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# Translating Questionnaire Items for a Multi-Lingual Worker Population: The Iterative Process of Translation and Cognitive Interviews With English-, Spanish-, and Chinese-Speaking Workers

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**Background** *The increasing ethnic diversity of the US workforce has created a need for research tools that can be used with multi-lingual worker populations. Developing multi-language questionnaire items is a complex process; however, very little has been documented in the literature.*

**Methods** *Commonly used English items from the Job Content Questionnaire and Quality of Work Life Questionnaire were translated by two interdisciplinary bilingual teams and cognitively tested in interviews with English-, Spanish-, and Chinese-speaking workers.*

**Results** *Common problems across languages mainly concerned response format. Language-specific problems required more conceptual than literal translations. Some items were better understood by non-English speakers than by English speakers. De-centering (i.e., modifying the English original to correspond with translation) produced better understanding for one item.*

**Conclusions** *Translating questionnaire items and achieving equivalence across languages require various kinds of expertise. Backward translation itself is not sufficient. More research efforts should be concentrated on qualitative approaches to developing useful research tools.* Am. J. Ind. Med. 53:194–203 2010. *Published 2009 Wiley-Liss, Inc.*†

***KEY WORDS: immigrant workers; homecare; cognitive interview; translation; questionnaire development; qualitative analysis***

## INTRODUCTION

The size of the foreign-born worker population is increasing in the US. From 2000 to 2007, nearly half (47.7%) of the increase in labor force was accounted for by immigrants [Bureau of Labor Statistics, 2009]. In 2008, 16% of the entire workforce, or one in six workers, was foreign born [Bureau of Labor Statistics, 2009]. These immigrant

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workers are disproportionately represented in high-risk jobs, such as construction and cleaning/maintenance [Bureau of Labor Statistics, 2009]. Immigrant workers have high rates of fatal occupational injury [Loh and Richardson, 2004], high likelihood of exposure to various occupational hazards [Arcury et al., 2002; Shelley et al., 2007; Tsai and Salazar, 2007], and less access to safety training and personal protective equipment [Ahonen et al., 2007]. These factors make the health and safety of immigrant workers an urgent priority in occupational health research.

In order to effectively address immigrant workers' health and safety issues, occupational health researchers must have linguistically and culturally appropriate tools. While researchers in anthropology and psychology have outlined strategies for conducting cross-cultural research [e.g., Kleinman, 1987; Harkness et al., 2003; Johnson, 2006], the current occupational health and safety literature offers very little to equip us for multi-lingual, cross-cultural research with immigrant worker populations. Studies of immigrant workers do not describe the process of developing data collection tools in appropriate languages, with a few exceptions [i.e., Escribà-Agüir et al., 2001; Pransky et al., 2002; Quandt et al., 2005]. Except in the rare study where data collection relies entirely on observation data such as biological markers or air samples [e.g., Rothlein et al., 2006], most studies rely at least in part on workers' self-report. When the study population includes workers with limited English skills, the validity of these studies may be compromised by invalid measures of exposure, safety knowledge, or health status. In a recent study that used the Job Content Questionnaire (JCQ, a commonly used job stress questionnaire) [Karasek et al., 1998] to collect information from immigrant farm workers [Grzywacz et al., 2008], the authors stated that even though JCQ has been translated in a number of languages, the unknown validity of the questionnaire is the most serious limitation of their study. Occupational health and safety research must address this lack of valid tools in order to examine the needs of immigrant workers.

Increasing diversity in US society in general has prompted some government agencies (e.g., Census Bureau, National Center for Health Statistics) to launch extensive efforts to translate their existing instruments to other languages [Carrasco, 2003; Pan, 2004; Goerman, 2006; Martinez et al., 2006]. Qualitative inquiries conducted as part of these efforts have revealed various challenges in obtaining information from a diverse group of respondents. Even seemingly straightforward information such as levels of education and racial identification could be difficult to obtain in certain circumstances [e.g., Pan, 2004; Martinez et al., 2006]. Based on their research efforts, the US Census Bureau issued guidelines for translating data collection instruments [Pan and de la Puente, 2005]. Acknowledging translation as an iterative process that requires interdisciplinary collaboration, the guidelines recommend a team approach to translation and rigorous pre-testing.

