

Enriching the quality of cross-cultural instrument development through cognitive interviewing: Implications for nursing research

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Abstract

Aim: During cross-cultural instrument development, a gap commonly exists between the intended meaning of questionnaire items and the extent to which the participant understands that meaning. Because cognitive interviewing can provide such a powerful means for ensuring an accurate interpretation of items, the purpose of this report is to provide a practical guide to encourage its use in nursing research.

Methods: This report provides in-depth information describing: (a) advantages of cognitive interviewing, particularly for cross-cultural instrument development; (b) specific problems it can identify and solve; (c) strategies for performing cognitive interviews, including the four-step model of the question-and-answer process; (d) practical guidance for conducting successful cognitive interviews.

Results: To achieve linguistic validity as well as cultural relevance, a variety of factors need to be considered in addition to language, such as cultural interpretations, attitudes, and values. Examples of health-related studies are presented, demonstrating the advantages of cognitive interviewing for instrument development and cross-cultural research. These examples show how cognitive interviewing can be productively used to verify question clarity, patient comprehension, and patients' ease of response and judgment while also helping to establish content validity based on patients' perspectives.

Conclusions: Cognitive interviewing can help nurse researchers discover potential instrument flaws and correct them in advance, subsequently avoiding collection of inaccurate data. Thus, cognitive interviewing should be considered an effective pretesting method for development of accurate instruments, particularly in cross-cultural nursing research.

KEYWORDS

cognitive interviewing, cross-cultural, instrument development, translation

1 | INTRODUCTION

Accurate instrument development has long been a cornerstone of nursing research, and given the increasing number of studies in international settings, cross-cultural instrument

development is exponentially growing, both in terms of new instruments and translation of existing ones. During the process of cross-cultural instrument development, a gap commonly exists between the intended meaning of questionnaire items and the extent to which the participant understands

TABLE 1 Cognitive interviewing contributions to cross-cultural studies

Study	Instrument	Issues identified	Revisions	Contributions
Akinpelu, Odetunde, & Odole, 2012 Translated from English into Yoruba language	SS-QoL 2.0	Cultural interpretation of terms used differed from the original language. Example: "Family" in Yoruba can mean either a nuclear or an extended family.	"Family" was replaced with "relations" (extended family) because there was confusion about whether the word in Yoruba for "family" meant extended family or nuclear family.	Changes provided clarity in the intended meaning, so that the question would be interpreted consistently across respondents.
Al-Khasawneh et al., 2016 Translated from English into Arabic	BCAM	Medical terms were not understood. Participants had limited experience with breast cancer screening practices. Examples: Difficulty understanding words used for nipple dimpling and menopause. Unfamiliar with breast cancer screening practices.	Common Arabic words were substituted for medical terms. Breast dimpling was described, and the colloquial term for menopause was used. All possible breast cancer early detection practices were enumerated.	Revisions resulted in high completion rate, little missing data, and minimal confusion regarding items. Validity and reliability of the revised instrument was supported.
Arnold et al., 2016 Translated from English into Spanish	NCI's PRO-CTCAE	Medical terms and phrases were not understood when translated. Examples: Difficulty understanding terms used for hot flashes, skin cracking at corners of mouth, sweating, and diarrhea.	Five items were revised: commonly used words were substituted and phrases were simplified.	No further difficulties with items were found with retesting. High levels of comprehension, meaningfulness, and content equivalence were found after revision.
Beksted et al., 2016 Translated from English into Danish	NCI's PRO-CTCAE	Respondents differed in their interpretations of five items; not clear which symptoms the items referred to when translated into Danish. Examples: Body odor, uncontrollable diarrhea, mouth or throat sores, unexpected decrease in sweating, feeling that nothing could cheer you up.	Phrasing for the five symptom toxicities was revised. "Other than normal" was added to clarify body odor and decrease in sweating. Diarrhea was clarified to mean "problems holding feces back," mouth sores was changed to "problems from the mucosa in your mouth or throat," and "nothing could cheer you up" was made simpler.	Revised phrasing was clear when tested, as well as culturally and semantically acceptable. Participants' interpretation of the meaning of items were conceptually equivalent to original English version.
Beck et al., 2017 Translated from English into Swedish	IPOS	Difficulties in comprehension and judgment formation. Examples: Comprehension problems were caused by the terms shortness of breath, "at peace," and depressed. The response option "overwhelmingly" caused problems with judgment formation.	"Breathlessness" was substituted for "shortness of breath." "Satisfied" was substituted for "at peace." Some participants interpreted the term "depressed" as the diagnosis of depression, so the word "gloomy" was used instead. The response choice "worst possible" was substituted for "overwhelmingly," which was more natural in Swedish.	All difficulties were resolved through the cognitive interviewing process. Both patients and staff found the revised instrument to be acceptable in subsequent testing. All questions were considered appropriate and important.

