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Translation and Pilot Test of the Implementation Leadership Scale in Chinese Nursing Context

Keywords: leadership; evidence-based practice; nursing; translations; linguistics

Running Title: Developing Chinese Implementation Leadership Scale

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Translation and Linguistic Validation of the Implementation Leadership Scale in Chinese Nursing Context

Abstract

Aim: To translate the Implementation Leadership Scale (ILS) into Chinese and evaluate how Chinese nursing staff and leaders understood and responded to the Chinese ILS.

Background: Leadership is a critical factor for implementing evidence-based practice. The ILS is a valid and reliable instrument to understand leadership for evidence-based practice; however, this scale or the other similar instrument does not exist in Chinese.

Methods: We followed the translation and cross-cultural validation guideline developed by Sousa and Rojjanasrirat. Translation included two forward and blind backward translations, and their comparisons. Two rounds of cognitive interview were used to evaluate the linguistic validity.

Results: The translation process took 12 months. In the forward and backward translations, 24 translation issues were identified, of which semantic equivalence issues were most frequent. Ten nurses participated in each round of cognitive interviews and 33 linguistic issues were found. The final Chinese ILS had seven significant adaptations to the original instrument.

Conclusion: This study provided a deep understanding of using the ILS in the local context and laid the foundation for future psychometric statistical testing.

Implications for nursing management: ILS could support organizational leadership development programs and strategies to facilitate and support EBP implementation and sustainment.

Keywords:
leadership; evidence-based practice; nursing; translations; linguistics

1 Introduction

Sackett (1996) defined evidence-based practice (EBP) as "the use of current best evidence in making decisions about the care of individual patients that integrates the best external evidence with individual clinical expertise and patients' choice (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996)." It is widely accepted that EBP is a significant advancement in health care services that promotes optimal clinical practice and positive patient outcomes (Grol & Grimshaw, 2003). As the largest professional group in health care delivery, nurses play a central role in advancing the implementation of EBP (World Health Organization, 2016). In 2012, the International Council of Nurses proposed the theme "Closing the Gap: From Evidence to Action" as a means of encouraging nurses to use evidence-based approaches to nursing practice (International Council of Nurses, 2012). However, EBP remains inconsistently applied with formidable implementation challenges (Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012).

EBP was introduced to the context of Chinese nursing in 2001, and is now considered a critical step in scaling up the quality and effectiveness of nursing services in China (Cheng, Feng, & Hu, 2017; The Lancet, 2012). A recent scoping review illustrated that the number of studies conducted in China on the implementation of EBP in nursing has been gradually increasing each year, from zero in 2001 to 28 in 2015 (Cheng, Feng, et al., 2017). However, this review also revealed that implementing EBP in the Chinese nursing context has its own unique challenges and system wide barriers. For example, barriers include widely held cultural values of respect for position, age, and working experience hierarchies and the pursuit of social harmony, most of which cannot be addressed in a short period of time (Cheng, Feng, et al., 2017).

Leadership is considered a critical factor for the implementation of EBP in different settings and among different professional groups (Gifford et al., 2018; Hu & Gifford, 2018). However, few published studies have focused on leadership for implementing EBP in China. Specifically, what leaders do to facilitate and support EBP has not been considered in Chinese nursing research (Cheng, Broome, Feng, & Hu, 2017a, 2017b) which has created a knowledge gap about implementation leadership in this context. To advance the science, a valid and reliable measurement tool is needed to understand how leadership influences implementation of EBP in Chinese nursing settings.

Without a validated, reliable, and acceptable measurement tool of implementation leadership, it is difficult to evaluate what nursing leaders do to implement EBP, or the impact of leadership interventions for improving nurses' attitudes, acceptance and implementation of EBP. Previous studies have used questionnaires measuring leadership in general to evaluate leadership for the implementation of EBP, such as the Multifactor Leadership Questionnaire including transformational and transactional leadership (Aarons & Aarons, 2006; Aarons, Ehrhart, Moullin, Torres, & Green, 2017; Brimhall et al., 2015; Marchionni & Ritchie, 2008; Masood & Afsar, 2017; Paparone, 2015; Powell et al., 2017). Leadership in general refers to a process of influencing others to accomplish shared objectives (Yukl, 2006), however instruments measuring leadership in general do not capture the particular leadership strategies and behaviors that are critical to implementing EBP (Aarons, Ehrhart, & Farahnak, 2014).

