Instrument Adaptation and Modification for Nursing Research

Presented by

Assoc. Prof. Dr.Sujitra Tiansawad

Adaptation and Modification of Research Instruments

- Regarding issue in instrumentation, two terms "adaptation" and "modification" are sometime used interchangeably.
- However, a term of "adaptation" has been basically used as an integral part of the translation process for achieving "semantic equivalence" in cross-cultural research (Stewart, Thrasher, Goldberg, & Shea, 2012)
- "Modification" is applied when researchers establish a new measure from an existing measure for use with population who substantially differs from the original target group.

Situations Where Adaptation is Required

Goal of Adaptation

Instrument Adaptation

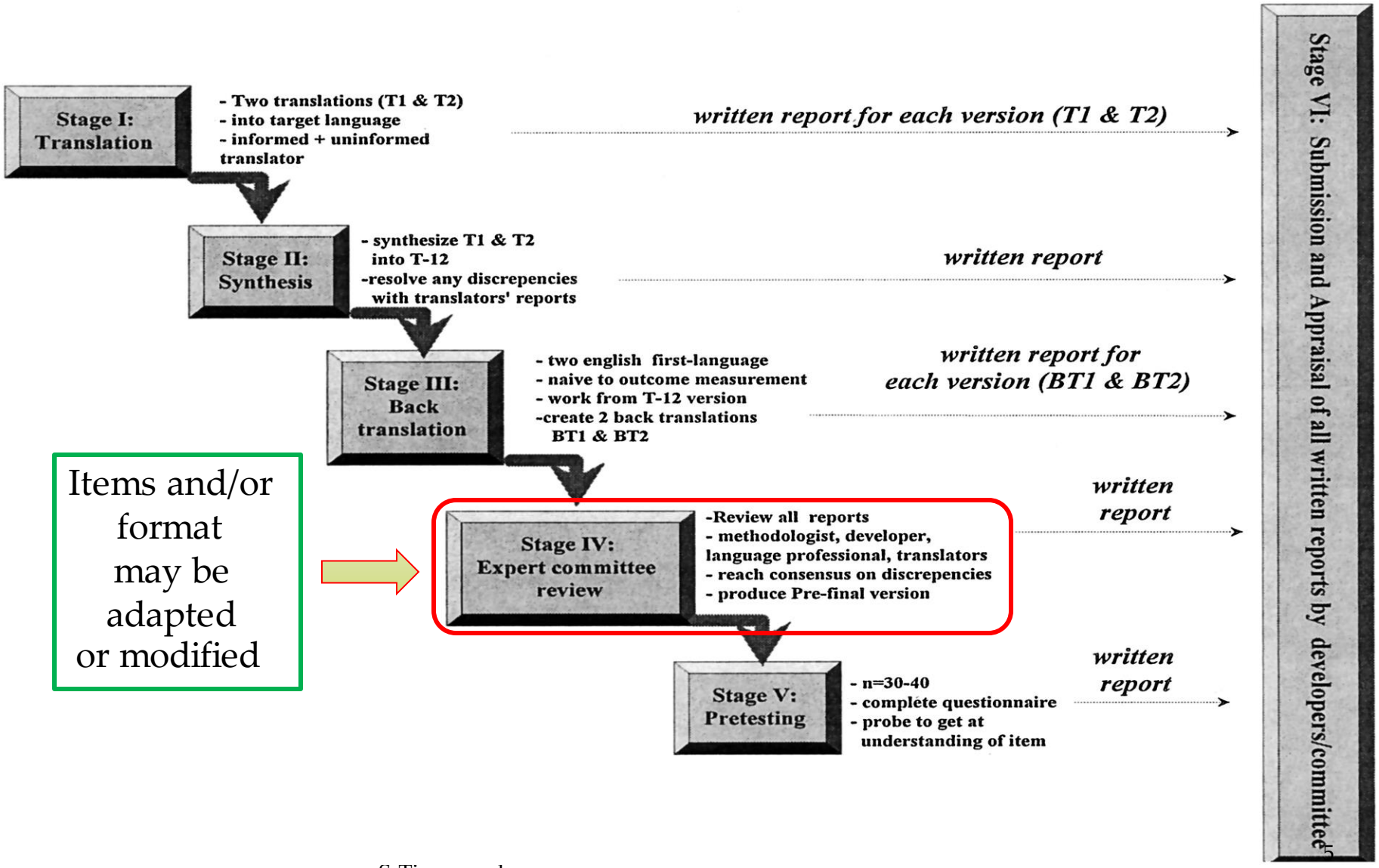
Guideline for Adaptation

Testing of Psychometric Properties of Adapted Instrument

Five Situations Where Some Forms of Cross-cultural Adaptation is Required (Beaton et al, 2000 adapted from Guillemin et al., 1993)

Wanting to use a questionnaire in a new population described as follows:		Results in a change in.....			Adaptation Required	
		Culture	Language	Country of use	Translation	Cultural adaptation
A	Use in same population. No change in culture, language or country from source	---	---	---	---	---
B	Use in established immigrants in source country	✓	---	---	---	✓
C	Use in other country, same language	✓	---	✓	---	✓
D	Use in new immigrants, not English speaking, but in same source country	✓	✓	---	✓	✓
E	Use in another country and another language.	✓	✓	✓	✓	✓

Guidelines for the Cross-Cultural Adaptation Process (Beaton et al., 2000)



Goal of Cultural Adaptation

- Item will be adapted or modified by the expert committee to achieve equivalence between the original and target versions in four areas:
  1. Semantic equivalence
  2. Idiomatic equivalence
  3. Experiential equivalence
  4. Conceptual equivalence
- The adapted, pre-final version will be pre-tested with target subjects, ideally between 30-40 persons.
- The pre-test process will provide information for some quality measure in ***content validity***.

Beaton et al. (2000)