In this article, we describe an iterative process of developing a survey instrument in three languages (English, Spanish, and Chinese). This survey is intended to collect information on job stress, risk perception, and safety climate from homecare workers—a multi-ethnic, low-wage worker population. The process of adapting items for a three-language questionnaire is illustrated in Figure 1. The process can be roughly divided into two stages: translating questionnaire items by two bilingual teams (one English–Spanish, the other English–Chinese) and conducting cognitive interviews in all three languages. Cognitive interviewing, also known as ''protocol analysis,'' is a technique used to identify sources of response error by asking the respondent to report the process of considering survey questions. This technique can provide important information for improving survey items. Each stage will be described in detail along with problems we encountered and suggestions for resolving them.

## DEVELOPING A THREE-LANGUAGE QUESTIONNAIRE

### Target Worker Population

The questionnaire is being developed as part of an educational intervention study targeting homecare workers in Alameda County, California. Homecare workers provide assistance with personal care and household tasks to the elderly and people with disabilities in their homes. With homecare services, these individuals are able to live independently in the community. Reflecting the rapidly aging US society, homecare is currently the fastest growing occupation [Bureau of Labor Statistics, 2007]. About 14,000 homecare workers work in Alameda Country: a third (35%) of whom are immigrants mainly from China, Southeast Asia, and Mexico [Howes et al., 2002]. Most of the homecare workers are women in their 40s and 50s [Howes et al., 2002]. Each task the homecare worker performs (e.g., laundry, cooking, bathing) has an assigned amount of time, and the workers are paid hourly ($10.50 per hour as of 2007). Their job involves a host of occupational hazards including cleaning chemicals, heavy lifting, and awkward postures. The intervention study aims to encourage homecare workers to actively utilize existing community resources in order to enhance workplace safety in collaboration with their clients.

### Questionnaire Items to be Translated

The questionnaire under development will be used during the formal evaluation of the intervention. In addition to questions directly related to the effectiveness of the intervention, it will obtain information on the following