One meta-analysis of 58 studies demonstrated that strategic leadership that focusses on activities for a specific organizational change initiative has a relative advantage when compared to leadership in general (Hong, Liao, Hu, & Jiang, 2013). In EBP context, this means that the evaluation of leadership that focuses specifically on implementation could predict implementation of EBP more accurately than those that focus on leadership in general (Aarons et al., 2014). It is therefore warranted that a valid and reliable instrument that measures implementation leadership in the Chinese nursing context is needed to understand and evaluate EBP efforts.

Aarons et al. (2014) developed the Implementation Leadership Scale (ILS), a valid and reliable tool that focuses specifically on leadership for implementing EBP. The ILS measures the degree to which a leader is proactive, knowledgeable, supportive, and perseverant in their efforts to implement EBP (Aarons et al., 2014). The ILS includes 12 items scored on a scale of 0 (not at all) to 4 (a very great extent) (Aarons et al., 2014). There are two versions of the ILS: one allows staff to assess their supervisor/leader, and another for supervisors/leaders to assess themselves (Aarons et al., 2014). Both staff and supervisor versions have the same 12 statements, but differ in the referent of the items (the supervisor name being used in the staff version, which is replaced by "I" in the supervisor version).

The ILS has been validated in mental health clinics with clinicians (Cronbach's alpha 0.98), alcohol and drug use treatment agencies with counselors (Cronbach's alpha 0.97), and child welfare services with social workers and other allied health professionals (Cronbach's alpha 0.97) (Aarons et al., 2014; Aarons, Ehrhart, Torres, Finn, & Roesch, 2016; Finn, Torres, Ehrhart, Roesch, & Aarons, 2016). It has shown to be an efficient and pragmatic scale for capturing leadership behaviors with which to implement EBP (Aarons et al., 2016). However, these studies were all conducted in the English language in United States of America, and it is unclear how ILS items and constructs would be interpreted and understood in Chinese settings. Thus, the purpose of this study was to translate the ILS into Chinese and conduct linguistic validation of the translated ILS in a Chinese nursing context. We undertook this study as part of a larger project to evaluate a leadership intervention for nurse managers to implement and support evidence-based pain management practices in infants and children in a large acute care hospital in China.

2 Methods

This study followed a systematic process from the guideline developed by Sousa and Rojjanasrirat (2011), which was based on a comprehensive review of methodological approaches to translation, adaptation, and validation of instruments for cross-cultural research (Sousa & Rojjanasrirat, 2011).

2.1 Step 1: Forward Translation

The supervisor version and staff version of the original English (source language) ILS were combined and then translated independently into written Chinese (target language) by two bilingual translators who had experience living in China and Western countries (termed bicultural). One translator was a registered nurse with over five years experience working in both China and Canada, and was knowledgeable about health care terminology and leadership. The other was a certified translator from China who had lived in an English language country (Australia) for more than 10 years.

2.2 Step 2: Comparison of the Two Forward Translation Versions

A forward-translation committee compared the two translated ILS versions and examined discrepancies between words, sentences, and meanings. The committee was composed of five nursing scholars in China with different experiences and clinical backgrounds (see Table 1). The committee discussed discrepancies and evaluated whether the translation was: 1) conceptually understood in the Chinese nursing context (conceptual equivalence); 2) correctly reflected the intended English meaning (semantic equivalence); 3) accepted by targeted respondents (item equivalence); and 4) had wording, format, instruction and scaling that could be used in Chinese nursing context (operational equivalence). Questions that could not be resolved by the forward-translation committee were discussed with the tool developers in the United States (GAA, ME) until consensus was reached.