(Continues)

TABLE 1 (Continued)

Study	Instrument	Issues identified	Revisions	Contributions
Lee & Lee, 2015 Translated from English into Korean	Health beliefs scales for CRC	Linguistic and cultural issues were identified, such as misunderstanding unfamiliar terms. "Privacy" was not understood in the Korean cultural context of a close-knit family system. Examples: "Stool blood test" was thought to mean a general blood test; "privacy" was intended to mean the ability to conduct fecal occult blood test alone in the bathroom, but this was not understood.	"Stool blood test" was modified to "stool test" to emphasize stool rather than blood. "Privacy" was removed entirely, with the revised item reading, "it is hard to use a bathroom alone, which would keep me from having a fecal occult blood test."	Scales were revised based on cognitive interview findings. Subsequent testing supported the reliability and validity of the revised scales.
Lee, Lee, & Aranda, 2018 Translated from English into Korean	Cultural belief scale	When directly translated, the fatalism items in the original scale were culturally inappropriate. Examples: Participants did not believe in destiny, expressed negative feelings about the terms "destiny" and "fate," and refused to answer the fatalism items.	Fatalism items were reworded to remove "destiny" and "fate," for example "if someone is meant to have colon cancer."	Changes made the instrument more acceptable by addressing traditional cultural beliefs, which resulted in an increased response rate.
Mohanraj et al., 2015 Translated from English into Tamil (India)	Brief COPE	Participants found three items to be culturally inappropriate, which focused on coping through humor and denial. Examples: The two humor items were, "I've been making jokes about it" and "I've been making fun of the situation." An item in the denial subscale stated, "I have been saying to myself this is not real."	Participants thought HIV was a serious condition that was inappropriate for jokes. Alternative phrasing in Tamil toned down the humor aspects, using the revised wording: "I've been taking the situation lightly" and "I've been taking the situation humorously."	The changes in wording resulted in an improved understanding and cultural acceptability of the questions. Subsequent testing supported the reliability, validity, and cultural appropriateness of the revised instrument.
Park, Park, McCreary, & Norr, 2017 Translated from English to Korean	FNPA	Six items were confusing or were interpreted incorrectly. Examples: It was unclear whether "sugar drinks" included juice, and whether "be active" referred only to outdoor activities.	Wording changes were made to all six items. For example, "my child drinks soda pop or sugar drinks (drink with sugar added: Does NOT include 100% juice)"; and "our family encourages our child to be physically active every day."	Clarity of the items and cultural appropriateness of the revised instrument were achieved.

(Continues)

TABLE 1 (Continued)

Study	Instrument	Issues identified	Revisions	Contributions
Wapenaar et al., 2016	CAMPBOR	Participants were confused by the wording of items on activity limitations and quality of life. Examples: "Doing it on your own with problems" and "I feel that I'm losing my role in life" were confusing.	Wording for the activity limitations item was changed to "with difficulties doing it on your own." For the quality of life item, "responsibilities" was added to clarify "role."	The changes ensured that items were understood in the same way as the original instrument, providing conceptual equivalence. The translated items also were expressed in commonly used language.