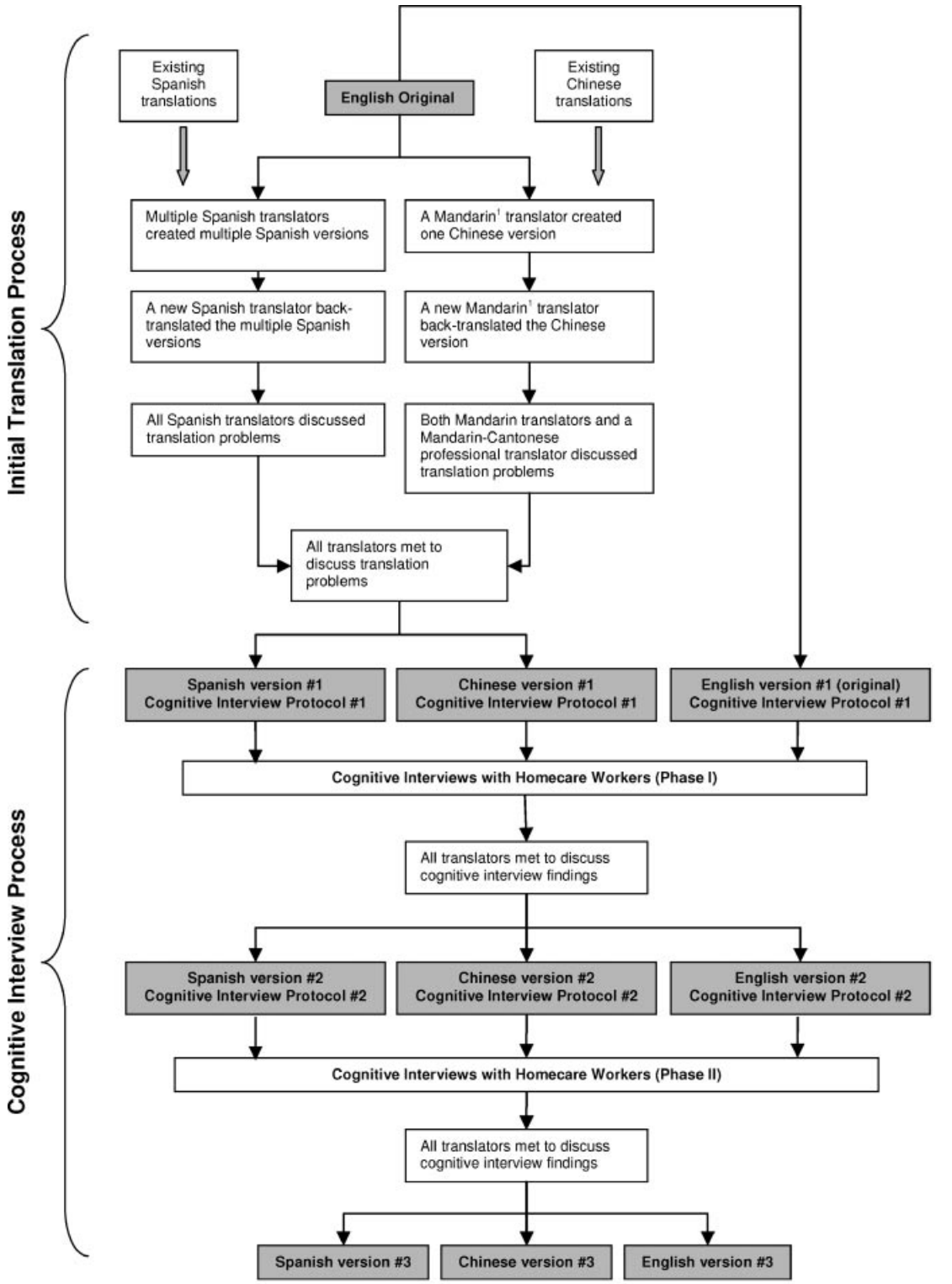


**FIGURE 1.** Three-language questionnaire development process.

constructs: job demands, job control, social support, job security, participation in decision-making, safety climate, and risk perception. This article focuses on these commonly used constructs. Items were taken from the JCQ [Karasek et al., 1998] and the Quality of Work Life module in the General Social Survey [Murphy, 2002]. The original English wording and response options are shown in Table I.

## Stage 1: Initial Translation Process

The goal of the translation process was not only to create an accurate translation from English but also to establish semantic equivalence across English, Spanish, and Chinese versions. Therefore, it was crucial to maintain regular communication between the English–Spanish and English–Chinese translation teams during the translation processes. A bilingual/bicultural translation team was formed for each target language. Team members represented various disciplines including anthropology, occupational medicine, sociology, and occupational health psychology. They were either native speakers of the target languages or had lived in countries where the target languages were spoken. In addition to these team members, several other native speakers reviewed translated versions and provided suggestions. Regular meetings were held to discuss translation problems and review cognitive interview findings (see below for more details).

After reviewing existing Spanish and Chinese translations, the translation teams produced initial Spanish and Chinese versions (forward translation). These translated versions were given to two bilingual persons for backward translation. The backward translators did not have previous knowledge of the original English items or constructs. When the back translation was completed, the forward and backward translators of each target language discussed the problems they identified in their tasks. Even when the forward translators had some reservations about their word or phrase choices, the back translators were generally able to produce nearly perfect back translations. This was partly because the translated word or phrase often strongly signals the original English words or phrase. This was true for both Spanish and Chinese translations. Both the forward and backward translators, however, identified difficulties in many of the translated items.

### *Translation findings*

Problems identified during the initial translation process included a lack of equivalent phrases/words in the target language, colloquialisms in English, and ambiguity in the original English items. A lack of equivalent words led us to use conceptual rather than literal translations. For example, Spanish or Chinese does not have a noun for ''job security.'' In Spanish, the literal translation of the original English ''The job security is good'' was ''La seguridad laboral es buena,'' but this was in turn back-translated as ''The safety of workers is good.'' The translators decided to depart from the literal translation and proposed a more conceptual translation: ''Tengo estabilidad en el trabajo'' [I have stability in my job]. Similarly, in Chinese, the translators proposed a sentence with a different structure: ''我的工作穩定'' [My job is stable]. Whether or not these slightly different sentences would address the same idea was tested in the cognitive interviews.