2.3 Step 3: Blind Backward Translation

The preliminary Chinese ILS (Post-Forward Translation) was then translated back into English by two different independent translators with qualifications similar to those of the forward translators. The backward translators had no previous exposure to the original English ILS.

2.4 Step 4: Comparison of the Two Backward Translation Versions

Similar to the forward translation comparisons, a backward translation committee was established to compare the backward translation versions and resolve discrepancies. This committee included one doctorate candidate who was bilingual in Chinese and English (JH), two nursing professors (WG, DH) and the ILS tool developers (GAA, ME). The committee

also compared the backward translated versions with the original English ILS, evaluating whether the back translation correctly reflected the intended meanings of the original. If the intended meaning of the back-translated ILS had been altered through the translation process, the related translated words underwent steps one to four again as outlined above. This cycle was repeated until all backward translation of the ILS were acceptable to the committee.

2.5 Step 5: Linguistic Validation

Linguistic validation evaluates how participants understand and respond to the instruments and assesses the clarity, intelligibility, appropriateness, and cultural relevance of the target language version to the target population (Mear I. & Giroudet C., 2012). It is strongly recommended as an important and necessary step before psychometric and statistical testing in local context (Egger-Rainer, 2018; Sousa & Rojjanasrirat, 2011). In this study, the cognitive interviewing methods, including think-aloud, verbal probing, and vignettes, were used to complete linguistic validation (see Table 2) (Nichols E. & Childs J.H., 2009; Willis, 2005).

A convenience sampling was used to recruit the participants, who were nursing staff and leaders having more than three years working experience in their current positions in China. Interviews were conducted in Chinese. Their audio recordings were transcribed by one research assistant (QL) and checked by another (YZ). Investigator triangulation was used to offer completeness in the data analysis. It involved an independent analysis of interviews by different investigators followed by research team discussions of findings (Tobin & Begley, 2004). Interview transcripts in Chinese were entered into NVivo (version 11 for Windows) qualitative software and analyzed for cognitive requirements and linguistic issues (QSR International, 2019, February 17th). NVivo is a computer software package to facilitate researchers to organize, store, categorize and display data during qualitative data analysis (QSR International, 2019, February 17th).

The analysis was conducted by a study investigator (JH) and two research assistants (QL, YZ), all of whom were bilingual and bicultural. Cognitive requirements included: 1) comprehension (encoding processes), 2) recall (retrieval processes), 3) inference (judgment

processes), 4) mapping (response processes), and 5) editing (processes used to edit answers). All the issues and relevant quotes in Chinese were translated to English (YZ), double-checked (JH, QL), and discussed by the research team and ILS developers.

After the first round of cognitive interview, the research team and ILS developers discussed the required revisions, and the revised ILS went through the forward and backward translation process again and was tested in a further cognitive interview round with different participants (Willis, 2005). This cycle was repeated until no further revisions were needed for linguistic validation.

2.6 Ethical Approval

The study was approved by the university and hospital Research Ethics Boards (H02-17-15). Permission to translate the ILS into Chinese was obtained from the developers of the original scale (GAA, ME).

3 Results

3.1 Translations and Committee Meetings

The translation process took 12 months to complete. In the forward and backward translation process, 24 translation issues were identified (see Table 3). Both forward and backward translations (with committee meetings) took two rounds to address all the translation issues and develop the preliminary translated ILS.

The most frequently identified translation issue was semantic equivalence (16 issues). Forward translation found seven issues with five English terms or phrases that were difficult to match in Chinese, including: “proactive” (conceptual term for Domain 1), “know what I am talking about” (scale item 6), “persevere” (scale item 10), “ups and downs” (scale item 10), and “carry on” (scale item 11). The forward translations of three English terms were found at risk for being misunderstood in a Chinese nursing context (six issues): “supervisor” (Title), “staff” (Title), and “department” (scale item 3). The backward translation committee identified four semantic equivalence issues that involved altering the meaning of the original ILS (scale items 3, 9, 10, 12).