Note: These studies involved cross-cultural instrument translation and varied in their reported data analysis approaches. Overall, the studies reported that cognitive interviewing contributed to the understandability of questionnaires, improved conceptual equivalence, increased response rates, and recognition of difficulties in understanding terminology for cancer-related symptoms. Most of the researchers asserted that cognitive interviewing contributed to the accuracy, validity, and reliability of their translated instruments.

Abbreviations: BCA, Breast Cancer Awareness Measure; Brief COPE, Brief version of the Coping Orientation to Problems Experienced; CAMPBOR, CAMbridge Pulmonary Hypertension Outcome Review; CRC, colorectal cancer; FNPA, Family Nutrition Physical Activity; IPOS, Integrated Palliative Care Outcome Scale; NCI, National Cancer Institute; PRO-CTCAE, Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events; SS-QoL 2.0, Stroke-Specific Quality of Life 2.0.

that meaning. Cognitive interviewing provides a powerful means to ensure that participants and researchers have a common understanding of the items.

In addition to language, many factors must be considered in the cross-cultural validation process, such as cultural interpretations, attitudes, and values, to achieve linguistic validity as well as cultural relevance (Willis & Miller, 2011). Thus, cross-cultural instrument development requires close attention to the selection and meaning of each word (Acquadro, Conway, Giroulet, & Mear, 2012; Willis, 2005). According to Ferrans (2010), cognitive interviewing is an essential final step to ensure clarity and cultural appropriateness, using monolingual speakers from the target population, who differ in language abilities from the bilingual, bicultural experts typically performing such translations. In addition, given that instrument developers inevitably bring their own viewpoints to instrument development, cognitive interviewing allows revision of an instrument based on the perspectives of intended research participants in order to increase instrument validity, which ultimately will improve the quality of the research (DeVellis, 2016).

With the increasing interest in cross-cultural nursing research, cognitive interviewing is a potentially valuable strategy for cross-cultural adaptation of instruments. Questionnaire instruments are essential for evaluating critical factors such as patients' symptoms and treatment outcomes and thus need to be carefully validated in order to ensure that they properly address the health outcomes of interest. Cross-cultural studies have demonstrated the effectiveness of cognitive interviewing in instrument development and translation to improve understanding of patients' experiences, as well as reliability and validity. Table 1 lists examples of instruments for a variety of health conditions, such as cancer, stroke, pulmonary hypertension, AIDS, palliative care, as well as family nutrition and physical activity. Thus, cognitive interviewing is a key step of cross-cultural validation in that it can identify participants' points of view in order to improve questionnaire items and constructs such that their intended meanings are accurately conveyed.

Because cognitive interviewing is such an important tool for developing and validating cross-cultural instruments, the purpose of this report is to provide a practical guide to encourage its use in nursing research. Specifically, this report provides in-depth information describing: (a) advantages of cognitive interviewing, particularly for cross-cultural instrument development; (b) specific problems it can identify and solve; (c) strategies for performing cognitive interviews, including the four-step model of the question-and-answer process; (d) practical guidance for conducting successful cognitive interviews.

1.1 | Value of cognitive interviewing

In recent decades, cognitive interviewing, as part of the translation validation process, has evolved as an approach to locating potential errors in survey questionnaires (Willis, 1999). The development of the cognitive interviewing method has contributed to the understanding of sources of measurement error and facilitated exploration of the thought processes of participants as they experience questionnaires (García, 2011; Knafl et al., 2007).

More specifically, cognitive interviewing is a useful method for examining how participants understand, mentally process, and respond to instruments, and thus can be used to enhance the validity of an instrument by revealing participant misunderstandings of its concepts and language that can then be addressed (Willis, 2005). Because it is intended for evaluating the transfer of information, both during instrument translation and during data collection, the focus of cognitive interviewing lies in the question-and-answer process rather than the entire survey process (Collins, 2014).