Testing for Psychometric Properties of the Adapted Measures

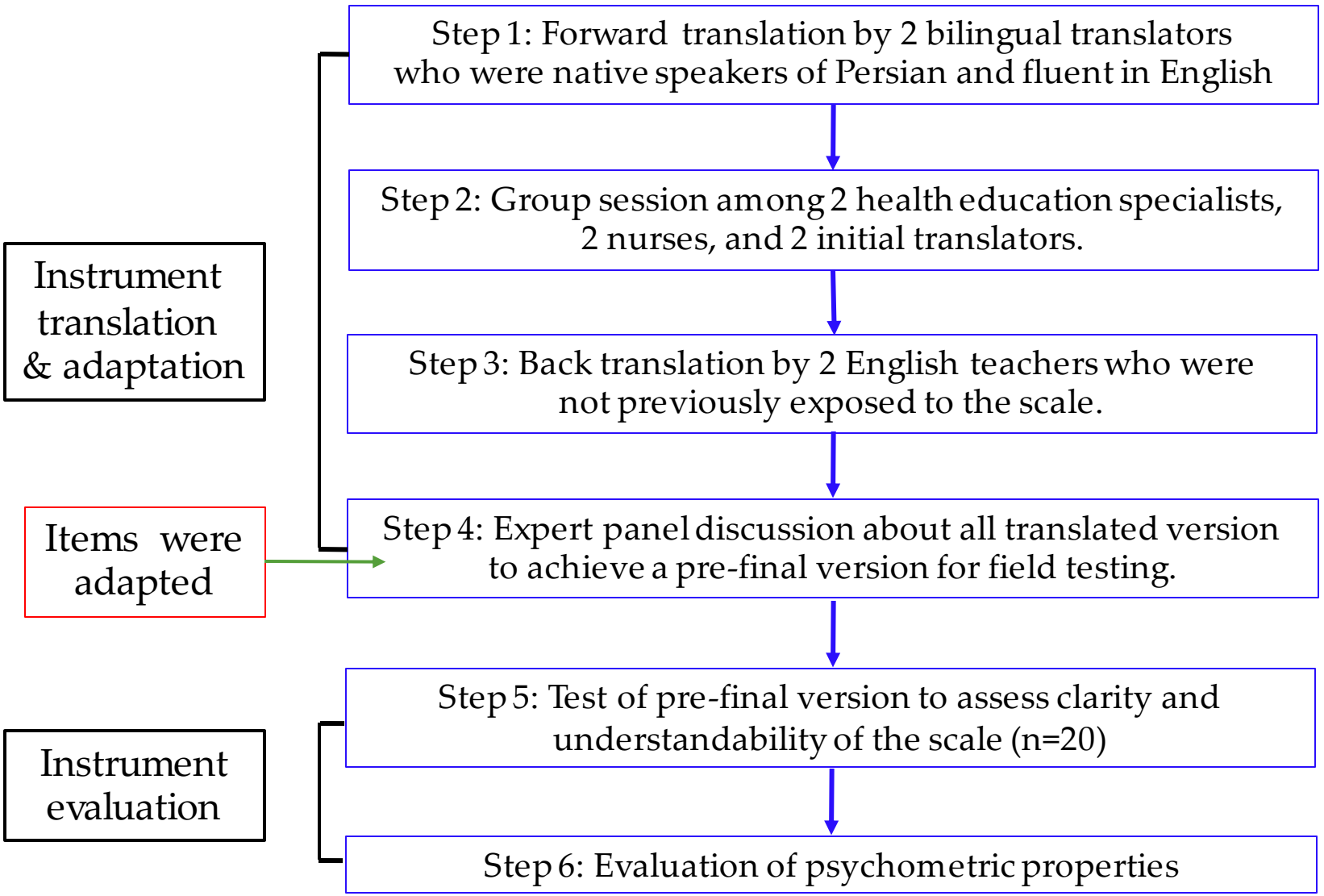
- Additional testing for psychometric properties of the adapted measure is highly recommended.
- The adapted measure should retain both the item-level characteristics (e.g. item-to-scale correlation); and score-level characteristics of reliability, construct validity, and responsiveness.
- It is possible to test reliability and validity in the pretesting stage.
- However, such testings often need larger sample sizes.

Beaton et al. (2000)

Example of Cultural Adaptation of a Measure (1)

- Saffari et al. (2017) translated and adapted the Jalowiec Coping Scale (JCS) for measuring coping strategies in Iranian women with multiple sclerosis (MS).
- The JCS was developed based on Lazarus & Folkman's stress theory to assess problem- and emotion-focused coping.
- They translated and adapted the JCS following the guidelines provided by Beaton et al. (2000)

Example of Cultural Adaptation of a Measure (2)



Example of Cultural Adaptation of a Measure (3)

- Evaluation of psychometric properties
  - Reliability
    - Internal consistency (n = 306)
    - Test-retest reliability (n = 20)
  - Validity: (n = 306)
    - Construct validity (factor analysis)
    - Convergent and discriminant validity (correlations between items and subscales)
    - Criterion-related validity (correlation between the whole scale and its subscales with the perceived stress scale)

Saffari et al. (2017)

Reasons for Considering Instrument Modification

Types of Modifications

Instrument Modification

Guideline for Modification

Levels of Modifications

Testing of Psychometric Properties of Modified Instrument

Reasons for Considering Modification to a Measure (1)

- In health care research, the most common reason for modification of a measure is that the *population group(s)* being studied *differs substantially* from the one in which the original measure was developed.
- Motivation for modifying measures is the concern that *racial/ethnic or generational differences* might adversely affect the *meaning*, *reliability*, or *validity* of the original measure.

Stewart, Thrasher, Goldberg, & Shea (2012)

Reasons for Considering Modification to a Measure (2)

- Some key reasons why measures developed for use in one group may not be appropriate for a diverse group include:
  1. A concept or dimension that is relevant to a new (or diverse) group may be missing from a measure;
  2. The new group may define or perceive concept or items differently;
  3. Item terms/phrases included in a measure may be misinterpreted by the new group due to unfamiliar language, idioms, or colloquialisms.