One issue arose for the operational equivalency translation of the scale. The backward translation committee found the "extent" to which respondents would agree with each item in the scale to be confusing to understand. The middle rating of number "two" on the 0-4 Likert scale had been translated into "neutral" but was deemed not incrementally equivalent to the difference between number "one" (slight extent) and number "three" (great extent), altering the operational equivalency of the original ILS. Therefore, the "extent" was revised to be continuous to allow respondents to gradually increase their agreement with each statement.

All five conceptual equivalency issues occurred with the terms "implementation leadership" and "evidence-based practice." Leadership for implementing evidence-based practice specifically was translated to represent the concept of "implementation leadership." In order to help participants understand what "evidence-based practice" means, it was decided to test four examples in the cognitive interviews and add the most acceptable one to the scale.

Two item equivalence issues were identified in the forward translation committee meeting for items that were not originally considered difficult to translate. The first was the "Name of supervisor" for each item in the staff version of the ILS; and the second was "I am able to answer staff's questions about evidence-based practice" (scale item 5). These issues underwent further tests in the cognitive interviews to evaluate whether the translated terms were acceptable to Chinese nursing staff and leaders.

3.2 Cognitive Interview and Adaptation

Two rounds of cognitive interviews were conducted. Fourteen nurses were invited to participate in round one and twelve in round two of the cognitive interviews. Ten nurses participated in each round, corresponding to a 71% response rate in round one and 83% response rate in round two (see Table 4). Thirty-three linguistic issues were uncovered: 25 in the first round and eight in the second (see Table 5). The final Chinese ILS (Supervisor Version and Staff Version) in this study had seven significant adaptations to the original instrument, including three changes in the instruction, three changes in 12 items of the ILS, and one added investigator guide for modifying "department" as required (see Figure 1).

The issues most commonly identified by participants were linguistic issues regarding comprehension (25 issues). Three comprehension linguistic issues were caused by a lack of known Chinese words that appropriately reflect the intended meaning of two of ILS's English terms: "standards" (scale item 3) and "appreciate" (scale item 7). The research team and the ILS tool developers discussed the meaning of these two terms using the Oxford English Dictionary and then identified an equivalent Chinese wording based on the dictionary definitions (Oxford English dictionary, 2018). The equivalent Chinese meaning of "standards" was deemed "expectation or requirements for a level of quality or attainment," and that of "appreciate" was "recognize a person in a good way."

Six participants argued that the term "removed" in scale item 2 ("I have removed obstacles to the implementation of evidence-based practice") was a final and completed action, for which it was difficult to provide a gradual or continuous extent of agreement. Thus, the term "removed" was changed to "worked to minimize" in the Chinese version (see Adaptation One in Figure 1). Eight participants had trouble responding to scale item 12 ("I react to critical issues regarding the implementation of evidence-based practice by openly and effectively addressing the problem(s)") because it seemed to reference multiple behaviors and made it unclear to which of them they had to respond. They were unsure if they had to evaluate the extent to which the reaction was "open," "effective" or "addressed the problem(s)." Thus, this item was simplified to focus on the extent to which participants "address critical issue(s) regarding the implementation of evidence-based practice." (see Adaptation Two in Figure 1).

Understanding "evidence-based practice" was another concern for respondents. Four respondents were unable to define the concept correctly and six could not link it to what they did in the clinical setting. Thus, participants were provided with Sackett's (1996) definition of EBP to assist their understanding (Sackett et al., 1996). Four pre-determined examples of EBP were discussed and participants voted on their preferred example. Using normal saline instillation prior to endotracheal suctioning only if clinically indicated (i.e. not routinely) was

considered the most robust example of EBP in the Chinese nursing context, and was therefore included in the scale's instructions (see Adaptation Three in Figure 1).

Linguistic issues regarding recall or inference arose when respondents were asked to evaluate leadership behaviors as being "knowledgeable about evidence-based practice." Moreover, they had difficulties mapping their evaluation of these behaviors on a five-point Likert scale. Therefore, the instruction "All answers are based on your perception of leadership behavior. If you are not sure, please give the best answer you think" was added to the Chinese ILS, to help respondents understand the intent behind each question (see Adaptation Four in Figure 1).