Traditionally, nursing researchers have conducted pilot studies to test newly developed or translated instruments, but such studies may not be sufficient to identify possible instrument flaws. Because pilot studies may not detect all the potential problems with an instrument, question-testing methods such as cognitive interviewing are valuable for thoroughly examining the instrument and the question-and-response process. In Asian languages and cultures in particular, communicative norms are frequently different from those of English language and culture, leading to difficulties in comprehending questions due to participants' lack of lexical knowledge or differences in participants' thought processes (Park, Sha, & Pan, 2014). Furthermore, cultural variability as well as questionnaire design matters such as response format, question length, and reading level all affect the way that questions are interpreted by participants (Johnson et al., 2006). Because of this, cognitive interviews have been found to be useful for pretesting the conceptual equivalence of survey items among a diverse target population (Napoles-Springer, Santoyo-Olsson, O'Brien, & Stewart, 2006). Thus, the overall value of cognitive interviewing as a pretesting method for health research questionnaires is that it provides a standardized process to maximize instrument quality (Knafl et al., 2007).

1.2 | History of cognitive interviewing

Over the past 30 years, developments in participant task analysis and error measurement have significantly influenced the application of cognitive interviewing. This is evidenced by the Cognitive Aspects of Survey Methodology (CASM) movement, which combined survey methodology and cognitive psychology and had its origins in the United

States and Germany in the mid-20th century (Collins, 2014). The basic principle of CASM is that information processing steps exist that require a sequence of complex cognitive processes. As an outcome of the CASM Conference held in 1984, the four-step cognitive model was proposed by Tourangeau (Willis & Miller, 2011). This model offers a helpful framework for understanding the various "errors of interpretation" in survey research (Collins, 2014). Moreover, this model has been widely used in various research fields and has become a major component of health-related survey research in Western countries. In its current form, cognitive interviewing typically involves the process of a researcher conducting meetings with individual members of a target population in order to elicit information, beliefs, and opinions that could not be effectively obtained using a quantitative instrument or other research means. This approach is used for a variety of research purposes ranging from straightforward qualitative data collection to instrument development and translation efforts.

1.3 | Examples of cognitive interviewing in health-related studies

Table 1 presents 11 health-related studies demonstrating the advantages of cognitive interviewing for instrument development and cross-cultural research. The instrument issues they identified are presented in Table 1, along with the associated findings and contributions. For example, Hay et al.'s (2014) research involved the US National Cancer Institute's (NCI) Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE). This is a library of questions for research to identify symptomatic adverse events from patients' perspectives. Cognitive interviewing proved to be valuable during initial development of this instrument, as Hay et al. (2014) used this approach to assess patients' comprehension of the item library. Three rounds of cognitive interviewing were used to evaluate patient comprehension, retrieval, judgment, and response for the questions. Over 20% of the questions evaluated were modified as a result of the interviews, until no further difficulties with questions could be identified. This example shows how cognitive interviewing can be productively used to verify question clarity, patient comprehension, and patients' ease of response and judgment while also helping to establish content validity based on patients' perspectives.

Cognitive interviewing again proved important when Arnold et al. (2016) translated the 124 questions of the US version of the PRO-CTCAE from English into Spanish. The researchers again applied cognitive interviewing to linguistically validate the translation of the item library. In their study, cognitive interviews were held with a total of

109 participants in two rounds. After the first round of interviews, 22 questions were identified as posing potential difficulties for participants, despite the fact that all problems in English had been resolved at the time of instrument development (Hay et al., 2014). For the Spanish translations, five problematic questions were revised, and subsequently were found to pose no interpretation difficulties during the second round of interviews. However, 17 questions were ultimately judged to pose only minor difficulties or to have no suitable alternative phrasing, and so were not revised after translation. Typically, the process continues iteratively until it is demonstrated that all problems with comprehension and cognitive processing have been resolved. This example does show the value of cognitive interviewing with each new translation, even in cases when the original language version previously has been verified through the process.

As a key step of cross-cultural validation, cognitive interviewing helps to ensure accurate participant understanding of questions through its question-and-answer process and reveals how researchers' and participants' interpretations of questions may differ. The ideal result of the instrument development process is an enhanced measure that blends the perspectives of the researcher with the points of view of potentially diverse participants to improve the accuracy and overall quality of the research. To this end, cognitive interviewing can expose the array of unexpected participant perspectives and responses and thus contribute to a more reliable instrument. With expanded use, cognitive interviewing can globally improve the reliability and validity of health research.