An example of difficulties regarding English colloquialisms can be found in one of the job control questions: ''I have a lot of say about what happens on my job.'' The English–Spanish translators could not confidently settle on one expression in translating ''a lot of say.'' They proposed several phrases such as ''tengo mucha influencia [I have a lot of influence]/autoridad [authority]/control [control]'' and decided to test each one in the cognitive interviews. The most confusing item to translate was one of the safety climate items: ''There are no significant compromises or shortcuts taken when worker safety is at stake.'' Both Spanish and Chinese translators found a number of difficulties in translating this item. For example, the subject/actor in this sentence is not clear: who makes compromises or takes shortcuts? Also, the Spanish word ''atajo'' [shortcut] simply means the shortest route between two locations and does not have a second meaning as a strategy to save time or efforts. In Chinese, ''捷徑'' [shortcut] does have the same second meaning as the English word, but the translators felt that this literal translation would not be understandable. They proposed a more straightforward phrase, ''簡單的解決方法'' [an easy way of solving problems].'' Despite these efforts, however, later in cognitive interviews, all respondents—including English speakers—found this item incomprehensible. As a result, it was excluded from the questionnaire.

As these examples indicate, the translation process was complex and revealed many problems inherent in crossing language and cultural lines. Some problems were resolved in the translation team meetings, but most problems were incorporated into cognitive interview protocols so that interviewers could investigate the most appropriate phrases and wordings with respondents.

## Stage 2: Cognitive Interview Process

### *Interviewer training*

Two bilingual interviewers, one for Spanish and English interviews, the other for Chinese interviews (conducted in Cantonese[1]), received half-day training for cognitive

[1] Cantonese is a spoken dialect of Chinese, and Mandarin is the official spoken language of Chinese. The written Chinese language is the same for both Cantonese and Mandarin. The initial translation was done by two native Mandarin speakers and one Mandarin–Cantonese speakers, and the interviews were done in Cantonese because our target worker population spoke Cantonese.

**TABLE I.** Questionnaire Items Tested in This Study

| Construct | Phase I item | Response options | Phase II item | Response options |
|---|---|---|---|---|
| Workload | I have enough time to get the job done | Very true; Somewhat true; Not too true; Not at all true | How often do you have enough time to get the job done? | Often; Sometimes; Rarely; Never |
| | I have too much work to do everything well | Strongly agree; Agree; Disagree; Strongly disagree | How often do you have too much work to do everything well? | Often; Sometimes; Rarely; Never |
| | | | How often do you have to work fast to get everything done? (added in Phase II) | Often; Sometimes; Rarely; Never |
| Job control | I have a lot of say about what happens on my job | Strongly agree; Agree; Disagree; Strongly disagree | How much say do you have about what happens on your job? | A lot; Some; A little; None |
| | I am given a lot of freedom to decide how to do my own work | Very true; Somewhat true; Not too true; Not at all true | How much freedom do you have to decide how to do your own work? | A lot; Some; A little; None |
| Social support | The people I work with can be relied on when I need help | Very true; Somewhat true; Not too true; Not at all true | How much can other homecare workers be relied on when you need help? | A lot; Some; A little; Not al all |
| | My supervisor is helpful to me in getting the job done | Very true; Somewhat true; Not too true; Not at all true | How much is your client helpful to you in getting your job done? | A lot; Some; A little; Not al all |
| Participation in decision making | In your job, how often do you take part with others in making decisions that affect you? | Often; Sometimes; Rarely; Never | In your job, how often do you take part with others in making decisions that affect you? | Often; Sometimes; Rarely; Never |
| | How often do you participate with others in helping set the way things are done on your job? | Often; Sometimes; Rarely; Never | How often do you participate with others in helping set the way things are done on your job? | Often; Sometimes; Rarely; Never |
| Job security | The job security is good | Very true; Somewhat true; Not too true; Not at all true | How stable is your job? | Very stable; Somewhat stable; A little stable; Not at all stable |
| | How easy would it be for you to find a job with another employer with approximately the same income and benefits? | Very easy; Somewhat easy; Not easy at all | How easy would it be for you to find a job with another employer with approximately the same income and benefits? | Very easy; Somewhat easy; Not easy at all |
| Safety climate | There are no significant compromises or shortcuts taken when worker safety is at stake | Strongly agree; Agree; Disagree; Strongly disagree | Dropped from the questionnaire | |
| | The safety of homecare workers is a high priority with management | Strongly agree; Agree; Disagree; Strongly disagree | To what extend does IHSS make the safety of homecare workers a priority? | Very much; Somewhat; Just a little; Not at all |
| Risk perception | In your opinion, how likely is it that a homecare worker might get hurt on the job? | Very likely; Somewhat likely; Not likely | In your opinion, how likely is it that a homecare worker might get hurt on the job? | Very likely; Somewhat likely; Not likely |