In the original version, item 3 ("I have established clear department standards for the implementation of evidence-based practice") substituted the term "department" with "unit," if it was predetermined that "unit" would be understood more readily in the implementation context. A guide, with an example, was included in the Chinese ILS, to help investigators pre-determine and modify appropriate terms before administering the questionnaire (see Adaptation Five in Figure 1).

There was one linguistic issue with the staff version of the ILS. The study investigators had predetermined and filled in the "Name of Supervisor" prior to administration, but participants were concerned that naming the supervisor on the questionnaire would make respondents in China uncomfortable, which might affect their ability to complete the survey truthfully. Therefore, the "Name of Supervisor" item was replaced by the term "Your Supervisor," and a note was added in the instructions that read "Supervisor means the direct nursing leader supervising you most in clinical practice," to ensure respondents were aware of whom they were rating (see Adaptation Six and Seven in Figure 1).

All eight linguistic issues in the second round were considered to be minor. For example, one participant believed scale item 11 ("I carry on through the challenges of implementing evidence-based practice") could be misunderstood because "If there are too many challenges, I think it is not necessary to carry on, as many challenges might mean the evidence is not appropriate for my clinical setting." The team discussed incorporating further explanations to

the related question, such as adding "when the evidence is appropriate" to the end of the item. However, no alterations were made out of concern for the face validity of the original scale.

4 Discussion

The implementation of EBP in the Chinese nursing context is on the rise (Cheng, Feng, et al., 2017), and leadership is likely to play a significant role in the successes or failures of such implementation efforts (Gifford et al., 2018; Hu & Gifford, 2018). Thus, validated measures of implementation leadership are needed to determine the degree to which leadership affects EBP adoption, implementation, and sustainment. This paper presented the creation of a Chinese version of the ILS, which was translated and adapted from the original instrument through a systematic and rigorous process. The Chinese ILS has the potential to play an important role in research on the development of implementation leadership in Chinese nursing and provides a common language for investigators conducting research in China to investigate and understand leadership within implementation science.

High quality translation and linguistic validation are foundation for psychometric and statistical testing (Streiner, 2008). In this study, we followed the rigorous guideline for translation and linguistic validation (Sousa & Rojjanasrirat, 2011), detailing the issues of translation equivalency that arose and the strategies used to address them. In addition to increasing researchers' confidence in the quality of the Chinese ILS, the comprehensive reporting featured in this study can facilitate researchers to translate the ILS into other languages, or other measurement tools into Chinese (Acquadro, Conway, Hareendran, & Aaronson, 2008; Sousa & Rojjanasrirat, 2011). Findings will support the interpretation of further psychometric testing and contribute to understanding the scores of the Chinese ILS when used in future studies (Sousa & Rojjanasrirat, 2011; Streiner, 2008).

Holding meetings with the translation committee regarding the forward and backward translation processes helped identify any discrepancies and improved translation quality (Sousa & Rojjanasrirat, 2011). While most ILS items were deemed not difficult to translate in forward translation, the committee discovered multiple discrepancies between the first and second forward translations. After meticulous detailing each stage of the translation process,

the translation committee identified a number of incongruences between the original English and Chinese versions. We used multiple approaches to resolve these issues, which included discussing the differences of multiple translation options, using the Oxford English Dictionary to clarify English terms, and repeating the forward and backward translation process until the results were acceptable to the committee.

The primary challenge in translating and linguistically validating the ILS was finding the appropriate Chinese words and expressions for some of the items specific to implementation leadership. For example, the term "implementation leadership" was not known or well understood to the translators and participants and therefore they lacked the appropriate Chinese words. The research team and ILS developers discussed this issue and decided to use "sense-to-sense translation" rather than "word-to-word translation" to come up with a conceptual representation of what "implementation leadership" means in Chinese (Gentzler, 2001). In cases where one English term had different meanings, such as with the words "standards" and "appreciate", the Oxford English Dictionary provided an effective way to identify different meanings and clarify the intentions of the original ILS with the developers to confirm the translated term.