Stewart et al., (2012)

Reasons for Considering Modification to a Measure (3)

- Some key reasons (cont'd):
  4. The new group may use different style of responding;
  5. Question format and response task may not be appropriate (e.g. too complex or to difficult) for the new group;
  6. The study context and mode of data collection my differ from that in which the original measure was developed.

Stewart et al., (2012)

Guideline for Modification of the Existing Measures (1)

- Although number of studies conducting modification of research instruments have increased during the last decade, there is little guideline on how to modify the instruments.
- The existing guidelines mainly focus on "***cultural adaptations***" of instruments for cross-cultural studies.
- Recently, Stewart and colleagues (2012) proposed a framework for guiding modification of instruments to improve reliability and validity of health care research involving diverse populations.

Guideline for Modification of the Existing Measures (2)

- Stewart et al's framework provides information regarding
  - sources of information to be used,
  - types of modifications,
  - assessment of the modified instrument, and
  - recommendation for reporting results of modification.

Stewart et al., (2012)

Sources of Information to be Used for Instrument Modification

- Qualitative research on the concept or measures. Two most common methods for exploring concepts or measures in diverse population are
  - Cognitive interview pretest
    - Two major types of cognitive interviewing method are *think-aloud interviewing* and *verbal probing technique*. (Willis, 1999)
  - Focus group.
- Literature reviews
- Researcher experience and knowledge

Stewart et al., (2012)

Types of Modifications (1)

- Instrument modifications are classified into 3 broad categories: Content, context, and format and presentation.

1. Content modifications:

  - Modifications can be made at the level of *dimensions*, *item stems*, or *response options*.
  - All of them can be *added*, *dropped*, *modified*, or *replaced*.
  - Dimension or items may be *added* when addition components are found to be needed,.
  - Dimension or items may be *dropped* when either if found to be unsuitable for a particular group.
  - Items may be *replaced* when an item is unsuitable and comparable alternative were suggested by respondents during cognitive interviewing.

Types of Modifications (2)

- Three broad categories of modifications (cont'd):

  2. Context modifications:

  - Modifications are made primarily due to study-specific differences.
  - Examples of the modifications may be changing referent from 'doctors' to 'nurses', changing instructions for a self-administered measure, and replacing the term 'doctor and nurse' with 'health care provider'.

Types of Modifications (3)

3. Format and presentation modifications:

- Modifications include changes in appearance or the way of responding to
  - Reduce errors in responding,
  - Reduce respondent burden,
  - Enhance readability or
  - Enhance motivation to respondents to complete questionnaire.
- Examples are simplifying instructions and increasing the font size, reformatting response options, and reformatting the questionnaires for consistency.

Stewart et al., (2012)

Three-level Classification System of Modifications

1. ***Minor modifications:*** Content or meaning of the instrument is not changed or modified.
2. ***Moderate modifications:*** Meaning of the items may be changed or modified but in small, subtle ways.
3. ***Substantial modifications:*** The modifications are extensive and almost always change or modify the content or meaning of the instrument. These more aggressive modifications might include dropping items and changes in item wording or response options.

Coons et al. (2009) as cited in Stewart et al., (2012)

Assessment of the Modified Measures

Modification Level	Recommendation for Assessment
Minor modifications	Small-scale pretest would be adequate to examine that the changes are working as expected.
Moderate modifications	A more thorough assessment of the psychometric adequacy of the measure or the extent to which its properties are similar to the original measure should be undertaken.
Substantial modifications	A full-scale psychometric assessment is probably required.