interviewing. The training session was conducted by the first author, whose expertise included survey development, cognitive interviews, and the concepts to be measured in the questionnaire. The second author, a medical sociologist and native Chinese speaker, also helped the training process. The training emphasized the following components: the purpose of the cognitive interview, the type of information to be obtained in each interview, review of the questionnaire items, review of the interview protocol, and role playing.

In the training, the purpose of the cognitive interviews was explained as the opportunity to test out the questions, and the focus was not so much on a respondents' answer itself but on the interpretation of the question and the process of arriving at the answer. It was strongly emphasized that if a respondent did not understand the question, it was not the respondent's fault. Rather, such an instance would provide a perfect opportunity to find out what is wrong with the question. During the training, the interviewers went through all items to be examined and discussed their own interpretations. The trainers clarified the intention of each item. After reviewing the items and protocol (see below for details), the Spanish–English interviewer conducted a practice interview with the trainer in English and another interview with a volunteer who was a native Spanish speaker. The Chinese interviewer conducted a practice interview with the other trainer. After each practice interview, problems were discussed, and advice for effective probing questions was provided.

### *Interview procedures*

A cognitive interview protocol was organized to obtain three types of information. First, the interviewer reads the question as written and obtains a response from among those offered. Second, the interviewer asks for explanations for the answer chosen (e.g., ''What made you choose that response option?'' ''Can you give me some examples for a situation like this?''). Third, the interviewer asks for alternative wordings (e.g., ''How would you say in your own words if you wanted to know . . .?'' ''Is this a good word for that? Do you have any other suggestions?''). For those items that created particular difficulties for the translators, specific probing instructions were given in the protocol. For the job control item, for example, interviewers were told to ask, ''Would it make any difference if I say 'authoridad' instead of 'control'?''

There are several methods for conducting cognitive interviews, including think-aloud, retrospective probing, and concurrent probing [Sudman et al., 1996]. Think-aloud (i.e., the respondent is asked to verbalize all thought process as she or he thinks about the question and response options) is a difficult task for many respondents and the novelty of the task might distract them from the questions themselves. Retrospective probing, which postpones probing until all the survey items have been asked, is truer to the actual survey process and has the advantage of not influencing the way the respondent interprets subsequent questions, but it may fail to capture immediate responses. Since developing the items in Spanish and Chinese was a new endeavor, and we wanted to minimize respondent burden, we chose the concurrent probing method until the items became refined.

A total of 30 respondents, 10 in each language, were recruited through the project's community partners. They received a $20-grocery gift card after completing an in-person interview, which typically lasted from 45 min to 1 hr. Interviews were conducted in a location chosen by the respondent, often his or her home. All interviews were audio recorded with the respondent's permission. The interview protocol was approved by the Human Subject Review Board of National Institute for Occupational Safety and Health, and each respondent provided an informed consent orally (audio recorded).

After each interview, the interviewers listened to the recording and filled out a data template in which each row represented each questionnaire item and each column represented each respondent. The interviewers were also instructed to take notes on their own reactions and observations and to document them in the spreadsheet. For quality assurance purposes, the interviewers met with the first author after each of the first few interviews to discuss problems they encountered during the interviews. After the interviews, the audio recording and the spreadsheet were sent to the first author for detailed analysis.