The discussions between the research team and the instrument developers over the course of the study were vital to the quality of the final Chinese ILS. Not only were the discussions useful in decision making in different translation and validation stages, but they helped determine when the forward and backward translation stages were complete and whether revisions or adaptations to the tool were necessary. The research team and instrument developers made a number of targeted and strategic changes based on judgments regarding the potential benefits and/or disadvantages of each revision, prioritizing the most unclear and important changes.

Although the concept of "evidence-based practice" was introduced in China in 2001, it remains unfamiliar to Chinese nursing leaders and staff (Cheng, Feng, et al., 2017). Most of the leaders and staff interviewed in our study learned about EBP in university courses or continuing education programs, but found it difficult to see its relevance to their clinical work.

To clarify the meaning of EBP, Sackett's definition (Sackett et al., 1996) along with an example of EBP that was identified by participants (not using normal saline instillations prior to endotracheal tube suctioning), were added to the Chinese ILS scale.

The modification to replace inserting the supervisor's name in the original ILS to the more referent of "your supervisor" in the Chinese version was considered an important linguistic change because respect for hierarchy and pursuit of harmony with others is strongly emphasized and embedded within Chinese culture (Cheng, Broome, et al., 2017a; Cheng, Feng, et al., 2017). This meant that identifying a supervisor's name on the Chinese ILS had the added risk of respondents answering favorably, increasing the risk of social desirability bias (Streiner, 2008). Respondents also felt that removing obstacles (item 2) was too finite but "minimizing obstacles" reflected the work reality more accurately and allowed respondents to gradually increase their extent of agreement. Regarding item 12, the ILS developers clarified that addressing critical issues was the core behavior the item was intended to address, and we therefore removed the extra English terms (such as "reacts to," "openly and effectively") that were redundant to the Chinese testers and risked misinterpreting the item.

4.1 Implication for nursing management

Given that the Chinese ILS is a brief measure of implementation leadership, it has little respondent burden and is therefore practical to use in nursing research settings where efficiency is paramount. The Chinese ILS can inform researchers' and nursing managers' understanding of how nursing leaders implement EBP in China. In addition, the Chinese ILS can be used as a tool to identify nursing leader, or to understand areas in need of development in existing leaders for implementing EBP. Nursing managers could use data that has been generated from the ILS to support leadership development strategies in their organizations to facilitate and support EBP implementation and sustainment.

4.2 Limitations

Despite its robustness, our study had limitations. First, the cognitive interviews were conducted in Shanghai, which has more educational resources on leadership and EBP than

other smaller cities in China. Therefore, participants in this study might have been more likely to be exposed to the concept of leadership and EBP that other samples. Second, the cognitive interviews were conducted and analyzed in Chinese, and the results with subsequent quotes were then translated to English. This meant that not every investigator had the chance to read the original transcripts, which may add bias. However, investigator triangulation was utilized to ensure the completeness of data analyses.

5 Conclusion

This study followed the rigorous and systematic guideline to translate the English language version of the ILS into Chinese and complete linguistic validation in Chinese nursing context. Having the original instrument developers involved in this process enhanced the robustness of the translation and linguistic validation. This study provided a deep understanding of using the ILS in the local Chinese context and emphasized the importance of understanding the different contexts where an instrument is developed and to be used. The Chinese ILS now requires further assessments in the local context using psychometric testing. Statistical testing is currently in progress and the psychometric characteristics of the Chinese ILS will be provided in a future report.