Stewart et al., (2012)

Psychometric Assessment of the Measures

- Validations:
  - Content validity
  - Construct validity***
    - Factor analysis
    - Hypothesis testing
    - Known-groups approach
    - Multitrait-multimethod approach; Convergent, Divergent V.
  - Criterion validity
    - Concurrent validity
    - Predictive validity
- Reliability estimation
  - Internal consistency
  - Stability: Test-retest, Intra-rater reliability
  - Inter-rater reliability

Tiansawad (2019)

Instrument Modification: Example 1 (1)

- Templeton & Coates (2001) modified the Toronto Informational Needs Questionnaire – Breast cancer version (TINQ-BC) for measuring the informational needs of men with prostate cancer.
- The TINQ-BC comprised of 52-item, 5-point rating scale measuring 5 subsections of informational needs: disease, treatment, investigative tests, psychosocial, and physical needs.

Instrument Modification: Example 1 (2)

- It should be noted that most items were written with *general*, *not too specific*, wordings.
- Examples of items (some might be revised ones):
  - How I will feel during/after investigative tests
  - How to prepare for my treatment
  - Who to talk to about alternative treatments
  - If I have side effects how to deal with them
  - What to do if I feel uncomfortable in social situation
  - If I can continue with my usual sports/hobbies

Instrument Modification: Example 1 (3)

- Thus, they could be applied to patients with other types of cancer.
- Templeton & Coates (2001) used 5 steps that are similar to development processes of a new instrument:

1. Omitting irrelevant items,
2. Content validity review,
3. Pilot study,
4. Construct validation, and
5. Reliability estimation.

Instrument Modification: Example 1 (4)

Step 1: 6 items that related directly to patients with breast cancer were omitted, 46 items were retained.

Examples of omitted items:

"If I can wear a brassiere"

"When to have a mammogram"

Step 2: A panel of 9 experts with different expertise reviewed the measure for *content validity* and suggested to omit some irrelevant or repetitive items and to revise wordings of some items.

Then 10 more items were omitted, 36 items were retained.

Instrument Modification: Example 1 (5)

Step 3: A pilot study was conducted with 6 men with prostate cancer to assess clarity, time spent, and feeling toward data collection procedure.

- Each of them was asked to complete the measure.
- Clarity of items, subjects' feeling, and time use were assess.
- A further item was deleted as it was considered inappropriate by 4 of 6 subjects.

Instrument Modification: Example 1 (6)

Step 4: Confirmatory factor analysis was performed with 90 subjects to test construct validity of the 35-item scale.

- Five subscales were outlined based on the original scale.
- Six items with factor loading < .30 were deleted.
- The revised 29-item scale was found to be an adequate fit of the structure proposed by developers of the original scale, thus enhancing validity of the scale.

Instrument Modification: Example 1 (7)

Step 5: Cronbach's alpha coefficients were calculated to estimate internal consistency reliability.

- The value of the total scale was .92 whereas the values of subscales ranged from .73 to .85

- The developers concluded that this modified scale demonstrated *content* and *construct validity*, and satisfactory *internal consistency reliability*.

Instrument Modification: Example 2 (1)

- Lee and colleagues (2018) developed a "culturally sensitive" instrument measuring "*cultural beliefs*" about colorectal cancer screening for Korean Americans.
- They translated the English version of the instruments into Korean, adapted, modified, and validated the translated version using 5 steps.
- Three existing cultural beliefs instruments were used for this instrument adaptation and modification.

Instrument Modification: Example 2 (2)

- The authors adapted 3 out of 4 variables/sections (*physical space, health temporal orientation* and *personal control;* not cancer fatalism) from Russell et al's cultural beliefs and modified items measuring *physical space, and health temporal orientation.*
- They added items adapted from Powe's fatalism scale to measure *cancer fatalism*.
- They also added items adapted from Shen et al's fatalism scale to measure *health fatalism.*
- The modified scale consists of 5 sections: *physical space, health temporal orientation, personal control, cancer fatalism* and *health fatalism.*

Instrument Modification: Example 2 (3)

Use committee approach

3 bilingual translators

Step 1: Translate initial scales from English into Korean
(Cultural Belief Scales, Korean version 1)

Instrument adaptation, modification

Step 2: Individual interview using cognitive interviewing (N = 26) with Korean version 1 scales
(Korean-1 scales were revised based of findings: Korean version 2 scales)