When several problems became apparent after the first few interviews (Phase I), the translation teams met and made a major revision to the items and interview protocol in all three languages. These problems were mainly the format of the items and response options. They are discussed in the next section. These revised items and protocol were used in the next phase of interviews (Phase II). Also during the interviews, the interviewers developed suggestions for different wordings and tested their ideas in interviews. These changes suggested in the interviews were recorded and discussed in the translation team meetings. This process was particularly useful because the interviewers, who had first-hand experience with the target workers' reactions, provided valuable information that would not have been incorporated if translation was done only by the translation teams.

## COGNITIVE INTERVIEW FINDINGS

### Common Problems Across Languages

Some problems identified in the cognitive interviews were common across languages. The translation teams made changes to all three language versions to incorporate these

common findings. A major change was the question format. Originally, most items were statements (e.g., ''I have too much work to do everything well.''), and the respondents were given four response options such as ''strongly agree,'' ''agree,'' ''disagree,'' and ''strongly disagree.'' After a few interviews, it was clear from the interviewers' feedback and respondents' comments that these response options were cumbersome in face-to-face interviews. For Phase II, the items were changed into the question format (e.g., ''How often do you have too much work to do everything well?''), and the respondents were given response options that indicated frequency or intensity (e.g., ''Often,'' ''sometimes,'' ''rarely,'' or ''never''; ''a lot,'' ''some,'' ''a little,'' or ''none''). Through this change, the survey items became more conversational, which was more comfortable to both the interviewers and respondents.

While using questions instead of statements in the questionnaire generally reduced the awkwardness of survey administration, the difficulty of choosing a response remained an issue for many respondents across languages. A common response was to say ''yes'' or ''no'' first, rather than to choose one response from the provided options. The interviewers noted that the respondents either did not pay attention to the options after listening to the question, could not find an option that sounded right to them, or could not retain or deliberate on all four response options at once. To alleviate some of these difficulties, the interviewers provided response options after the respondent provided the initial answer with yes or no. This strategy was effective for some respondents on some items, but as the following quote shows, it did not always work.

> Interviewer: How helpful is your client's family in getting your job done?
> Spanish #10: Yes, they are good.
> Interviewer: And do they help a lot, somewhat, a little?
> Spanish #10: No, because they are not here. They live far away.

In this case, the initial response may be interpreted as acquiescence bias, which is a serious problem when the response is limited to ''yes'' or ''no.'' In such exchanges, the interviewer has to provide a new set of response options (i.e., ''Do they not help at all, or a little?'') in order to capture the respondent's assessment of helpfulness.

Finally, these interviews found that some of the items did not work well in any language. As described above, one of the safety climate questions was difficult to translate. As expected, the Spanish- and Chinese-speaking respondents found the question confusing and could not provide their own understanding of what was being asked. The item was found to be difficult for English-speaking respondents as well. The translation teams decided to exclude the item from the questionnaire.

## Different Interpretations Across Languages

In addition to common problems regarding question format, response format, and hard-to-translate items across three languages, the cognitive interviews also revealed language differences in interpreting certain items. Some of the across-language differences stem from different properties of a concept, and others reflect different sets of connotations. In addition, the across-language differences pointed out problems in the original English.

### *Concept properties: "Time" as a commodity*

Three items from JCQ's psychological job demands scale were examined in the cognitive interviews: ''have enough time,'' ''too much work,'' and ''work fast.'' The ''enough time'' item seemed to provoke some culture-specific responses. All English-speaking respondents said that there was ''not enough time'' while all Spanish- and Chinese-speaking respondents indicated that they generally had enough time to get the job done. It is possible that the English-speaking respondents happened to have more demanding work for the allocated time; however, the Spanish- and Chinese-speaking respondents did mention a lack of time in other contexts during the interview. It was therefore suspected that these languages have different response sets (i.e., tendency to respond in a particular way) regarding time. That is, when asked about having enough time, English-speaking Americans tend to answer that there is never enough time whereas Spanish and Chinese speakers' typical answer is there is ''usually enough time.''

