(2), 133–143.

Sørensen, K., Broucke, S. V. D., Pelikan, J. M., Fullam, J., Doyle, G., Slonska, Z., … Brand H. (2013). Measuring health literacy in populations: Illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). *BMC Public Health*, *13*(1), 948. doi:10.1186/1471-2458-13-948

Sørensen, K., Pelikan, J. M., Röthlin, F., Ganahl, K., Slonska, Z., Doyle, G., … Uiters, E. (2015). Health literacy in Europe: Comparative results of the European Health Literacy Survey (HLS-EU). *European Journal of Public Health*, *25*(6), 1053–1058.

Sousa, V. D., & Rojjanasrirat, 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.

Sperber, A. D., Devellis, R. F., & Boehlecke, B. (1994). Cross-cultural translation: Methodology and validation. *Journal of Cross-Cultural Psychology*, *25*(4), 501–524.

Tang, Y. H., Pang, S., Chan, M. F., Yeung, G. S., & Yeung, V. T. (2008). Health literacy, complication awareness, and diabetic control in patients with type 2 diabetes mellitus. *Journal of Advanced Nursing*, *62*(1), 74–83.

Taylor, W. L. (1953). Cloze procedure: A new tool for measuring readability. *Journalism Quarterly*, *30*, 415–433.

Toçi, E., Burazeri, G., Sørensen, K., Kamberi, H., & Brand, H. (2015). Concurrent validation of two key health literacy instruments in a south eastern European population. *European Journal of Public Health*, *25*(3), 482–486.

UNESCO. (2004). The plurality of literacy and its implications for policies and programmes. Paris, France: Author.

Vaart, R. V. D., Drossaert, C. H. C., Taal, E., Klooster, P. M. T., & van de Laar, M. A. F. J. (2012). Validation of the Dutch functional, communicative and critical health literacy scales. *Patient Education and Counseling*, *89*(1), 82–88.

Wångdahl, J. M., & Mårtensson, L. I. (2014). Measuring health literacy—The Swedish functional health literacy scale. *Scandinavian Journal of Caring Sciences*, *29*(1), 165–172.

Weiss, B. D., Mays, M. Z., Martz, W., Castro, K. M., & Hale, F. A. (2005). Quick assessment of literacy in primary care: The newest vital sign. *The Annals of Family Medicine*, *3*(6), 514–522.

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., & Erikson, P. (2005). Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*, *8*(2), 94–104.

Wong, H. M., Bridges, S. M., Yiu, C. K. Y., Mcgrath, C. P. J., Au, T. K., & Parthasarathy, D. S. (2012). Development and validation of Hong Kong Rapid Estimate of Adult Literacy in Dentistry. *Journal of Investigative and Clinical Dentistry*, *3*(2), 118–127.

Xue, J., Liu, Y., Sun, K., Wu, L., Liao, K., Xia, Y., … Shi, H. (2018). Validation of a newly adapted Chinese version of the Newest Vital Sign instrument. *PLoS One*, *13*(1), e0190721. doi:10.1371/journal.pone.0190721

Xuewei Chen

Oklahoma State University

Sandra Acosta

Department of Educational Psychology, Texas A&M University