Calculate I-CVI & S-CVI

Step 3: Expert reviews (N = 3) of Korean version 2 scales
(Korean-2 scales were revised based of findings: Korean version 3 scales)

Instrument validation

Step 4: Pilot test (N = 11) Korean version 3 scales
(Korean-3 scales were revised based of findings: Korean version 4 scales)

Step 5: Cross-sectional survey (N = 202) with final Korean-4 scales
(Final Korean version scales were developed

Instrument Modification: Example 2 (4)

- Psychometric assessment of the modified Cultural Belief Scales
  - Content validation by 3 Korean content experts (Step 3)
  - Construct validation: Both exploratory and confirmatory factor analysis (Step 5)
  - Internal consistency reliability

Recommendations for Reporting Results of Modifications (1)

- Stewart et al (2012) recommended two approaches of reporting results of modifications:
  1. Reporting the entire process of the modification and assessment in a separate methods paper.
  2. Report details of the modification and assessment process within the methods section of a substantive paper.

Recommendations for Reporting Results of Modifications (2)

- At a minimum, publishing paper should report
  1. features of the original instrument that required modification;
  2. source of information on the basis for modifications;
  3. specific type of modification made; and
  4. how the modified instrument was tested for psychometric properties and results.

Stewart et al. (2012)

Selecting and Evaluating the Existing Instruments

- Conceptual/Theoretical basis*: concept, theoretical and operational definitions, dimension
- Measurement framework: norm-referenced or criterion-referenced
- Target population
- Administration
- Psychometric properties*: validity, reliability, and other specific characteristics

Problems of Modification of Existing Instruments (1)

According to my personal experiences:

- Some existing instruments employed for modification have *inadequate evidence* of psychometric properties especially validity (only content validity was reported).
- Since several nursing research instruments have been developed to measure specific attributes in a very specific context, modification of the instrument involves changes of *almost all contents*.

Problems of Modification of Existing Instruments (2)

- An example is the modification of a measure of preventive behaviors (or self-care) of COPD patients to a measure of preventive behaviors (or self-care) of renal failure patients.
- Since self-care items are specific statements that are relevant to patients with specific disease, the modification of this measure will yield a new measure with different contents.

Problems of Modification of Existing Instruments (3)

- In addition, some researchers have modified existing instruments without consideration of their *level of specificity*.
- Thus, existing instruments designed for measuring *global behaviors or attributes* were inappropriately modified for measuring behaviors or attributes in a specific context.
- An example is the modifications of Jalowiec Coping scale for use among women with breast tumor and women with abnormal pap-smear.

Example of Inappropriate Modification of an Existing Instrument

Items of Original Scale	Translated and Modified Items
Think through different ways to solve the problem or handle the situation. (P)	คิดหาทางออกหลายๆ วิธีที่ทำให้ก้อนที่เต้านมหายไป
Do nothing in the hope that the situation will improve or that the problem will take of itself. (A)	ไม่ทำอะไรเลย โดยหวังว่าก้อนจะหายไปเอง
Try to draw on past experience to help you handle the situation. (P)	นำประสบการณ์การรักษาก้อนที่เต้านมหรือประสบการณ์อื่นๆที่เกี่ยวข้องของตนเองหรือผู้อื่นมาใช้

Summary (1)

- Adaptations of the existing instruments have been performed mostly for cultural appropriateness.
- Modifications are needed when the population being studied differs substantially from the one in which the original instrument was developed.
- Researchers should thoroughly examine the original instruments in terms of concept being measured, level of specificity, development process, and evidence of validity and reliability before deciding to adapt and/or modify them.

Summary (2)

- An original instrument to be used for adaptation or modification must measure the *same concept*, *be well-developed* and *have evidence to support psychometric properties*.
- Both adapted and modified measures must be evaluated for *psychometric properties* as recommended.

QUESTION

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ANSWERS

Thank You for Your Attention