It is well documented in the anthropological literature that different concepts and metaphors of time exist across cultures [Birth, 2004; Mann, 1992]. English has a number of metaphors that indicate time as commodity: time can be spent, saved, wasted, and invested [Lakoff and Johnson, 1980], and the ''enough time'' item itself embodies this idea. It may be that Spanish and Chinese do not have or ''live by'' this distinct notion of time as commodity. If that is the case, then either (1) Chinese- and Spanish-speaking workers do not experience time pressure, or (2) asking directly whether or not they have ''enough time'' does not capture the sense of work overload they may feel. Because Spanish and Chinese speakers mentioned insufficient time in their responses to other job demand items (e.g., Interviewer: ''How often do you have too much work to do?'' Spanish #10: ''When [the client] is very bad, I have to work 2 or 3 hours more, and they don't pay me''), the second possibility seems more likely. Assessing psychological job demands in a multi-cultural worker group using the ''enough time'' item may be problematic.

### *Different connotations: "Freedom" on the job*

One of the job control items asked about having freedom to decide how to do one's job. There was no confusion about the idea of ''freedom on the job'' among the English-speaking respondents. Without exception, the English speakers discussed freedom in terms of decision-making power. If they felt that they were able to decide how to do the work, they reported that they had a lot of freedom on the job. In contrast, asking about freedom in the work context created a considerable confusion for Spanish-speaking respondents. The word ''libertad'' [freedom] was either not understood at all or interpreted as having spare time during or after work. Another item for job control contained the word, ''control,'' as a translation of ''a lot of say.'' This was one of the hard-to-translate phrases, and some of the Spanish-speaking respondents interpreted ''control'' as doing the job in a calm, controlled manner. With both job control items containing problematic words, the interviewers felt that asking about job control in Spanish was challenging.

### *Different connotations: To "rely on" others*

Among Chinese speakers, the most common response to social support questions (e.g., ''How much can other homecare workers be relied on when you need help?'') was ''I don't need any help.'' This response may reflect their interpretation of the phrase, **''依靠''** [to rely on]. It was interpreted by some Chinese-speaking respondents as ''to depend on'' and triggered denying comments: ''You should not depend on others. If that's your job, you have the full responsibility to do it. (Chinese #6)'' ''What do you mean by 'depend on'? Are you asking my dependency on other workers, right? Why would I have to depend on others? (Chinese #9).'' According to the American Heritage Dictionary (4th edition, 2001), ''to rely on'' encompasses a sense of trust, having faith or confidence. In Chinese, at least for some, the sense of trust was not perceived when they considered if they would **''依靠''** [rely on] others. Instead, the independence and capability as a worker became a central issue, and therefore this question brought about somewhat defensive responses.

### *Reexamining the English original: "Job security"*

As described in the Translation Findings Section, ''My job security is good'' was translated into slightly different sentences in Spanish (''I have stability in my job'') and Chinese (''My job is stable''). The Spanish and Chinese interviews revealed that these translations were understood as intended. That is, the respondents talked about fear of losing the job, past experiences of suddenly losing a job, and reasons for them to lose the job (e.g., the client might die). In contrast, the English interviews identified difficulties in understanding the item. The English-speaking respondents provided a wide range of interpretation for ''job security'': health insurance, dental and vision coverage, social security, and regular pay check. In one case, job security was understood as personal safety on the job.

> English #1: Nothing's secure, anywhere we go. No one can always walk you to your car. Even when security [guard] is there, still you can be scared because stuff can still happen. You don't feel any safer, but homecare workers tend not to have hours at night.

Apparently the original English item did not convey the intended meaning to some of the respondents. In Phase II, the item was changed to ''How stable is your job?,'' which is closer to the Spanish and Chinese translations. The English-speaking respondents in Phase II responded to this revised question by telling the interviewer why they thought the job was stable or unstable in the same way Spanish and Chinese respondents did.

## DISCUSSION

Developing a questionnaire in a multi-lingual setting is a complex process requiring multi-disciplinary collaboration and careful testing. Even though we adapted commonly used English items and incorporated some existing translations, the translation process involved many individuals in numerous discussions to produce the initial translation in Spanish and Chinese. As the cognitive interviews brought in a wealth of information, discussions continued in order to refine the translations. The first lesson we learned was that translating survey items is a labor-intensive, iterative process. Future projects involving multi-lingual worker populations should take this into account at the planning stage. Both funders and grant reviewers need to be sensitive to the additional time and costs associated with developing adequate translations. The following were some other lessons that we believe are useful for future research.