1.4 | Problems avoided through cognitive interviewing

Questionnaires are ubiquitous in nursing research, and it has become commonplace to employ translated instruments in cross-cultural and multi-cultural settings (Willis & Miller, 2011). However, use of faulty instruments in cross-cultural research can result in participants being unable to retrieve information, finding questions irrelevant or overly sensitive, being confused by complex formats, and failing to complete the instrument (Conrad & Blair, 1996; Drennan, 2003; Tourangeau, 1984).

While both researchers and participants can be sources of error in survey efforts, participant errors in particular can be clustered into five categories, as suggested by Conrad and Blair (1996). First, lexical problems involve the wording used in a questionnaire and affect the participants' understanding of the questions. Second, when participants do not clearly understand the scope of a question, a problem arises with respect to what the question specifically includes and excludes. Third, temporal problems are related to

participants' misunderstanding of timeframes. Fourth, logical problems occur when participants misunderstand how to answer a question (e.g., whether to answer once or twice because of the presence of connecting words like "and"). Fifth and finally, computational problems involve computations that cause participants to answer inaccurately or not at all (Drennan, 2003).

In nursing research, many investigators have reported that study participants from diverse backgrounds were uncertain about how to properly respond to questions. Moreover, participants were often not used to dealing with researchers, and even when the research purpose was explained using informal language, participants needed further explanation in a more conversational style (García, 2011). Instruments used in nursing research, in particular, can be misinterpreted by participants, because they may employ more formal language as well as specialized terminology. Because health matters are involved, participants tend to be sensitive to the wording used in questions, and they can easily misunderstand intended meanings. Thus, in nursing research, survey questions must be carefully designed and phrased so as not to confuse participants and thus affect the quality of data collected. This is especially true for instruments used in cross-cultural research, where the potential for participants' misunderstanding is even greater.

1.5 | Cognitive interviewing process

1.5.1 | Four steps of the question-and-answer process

Tourangeau (1984) developed the four-step model of the question-and-answer process to represent the CASM, and these four steps have been widely used to identify potential challenges to instrument reliability and validity and thus to accurate measurement (see Table 2). A well-designed survey question is understood equally well by all participants and with the intended meaning.

The first step is comprehension of the question, which may also be referred to as question interpretation. The goal is for participants to interpret the question in the way intended by the researcher in order to avoid inappropriate responses. Therefore, this step of the process broadly ensures that researchers' and participants' interpretations of the question are conceptually equivalent. Cognitive interviewing can reveal instances where researchers' and participants' interpretations of the questions differ in scope and depth (Willis, 2005).

The second step is information retrieval, which involves participant retrieval of the necessary information stored in long-term memory. This involves the participant's applying retrieval strategies, using cues to prompt recollection,

TABLE 2 The four steps of the question-and-answer process

The four steps	Description	What the participant thinks	What the researcher thinks
Step 1 Comprehension (interpretation)	Understanding the question as intended by the researcher	What does the participant believe the question is asking?	What do specific words and phrases in the question mean to the participant?
Step 2 Information retrieval	Retrieving necessary information from long-term memory	What types of information does the participant need to recall in order to answer the question?	What types of strategies does the participant use to retrieve information?
Step 3 Judgment formation	Judging how to answer the question based on the “raw material” available	Does the participant judge the response to be adequate to answer the question?	How does the participant arrive at the answer? Is the answer a logical outcome of the comprehension and retrieval steps?
Step 4 Response editing	Responding through formatting (if applicable) and editing the response	Can the participant match the internally generated answer to one of the response options given by the question (if applicable)? Does the participant believe that answering the question honestly will detract from his/her reputation?	Does the participant understand how to formulate the response according to the question format? Does the participant want to tell the truth in answering the question? Is the answer affected by the participant's impulse to “look better” to others?