Figure Legends

Figure 1. The adaptations in the Chinese Implementation Leadership Scale

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Table 1. Forward Translation Committee

	Experience and Clinical Background	Department	Education	Working Years
1	Chief Director	Department of Nursing	Master Degree	33
2	Clinical Manager	Division of Internal Medicine	Master Degree	30
3	Bedside Nurse	Department of Orthopedics	Bachelor Degree	14
4	Nurse Educator	Department of Emergency	Doctoral Degree	13
5	Head Nurse and Nurse Researcher	Department of Ophthalmology and Otorhinolaryngology	Master Degree	6

Note:

* A clinical manager supervises head nurses across numerous clinical departments in one division

Table 2. Cognitive Interviewing Methods and Example Questions

Methods	Description	Example
Think-aloud Technique	Interviewers induced the subject to describe how and what he/she understood one target item or one specific element of the ILS.	1) Could you tell me what you think when you read this question/word? 2) What did you think when answering the question?
Verbal Probe	Following participants described his/her understanding, the interviewer probed for some specific information relevant to the target item or to the specific element of the ILS.	1) Comprehension/Interpretation Probe: What does the term "implementation leadership" mean to you? 2) Paraphrasing: Can you repeat the question I just asked in your own words? 3) Confidence Judgment: How sure are you that "you are knowledgeable about evidence-based practice?" 4) Recall Probe: How do you remember that "you persevere through ups and downs of implementing evidence-based practice?" 5) Specific Probe: Why do you think that "you support employee efforts to use evidence-based practice?" 6) General Probes: How did you arrive at that answer? Was that easy or hard to answer? Do you have any other comments regarding the questionnaire? Are these questions understandable?

		Do you have any better suggestions on the format?
Vignettes	Vignettes are short stories or descriptions of a hypothetical respondent that are used to investigate the participant's cognitive processing with respect to survey-relevant decisions	1) Could you give an example of implementation on evidence-based practice? 2) Do you think it is a good example of implementation on evidence-based practice?

Table 3. Translation Issues in Forward and Backward Translation

	Forward Translation, n (%)	Backward Translation, n (%)
Number of Round	**2** (Step 1-2,1-2)	**2** (Step 1-4, 1-4)
Rating Difficulty (22 items)		
Two Translator	3 (13.64)	1 (4.55)
One Translator	7 (31.81)	3 (13.64)
No Translator	12 (54.55)	18 (81.81)
Discrepancy (22 items)		
Strong	10 (45.46)	4 (18.18)
Slight	9 (40.91)	1 (4.55)
No	3 (13.63)	17 (77.27)
Category of translation issues	**19**	**5**
Conceptual Equivalence	5 (26.32)	0
Operational Equivalence	0	1 (20.00)
Semantic Equivalence	12 (63.16)	4 (80.00)
Item Equivalence	2 (10.53)	0

Note:

Conceptual equivalence: The translation is conceptually understood in the Chinese nursing context; Semantic equivalence: the translation is correctly reflected the intended English meaning; Item equivalence: the translation is accepted by targeted respondents; Operational equivalence: the translation has wording, format, instruction and scaling that could be used in Chinese nursing context.

Table 3. Demographic Characteristics of the Participants in Linguistic Validation

Characteristics	1st Round (n=10)	2nd Round (n=10)
Sex		
Female	10	8
Male	0	2
Education		
Doctoral Degree	0	1
Master Degree	1	2
Bachelor Degree	7	5
College Diploma	2	2
Position		
Senior Nurse Leader	1	1
Clinical Manager	1	1
Head Nurse	2	3
Nurse Educator	1	1
Care Facilitator	1	2
Bedside Nurse	4	2
Working Years		
4~10	2	4
11~20	6	4
>20	2	2

Table 5. Linguistic Issues in Cognitive Interview

	First Round, N (%)	Second Round, N (%)
Response rate of participants	10/14 (71.43)	10/12 (83.33)
Length range	27min-61min	16min-47min
Words range	4610-11318	3177-7302
Category of linguistic issues	**25**	**8**
Comprehension	14 (56.00)	7 (87.50)
Recall	5 (20.00)	0
Inference	2 (8.00)	1 (12.50)
Mapping	3 (12.00)	0
Editing	1 (4.00)	0

Note:

Comprehension: This reflects the encoding process; Recall: This captures the retrieval process; Inference: This reflects the judgment process; Mapping, which reflects the response process; Editing, which reflects the process of respondents' editing their answers

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