(1) Forward and backward translation is not sufficient.

Forward and backward translation is an important starting point, but reasonable backward translation does not guarantee equivalence between the original and target language versions [Johnson, 2006]. Behling and Law [2000] caution that bilingual individuals who serve as backward translators can often guess the source language structure from even an awkward sentence in the target language. Therefore, the similarity between the original and backward translation is not necessarily a marker of the optimal wording in the target

language version. Shortcomings of backward translation may be remedied by having more than one bilingual person to do the translation, involving experts of the study constructs in the discussion, and asking monolingual target language speakers to review the translation.

(2) Examining the original English items would enhance our ability to produce equivalent tools.

Given the changing nature of work in the US (e.g., manufacturing to service), researchers should revisit ''tried and true'' English items with a fresh eye. Many of the items we examined in this study were developed in the 1970s, when the composition of the US workforce was quite different from that of today. Different work contexts as well as potential shifts in language usage may affect the interpretation of these, and potentially many other items. For example, in this study we found that one commonly used English questionnaire item (e.g., ''My job security is good.'') did not work well among English speakers in this particular target population. Researchers who attempt to create equivalent translated versions must examine the usability of the original language version as well.

(3) De-centering can enhance semantic equivalence across languages.

In order to establish semantic equivalence across languages, Nàpoles-Springer et al. [2006] recommend de-centering, or modifying the source-language wording according to the target language. De-centering suggests that different versions of a multi-lingual instrument be developed simultaneously, rather than perfecting one language version first, then trying to translate it to other languages. Especially when the source language items are highly idiomatic, they may be understood perfectly in that language but may not be easily translated into other languages. In our experience, the job security item (''My job security is good'') was changed to ''How stable is your job?'' based on the Spanish and Chinese versions. This change increased the comprehension of the item among the English speakers.

(4) Involving interviewers in the translation/revision process is valuable.

Researchers who wish to conduct research projects in multi-lingual settings may not have the necessary language or cultural expertise. Bilingual/bicultural interviewers may need to be recruited from the target population. They can be not only essential personnel for carrying out interviews but also an invaluable source of information. Our interviewers, though they were not formally trained in survey development, provided a number of useful suggestions for wording and format change. In this study, the items to be translated were originally designed for self-administered surveys while the translated items will be eventually administered over the phone. This shift in data collection mode required adjustment in the way response options were provided. It was the interviewers' suggestion to use a two-step response (i.e., first obtaining yes/no, then providing appropriate response options). Using interviewers from the target population can also be useful in tailoring the translations to regional or occupation-specific differences in terminology. For example, regional differences in Latin American Spanish include distinct idioms and commonly used words [Alegria et al., 2004]. Although it was not feasible in this study, recruiting and training multiple interviewers from various regions for one language would help tailor the target language wording to the target population.

## STUDY LIMITATIONS

A few caveats in this study should be acknowledged. Only one interviewer conducted all of the English and Spanish interviews, and another interviewer did all of the Chinese interviews. If there were interviewer-specific biases, we had no means to investigate them. Had the interviews been conducted until we reached theoretical saturation (i.e., new interviewees no longer provide new findings, Strauss and Corbin, 1998), the findings from this study would have been stronger. In addition, the respondents were all from a single occupation. While the interview findings helped us identify a better wording and format for homecare workers, it may not be applicable to other occupation groups. This poses the fundamental difficulty in adapting questionnaire items across languages, cultures, and occupations. The more tailored the items are, the better they capture the information from the specific group of workers. However, these tailored items do not allow direct comparisons with previous studies that used the original items.

## CONCLUSION

As the US workforce becomes more diverse, occupational health and safety researchers will need to incorporate methods outside of their traditional approach in developing high-quality, multi-lingual survey instruments and intervention materials. This article is one of the few that thoroughly documents a qualitative approach to developing multi-language questionnaires. Only through critically examining questionnaire items can we clarify what exactly is measured in different settings. More efforts should be devoted to multi-lingual, multi-cultural questionnaire development.

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