Note: The information in this table is generally drawn from Tourangeau (1984) but has been modified based on the authors' experience and literature review results (e.g., Collins, 2014; Willis, 2005).

retrieving personal memories, and filling in memory gaps through inference. Individual participants may have different perspectives on a question's meaning that are affected by how much they remember about a specific event and how their memories make them think about it; and, in some cases, participants may have no memories at all related to the question. Moreover, participants' ways of understanding a question differ depending on their individual experiences and memories. Therefore, knowledge of the retrieval process helps researchers to recognize and avoid barriers to participant understanding and recall (Collins, 2003).

The third step is judgment formation, which involves participants making a judgment regarding the information necessary to answer the question, as well as formulating a response. Formatting the response refers to adapting it to a closed-ended question, where the participant must select from the options provided. Participants formulate their answers to questions based not only on the “raw material” they remember but also on what they cannot recollect. That is, they estimate whether what they do remember is adequate to provide the information requested. This form of judgment formation requires an accurate and fully understandable response scale (Collins, 2003; Willis, 2005).

The last step involves participants answering the question, which entails “formatting” and “editing” of the response. Editing the response refers to the participant's impulse to conform to social norms and thus may involve social desirability bias and acquiescence (Collins, 2003). After the participant marks their answer, the discussion of

the fourth step may address why that answer was given and whether another individual would be likely to interpret the question in the same way.

This four-step process is iterative in nature, as it is conducted repeatedly until all instrument questions are tested, questions are modified, and all sources of confusion are resolved. The cognitive findings of every set of interviews are discussed in a meeting of the research team for validation purposes. During this meeting, the team evaluates every question-related issue identified and determines appropriate modifications to the question, which are then tested with a new group of participants.

During the interview process, the interviewer not only records the participant's thoughts about and erroneous interpretations of questions but also invites the participant to recommend alternative words and phrases that might better capture the concepts and meanings intended. This activity is especially important when an instrument translation is involved, as the opportunities for misguided linguistic choices are all the greater. Through the four steps and subsequent research team evaluation of findings, all major sources of response error should be identified and corrected.

1.6 | Techniques of cognitive interviewing

In accordance with the four-step question-and-answer process, two major techniques are used in cognitive interviewing: the “think-aloud” technique to expose the participants' thought processes and “probing” to apply more specific questions in

order to clarify a response (Collins, 2014; Willis, 1999). The two techniques are not entirely independent and are often used in combination (Willis, 2005).

The think-aloud technique involves the interviewer explicitly asking the participant to verbalize her/his thoughts in answering each item of the questionnaire. The researcher states each item aloud and then records notes on the participants' thought processes in generating an answer. Before conducting a cognitive interview, the interviewer explains how the participant should answer "think-aloud" questions to better reveal the thought process. The interviewer may choose to be more or less assertive during the interview process, either intervening as little as possible or asking additional probing questions (Beatty & Willis, 2007; Willis, 2005).

Along with the "think-aloud" technique, interviewer probing is important for searching more deeply into the basis for a response to a questionnaire item. The interviewer states each item aloud, and the participant answers; the interviewer then asks for more details related to the item or the answer given. Categories of cognitive probes include comprehension/ interpretation probes, paraphrasing, confidence judgment, recall probes, and specific and general probes (Willis, 2005).

The advantages of verbal probing are interviewer control of the flow of information, the ease of preparing participants before the interview, and the ability to maintain the focus of the interview on the questionnaire items. Disadvantages include "artificiality," where probing for further information influences how the participant answers, and the potential for bias in probe questions, avoidance of which requires careful training for the interviewer (Willis, 2005).

The think-aloud and probing techniques both support exploration of the thoughts and recollections of participants while completing a questionnaire in order to gather the desired data as well as participants' suggestions for an items' focus and language. Consequently, cognitive interviewing employing these techniques results in instrument development that reflects the perspectives of both researchers and participants.

1.7 | Practical guidance for conducting cognitive interviews

The cognitive interviewing process requires careful preparation and decision-making regarding the kind of information that must be acquired to meet the research objectives. For cognitive interviews to be successful, a number of interviewer characteristics are desirable. First, the interviewer should be a good listener, nonjudgmental, patient, and friendly but professional (Collins, 2014). Effective cognitive interviewing is more the result of interpersonal skills than academic qualifications. However, the interviewer also needs to have knowledge of the research's subject area,

training in cognitive interviewing, and familiarity with concepts such as bias (Willis, 2005). Moreover, the interviewer should be able to make participants comfortable enough to freely express thoughts and feelings.

Cognitive interviews are mostly face-to-face interviews, and choosing an appropriate interview location is a major consideration. The setting should be private, quiet, convenient, comfortable, and free from distractions. Both naturalistic and controlled interview environments are considered acceptable (Collins, 2014). Unlike the telephone interview, meeting face-to-face allows the interviewer to observe non-verbal cues and establish a more natural interaction with the participant, and thus the face-to-face mode is generally applied. However, telephone interviews may be employed when the questionnaire is intended for telephone surveys or when it is not feasible for the interviewer and participant to meet in person (Willis, 2005).

The time required for the cognitive interviewing process depends on a number of factors such as the target population, the number of questionnaire items, the number of rounds of testing, and the specific questioning mode used by the interviewer. Another main factor is also how much time is available for the research as a whole (Collins, 2014). For each cognitive interview, the ideal length is 1 hr, and it is not advisable for an interviewer to conduct more than three interviews in a given day. For every testing round, a minimum of five to a maximum of 15 interviews is usually suitable to obtain the data needed to verify or modify questionnaire items, and usually three iterative rounds of interviews are recommended (Willis, 2005).

After each round of cognitive interviews, the research team meets to discuss the interview findings. Based on the findings, a consensus is reached on which questionnaire items should be modified in terms of content or language. The modified questionnaire is then subjected to a subsequent round of cognitive interviewing until a final version of the questionnaire is achieved.

Another consideration is the number of interviewers to be involved. This decision partially depends on the time and resources available. One advantage of having multiple interviewers with varying perspectives is that more comprehensive identification of questionnaire problems should be possible. Another advantage is that multiple interviewers can be more flexible regarding the times and locations of interviews (Collins, 2014). On the other hand, a single skillful interviewer can apply a consistent and reliable approach to a range of participants.

2 | CONCLUSION

Cognitive interviewing in instrument development can help to avoid a number of problems commonly encountered in

nursing research. Accurate instruments are required to interpret and assess patient outcomes, and instrument revision based on cognitive interview findings can reduce measurement error, improve reliability and validity, and contribute to accurate and unbiased research results. The advantages of employing cognitive interviews include allowing exploration of whether questionnaires are interpreted properly by participants, identifying alternative wordings for improvement of questions, and determining whether the data desired can be obtained and whether it is willingly provided by participants. This method also allows researchers to determine whether response options are adequate to obtain accurate data and whether the questionnaire as a whole is regarded as usable by participants (Collins, 2014). In essence, cognitive interviewing can help researchers discover potential instrument flaws and correct them in advance, subsequently avoiding collection of inaccurate data that will result in faulty conclusions (García, 2011).

Considering the cultural diversity of nursing research settings, cognitive interviewing is an essential aspect of cross-cultural instrument development. Cultural and linguistic differences need to be accounted for to achieve concept and item equivalence to the intentions of original developers and ultimately to achieve greater consistency in health assessment worldwide. Furthermore, the ability of properly conducted cognitive interviews to obtain comprehensive feedback on an instrument promotes precise understanding of how it can be modified to obtain appropriate responses, which is essential to acquire accurate information on health outcomes. For these reasons, cognitive interviewing should be considered a key pretesting method for development of accurate instruments and enhancement of cross-cultural nursing research.

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The authors have no involvements, financial or otherwise, that influenced their contributions to this article.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

M.K.J. conducted the review of literature relevant to cognitive interviewing, synthesized the review findings, and wrote the initial draft of the paper. S.K., E.G.C., L.T.Q., and C.G. P. provided critical reviews of this paper and significantly contributed to its content. Lastly, C.E.F. provided guidance for the development of this paper, contributed significantly to its content, and contributed to all phases of writing and revision.

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